









# Street Railway Review

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WINDSOR & KENFIELD PUBLISHING COMPANY,  
**OLD COLONY BUILDING, - - CHICAGO.**

TELEPHONE, HARRISON 754.

Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

FOREIGN EDITION (QUARTERLY) - - ONE DOLLAR.

*Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.*

**H. H. WINDSOR,**  
 Editor.

**P. 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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7.                      JANUARY 15, 1897.                      NO. 1

As ANNOUNCED last month, we have inaugurated a special FOREIGN EDITION of the STREET RAILWAY REVIEW, which is being mailed to every street railway in the world. It contains a large amount of matter specially prepared for foreign readers, and cannot fail to furnish most valuable information to the hundreds of foreign roads now seriously contemplating a change to electricity. As the United States leads the world in this industry, foreigners naturally look to it as the fountain head, and already large amounts of supplies and machinery have been purchased here and scattered throughout the world. It will be the special province of our FOREIGN EDITION to furnish not only a description of our best methods in operation, but to acquaint every possible buyer in the world with our American manufacturers. Letters are pouring in from abroad expressing the greatest satisfaction at our new departure.

The several fires of the month call attention to the necessity for frequent reminders to barn foremen and others to maintain strict discipline in these matters. At Janesville a spark from the generator fell upon waste, which ignited and spread to oil cans. To increase the excitement a stream of water struck the cylinder head, which blew out and maimed three people.

PROFESSIONAL agitators undertook to work up a strike among the 4,500 men on the West End road, Boston. Recognition of the union was the principal and only important issue. About 800 of the men refused to abide by the agreement of their committee with President Little to defer action on the demands one week from December 23. The effort was to force the demands by a tie-up on Christmas and the big shopping day previous. It was a dismal failure, as it deserved to be, and at no time amounted to a complete abandonment of car service an any line.

ELECTRICITY for use on suburban steam roads bids fair to make decided progress this year. The experiments and experience of the N. Y., N. H. & H. R. R. have decided its management on further electric installation; the C. H. & D. will also do some trolleying. In Chicago the C. & N. P. will spend over a million. If the steam roads are wise and progressive they will not only use electricity largely for their suburban service, on account of its advantages and economies; but also as the most effective means of preventing electrical competition by furnishing it themselves. Three cars in one hour serves the people vastly better than three cars in one train once an hour. Steam cannot afford frequent service; electricity can, and very soon will.

As PREDICTED in these columns, the hostile and selfish attitude of the steam roads in Connecticut, which has so effectually blocked interurban construction in that state, has resulted in the people waking up and taking action. The recent election worked radical changes in the state legislature, and it is conceded the trolley interests are in the majority. Judge Hall, vice-president of the New Haven system, in a recent interview shows the change of heart induced by the election returns, and now announces the steam roads admit a sphere for electric roads, but still denounces any proposition to parallel the former. The electric interests will surely ask a repeal of the general law against parallels. The steam roads will, of course, fight it bitterly, but we believe unsuccessfully.

On December 14, 1896, the Chicago city council passed an ordinance reducing the price of car fares from five to four cents. There was no public demand for the change. Even the press had not urged the measure. It originated in the council, and antedating Christmas only a few days as it did, had every appearance of a sand-bagging scheme. The four cent fare was to take effect on January 4, 1897. One week later the same council meekly reconsidered the ordinance and killed it. Their bluff did not work, but the 20,000 street railway employes in Chicago, who were promised a reduction in wages in the ratio of 5 to 4, did. It was a humiliating spectacle, and a very bitter pill to take, but these great reformers who want to be re-elected the coming spring suddenly forgot all about their alleged duties to the 1,700,000 other citizens of Chicago, pulled in their horns and marched down the hill they had



ascended with so much flourish of trumpets one week previous. Great is the glory of the Chicago alderman.

THE limited speed ordinance has been tested as far as the appellate division of the Supreme court in Brooklyn. In the justice court the city won, but was reversed in the county court. The company lost in the appellate court. The ordinance called for a speed not in excess of six and eight miles per hour in certain districts. Police-men testified to a speed of nearly fourteen miles. We have commented on the subject of limited speed so often it is hardly necessary to refer to it again. At the same time we find no occasion as the history of electric cars grow into years to alter our policy. We maintain that companies are the best judges of what is a suitable and safe speed, which is subject to local conditions. In certain hours of certain days the six miles allowed in the ordinance might be positively dangerous at certain places, while at other times twice that speed would be perfectly safe over the same rails. Where there is a clear track there can be no objection to a good speed, and where pedestrians and traffic crowd the street greater caution is necessary. No company is deliberately going to work to smash wagons and kill people, and bankrupt itself just to see the cars run fast. Speed limitations are unwise and should be unnecessary.

The REVIEW takes pleasure in announcing a movement which is one of the most important in a long time, to certain departments of street railway work. The need of a better system of accounts; but especially a standardizing, has long been felt, but has now reached a point where definite action is actually necessary. It is work which cannot successfully be done in the sessions of the American Street Railway Association, partly for lack of time, but chiefly on account of the nature of the work. We publish on another page a call for a meeting to form an Accountants' Association. The initial meeting will be held in Cleveland on March 23 and 24, at which organization will be made. Interesting papers will be read and discussed by some of the best authorities in street railway work. Forms, systems of distribution, fare accounting, are among the subjects. Committees will be appointed to report at the first regular meeting, which it is intended to hold at the same time and place as the American Street Railway Association. While the organization is a distinct one, and the nature of its work demands a separate meeting room from that occupied by the American, whose time is already more than fully occupied with operating subjects, the new organization will be in perfect harmony and prove a most valuable adjunct. The history of steam road convention work leaves no doubt as to the necessity and wisdom of this course. It takes nothing out of or away from the American Association, for the work it has to do has never been done. The large number of leading accounting officers who have urged the formation of the new work is more than a guarantee as to its need and success. The meeting point is central, the meeting will be interesting,

practical and helpful, and every company which can possibly spare its secretary, auditor or whoever is the man in charge of accounts, should not allow the opportunity to pass without representation.

## FOUR-CENT FARE FIASCO.

Business was dull in the Chicago city council. The big corporations which were accustomed to come forward with a smiling countenance and seek franchises were in seclusion. They did not seem to want anything. Christmas was coming on and the situation grew serious. If the companies did not want anything, they should not be forgotten, even if it happened to be something they didn't want.

In street railway circles things were quiet. Nothing had been heard of the "no seat—no fare" in many moons. So far as any one could discern from the usual sources of information, the dear public were joggling along in a very contented frame of mind. Certainly there was no public demand for a reduction in the price of car fares. By the time a man had ridden 12 to 15 miles with two or three transfers, for five cents, he was glad enough to be allowed to get off, or pay another fare to retain his self respect. The papers had not even been howling about a reduction in fares. This, however, made no difference, and in the aldermanic star chamber it was decided on as the surest, swiftest arrow with which to pierce the armor of the enemy. Therefore, like a stroke of lightning came the passage of an ordinance, on December 14, reducing car fares from five to four cents, the same to take effect on January 4.

But to the great surprise of the solons, the companies made no remonstrance. They did not send deputations to sue for peace, or mourn upon the streets and ask the public to help fight their battles. What they did do was to inform the 20,000 street railway employes, who are the best paid in this country, that the revenue of the companies would suffer a reduction of one-fifth on January 4, and that wages would likewise be reduced in the same proportion. As the wage item is over one-half the gross earnings, this was about an equal division of the proposed loss between the company and its men.

But while the companies appeared resigned to the new order of things, the men did not. Mass meetings were held after midnight by the men, and when the situation was understood the air grew hazy. The men were accustomed to good wages, and somehow failed to take kindly to the great reform. They did not blame the companies, who were to share an equal loss with them, but they did express themselves in no uncertain language as to the aldermen who were the cause of the disaster. And the boys "got a move" on themselves. As many as 500 or 600 in one body would march to the home of their alderman, and at any time between 2 and 4 o'clock in the morning get him out of bed to explain to his admiring constituents where he was at. And the boys had a way of making themselves understood. They lost no time in stating the case before the house, and they did it in terms that left no room for doubt. Alderman after alderman was routed out, even the mayor was waited on Sunday afternoon by several hundred. It began to look as if an entire new council would be elected this spring. So the city fathers hastened to accept light on the subject, and in just one week had repealed the four-cent fare, which no one asked for, and nobody wants.

The little bluff didn't win.

JOHN M. ROACH.

For a quarter of a century John M. Roach has devoted his time and thought to railway interests in Chicago. The reward for his faithfulness has been one promotion after another and added responsibility from year to year. After futile efforts to make a fortune in the far west, he came to Chicago in 1872 and began his street railway career by collecting fares on the North Chicago City Railroad. President Turner took notice of the ambitious young man and soon gave him the position of cashier, taking money at the barn from the conductors. He next performed the duties of purchasing agent in an acceptable manner. From this on, his rise was rapid, changes of administration not affecting his progress. He has been general manager of the north side system and the outside electric lines. One more responsible position has been added by his recent election as general manager of the West Chicago Street Railroad, thus placing the entire Yerkes railway interests under his management. The honor has been honestly earned and his many friends will take unusual pleasure in congratulating him on deserved recognition.



J. M. ROACH.

NIAGARA FALLS HYDRAULIC POWER & MANUFACTURING COMPANY.

The new power plant of the Niagara Falls Hydraulic Power & Manufacturing Company is in operation and is recognized as one of the great works in the city so rich in power facilities and developments. The erection of the plant was under the immediate supervision of Wallace C. Johnson, chief engineer of the company.

The hydraulic canal takes water from the upper Niagara river at about the lowest practical point, there being a descent of 50 feet from the entrance of the canal to the falls. The canal is 4,400 feet long, 70 feet wide, with an average depth of 11 feet, opening at its lower end into a basin parallel to the bank, 400 by 70 feet. For the installation here described a canal 16 feet wide and 20 feet deep, runs 275 feet to a forebay 180 by 30 feet and 22 feet deep. This forebay lies between the canal basin and the edge of the high bank, and over it is built the gate house, which covers the gates controlling the admission of water to the penstocks. There are also two waste gates, each 20 feet deep by 8 feet wide, by which the canal may be cleaned at any time. For handling the gates, Mr. Johnson designed apparatus in which he takes especial pride. Before each pair of gates are two cast iron cylinders about 8 feet high, with pistons. The two ends of each cylinder are connected to a pump, driven by an electric motor, by which the oil with which the cylinders are filled is pumped into either end at will, forcing the pistons to move accordingly. The piston rods are connected by an iron beam on which are hoops taking hold of pins on the gates. With this apparatus a pressure of 100,000 pounds can be exerted.

The penstock proceeds horizontally for 25 feet to clear the



NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY.

edge of the bank and then descends for 135 feet to a solid foundation on the lower stratum of Niagara limestone (see illustration). From here it extends at an angle of 45 degrees to the power house building, under the floor of which it runs for 70 feet. The diameter of this portion is 10 feet. The penstock is of steel plate,  $\frac{5}{16}$  inch at the top and  $\frac{1}{8}$  inch at the bottom. The tail race is formed by two masonry walls 17½ feet apart.

The power house is of stone, 100 feet wide, 60 feet (to be extended to 180 feet, the work being now in progress) long and 30 feet from the floor to the eaves. The roof is supported by steel trusses, leaving the floor free from posts. The interior is served by a 26-ton traveling crane. There are now installed four water wheels of the James Leffel & Co. Niagara type, each taking water from a separate 5-foot pipe leading from the penstock. Each wheel weighs about 50 tons and stands on heavy double steel beams spanning the tailrace. The horizontal portion of the penstock is suspended from these beams by forty-eight 1½-inch square iron rods.

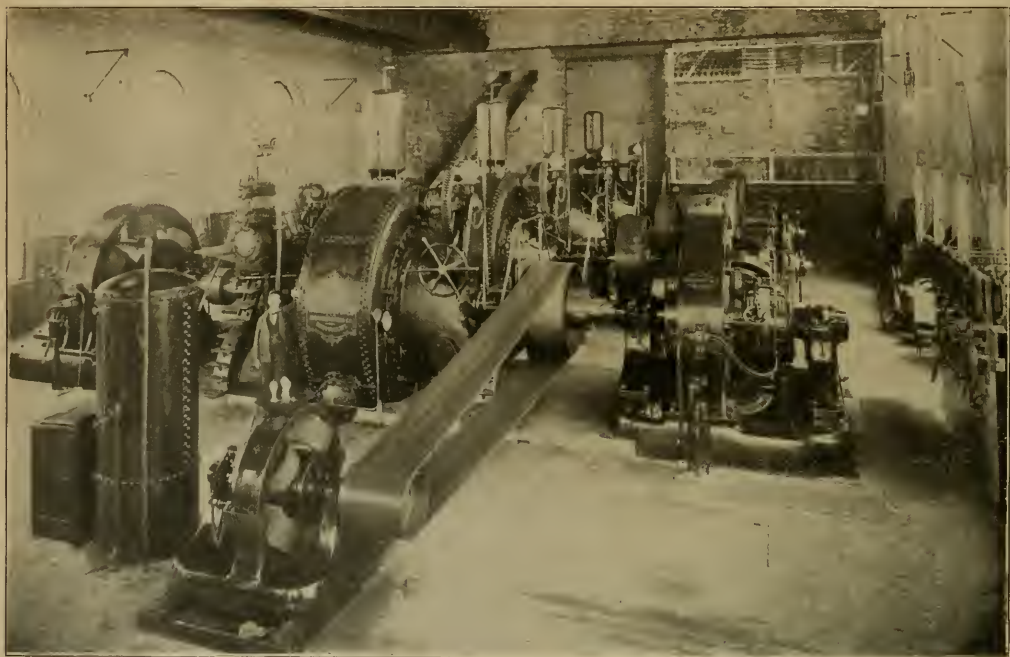
The wheel consists first of a vertical, circular casing of ¾-inch steel plate, double riveted to cast iron curved heads 3½ inches thick. To this case the water is admitted from the supply pipe underneath, flowing upward and surrounding the guide case, being admitted to the runner through oscillating guides which constitute the gates. The runners of the wheels are 74 inches in diameter and made of iron and bronze, the shell comprising the buckets being of bronze, and secured to an iron center. The buckets have sharp dividing diaphragms or ridges so that the entering water is split and consequently there is no end pressure on the shaft.

The gates are of the James Leffel pattern and operated by the double-ring arrangement which is controlled by a hand wheel easily operated by one person. To the hand wheel shaft is attached an automatic mechanical governor made by the Lombard Water Wheel Governor Company, of Boston. The discharge is lateral into receiving pipes, to which are connected draft pipes extending downward for 20 feet. The total head of water is about 210 feet.

Three of the turbines are direct connected by flexible couplings, each to two 560-kilowatt electrolytic Westinghouse generators, running at 250 r.p.m. and generating 2,000 amperes at 280 volts. The current from these machines is transmitted on two aluminum cables of 250 wires each, to the aluminum factory of the Pittsburgh Reduction Company.

The fourth turbine is rigidly connected to two 550-kilowatt General Electric generators and runs at 300 revolutions per minute. The generators are compound wound for railway service and are to be run in multiple. Since the completion of the plant the company has supplied the Niagara Falls & Lewiston Railroad, better known as the Gorge road, and the Lewiston & Youngstown Railway with power. For this latter service the booster (shown in our illustration) is used. The service it gives is good; the voltage at Lewiston is 580 volts, and at Youngstown, 15 miles distant, about 507.

The superintendent of the power company is F. G. Lott, who is also superintendent of the Buffalo-Niagara Falls Electric Light & Power Company, and the business head of the company is Arthur Schoellkopf, formerly president of the Niagara Falls & Suspension Bridge Street Railway Company.



NIAGARA FALLS HYDRAULIC POWER AND MANUFACTURING COMPANY—INTERIOR OF POWER HOUSE.



## ST. LOUIS OFFICE MEN'S ASSOCIATION.

The secretaries, treasurers, auditors and assistant officers of the various street railways in St. Louis, formed a local organization on December 30, and elected officers. They will meet once in three months, and after a dinner discuss questions of local interest, read papers and make these occasions the date for the clearing house work of settlement and exchange of tickets between the different roads. The first meeting was a success and proved very enjoyable. C. N. Duffy, secretary of the Citizens', was the originator of the idea.

## WEST AND NORTH CHICAGO ANNUAL MEETING.

The West Chicago Street Railroad held its annual meeting December 12. The Yerkes board was elected. J. B. Parsons who has gone to Philadelphia, and W. L. Elkins, retire from the board. Arrangements were announced for floating of \$10,000,000 consolidation bonds to retire the \$4,000,000 first mortgage bonds, \$2,700,000 other debentures and \$3,300,000 to liquidate floating debt incurred in powerhouse and new construction work.

	1896.	1895.
Passenger earnings.....	\$3,073,895	\$4,157,237
Other sources.....	45,953	44,340
<b>Total income.....</b>	<b>\$4,019,848</b>	<b>\$4,201,477</b>

	1896.	1895.
Conducting transportation.....	\$1,219,416	\$1,252,410
Maintenance of way.....	83,041	99,758
Motive power.....	454,928	526,698
Maintenance of cars.....	133,495	92,863
General expenses.....	247,495	295,455
<b>Total expenses.....</b>	<b>\$2,138,375</b>	<b>\$2,267,193</b>

	1896.	1895.
Rentals.....	\$ 493,497	\$499,500
Coupon interest.....	241,800	211,813
Other interest and taxes.....	280,916	169,702
<b>Total fixed charges.....</b>	<b>\$1,016,113</b>	<b>\$902,015</b>

	1896.	1895.
Gross receipts.....	\$4,018,948	\$4,201,477
Operating expenses.....	2,138,375	2,267,195
Net earnings.....	1,880,569	1,934,281
Fixed charges.....	1,016,114	902,015
Earned on stock.....	864,455	1,032,266
Dividends paid.....	794,340	791,340
Surplus for the year.....	73,115	240,626

The income from cable lines was \$1,701,306, a decrease of \$126,034, and the income from horse car lines was \$255,105, a decrease of \$987,128, while the income from electric lines was \$2,017,182, an increase of \$1,230,120; the expenses of the cable lines were \$888,539, a decrease of \$81,115; the expenses of horse car lines were \$347,284, and the expenses of electric lines \$902,554, making a decrease in the cost of operating horse and electric lines amounting to \$173,693.

The expense of operating a car a mile was 13.85 cents for the cable, 20.77 cents for horse car lines, and 10.69 cents for electric lines. The average cost per passenger was 3.87 cents.

### NORTH CHICAGO STREET RAILROAD.

The North Chicago road held its annual election January 12, re-electing the Yerkes board.

The report of the treasurer was as follows:

### INCOME.

	1896.	1895.
Passengers.....	\$2,826,800	\$2,694,359
Other sources.....	86,099	86,128
<b>Total income.....</b>	<b>\$2,913,709</b>	<b>\$2,780,487</b>
Operating expenses.....	\$1,394,387	\$1,312,107
Net earnings.....	\$1,519,322	\$1,468,380
Fixed charges, rentals, etc.....	524,231	471,251
Applicable to stock.....	\$995,091	\$997,129
Surplus brought forward.....	594,281	1,357,975
<b>Totals.....</b>	<b>\$1,589,372</b>	<b>\$2,354,204</b>
Regular dividends.....	758,991	659,922
Surplus balance.....	\$830,471	\$1,694,282
Deduct extra dividend January 1896.....		1,100,000
		<b>\$594,282</b>

The following are given details of operation:

	1896.	1895.
Total passengers carried.....	56,523,620	53,887,428
Total mileage.....	10,590,036	9,697,326
Percentage net earnings on capital stock.....	15.07	18.12
Percentage operating expenses to gross earnings.....		
Cable.....	47.13	39.9
Electric.....	51.23	45.2
Horse.....	90.68	91.2
Average.....	49.32	47.72

The total receipts from cable lines were \$1,535,311, and expenses, \$693,532; receipts from electric lines, \$1,192,601; expenses, \$610,893; receipts from horse car lines, \$98,887; expenses, \$89,962. The cost a car a mile was for cable, 13 cents; for electric car, 12.5 cents, and for horse car, 22 cents.

### LAKE STREET L.

President Loderback shows an average daily traffic at present of 30,208, a daily gain of about 3,000. By a reduction in operating expenses from 61.78 per cent of gross receipts to 59.16 per cent the year's deficit was only \$13,911 against \$38,148 for previous year. Steam was displaced by electricity on September 20, 1896, at a cost of \$341,813 and is to be largely credited with the reduction in operating expense and gain in traffic. Under these new conditions the road should show up nicely next year.

## CAHALL-BABCOCK & WILCOX BOILERS.

About a year ago the Aultman & Taylor Company, of Mansfield, O., began the manufacture of horizontal water-tube boilers of the Babcock & Wilcox type, which are known as the Cahall-Babcock & Wilcox boilers. Far from being antiquated in design or construction, they are of the same type as the Babcock & Wilcox boilers exhibited at the World's Fair in 1893, with several improvements in construction added. The steam drums are of open hearth flange steel, the heads being of the same material hydraulically flanged. For pressures from 150 to 250 pounds the horizontal seams are butt and double strapped joints with six rows of rivets; for lower pressures the seams are double rivetted. At each end is a Cahall swinging manhead. The flanges at the steam and safety valve openings are drop forged from flange steel plates. On the drums are cross boxes or saddles to which the tube sections are connected by nipples. These saddles differ from those in other boilers in being of cast open hearth steel or "flowed steel" which, when annealed, has the same properties as boiler plate. The headers or manifolds are of the standard sinuous type and

made of tough cast iron for pressures below 225 pounds, and of flanged steel for higher pressures. The holes into which the tubes are expanded are all reamed smooth. The fronts are made up of a steel frame work with only the door frame panels cast, giving a light and rigid construction uninjured by internal heat.

### NEW PUBLICATIONS.

The December number of Hartshorn's Roller is at hand, and proves to be as attractive as heretofore.

"Dixon's Graphite Productions" is the title of a fifty-six-page catalog, recently published by the Joseph Dixon Crucible Company, of Jersey City, N. J.

Charles A. Alden of Steelton, Pa., has issued a little book of blue prints, containing convenient formulæ for laying out and curving rails for street railway transition or spiral curves. It will be found a convenient reference pocket book for track engineers. Price, 50 cents.

Mr. St. Clair, the special correspondent of the Glasgow Herald, who visited this country last summer and furnished a series of most interesting articles on the street railway systems of our leading cities, has republished them in pamphlet form. It is extremely interesting as a glimpse of our methods by one who is entirely uninfluenced by local conditions.

"Information on the Preservation of Iron and Steel Structures" is the title of a pamphlet recently issued by the Goheen Manufacturing Company, Canton, Ohio. A pamphlet by the chief engineer of the Youngstown Bridge Company is added as an appendix. A copy will be sent free to engineers, architects, iron and steel manufacturers and contractors who will send address.

The report of the electrical commission of Baltimore to the mayor and city council on a general subway system, to be owned by the city of Baltimore, was received through the courtesy of Nicholas S. Hill, Jr., the city engineer. Mr. Hill has made this a very comprehensive work, explaining and illustrating in detail the different plans which have been considered to put the overhead wires of Baltimore underground.

In "Roentgen Rays and Phenomena of the Anode and Cathode," a book of 190 octavo pages, published by the D. Van Nostrand Co., New York, Edward P. Thompson has compiled complete and valuable data on this subject. With the exception of the concluding chapter by Professor William A. Anthony, the subject matter has been abstracted from the proceedings of scientific societies and the technical press of Europe and America. The book is illustrated by 60 diagrams and 45 half tones. List price, \$1.50.

"Auto-cars" (295 + ix pages, 12 mo., cloth, \$1.50. The Macmillan Company, 66 Fifth avenue, New York), by D. Farman, translated from the French by L. Serrallier, cannot fail to interest all readers who wish to keep abreast of the times on this subject. The opening chapters contain a very brief discussion of the principles of different motors and a short historical sketch of mechanical traction. Then follow descriptions, with illustrations and data as to performance of various types of motors for street and other auto-cars.

Petroleum motors are discussed more fully than the others. It is to be regretted that clearness has in some instances been sacrificed to brevity.

### CHAMBERS CLIPPERS.

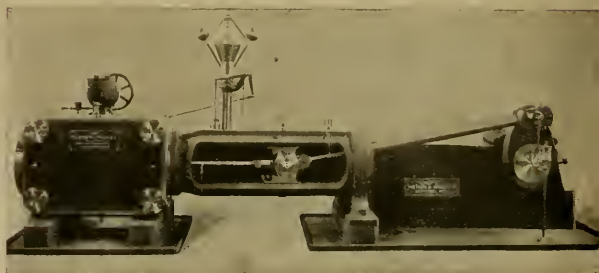
Chambers Brothers Company, of Philadelphia, is now making a bolt and rivet clipper which is also a useful tool for use in overhead construction, especially where the larger sizes of round trolley and figure-8 wire are in use. These



clippers have head castings made of steel, and the cutters are made of the best quality of tool steel, carefully tempered. They are similar to a tool that has been made for years by this company, for bolt and rivet cutting, and which has given excellent satisfaction. The present improvement of having them open at the sides makes them applicable to wire cutting. They will take in anything up to  $\frac{3}{8}$ -inch diameter.

### THE FILER-STOWELL CORLISS.

We take pleasure in illustrating herewith an entirely new corliss engine, introduced by the Filer & Stowell Company, Milwaukee, Wis. This company, which has been in business for nearly half a century, and is enjoying an enviable reputation amongst machinery manufacturers, added a well equipped engine department to its already extensive works in 1890. A large number of its engines are now in successful operation, and experience has proven their efficiency. The company takes special pride in the design of the engine frame and in the detail construction of the valve gear and governor, which are eminently adapted for street railway and electric light work. The selection of the Filer & Stowell Company's corliss engines for the Garfield park power plant, this city, which was determined upon by the board of park commissioners, after a very careful examination, was especially pleasing to the builders, as this plant is intended to be a model of its kind, and such decision gave indisputable proof of the excellence of these engines. The plant was started up a few weeks ago, and is operating very successfully.



FILER-STOWELL CORLISS.



## STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

A convention of street railway accountants will meet at the Hollenden hotel in Cleveland, Ohio, on Tuesday and Wednesday, March 23 and 24, 1897, to organize a street railway accountants' association. There can be no question that the time has come when an association of this kind is an absolute necessity. The American Street Railway Association is doing a splendid work, but the character of its work must of necessity be so largely along the lines of policy, and operation, both mechanical and electrical, as well as engineering matters, that it has no time left for the proper study of those problems which beset the accounting department. The secretaries, treasurers and auditors are less interested in electrolysis and sappy ties than they are in a model system of accounts; while the operating men would hardly care to spend three hours at a stretch studying out a perfect system of distribution of accounts. The accountants can easily occupy every minute of time now devoted to convention sessions, and still leave unfinished work. The steam roads have long ago separated their departments in convention work, and have an association for passenger agents, freight men, auditors, master mechanics, bridge superintendents, motive power, etc. While the street railways have no necessity for any such number, they do need at least one division, that of operating and accounting.

There is not one street railway in the country today but could improve in some respect its system of accounting. While we have changed our motive power from animal to mechanical means, most roads are still laboring under the heritage of much of an old system of accounts left over from the horse age. What is vitally needed is some standardizing of accounts which will admit of at least something like a comparison, one with another. The president of a large western road, who is also a director in another large road, said within the past few days to the writer, that he had given up trying to compare the two roads. While the lump sums of earnings and expenses were evident, the items which went to make up the several expense accounts were arrived at in such different ways, the results were useless for comparisons. This is generally the case; scarcely any two roads make the same distribution of expense accounts throughout.

Managers are giving much attention to economies, and it is found where such can be effected it is in items which are at present lost to sight by being assembled with other expense items. To formulate a system for a wide range of comparisons is the province of the accountants' association.

Another important reason for standardizing of accounts is found in the changed condition of the security market. A few years ago investors stood in line and crowded one another in their anxiety to buy. Now they insist on a critical examination. It is not sufficient that a road is in good physical condition and making money. They want to know how its expense accounts compare with other roads of similar size and conditions. To be able to furnish this information in satisfactory shape may mean the ability or failure to float desired securities.

There will be to be two long days of hard work for the men at the Cleveland meeting. Each will bring a set of blanks and forms he is using. They will sit around some large tables on which these forms can be grouped, and they will

take up the same work in the same systematic thorough manner in which they keep their own company's accounts.

Cleveland has been selected by the committee as a central point, and the date set at that time of the month when delegates can best leave. Some have suggested calling the association an "Auditors' Association," but the majority favor the other title, "Street Railway Accountants' Association" as more comprehensive, and including such roads as do not have a special title for the officer doing the auditing. Lest any should get a wrong impression, it may be stated the meeting is not for an exchange of figures, but of the systems of arriving at figures. If any one sees fit to seek a comparison of what his road is doing with any other present, that would be a matter between the two so desirous of comparison, though, under the present system, it is probable neither would gain much until the general standardizing is worked out.

### THE CALL.

Street railway companies in the United States and Canada are hereby invited to send a delegate to a meeting to be held at the Hollenden hotel, Cleveland, Ohio, on March 23 and 24, 1897, for the purpose of forming a "Street Railway Accountant's Association." The object of said association is to improve the present systems and methods of accounts, by an exchange of ideas among those engaged in this department of street railway work.

C. N. DUFFY,

Secretary Citizens' Street Railway, St. Louis.

FRANK R. GREENE,

Secretary Chicago City Railway.

H. C. McJILTON,

Auditor Baltimore Traction Company.

W. G. ROSS,

Act'g Comptroller Montreal Street Railway.

DANA STEVENS,

Acc't for Receiver, Belt Ry. Co., Washington, D. C.

E. D. HIBBS,

Auditor, Consolidated Traction Company, Jersey City.

### WHAT THEY SAY.

P. V. Burlington, secretary and auditor Columbus (O.) Street Railway: The project has some good points in its favor, and if carried out would undoubtedly be not only an agreeable getting together of the men who are expected to *always show good results*, but as well a profitable thing for themselves and street railway managers and owners.

T. C. Penington, secretary American Street Railway Association and treasurer Chicago City Railway: A standardizing of accounts is greatly to be desired. As it is now one company charges certain items to one account, and another road charges the same item to a different account, making comparisons valueless. The proposed plan for heads of accounting departments to meet and put under way the work of bringing about this reform, is an excellent one and I am in favor of it.

Frank R. Henry, secretary and treasurer Missouri Railroad Company, St. Louis: I am heartily in favor of the movement, but think that better results would be obtained if said association would take a wider scope and include all of the street railway office employees, and all subjects that pertain to the office be open to discussion, and that said association be made an annex to the regular American Street Rail-

## Street Railway Review

way Association, the meeting to be held in a separate hall or room, as then all that attend either association could if they desired obtain the benefits of both meetings.

A. A. Anderson, general manager Youngstown Street Railway: Answering your favor of the 15th inst., will say, I certainly would favor a movement in the direction of a Street Railway Auditor's Association. I would be glad to attend a meeting held for such purpose, and of course, Cleveland or Pittsburg, would suit my convenience better than most any other point. I think February or March would be a good time to hold such a meeting.

E. D. Hibbs, auditor Consolidated Traction Company, Jersey City: I have your favor of the 15th inst. in connection with suggested convention to be held at Cleveland. In reply I beg to say that I am strongly in favor of the arrangement and will make it a point to be there providing the scheme is successful.

H. C. McJilton, auditor Baltimore Traction Company: I beg to acknowledge receipt of your circular letter of the 15th instant with reference to the proposed Street Railway Auditors Association, and in reply beg to say that I concur with you that such an association will not only benefit the auditors of the different street railway companies, but would be very beneficial to the companies themselves.

I believe such an association, bringing together the heads of the department which is most criticised, will result in the adoption of a fixed set of accounts that will embrace every want, and place the companies in a position to exchange the cost of operation, a much needed condition.

I think if nothing else is accomplished, that alone will be worth considerable to the enterprising companies, as an interchange of percentages, cost of operation, proper forms for which can easily be arranged, would be very valuable.

The Street Railway Association has presented a set of accounts, which I think can be very much improved upon.

Your efforts in this matter should be encouraged, and any information that I can give you will be cheerfully given.

It will give me a great deal of pleasure to be present at the proposed meeting, to be held in Cleveland, but as our stockholders' meeting will be held in February, I cannot, at this writing, state positively that I can attend, but could do so were the meeting held in March.

W. G. Ross, acting comptroller Montreal Street Railway: I think the meeting of street railway auditors is a good idea and will be glad to attend.

J. P. E. Clark, general manager Binghamton Railroad Company: I believe a meeting and general conference of auditors, as suggested, would be beneficial in many ways.

A thorough discussion and interchange of ideas relative to "systems of accounts," etc., would, in my opinion, prove productive of good results to all in attendance. As to this company being represented, I could not state definitely at present writing, but think probably we would be pleased to avail ourselves of the opportunity.

H. L. Wilson, auditor West End Street Railroad, Boston; I have your favor of the 15th in reference to a meeting of the auditors of the street railway companies and think the suggestion which you have offered an extremely good one and if properly carried out, will no doubt, be of great

benefit to a large number of the street railway companies. At this time it will be impossible for me to state whether I could attend such a meeting as you suggest, but if anything further is done in relation to the matter, I will be glad to hear from you again.

Ford Starring, auditor Detroit Electric Railway: Replying to yours of the 14th, I have to say that I believe it would result beneficially to the railroads if they would encourage as much as possible the exchange of views and ideas by the heads of the various departments, not excepting auditors. Will be pleased to co-operate with you in any manner to reach the desired end.

John Hourigan, auditor Albany Railway: I am very cordially in sympathy with the idea of a gathering of street railway auditors. I believe it would be helpful to every man who would attend. I hope you will work up the idea, and if your efforts result in a meeting, I will strain more than one joint to be present. Casually, I would a little rather go to New York than Philadelphia, but if Cleveland appears to be the best for all concerned, I would be entirely satisfied. Please let me know if I can be of any service in the matter, and I will promptly respond, if possible.

Dana Stevens, accountant for receiver, Belt Railway, Washington, D. C.: I have noted contents of your circular letter of the 15th, and heartily endorse your plan. Such a meeting as you have in view would doubtless prove valuable to street railway accounting departments, and I hope your suggestion may meet with sufficient encouragement to lead to a well attended conference. Uniformity in street railway accounts would, I think, be advantageous and I think should be urged. Of course, I cannot state definitely, but know of nothing to prevent my attendance if meeting is called, and shall be pleased to meet with you.

Frank R. Greene, secretary Chicago City Railway:—I am heartily in favor of the formation of such an association and believe it could be made very valuable to both companies and officers. I expect to attend the meeting.

Russel B. Harrison, president Terre Haute Electric Railway:—The idea is an excellent one as a standardizing of accounts is greatly needed. I will attend the meeting or send a representative.

C. N. Duffy, secretary Citizens' Street Railway, St. Louis:—In my opinion if such an organization is to be formed it should be called a "Street Railway Accountants' Association," so as to embrace the head of the department doing that work whether the secretary, treasurer, auditor or whoever it is. I think the association should either be made a part of the American Association, or at least hold its annual meetings at the same place and date but in a separate room or hall. If organized along these lines I am greatly in favor of it, and will promise the attendance at the first meeting in Cleveland to organize, of six representatives from as many St. Louis roads. There is a large amount of work which should be put under way and by October the committee appointed at the Cleveland meeting can report.

Robert McCulloch, president American Street Railway Association: Am heartily in favor of organization as outlined.

The program will appear in the February REVIEW.

## SUDDEN DEATH OF COL. SINCLAIR.

Col. Wm. H. Sinclair died suddenly of apoplexy while writing letters in his room at the Powers House, Rochester, N. Y., on January 11. He was in that city to confer with gentlemen in regard to the construction of a proposed suburban road, and had parted with them at 11 o'clock in the

morning in apparently the best of health and spirits. The conference was to be resumed at 3 p. m., at which hour the party went to his room, where he was found lifeless on the floor, having fallen from his chair. Several letters and one unfinished letter were upon the table. The pen was also on the floor, having dropped as he fell. While his friends knew he had suffered from indigestion

the past few years, no one had any reason to anticipate so sudden an ending to his busy life.

Col. Sinclair was born at Akron, Ohio, October 31, 1839; was educated in Michigan, and entered the federal army in May, 1861, at the age of 21. He rapidly rose by frequent promotions, and when mustered out, which was not until 1867, he left with the rank of Colonel. He engaged in many prominent battles and sieges and twice had his horse shot from under him. He won numerous commendations from leading generals for bravery and ability, and marched with Sherman to the sea. Upon leaving the army, he decided to remain in Texas, where he became a leader in public affairs, serving in the legislature and as Speaker of the House; as collector of internal revenues and postmaster at Galveston, which has been his home. He took hold of the Galveston Street Railway in 1876 and built it up into one of the best systems in the south. About two years ago he sold out his interest at a good figure, but continued to make Galveston his home. Mrs. Sinclair, a most charming and lovable lady, died suddenly about eighteen months ago. Both were constant attendants at the annual street railway conventions.

To attempt to enumerate the sterling qualities of Col. Sinclair from a personal point of view, would be no easy task. He was generous to a fault, and above all, supremely just, universally kind, and always true, and in the highest degree possessed the esteem and honor of all who knew him. His warm hearted, genial nature quickly won its way into the hearts of others and bound them to him in ties of friendship unusually strong. Those who, like the writer, have enjoyed his confidence and friendship for many years past, will specially feel his death as a personal loss never to be replaced, and the hundreds of friends, by whom he was universally beloved, will likewise mourn the parting.

He rarely missed the annual conventions, and was present at St. Louis. He was one of the prime movers in the Texas Street Railway Association and its only president. He had also served the American Association in several official capacities.

A verdict of \$25,000 damages against the Chicago City Railway Company and the Chicago & Grand Trunk Railroad was given in favor of Isaiah C. Smith for permanent injuries received in a collision between a horse car and a Grand Trunk train, July 17, 1893. A new trial was moved.

## DEATH OF JOHN F. OSTROM.

We are pained to announce the death of John F. Ostrom, for several years past the manager of the street railway department of the Pennsylvania Steel Company. Mr. Ostrom died at Philadelphia, January 3, after an illness of five months. He was a most energetic and faithful worker, was widely and favorably known in the street railway fraternity, and highly thought of by the officers of his company.

The Alameda and Oakland (Cal.) Electric Railway has issued the decree that hereafter patrolmen and mail carriers must pay their fares when off duty.

The Western Society of Engineers gave its annual banquet at the Technical Club, January 5. Attendance was large and the event a most enjoyable one.

It is reported that the Nashville, Tenn., street railway has been sold to Chas. M. McGee, of Knoxville and New York, the consideration being in the neighborhood of \$1,000,000.

During his recent visit, the Rev. Dr. John Watson, expressed his surprise at the courtesy and intelligence of the officials and employes of the railroads and "tramways" in this country.

At the annual meeting of the Citizen's Traction Relief Association, of Pittsburg, the report of the treasurer, Charles Fitzgerald showed the following: Receipts during year, \$4,660.69; paid on deaths of members, \$900; sick benefits, \$2,592.50; miscellaneous expenses, \$212.20; balance, \$955.99; present membership, 234.

Four persons were seriously injured in a cable car collision in St. Paul. A grip car with two trailers was nearly at the top of Selby avenue hill when the gripman lost control of his car and it rapidly descended until it struck another train of three cars. The cars were demolished and it was strange that a greater number were not injured.

The Elgin (Ill.) City Railway has been spending money during the past year in improving its service and in keeping the road bed and entire system in good condition. The company bought out the Edison electric light plant and incorporated it with the railway company, and at present is doing all the electric commercial lighting of the city.

John I. McDuffee filed a petition in the United States Circuit Court against the City and Suburban Railway Company, the Traction Company, the Central Company and the City Passenger Railway Company, of Baltimore, Md., claiming that they have infringed the patent rights of an invention made by him for improvements upon electric railroads.

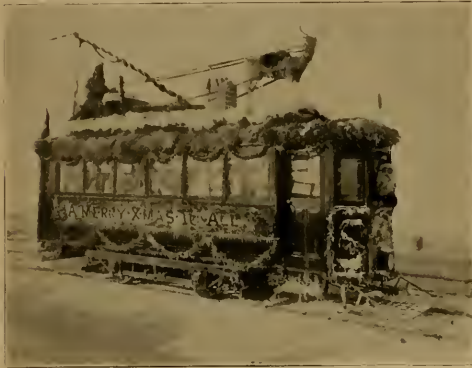
Mayor Fleming, of Toronto, has, after several months of negotiation, come to an agreement with the Toronto Railway Company. The street cars are to run on Sunday, tickets being sold seven for a quarter. As soon as the city builds a bridge to Toronto Island the company is to extend its lines over the island and charge only the ordinary fare from any part of the city. The council has yet to give its sanction to this but this is reasonably sure.



### SANTA CLAUS TROLLEY CAR.

The unique applications of electric cars for novel parade purposes multiply. The latest, and by no means the least interesting is a Santa Claus car, which was designed and constructed by Warren Y. Soper, of Ahearn & Soper, contracting electrical engineers, Ottawa, Canada.

The idea originated with Mr. Soper, who for some days previous caused letters to appear in the newspapers, dated



SANTA CLAUS CAR—OTTAWA.

from various points between the North Pole and Ottawa. These letters were signed "Santa Claus," and gave the information that he had decided to make a daylight visit to the city, and that he would arrive with his reindeer the day before Christmas and go through the streets of the city mounted on top of an electric car. Santa Claus intimated that his visit was made specially in the interest of the children in order that they might see him in person, and that during his trip through the city he would distribute several thousand oranges. He furnished a time table indicating the hours at which he would pass the various street corners. The result of these letters was that for some time before his announced appearance on the afternoon before Christmas the streets were thronged with men, women and child-



CROWD WATCHING THE SANTA CLAUS CAR.

ren. Promptly on time the car came in sight, covered with snow and ice and apparently just arrived from the far north. On the front vestibule were the figures "1896" and on the rear vestibule the figures "1897." The interior of the car was filled with toys of every description. Santa Claus himself was on top, seated on a toboggan and driving his reindeer. The basket on Santa Claus' back, as well as the chimney appearing through the top of the car, was overflowing with toys. The motorman and conductor were costumed as Icelanders, and beside the motorman stood an Eskimo who played on a cornet during the trip. As the car proceeded, Santa bowed in a genial way to the throngs, and from a basket in front of him distributed oranges. He was aided in the distribution by several assistants inside the car. Some four thousand oranges were thus thrown to the children. The scrambling for them furnished no end of fun.

The whole affair was carried out most successfully, and created greater interest and excitement than any event that ever occurred in Ottawa.

Our illustrations show the car, and the big crowds it occasioned.

### LENOX AVENUE CONDUIT IN A STORM.

The severe snow and sleet storm of December 16, caused a shut down on the Lenox avenue, New York, line, for several hours. Overhead trolley lines in other cities also suffered delays from the same storm. As this was the first severe storm on the line since the conduit system was installed it attracted much attention.

There was some surface accumulation of snow which drifted badly, and as the cars were not equipped with scrapers soon made a heavy track. Changes being made in the power station also cut down the supply of current to about one-half the ordinary output. In addition the conductor bars in the conduit became coated with ice, and as this was the first time the difficulty had presented itself, some time was lost locating the trouble. When discovered it was remedied by putting on some plow shares with sharp cutting edges, but this required several hours to do. The entire delay, however, was not nearly as bad as frequently occurred on overhead lines in their early days. Now that the difficulty has been solved there is no reason to expect delays in future from this cause. The fact that the company has decided to build about 40 miles more of the same conduit system is evidence that the anticipated difficulties from this source are very small.

### FULTON FOUNDRY ASSIGNS.

The Fulton Truck & Foundry Company, of Mansfield, Ohio, made an assignment for the general benefit of its creditors, without preferences, to W. S. Coppeller. Liabilities, \$30,000. Shop, machinery, tools, stock, etc., have been appraised at \$13,780, and under order of court will be offered at auction on January 30.

General Manager W. J. Hart, of the Union Street Railway Company, of Saginaw, Mich., has posted the following notice in the cars: "Union Street Railway rates of fare: single ride, all persons over eight years of age, five cents; children—one child under the age of eight, accompanied by parent or guardian, free; two children under the age of eight years, so accompanied, five cents."

## TROLLEY ATTACHMENT TO THE VAN BUREN STREET ROLLING LIFT BRIDGE.

When the Van Buren street rolling lift bridge was constructed and put in operation it presented a nice problem to the engineers of the West Chicago Street Railroad. The question was how to get a trolley connection suitable to that form of bridge. J. R. Chapman, the manager of the electrical department, was largely instrumental in solving it.

In the cut one-half of the center span of the bridge is shown, together with the trolley posts, one on the stationary

Western avenue station to the Hobbie street power house. No difficulty has been experienced with the operation of this device, and its success has made this form of bridge most suitable for street railways. With it the danger of plunging into the river when its is open is entirely eliminated.

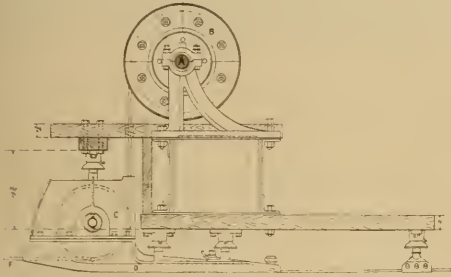
## BRUSSELS INTERNATIONAL EXHIBITION, 1897.

The international exhibition at Brussels will be opened on April 24, and will be kept open at least six months, but the directors reserve the right to delay its closing till November 15, 1897. Brussels, next to London, is the most important tramway and railway center in Europe, as the Belgians have always held very large interests in such properties, going extensively into the installation and equipment of tramways outside of their own country. Robert W. Blackwell, 39 Victoria street, Westminster, London, who is the foreign representative of many large American supply houses, has reserved a large space at the exhibition, and will make an elaborate show of the electric railway specialties of the houses represented by him.

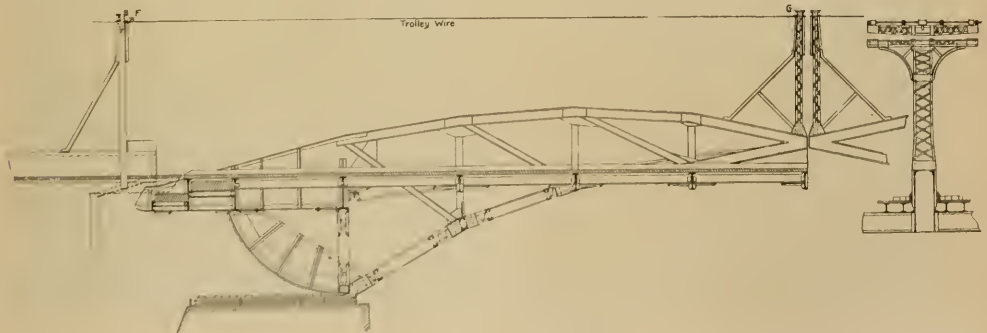
## BRISTOL AND ITS TRAMWAYS.

part and one on the movable portion of the bridge. We also represent an end view of the mechanism for taking care of the trolley wires for the double track. Upon shaft, A, are three drums, two of which are made of wood and receive the trolley wire, while the third supports a counter weight to revolve the shaft and hold the wire taut as the bridge is raised and lowered. A brass casting, D, receives the No. 0 trolley wire and supports the sheave, C. The wire F-G, which extends from the center to the sheave and around the drum, B, is composed of 37 strands of No. 15, and its length provides for a slack of 38 feet when the bridge is lifted. Upon the shaft A are cut screw threads, which provide for a horizontal movement sufficient to wind the wire in the grooves of the two drums. The apparatus was designed so that different weights could be used, depending on the desired tension of the wire. As the car passes the center of the bridge the current supply is changed from the

The tramway company, of Bristol, England, equipped its Kingswood line with the trolley system, and a year's trial has proved it to be satisfactory in every way. When suggestions for operating the rest of the lines by electricity were made the town council appointed a committee to investigate the subject. This committee consulted Mr. Preece, the eminent authority on submarine cables, and with his assistance a report was made. The trolley system was entirely acceptable to them, but they imposed conditions to which the tramway company would not agree. It is the option of the city when the franchise expires in twenty years to purchase the tramway. With this in view, and the fact that the city owned the lighting station, which was not paying expenses, the committee insisted that the tramway company should rent power from the city. This the company refused to do, as the city power was inadequate, and an alternating current of 2,000 volts. So Bristol will pursue its sleepy way with no speedier form of locomotion than that furnished by the ancient horse cars, unless the council relents.



TROLLEY WIRE CONNECTION AND WINDING DRUM.



PLAN FOR TROLLEY ATTACHMENT.

### TOLEDO TRACTION COMPANY'S POWER HOUSE.

The Toledo Traction Company, of which A. E. Lang is president and W. S. Jewell general manager, and whose new power house is the subject of this article, has resulted from the consolidation of various street railway and other electrical interests of Toledo. This company, in connection with the Toledo Consolidated Electric Company, a company furnishing light and power only, the current for which is supplied by the Toledo Traction Company, operates what was form-



POWER HOUSE—TOLEDO TRACTION COMPANY.

erly the Toledo Consolidated Street Railway Company, the Toledo Electric Street Railway Company, and the Western Electric Light & Power Company. During the coming year the Toledo Electric Company will also be merged with this company.

This combination of a railway and a light and power plant furnishes an almost continuous load for the station, and a high economy of operation is the result. The general arrangement is admirable, and the details have all been carefully worked out by the engineers, Sargent & Lundy, of Chicago.

Work on the power house was commenced in June, 1895, and the first fire started under the boilers in May, 1896. The building lies north of Madison street and extends from Water street to the river, having a frontage of 196 feet on Madison and 210 feet on Water. The foundations rest on piling, as will be seen in one of our illustrations. The walls are brick and quite high, it being 54 feet from the basement floor to the top of the walls. The side walls are plentifully supplied with windows, while the end walls are solid, excepting for the doors.

The boiler room is 40 feet wide, and extends the entire length of the building on the east, or river side. This portion of building has a flat roof resting on I-beams. The floor of the boiler room is 9 feet above the basement floor, which is about 2½ feet below the street grade. In the boiler room there are to be ten boilers, six 350-horse-power Heine boilers with Hawley down-draft furnaces and four 500-horse-power Stirling boilers, with McKenzie furnaces,

which were removed from the Consolidated Railway plant. Two of the Heine boilers have not been installed as yet. Our illustration shows the boiler room with the Heine boilers in place and the Stirling boilers in process of erection. Ideal arrangements are made for handling coal and ashes in this plant. The coal is delivered at the north end of the building, shoveled onto a grating, through which it drops onto an elevator that carries it up an iron chute affixed to the wall on the outside and dumps it into the storage bin. This bin is 10 feet, 8 inches wide and 39 feet, 9 inches long, having a capacity of 400 tons. In the bottom of the bin, which is 8 feet above the boiler room floor, are four hoppers, through which the coal is dropped into iron carts and hauled, after being weighed, to the boiler where it is to be burned.

Similar arrangements are made for handling the ashes. The basement under the boiler room is divided by a longitudinal wall into two nearly equal portions, of which the western one forms a single room. Hoppers, one under each furnace, receive the ashes which are from time to time dumped into an iron wagon, wet down, hauled to the north end of the room and dumped in front of the ash conveyor which delivers them to the wagons outside with but a single handling. The ash and coal conveyors are driven by electric motors, a 5-horse-power motor being used for the former and a 10-horse-power for the latter. This machinery was furnished by the John A. Mead Manufacturing Company.

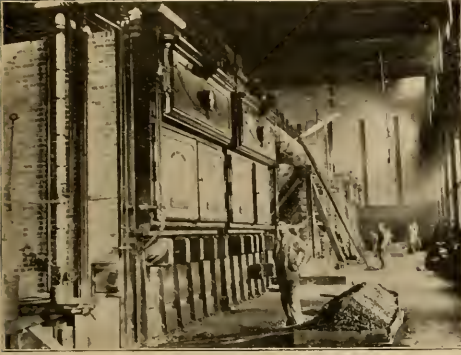
The eastern portion of the basement is cut up into several rooms, one of which serves as a general store room, one as an oil room and one as a testing room. In this last is a D'Arsonval reflecting galvanometer and a 100-cell Leclanche battery used for testing insulation by the method of substitution. From tanks in the oil room oil will be supplied to the machinery by an elaborate system of piping, the oil being forced through the pipes by water from the house tank on the roof of the boiler room, the water being admitted near the bottom of the oil tanks. A Deming triplex pump with 5½ by 8-inch cylinders, driven by 15-horse-power electric motor supplies water for general purposes.

The hot gases from the boiler furnaces are conducted through a rectangular smoke flue suspended along the west side of the boiler room to a Green economizer, which is located upon a girder work construction about 20 feet above the floor, and just north of the stack, thus leaving room to



VIEW OF FOUNDATIONS.





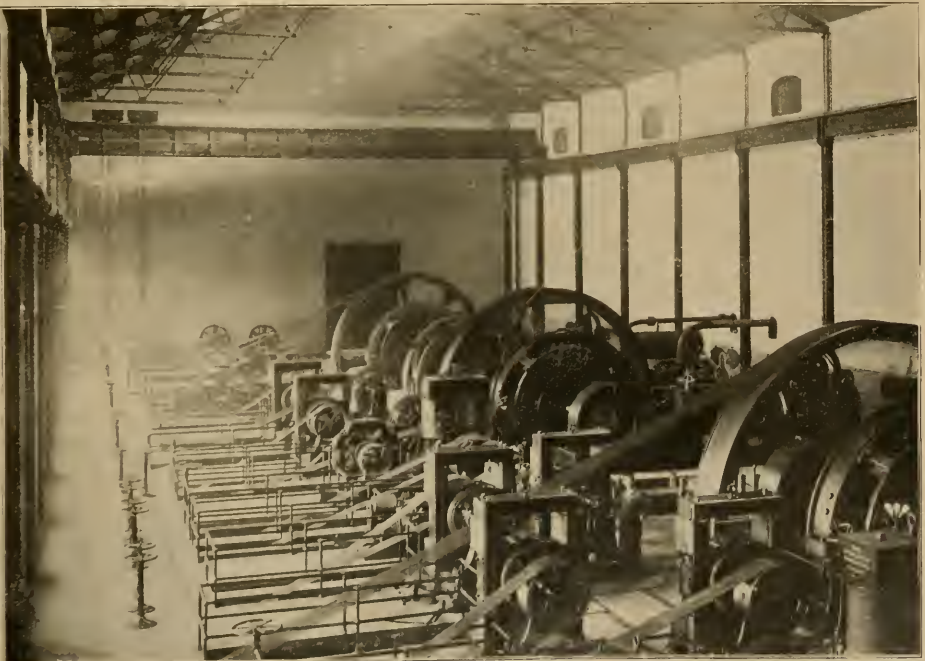
BOILER ROOM.

install boilers underneath the economizer. The economizer is arranged to be 16 tubes wide, and the present installation is suitable for 2,000 boiler horse-power, space being left for another 1,000-horse-power to be installed later. The feed-water is heated to 250° F. in the economizer. The scrapers for keeping the tubes free from soot are operated by an electric motor. This economizer, heating the water to a high temperature, could also be used with advantage where surface condensers are used instead of jet condensers as in this plant. The feed water is measured by means of two Worthington hot-water meters located in the basement.

The stack, from the piling foundation up to the top of the building wall, 63 feet, is built of brick laid in Portland cement. On the outside it is nearly square, 18 feet on the side, the south side being part of the south wall of the building. The flue proper begins 21 feet, 6 inches above the boiler room floor, a flooring of concrete 8 inches thick, supported on 12-inch 32-pound I-beams, being laid across the stack at this point. The stack below this floor is octagonal in section, 12 feet, 6 inches in diameter, and contains a spiral stairway, thus serving as the entrance to the building. Above the walls of the building the stack is of steel, circular in section and self supporting. It is 11 feet inside diameter, the flue being lined with fire brick for the first 90 feet, and from that point to the top (206 feet, 6 inches above the grates) it is lined with tile. The draft secured is from  $\frac{3}{4}$  to 1 inch of water, depending on atmospheric conditions.

The steam pipes from the boilers all open into an 18-inch header extending along the entire length of the west wall of the building. This header is of wrought iron, lap-welded, with cast-steel flanges, and is in three sections. These sections are connected by expansion joints, consisting of copper U-tubes of somewhat smaller diameter. From the header run steam pipes to the engines, all the valves being located in the boiler-room, just in front of openings in the partition wall so that they can be easily operated from the engine room. All valves about the building are Chapman gate valves.

The engine room is 70 feet wide and about 206 feet long. The engines are located on the east side of the room. Our illustrations from photographs show a view of the switch-



INTERIOR OF ENGINE ROOM.

board as it appeared in the shops of the General Electric Company, and a view of the engine room looking north from the switch-board. The general arrangement of the machinery will be understood from the line drawings.

There are four American-Wheelock compound condensing and two Porter-Allen tandem compound condensing engines. The Wheelock engines were built by Cramp & Sons, of Philadelphia, and have cylinders 18 and 48 by 48 inches, run at 90 r. p. m. and with the normal boiler pressure of 150 pounds, will develop 1,200 horse-power when cutting off at 55 per cent of the stroke. The most economical power is 800 horse-power. Jet condensers are used and the air pumps are belted to the engine shaft. There are also two auxiliary pumps, one for the boiler feed and the other for the water of condensation from the jackets. The heads and barrel of the high pressure and the head of the low pressure cylinder are jacketed with the live steam. The valve gear for these engines was built by the Wheelock Company, of Worcester, Mass. The valves are of the gridiron type and move horizontally at right angles to the cylinders. On the low pressure cylinders there are two exhaust and two steam valves at each end. The motion of the valve stems being horizontal instead of vertical, springs instead of dash pots are used for closing the valves. Between the high and low pressure engines are located the gages, levers for operating the quick throttle valve, the primer and the drip cocks, and wheels for operating the throttle valve slowly, and the injectors.

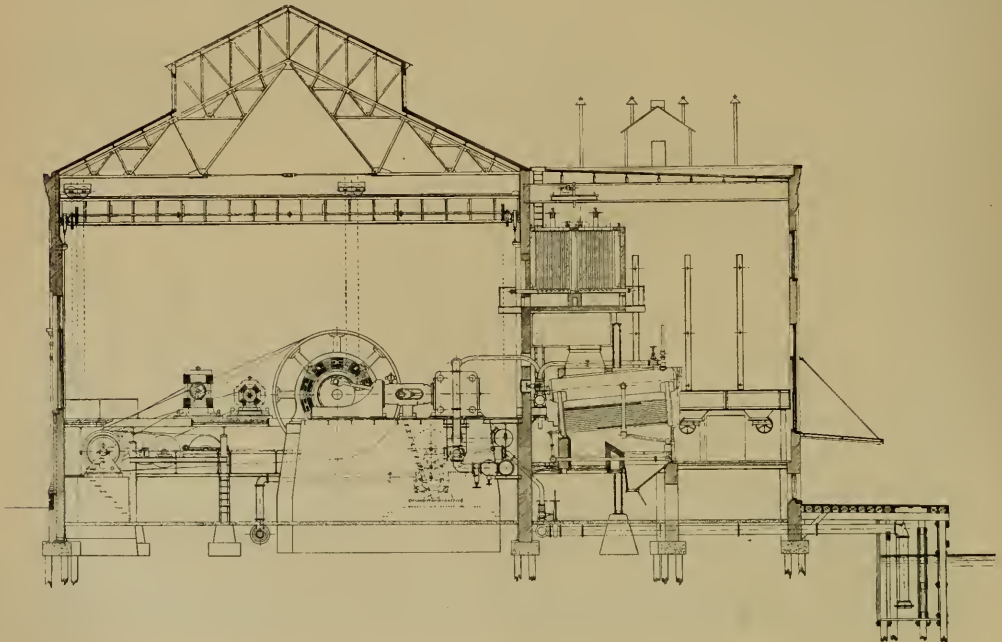
On the shaft, which is 22 inches in diameter in the middle, 18 at the bearings, and 14 feet, 4 inches between bearings, are a 500-kilowatt G. E. 10-500-90 generator and a fly wheel. The fly wheel is 20 feet in diameter, with solid hub and built-up spokes. On the periphery are grooves for a 14-

strand rope drive by which the line shaft located in the basement of the engine room at the west side of the building is driven.

The Porter-Allen engines were built by the Southwark Machine & Foundry Company, Philadelphia. Each has cylinders 15 and 36 by 30 inches with the receiver on top. The low pressure cylinders only are jacketed. The air pumps for these engines are Blake steam pumps. Each engine will be direct connected and to two 200-kilowatt lighting generators, which are not yet in place, however. At present one of these engines is belted to a 300-kilowatt alternating current generator. The maximum power of these engines is 700 and the economical power 550 horse-power each.

The line shaft is connected to the four large engines by Hoadley rope drives, built by the New England Engineering Company, Worcester, Mass. This shaft has a total length of 198 feet, 5 inches, and is of hammered iron 6½ inches in diameter, and together with the clutches was furnished by the Hill Clutch Company, Cleveland. It is divided into four sections, 42 to 57 feet in length, which may all be connected by means of friction clutches. This shaft carries the pulleys which drive all the generators not direct connected to the engines. There is a friction clutch for each pulley on the shaft. All clutches are operated from the engine room floor by the hand wheels shown in the illustrations.

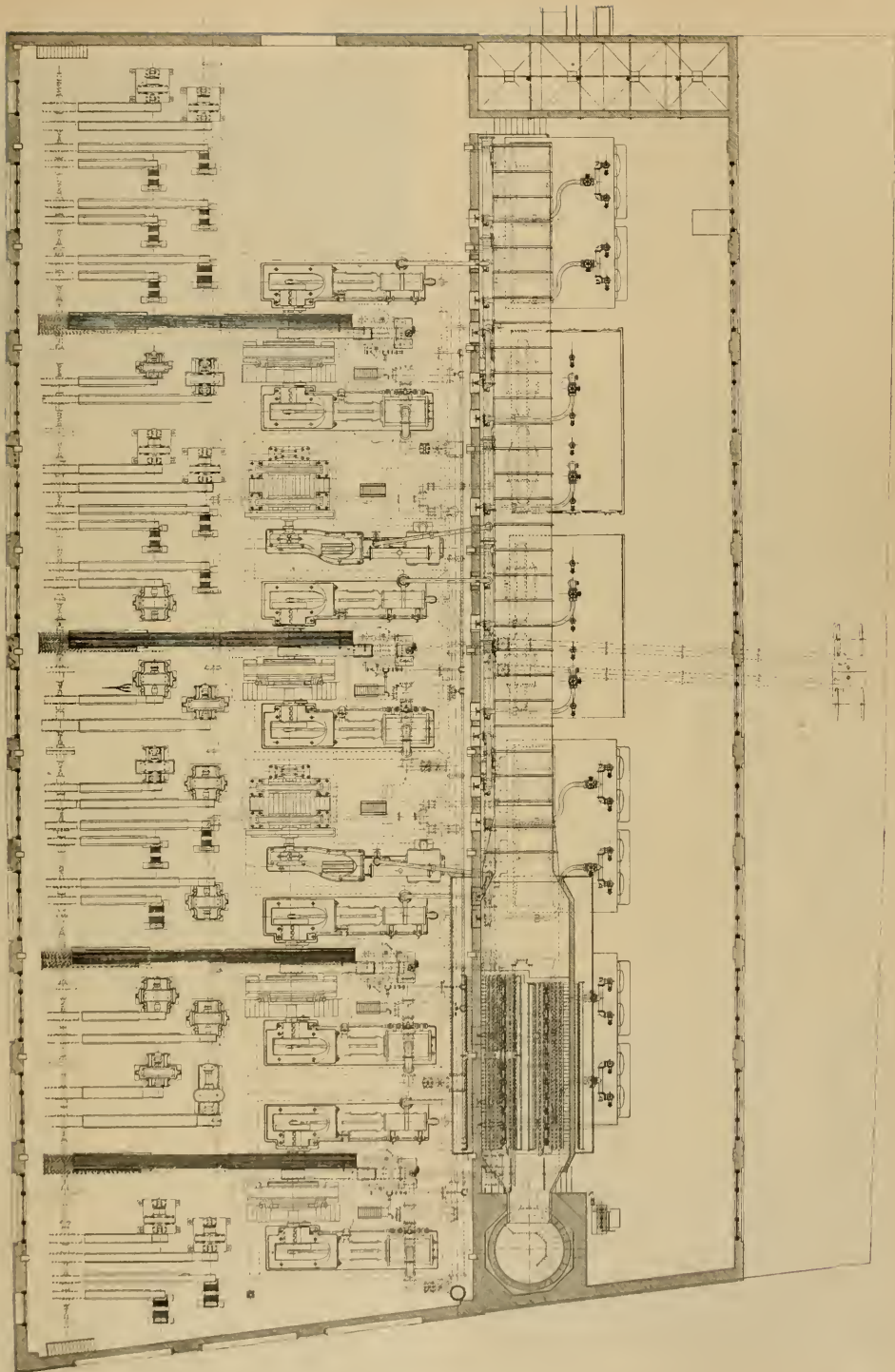
One of the novel features in this station is use of the same engines for furnishing railway and lighting current. The direct connected generators are used for railway work and the belt driven machines for lighting, all the engines being connected by the line shaft clutches. It has been found that to obtain satisfactory lighting service the railway load should



TRANSVERSE SECTION LOOKING FROM SWITCHBOARD.



PLAN SHOWING GENERAL ARRANGEMENT OF MACHINERY.



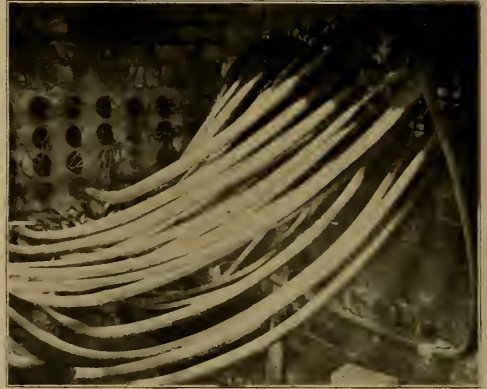
not exceed fifty per cent of the total. A Moscrop speed recorder gives a continuous record of the speed.

The engine foundations extend down to the piling as do the piers supporting the line shaft bearings. The engine room floor is of brick and cement, supported by 12-inch I-beams, spaced 45 inches between centers and resting on similar beams running at right angles and supported by the walls and engine foundations. The basement is 15 feet high in the clear and here are located the drums for tightening the rope drives, the condensers, the Jewell oil filter, and the wiring from the generators to the switch-board. Along the east side of the basement is a 24-inch exhaust header. Water for condensing is drawn from the Maumee river through two 18-inch mains.

The machines installed comprise four multi-polar 6-100-562 Edison used on the 3-wire tubing system; two 500-volt machines for power current, one an Edison 60 and the other a Thomson-Houston multi-polar 90; four 500-kilowatt G. E. 10-500-90 railway generators direct connected to the large engines; one 150-kilowatt Edison machine which has been rewound and is used as a booster in series with the railway bus bars of the Toledo & Maumee Valley road, a 24-mile loop; one 2,200-light and one 4,000-light alternating current Westinghouse; one 5,000-light G. E. type A 22-300-682; two old T-II D-62 machines rewound and used for exciters; ten 50-light Western Electric arc machines, and six 125-light Wood (Ft. Wayne Electric Corporation, Ft. Wayne, Ind.) arc machines. The arc lights, of which there are about 600, now supplied by the station are operated by the six Wood machines. The dynamos furnish 9.6 amperes at 6,250 volts and have a maximum capacity of 6,800 volts at 500 r. p. m., with an efficiency of 90 per cent. The regulating mechanism on these machines is on the same principle as the older Wood type, but remodelled, and is very sensitive in its operation so that the variation in current does not exceed  $\frac{1}{10}$  of an ampere. The armatures are of the ventilated type, smooth core. Four sparkless brushes are used.

For handling machinery there is one of the Brown Hoisting & Conveying Machinery Company's 20-ton cranes, with two carriages of 10 tons capacity each.

The switch board is of white marble and extends across the south end of the engine room, the gallery in front of it being 14 feet above the floor. On the west wall is a small



MANHOLE NO. 1—TOLEDO TRACTION COMPANY.

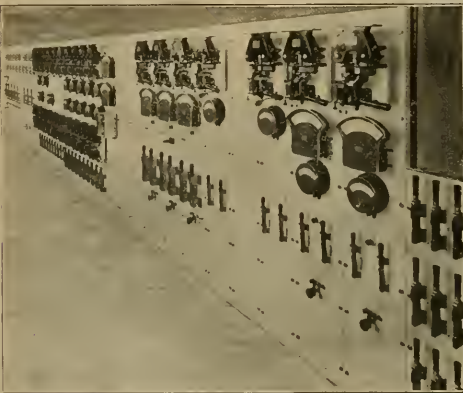
potential board with meters to show the drop between the station and the tubing system. Beginning at the west end, the board is divided into panels as follows: one for the 3-wire machine now installed, and one blank for the generators on the Porter-Allen engines; one panel for the 3-wire system feeders, 24 cables, with Van Fleck vertical ammeters; two panels for the power current machines; four panels for feeders, one with a recording watt-meter; four panels for the railway machines on the large engines; one panel with a 5,000-ampere recording wattmeter; ten double panels for 20 railway feeders, with a switch, ammeter and circuit breaker for each; one blank for feeders; three panels for alternating feeders; one potential panel with voltmeter and ground detector; eight panels for alternating feeders with recording wattmeters on the back of the board; and the arc board for 20 circuits and 20 machines with 4 ammeters, each of which may be connected to any one of 5 machines, and a voltmeter reading to 7,000 volts. Automatic circuit breakers are used for all except the 3-wire and the arc circuits. Behind the board are the track return cables, of which there are now four of 1,000,000 and five of 500,000 circular mils in cross section. Weston meters are used on the direct circuits and General Electric meters on all alternating and arc circuits.

All of the wiring for the 3-wire system is underground and the railway cables also leave the station underground. One of our illustrations is a view of manhole No. 1. The tubing system will supply an area about one mile square in the business portion of this city.

This station is now supplying current for 96 street cars in regular service, for 8,000 lamps on the 3-wire and alternating current systems, and for 600 arc lamps. During November, 1896, the average daily output of the station was 25,000 kilowatt-hours. During December the output has been somewhat higher, running from 30 to 38 thousand kilowatt-hours per day.

For our photographs of the station we are indebted to G. A. Cooke, assistant to the general manager.

The Chicago City Railway is being sued by Thomas T. Moran, for \$10,000, on account of the damage done his property on Wabash avenue, by the noise, smoke, cinders, soot and the vibration caused by the machinery in the new electric power house on Fifty-third street.



SWITCH BOARD.

## STREET RAILWAYS IN MEXICO.

BY FRANK HUMBOLDT CLARK.

"How often do the street cars run?"

"About every half hour, but they aren't very regular."

This conversation, which related to the street cars of Chihuahua, would apply with equal accuracy to most of the cities of Mexico, and conveys a whole volume of information regarding street railway management in our neighboring republic. The Chihuahua Railway Company, which may be taken as a fair illustration of the larger cities, for a population of 40,000 has about twenty street cars, but only

blanket-like zerape and wearing the high sugar loaf hat universally used beyond the Rio Grande, the street car driver of Mexico is as little like an American motorman as can be imagined.

The conductor goes in pairs. One man sells you a ticket for which he charges you six centavos—or more if you are particularly unsophisticated Americans, as was the case with us in Aguas Calientes. The second man comes later and collects the tickets, from which it would seem that it is cheaper to have two men instead of one man with a bell punch or register. The only exception to this rule is Monterey which is one of the most progressive cities in Mexico and boasts the proud title of the "Chicago of Mexico;"



SCENE AT GUANAJUATO.  
FREIGHT CAR, ZACATECAS.

PLAZA, VERA CRUZ.  
STREET CAR OF CHIHUAHUA.

A TANDEM TEAM, MONTEREY.  
POSTAL CAR, PUEBLA.

has four cars in regular service. The fare in a first-class car is six centavos and second-class three centavos; the longest ride is about four miles.

The trolley cars of Mexico are all donkey cars. These patient little animals are the universal motor and are driven in every style, or lack of style. Sometimes they are seen tandem as in Monterey, and frequently four, six and eight to a car, as in the steep and narrow streets of Guanajuato or Jalapa. The Mexicans are a quiet people not given to loud noises on the street, and instead of shouting, the drivers urge their donkeys on by a sharp hissing sound. The bell, as a signal, is universally supplanted by the horn. A Mexican Jehu, therefore, urges his galloping burros to greater speed by hissing at them and announces his approach by blowing what seems like a toy tin horn; wrapped in his

there, the collector, after receiving our money went to a register hanging by a strap over the dash board of the car and rang up the fares.

An important branch of the street railway business in Mexico is the transportation of freight, and the miniature freight cars, both box cars and flat cars, are a common sight, especially in Vera Cruz and Zacatecas. The unique funeral cars of the City of Mexico have already been illustrated in the STREET RAILWAY REVIEW. Another branch of the business, by which we frequently had occasion to profit, is the practice of sending one or more cars marked "Especial," to meet a large party. On these special cars no passengers other than the members of the party to be accommodated are allowed, and the rate of fare is from ten to twenty-five centavos.



The Mexicans seem to have anticipated us in utilizing street cars in the postal service. In Pueblo a postal car is run to meet all mail trains and is attended by a guard of the national soldiery known as "rurales." At Pueblo we were reminded, in a manner we will not soon forget, of the good but sometimes inconvenient custom of taking a siesta from two to three o'clock. As is usual in Mexican cities, the railway station is a mile or more from the center of the city. Our special train was to stop for several hours that we might see the town. After wandering about the Plaza we went into the great Cathedral, one of the most famous on the continent. Here we lingered, allowing ourselves only time enough to reach the train at three o'clock. Upon looking for a street car, what was our consternation to find that the donkeys and cars were leisurely taking their daily siesta, the conductors and drivers were not even in sight, and there was no prospect of a ride until after three o'clock.

In Mexico the street cars go as the animals went into the ark, two by two. A first-class car, usually buff in color is closely followed by a green second class car. This is made necessary by the character of the population. There is no middle class: the people are either well to do or they belong to the wretchedly poor peon class. So common is the practice of smoking, that the men smoke their cigarettes in the first class cars as a matter of course, and women of the poor class are often seen smoking on the street.

One of the most interesting lines of the Mexican "travias," as they are called, is that which extends from Zacatecas to the well known shrine of Guadalupe, a distance of over four miles, and which is operated solely by gravity. In the expressive language of the Chinaman, "No pushee, no pullee, go like helle!" Taking on board of an accompanying flat car, the burros which are to draw you back, you start slowly and are soon whirling over bridges, past quaint flat roofed houses dropped down from the orient, by rich silver mines, through picturesque groups of natives, with magnificent views presented at every turn; in a few minutes you have completed a ride worth going a long way to enjoy, and one which located at the gate of an American city of seventy thousand souls would make the fortune of some railway manager.

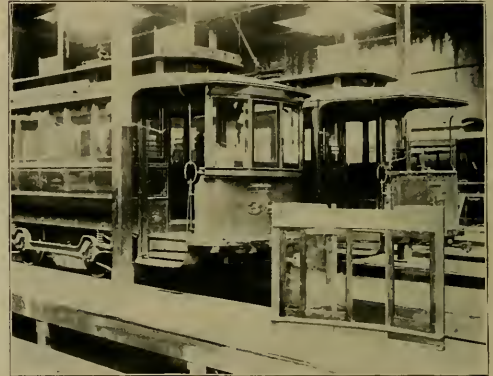
Of the street railways of Mexico it may be said in general that, though their methods are primitive, they are a real accommodation to the public. The heart of a Mexican town is its plaza and at the plaza of every considerable city one can generally take a street car to the part of the city or neighboring point of interest he wishes to reach. American car builders have been liberally patronized and few enterprises are more inviting or promise better returns than the application of modern methods and equipment to the street railways of Mexico.

#### CHICAGO ELECTRICAL ASSOCIATION OFFICERS FOR 1897.

The Chicago Electrical Association elected officers for 1897 at its last meeting in December. They are as follows: S. G. McMeen, president; F. S. Hickok, vice-president; E. J. Jenness, treasurer; H. Cochrane, auditor; J. R. Cravath, secretary; W. Clyde Jones, G. W. Knox and K. B. Miller, directors. This association is constantly growing in membership and a good attendance at every semi-monthly meeting indicates a healthy interest.

#### AURORA VESTIBULES.

In last month's issue we described several of the most up-to-date forms of vestibules and gave the thoughts of several managers on the subject. We are now able to supplement that article with a description of the removable vestibule used at Aurora, where D. A. Belden is general manager. Our engraving shows a vestibule on and a vestibule off the car. It is made of ash reinforced with band iron and having angle irons at sash frame intersections. The middle window



CAR BARN—AURORA & GENEVA RAILWAY.

slides to the left. The window frames are of cherry and are fitted with extra thick glass. The vestibule leans slightly back so that the top may come under the hood of the car. The platforms are long enough so that the brake staff can be moved back 8 inches to clear the vestibule. Our engraving shows a car "before and after taking," a vestibule, and a detached vestibule.

#### CITIES MAY LIMIT SPEED.

The Brooklyn city council passed an ordinance limiting the speed of street cars to 6 miles per hour in certain down-town districts, and to 8 miles in other districts. The city recently made a test case, based on the evidence of two policemen with a stop watch, who measured a distance of 285 feet on one of the lines of the Brooklyn City & Newtown; and testified that a certain car passed at a rate of nearly 14 miles an hour. The city won in the justice court, where a fine of \$25 was rendered. The county court reversed on the ground that there was no evidence to show the action of the motorman was willful or negligent.

The appellate division of the Supreme Court sustained the ordinance and the justice. Part of the ruling is as follows: "In the case before us it appears that the motorman was in control of the car. It does not appear that any accident had occurred to the car which rendered its proper management difficult or impossible. No circumstance is shown from which it appears that the motorman could not have run the car at a speed within the rate prescribed by the ordinance. The testimony of the motorman and conductor that they did not know the car was going faster than eight miles an hour, at the most, only raised a question of fact of which the determination of the justice is conclusive."

## THE THEORY OF THE WIRING TABLE.

BY THOMAS G. GRIER.

Wires are used to form an easy and direct path for the distribution of the electric current as pipes are used for distributing gas or water to places at a distance from the source of supply. The sizes of pipes are determined upon the basis of the distance and the quantity of material sent through them. Wires, as well, must have some distinct size depending upon the circumstances governing different conditions. It is necessary to make calculations in order to ascertain the size of wire, and to shorten and to simplify this work of calculation wiring tables have been compiled. A wiring table gives at once the result in the commercial size of wire, and when the proper table is at hand no multiplying or dividing, no figuring, no application of a formula is required.

In all substances there exists some unknown obstruction to the flow of an electric current. The technical name given to this obstruction to the passage of an electric current is resistance. It is not known what causes this resistance, but by experiment the extent to which it exists in any substance can be ascertained and measured. It is known how in any substance the amount of resistance may be varied by altering the dimensions, also as to the amount of energy necessary to overcome any resistance. The theory of the wiring table is simply one of proportioning resistances.

The first point to be considered is, how is the resistance varied in any substance? The law states that the resistance of any substance varies directly as its length and inversely as its cross section. This law has been verified by experiment and is universally accepted as a law of nature. The resistance varies directly as the length of any given substance, means that if the length of a wire is doubled the resistance is doubled, and three times the length means three times as much resistance. The resistance varies inversely as the area of cross-section, means that if the area of a wire is doubled, that is, if there is just twice as much metal for a given length of wire, the resistance is decreased one-half. If the area is increased three times, the resistance is decreased to one-third. In a wire of a given substance if the length is doubled, and at the same time the area is doubled, the resistance remains the same, or if the length is increased to three times as great, and at the same time the area is increased three times, the resistance remains the same. From this application of the law already referred to, it can be seen how it is possible to vary the size of a wire so that the resistance remains constant for any length, or how the resistance may be changed to suit any condition or circumstance.

The next consideration is the action of the electric current. The pressure is measured in volts, and the flow is measured in amperes. The volts are all used up in forcing the amperes against the resistance. The resistance (if it were all in the wire) would mean a total loss of the electrical energy, because the volts would be used in doing work from which no results were obtained. It is necessary, therefore, to make the resistance of the wire which conducts the current but a proportion of the total resistance. The rest of the resistance of a circuit being that which exists in the lamps, and the other devices or apparatus which converts the electrical energy into commercial forms, as light, power or heat.

To so compile a table and calculate the sizes it is necessary to consider the relation which exists between the unit of

resistance, the ohm, the unit of pressure, the volt, and unit of current, the ampere. One ohm resistance requires the pressure of one volt to transmit one ampere. Two ohms require two volts to transmit one ampere. One volt will transmit but one half an ampere over two ohms, and 100 volts will transmit 10 amperes over 10 ohms. This is Ohm's law, which, when given in the form usually found in text books, is as follows: The flow, or current, measured in amperes is equal to the volts divided by the ohms. The volts are equal to the amperes multiplied by the ohms, and the ohms are equal to the volts divided by the current flow or amperes.

Knowing the relation of resistance to the flow of currents, and the pressure, the next point to be considered is the substance used for the wires and ascertain the amount of its resistance for a given length and size, to be used as a unit for making the calculation necessary in compiling the table. Copper commercially and physically represents the best conductor for the transmission of the electric current. A dollar's worth of copper will conduct a greater amount of electric current than any other metal of equal value with the same loss of energy. In the illustrations following, copper will be the substance considered, as the wiring tables used for ascertaining the size of wire are for copper wire. The units by which wire is measured are the circular mil and the foot. The circular mil is the area of a circle whose diameter is one one-thousandth of an inch. The foot is a unit familiar to all. The unit of wire then would be a wire one foot long, the area of which is one circular mil, and the resistance of this unit of copper wire is between 10 ohms and 11 ohms, depending upon the temperature of the wire.

Ten and six-tenths ohms may be assumed as the resistance which approximates closely to the average at ordinary temperatures. Taking this as the basis for compiling a wiring table, it is known that to send an ampere through this unit of wire would require 10.6 volts. For, as stated in Ohm's law, the volts must equal the ohms multiplied by the amperes. But in every day problems the known quantities are the volts and amperes, and the calculation is to find wires of proper resistance to suit conditions. The resistance, or the ohms, must equal the volts divided by the amperes. To solve this problem, the volts are divided by the amperes, and we have the resistance. The resistance varies as the length and inversely as the area. It is the area of a wire which is desired, and one the resistance of which will equal the resistance found by dividing the volts by the amperes. The resistance of one foot of copper wire, one circular mil in area, equals 10.6 ohms. The resistance of any wire is equal to its length multiplied by 10.6, and this divided by the area. Now it is known that the volts divided by the amperes equal the resistance, and the volts divided by the amperes are, therefore, equal to the length of the wire multiplied by 10.6 and divided by the area. In any problem of wiring we have the number of volts and amperes, also the distance the current is to be transmitted, and the only thing remaining to be found is the area. To find this we multiply 10.6 by twice the distance or the total length of wire (in multiple arc work there is one outgoing wire and the return circuit, which makes the total length of wire double the distance) and multiply this by the amperes, and divide the product by the volts used, which gives the area of the wire.

The volts used are not the total volts of the system, but the volts lost at the wire. If the problem is given so many per cent loss, it would mean a per cent of the total number of

volts. To illustrate: If the wire is to use up 2 per cent of the pressure, and the voltage of the system was 50, then you would divide by 2 per cent of 50, or one volt, or if the pressure was 100 volts you would divide by 2 per cent of 100 or 2. In compiling a table let it be assumed for a 50-volt system for a regular increase of distances of ten feet, the following method is pursued: First, the per cent loss is ascertained, let it be 2 per cent. This then would be one volt. Then one ampere will be considered, first, as the total current flow, and the following calculations would be made: 10.6 would be multiplied by 10 feet and by 2 to get the length of the wire, and this multiplied by one ampere and the product divided by volts lost, or in this case, by one which would give us an area of 212 circular mils. This would be the size of a wire necessary to allow one ampere to be transmitted 10 feet with one volt loss (or 2 per cent of 50 volts). The next calculation would be for 20 feet distance, and as the resistance of the wire must remain the same, the area first found, namely 212 circular mils, must be doubled as the distance has been doubled. For 30 feet to keep the resistance constant, the area is increased 3 times, and so on until the limit of the table, say 200 feet, is reached, when the area will be increased 20 times, as the length has been increased in that ratio. Then the same method will be continued for 2 amperes, namely multiplying 10.6 by the distance and by 2 to get the length of wire, and this multiplied by amperes and the whole divided by the volts lost. This is continued until the area for all the wires for each of the distances and for the various numbers of amperes have been determined.

As it is necessary to multiply 10.6 by the (distance multiplied by 2) in every instance, 21.2 is used instead, and the straight distance used. The whole resolves itself into the simple formula:

$$\frac{21.2 \times \text{distance} \times \text{amperes}}{\text{volts lost}} = \text{area of wire.}$$

When these areas are found the commercial sizes of wire are inserted in the table which are nearest to the size found, but always larger never smaller; that is, if the area found in the calculation came between a No. 0 wire and a No. 00 wire, the No. 00 wire would be the size used in the table.

#### A COLUMBUS (O.) PALACE CAR.

The special car "Minerva," of which we illustrate exterior and interior views, was built for the Columbus (Ohio) Central Railway Company, by the Brownell Car Company, St. Louis, Mo. The body is 21 feet long, with vestibuled platforms, 3 feet, 6 inches long, and 7 feet, 6 inches wide over posts. The vestibules are permanent and designed to form an integral part of the car, which is quite an unusual thing in car construction. All of the continuous work is bent to shape. The interior is finished in selected mahogany, with all of the cappings, moulding, etc., hand carved. Between the windows, which are of French plate glass throughout, are oval mirrors extending from the ceilings the full length of the sash. On one side one mirror gives way to an ornamental water cooler of polished bronze, designed to match the rich metal trimmings of the car. The shades are of heavy green gros-grain silk, on spring rollers, and the portieres of green silk damask with gilt figures. In summer the side sashes may be removed and storm curtains of oak-



COLUMBUS PALACE CAR.

etc, on spring rollers, substituted. Ten chairs and four divans of rattan with plush-covered hair cushions provide seats for eighteen. The floor is covered with a Wilton carpet of color and design to harmonize with the other details, and the platforms and steps are provided with thick rubber mats. Over each window is a decorative painting of appropriate design and artistic merit. The subjects of these paintings, of which there are twenty, are from the mythology of Minerva. The car is lighted by three four-burner Pintsch lamps with cut-glass globes, and heated by four "consolidated" heaters, disposed under the side risers. The ventilator sashes are filled with beveled plate glass. Electric call bells are provided throughout the car. On the vestibules are electric headlights. A movable gate of



"MINERVA"—INTERIOR.

wrought iron is also provided. The car body is painted a deep quaker green with ornamentation in gold, and mounted on Brownell's No. 3 electric motor truck, equipped with two Westinghouse No. 12 motors. This car was especially designed for use by private parties, and no expense has been spared in making it a thing of beauty that will be a joy to hundreds. Rare taste has been displayed in the decoration and furnishing, without making the very common mistake of overdoing it.

In Minnie Hall's suit against the city of Manson, Ia., for personal injury caused by falling into a hole dug in the street to lay water mains, the state supreme court decided against plaintiff, on the ground that, as the expert witnesses had disagreed, the injured limb should have been examined in open court before the jury.



## STREET RAILWAY NOTES FROM PARIS.

(From Our Own Correspondent.)

About a month since the general council of the Seine forwarded to the monopolies commission and to the public works committee, with its favorable opinion, the proposition of the General Tramways Company (late Compagnie des Tramways Sud) to substitute on the whole of its lines mechanical for animal traction. It was at this time that the company made its proposition to install a trial line from the Bastille to Charenton. Louis Puech, whose name figures in everything connected with the suppression of horses in Paris, has, in behalf of the competent commissions, prepared a report deciding upon the adoption of the transformation by the former Compagnie des Tramways Sud. It is with no small pleasure that we witness this first root of electric wire enter into Paris after the determined resistance that has been for so many years past opposed to it, for the use of it is certain to spread. This will mean much to the French company exploiting the Thomson-Houston patents; but it will also give a chance to other electric companies beside, and it is to be hoped that, for the successful working of the lines, a goodly number of orders for material will be placed with American supply companies.

Mr. Puech points out that in addition to a one-third reduction in fares, the speed will be increased. Up grades abound in Paris, necessitating a team of four horses struggling painfully in front of cars weighing six tons loaded, and making only from one to two miles per hour. The quicker service will mean less waiting at stations, where at present one frequently sees from fifty to several hundred persons waiting upwards of an hour to obtain places. The example of this company, which has the finest horses of any company in Paris, and whose term of franchise ends in 1910, is considered to be a good argument against the other two companies. These either refuse to suppress horses without special guarantees from the city on account of the expiration of the monopoly fourteen years hence, or will make the transformation only in maintaining the old rates of fares.

It may be mentioned that independently of the trial proposed for the overhead wire, the same company has agreed to fit up one of its lines with underground wires and superficial road contacts, similar to the system employed on the Place de la Republique to Romainville line in East Paris. The terminal stations of this installation will be the Boulevard St. Germain and rue Bonaparte at one end, and Clamart, a charming village under the Meudon wood, at a distance of about five miles over heavy grades, at the other. The same fares will be charged as on the Bastille-Charenton line.

Electric lighting trials are at present being made upon the compressed-air cars which work between the Gare St. Lazare and the Cours de Vincennes. Hitherto the illumination of street cars in Paris has been very insufficient—with it reading has been impossible—and as the trials are proving satisfactory, it is expected that the new illuminant will be applied to the vehicles of the more important lines this winter, but more particularly those worked by omnibuses.

Plans have been completed for the working of the Charenton, Pantin & Port d'Ivry combined street lines, a length of about nine miles, by mechanical power—steam most probably.

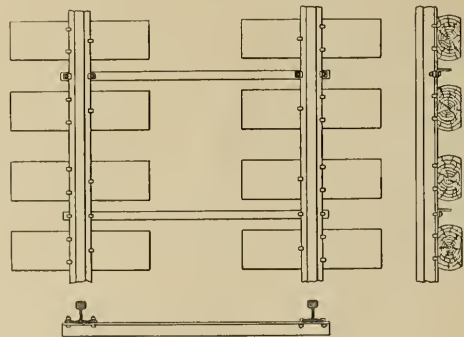
The accumulator electric cars running between the Opera and Saint Denis, although working most quietly and inoffensively as regards pedestrians and street traffic, have, nev-

ertheless, just been the subject of a complaint to the prefect of police, pointing out unbearable stoppages and delays and asking that the company (Compagnie des Tramways du department de la Seine) provide a better system of traction. The reply received is, that improvements now being made in the working of the motors are such as will give the public satisfaction. This will show American readers the means taken in this country by the public to obtain a better service. Competition is greatly needed.

The gas motor working a car on one of the La Villette lines, while attracting no especial comment, good or bad, was not particularly happy in a trial run it made last week, when the vehicle became ablaze through the explosion of the gas-holder. No one was hurt through the accident, which, it is to be hoped, will not prejudice the Campagnie Generale des Omnibus against this interesting motor before it has had a fair trial.

## IRON TIES AND WOOD SLEEPERS.

Jacob T. Wainwright, in the Iron Age, suggests a combination of wood sleepers and iron ties for steam railroad work, which is also applicable to street railway work. The rails are held to gage and kept from canting by an angle iron



tie-rod or bar. The rails are supported on separate lines of cross sleepers. An angle iron tie-bar with bolts for it costs 35 cents according to Mr. Wainwright so that there is an economy in first cost as compared with the ordinary tie construction, where ties cost 70 cents each. The functions of the spikes are also changed as they do not have to maintain the gage and consequently rotting wood can be used longer.

## ARABS AND THE TROLLEY.

A Cairo correspondent writing the Paris edition of the New York Herald, says: The electric trams, which are the latest acquisition to Cairo, are vastly popular with all classes. A new line was opened on Sunday near the Kasr-el-Nil bridge, and the cars are crammed daily. At the outset the cars and track had to be guarded by a posse of Egyptian police—not to protect the cars, however, but the Arabs, who with characteristic fatalism would have calmly walked in front of the vehicles and been killed in dozens. As it is, the victims number six since the institution of the new mode of transit. The Arabs are now beginning to regard the warning bell as an indication that the neighborhood of the track is unhealthful.

## J. B. PARSONS.

J. B. Parsons, who for the past 10 years has been so prominently identified with street railway interests in Chicago, has accepted the very flattering offer of the Union Traction Company, of Philadelphia, and already entered upon his duties as general manager of that road. His work in Chicago, as was his work in Philadelphia prior to coming here, has been progressive and constitutes a record of which he may well be proud.



J. B. PARSONS.

Mr. Parsons was born May 17, 1850, near Whitesville, a small village in southern Maryland. When about six years old his father, who had been a farmer, removed to Salisbury where he embarked in mercantile pursuits.

After attending the Salisbury Academy until his eighteenth year Mr. Parsons

associated himself with his father in business. He did not take kindly to a mercantile life, however, and shortly afterwards began his railroad career as assistant to the railroad agent at Salisbury.

Remaining here two years, he next moved to Philadelphia and became a clerk in the offices of the Chestnut and Walnut Street Railway Company, being soon after made division superintendent. He continued with this company until 1881, when he was elected president of the Lombard and South Streets Road. In 1886 the stockholders of this company bought a controlling interest in the Peoples' Passenger Railroad of Philadelphia, which leased several other roads, and Mr. Parsons was elected to the presidency.

In 1886 Mr. Parsons was married to Miss Katharine F. Flickinger, and in the next year removed to Chicago to accept the position of vice-president and general manager of the West Chicago Street Railroad. Since that time Mr. Parsons has been identified with this road and to him in a great measure is to be attributed the economic success achieved by it.

Our best wishes go with him in his new work in his old home.

## DYNAMOMETER CAR.

A short description of the dynamometer or dynamometer car, used by the Chicago City Railway, was embodied in the paper read by M. K. Bowen, superintendent of the road, at the St. Louis convention, reported in the STREET RAILWAY REVIEW, November, 1896. In the December issue we published illustrations from photographs showing a general view of the car and of the recording mechanism. The line drawings give the details of construction. Figures 1 and 2 show, respectively, longitudinal and cross-sections of the car, and figure 3 shows the arrangement of the recording levers and drum.

The middle axle, carrying the wheels, M, is in two pieces, a 4-inch helical spring, 9 inches long, being inserted between the inner ends of the "half-axles" and pressing them outward so that the flanges of the wheels are always tight against the rails. The spring is contained in a box made of two short pieces of gas pipe, F and D, which are screwed into blocks with conical centers fitting into corresponding holes in the axle ends. The bearings and guides for these half-axles are so arranged as to permit of both vertical and lateral motions at the wheel ends, and of lateral motion only at the inner or spring ends. To one portion, D, of the spring box, a wire cord, A, is fastened and led over a pulley fixed on the other portion, F, of the spring box to the "gage" recording lever (figure 3). It is evident that any motion of the wheels, M and M, relative to each other will be transmitted to the gage lever and recorded.

The car rests directly on the bearings of the two end axles, no springs being used, and in consequence the vertical movements of the wheels, M and M, afford an accurate measure of inequalities in the track. The movements of these wheels are transmitted through the wire cords, I and J, to the two "low-joint" recording levers of figure 3.

The difference in level between the two rails is measured by noting the motion of two wooden blocks which float in mercury contained in the two cups, G and H. The cups are connected by a pipe as shown, so that the surfaces of the mercury in the two cups may be at the same level. The wooden floats are attached to a lever supported in bearings at K, and through the vertical arm and the rod, B, a positive motion is given to the "level" lever whenever any change in the transverse level occurs. Vibration of the mercury may be checked by throttling the flow at the valve, L.

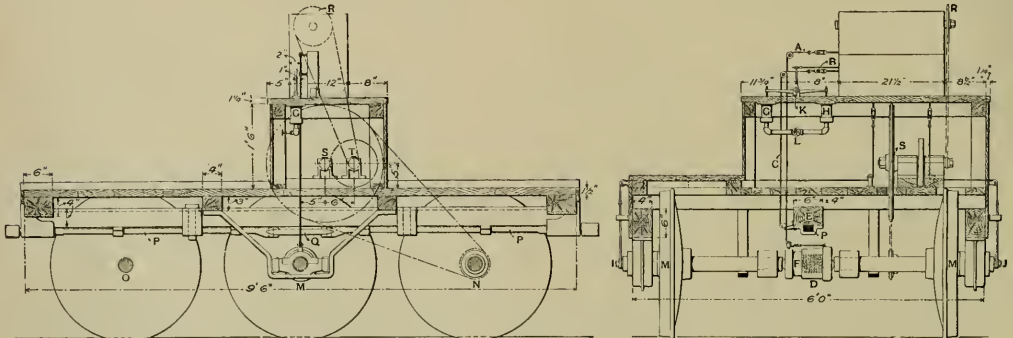


FIGURE 1, LONGITUDINAL SECTION—DYNAMOMETER CAR—FIGURE 2, TRANSVERSE SECTION.



For recording the force necessary to pull the car, a calibrated spring, Q, is placed between the ends of the two drawbars, P, P, (figure 1). A wire cord, C, is fastened to one drawbar and led over a pulley fixed on the other, to the "dynamometer" lever, the deflection of the calibrated spring being transmitted and recorded the same as is done with the lateral motion of the middle axle. Either tension or compression can be recorded by this device and as the drawbars are supported in roller bearings, there is but little loss due to friction. The car can be run in either direction, the rear drawbar being always fastened with a pin so that it constitutes the fixed point of the dynamometer.

With the exception of the "level" lever, which is operated by the rigid levers, each recording lever is provided with a spring (not shown in the cut) which is strong enough to take up the slack in the cord connections and keep the latter always taut.

The records are made on a strip of paper drawn over a drum by means of friction rollers. The speed of the paper

NEW GRIP FOR BALTIMORE.

The Baltimore City Passenger Railway is equipping its cable cars with Earll Automatic Grip. This grip is used by the Metropolitan Street Railway Company of New York and has been previously described in the REVIEW. The advantage secured by its use is the automatic release at the end of ropes and "let-go's," which make it impossible for a rope to be cut should the gripman fail to let go of the cable. Previous to the adoption of this grip the system of gripping was that employed by the Chicago City Railway, an open grip car and a closed trailer. The order is now reversed, the grip-car is a closed car, with the gripman on the front platform, and an open trailer (the old open grip car converted into a trailer). The old style of coupling has been abandoned and a solid bar substituted which obviates lost motion and the consequent jerking of the cars. Both the employes and the patrons of the road consider the new arrangement a great improvement. The gripmen are better protected and so there is now no reason for opening the forward door, the passengers are not subjected to cold drafts as formerly.

IMPROVED BRAKE HANGER.

The illustration shows an improved brake hanger support recently designed by W. G. Price, of the Chicago City Railway Company, to prevent the brake shoes "chattering" when nearing the end of a stop. The plate with a lug cast on, now used for attaching the brake hanger to the truck is replaced by the casting shown, which is made of malleable iron. It is of the same general dimensions as the old support so that no change in the hanger itself is made necessary. For the lug is substituted a box which contains two rubber cushions, A,  $\frac{3}{4}$  inch thick, and two cast iron plates, B. The bolt forming the upper part of the brake hanger is driven in between the plates, B, which serve as a

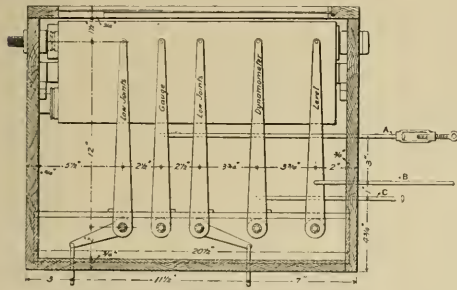
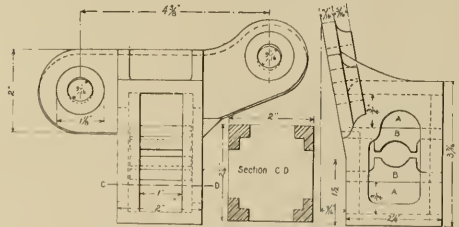


FIGURE 3 RECORDING LEVERS AND DRUM.

is proportional to the distance the car is run, the rolls being geared to one of the car axles. Light bicycle chains running over sprockets are used so that a positive drum motion is secured. As the paper must always travel in the same direction, the ordinary gear used for reversing lathes is attached to the drum motion, so that it may be thrown in when the direction of the car is reversed.

In using the car no adjustment is required except to set a stationary pencil (not shown) so that it will record a continuous zero line for the dynamometer record. The motions of the other levers being to record differences only require no zero lines for reference. In using the car it has been drawn by horses, but for future work it is intended that it shall be drawn by a motor car equipped with motors specially wound for low speeds. The speed at which the best records are obtained is about four miles per hour. In using the car with a view to determining the power lost because of low joints, it is important that the rails be clean as it has been found that a dirty rail will cause an increase in the drawbar pull of from 50 to 75 per cent in some cases.

The plaintiff in a personal injury suit against the Detroit Railway claims that running two cars close together at high speed constitutes negligence. A building at the intersection of two streets obstructed the view. After one car had passed, plaintiff, believing a second car would not be following closely, drove upon the track in time to be struck.



BRAKE HANGER SUPPORT.

bearing, compressing the rubber cushions a trifle. Any wear of plates or bolt may be easily taken up by driving a wedge under the lower cushion. The rubber being soft will not vibrate in the same period as the brake shoe and hence tends to destroy the vibrations of the latter and prevent "chattering." These hanger supports have been applied to one car, with the result that all "chattering" has been stopped, and should a further trial prove them to be satisfactory, all cars operated by the company will be so equipped.

The management of the Belle City Street Railway of Racine, Wis., will issue no more complimentary tickets to members of the city council or newspaper men.

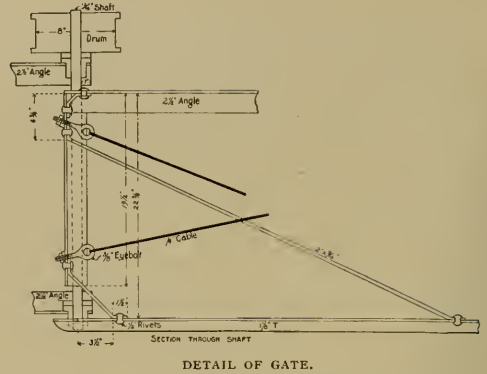
A NOVEL TROLLEY CROSS-OVER.

An illustration of the truth of the adage, "necessity is the mother of invention," is furnished in the ingenious method by means of which the engineers of the Hingham Street Railway, of Hingham, Mass., overcame an obstacle this summer, in the form of the trolley wire of the all-powerful New York, New Haven & Hartford Railroad. The Nantasket Beach branch of the latter road is, as is well known, equipped with a trolley and current is by this means furnished at a high voltage to large motor cars. The rival street railway and trolley railroad intersect at three points of their lines. The railroad, using as an argument the difference in potential between the two trolley wires, entered into litigation which resulted in a decree of the court prohibiting the installation of any form of the many safe and admirable patent trolley crossovers commonly used at the intersection of street railways. As a result the engineers and constructors of the Hingham Street Railway, Pepper & Register, of Philadelphia, installed at Hull, Mass., the device illustrated. Similar constructions are used at the other points of intersection.

Two heavy poles are erected along the street railway, one on either side of the railroad, and as close to the tracks as is allowable. To these poles, at a distance of 18 feet above the road grade are bolted trussed iron brackets, which extend to the center line of the railway track and receive the ends of the trolley wire. This leaves unobstructed the space above the railroad tracks.

To the end of the short bracket, 5 feet 7 inches long, is pivoted a light "gate," swinging in a horizontal plane 12 inches below the railroad trolley wires, which makes the trolley wire connection for the street railway. The top member of this gate is a 2½-inch angle and the bottom member is a 1½-inch T which, when the gate is closed, receives the trolley wheel. The gate is braced diagonally by two ½-inch cables which are fastened at the outer end, run through holes in the vertical struts and secured at the butt to eye-bolts. The gate swings about a 1⅝-inch shaft, supported in roller bearings, having on its upper end an 8-inch drum. A continuous cable passes around this drum and runs back to the pole, where it is led over sheaves (not shown in the illustration) and down the pole to a second drum, fastened to the pole near the ground.

Upon the arrival of a street car at the crossing the conductor attaches a crank to the lower drum shaft and swings

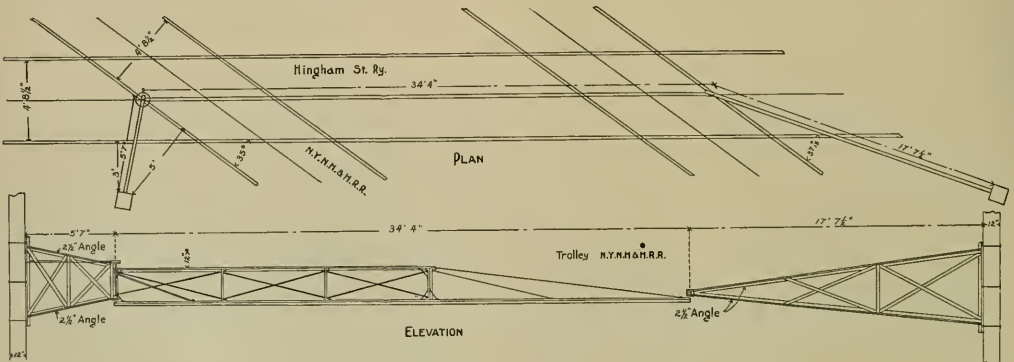


the gate into position. When the car has passed, the gate is swung back into its place parallel to the railroad tracks by means of a weight or counter poise attached to one of the vertical portions of the operating cable.

Although a makeshift, and a very expensive one at that, the device is successful as far as such a roundabout method can be. In every way inferior in convenience, durability and safety to the many patent trolley crossovers on the market, the swinging trolley gate is nevertheless a very ingenious solution of a problem developed by the unfortunate circumstances attending the case.

TROLLEY ROAD MUST SHIFT ITS TRACKS.

In the superior court at Hartford, Conn., Judge Wheeler, on December 11, refused to dissolve the injunction restraining the Enfield & Longmeadow Electric Railroad Company from laying its tracks from Warehouse Point to the Massachusetts line, through the town of Enfield. Permission had been given to lay the tracks and afterwards a radical change in the location was made by the contractor and ratified by the company. The selectmen alleged that no permission had been given to make the changes, while the engineer and others of the company maintained that such permission had been received. The court held that the evidence was in favor of the selectmen and the company will be compelled to move its track and reduce the number of highway crossings from four to two.



TROLLEY CROSS-OVER AT HULL, MASS.

## STREET RAILWAY LAW.

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

*Construction of Elevated Railroad—Injunction by Abutting Owner Where Ordinance is Invalid.*

The erection upon a public street of an elevated railroad imposes no additional servitude where an additional use of a street has been granted by the city authorities to build and operate a street railroad an injunction will not be granted to restrain the construction or operation of the road at the suit of an abutting property owner until the resulting damages to his property are ascertained and paid, but his remedy is by action at law for such damages.

The proposition that a railroad unlawfully in a street is a public nuisance and liable as such to be abated at any time, and therefore a recovery for damages can only be had to the time of bringing the action is untenable; the injury would be a continuing and permanent one, and therefore a single recovery can be had for the whole damages, present and future. The abutting property owner having a complete remedy at law, courts of equity will not, upon his allegation that the ordinance authorizing the construction is illegal, enjoin the defendant from proceeding until the question of illegality can be litigated and determined, but will remit him to his action at law.

In delivering the opinion of the Court, Justice Wilken said:

We held in Chicago, Burlington & Quincy Railroad Company v. Street Railroad Company, 156 Ill. 255, that a street railway operated by electricity, with trolley posts on the streets, was not a new servitude of the street, and that the poles were not unwarranted obstructions in the same, as are telegraph and telephone poles, "because such erections aid and facilitate the use of the public street for the purposes of travel and transportation."

The same is true of the pillars used in constructing elevated roads. In view of the known fact that such elevated lines in large cities greatly accommodate the public by increasing the facility and safety of transit, it can scarcely be seriously contended that permitting them to be constructed and operated is to subject the streets to a new servitude or unlawful one. The right of a city to permit them is clearly recognized by the act of July 1, 1883, entitled, "An act in regard to the use of streets and alleys in incorporated cities and villages by elevated railroads and elevated ways and conveyors." (C. 114. Sections 201, 202, 203. S. C. vol. 2, 1879.)

This Court has frequently held that where an additional use of a street has been granted by the city to build and operate a street railroad, an injunction will not be granted to restrain the construction or operation of the road at the suit of an abutting property owner (*Moses v. R. R. Co.*, 21 Ill. 515; *Murphy v. the City of Chicago*, 29 Ill. 279), and that since the constitution of 1870 such owner cannot maintain a bill to enjoin the same until the resulting damages to his property are ascertained and paid, but that this remedy is by action at law for such damages. (*Stetson v. R. R. Co.*, 75 Ill. 74; *Patterson v. C. D. & V. Ry. Co.*, id., 588; *R. R. Co. v. McGinnis*, 79 Ill. 269; *Schertz v. R. R. Co.*, 84 Ill. 135; *Penn Ins. Co. v. Heiss*, 141 Ill. 35.)

The same doctrine is recognized in *Corcoran v. C. M. & N. R. R. Co.*, et al., 149 Ill. 291; *White v. Elevated Railroad Company*, 154 Ill. 620. We said in Chicago, Burlington & Quincy Railroad Company v. Street R. R. Co., 156 Ill., supra, "where the fee of the street is in the city such damages as the owner may suffer from the laying of a railroad track in the street are merely consequential, so far at least as they affect the property abutting on the street. In such

case, as there is no physical taking of the land, injunction will not lie to enjoin the taking, the remedy being an action at law for damages.

But it is insisted on behalf of complainant that on the facts set up in his bill, the ordinance must be treated as passed without the required consent of abutting owners, and therefore illegal and void, which being true the defendants should be held as proceeding with the work without any authority of law whatever, whereas in the cases referred to lawful consent of the city was shown.

The real ground upon which relief by injunction is denied in such cases is that the use of the street being within the purposes for which it is laid out, and therefore a proper use, the right to occupy is properly a question between the defendant and the municipality having the control of its streets and charged with the duty of keeping them free from unlawful obstructions, or between the defendant and the public generally, the individual being left to his action for damages for any injury resulting to his property. He has no standing in equity on account of public injury, or for the purpose of inflicting punishment upon the defendants for its wrongful acts. He can only invoke that jurisdiction in order to protect his property from threatened injury.

His injury is a depreciation of the property which is capable of being estimated in money, and recoverable in an action at law, therefore, a court of equity will not interfere by injunction.

As stated by Chief Justice Fuller in *Osborne v. Missouri Pacific Railway Company*, 147 U. S. 248. "But where there is no direct taking of the estate itself, in whole or in part, and the injury complained of is the infliction of damage in respect to the complete enjoyment thereof, a court of equity must be satisfied that the threatened damage is substantial and the remedy at law in fact inadequate before restraint will be laid upon the progress of a public work, and if the case made discloses only a legal right to recover damages rather than to demand compensation the court will decline to interfere." To the same effect is the language used in the opinion of Justice Brewer in *re Debs*, petitioner, 158 U. S., 591. In *Morris & Essex Railroad v. Pruden*, 20 N. J. Equity 530, cited in the *Debs* case, it is said: "Mere diminution of the value of the property of the party complaining by the nuisance, without irreparable mischief, will not furnish any foundation for equitable relief." *Zabriskie v. the Jersey City & Bergen R. R. Co.*, 2 Beas. 341.

It must not be overlooked that the defendants are engaged in a public work, by the completion of which the public interest will be greatly advanced. The injunction by which the progress of the work is arrested, must not only cause great injury to the defendant, but also is the occasion of great inconvenience to the public. "And again, the defendants will not occupy with the proposed track any of the complainant's lands. For the contingent and consequential damages he may suffer from any unlawful interference with his enjoyment of his property, he has his remedy by action at law whenever and as often as loss or damage ensues; and if the use of a railroad in front of his premises becomes a nuisance or the aggression proves to be a permanent injury, without an adequate remedy at law, then the court will be competent



to administer equitable relief by injunction to prevent its continuance as for its removal. But a strong case must be presented and the impending danger must be imminent to justify the issuing of an injunction as a precautionary and preventive remedy," citing *Drake v. the Hudson River R. R.*, 7 Bar., (N. Y.) 508.

\* \* \* \* \*

The principle is, that the abutting property owners having a complete remedy at law, courts of equity will not, upon his allegation that the ordinance authorizing the construction is illegal, enjoin the defendant from proceeding until the question of illegality can be litigated and determined; but but remit him to his action at law, and this, it seems to us, is a just and reasonable rule, the enforcement of which will protect the rights of all parties interested. To hold otherwise would be to render impracticable the building and operation of street car lines under our statute. While such improvements are owned and operated by private individuals or corporations, the use of the streets is public, and not private, and upon that theory alone they are permitted to be constructed in the streets, and it will not be denied that in large and populous communities they are of great public utility, if not a public necessity.

While, therefore, the private owner is entitled to have all his property rights fully protected, that right should be accorded him, if possible, by a remedy, which will not unnecessarily injure others and render impossible the construction and operation of necessary facilities for public travel.

A moment's reflection will, we think, convince anyone that if every abutting owner not consenting, may enjoin street railway companies from building their lines in streets upon the ground that the consent of the city has not been legally obtained, because of facts alleged which do not appear upon the face of the proceedings, the building and operation of all such lines will become practically impossible.

In a case like this the work would necessarily be stopped until titles to abutting property could be adjudicated and settled, the powers of agents, etc., determined and the motives which may have prompted owners to give their consent inquired into.

After this has been done, which in the ordinary course of litigation would require many months or even years of time, if the facts should be found in favor of the validity of the ordinance, the work may proceed as to the complainant, he still, being entitled to his action for damages. The decision, however, would settle the validity of the ordinance between him and the defendant and no one else. Any number of other owners may in succession procure injunctions on the same or similar grounds and prosecute them to a like final determination.

Manifestly, neither persons nor corporations would hazard capital in an enterprise subject to such uncertainty and delay. There is a certain adequate and complete remedy at the suit of the public whenever there is a threatened, or actual unlawful obstruction of streets and highways, and, as we think, an equally certain adequate and exclusive remedy to the abutting owner for all his damage present and prospective.

The contention that he cannot have such remedy by a single action we deem untenable. It is not denied that the damages which he would be entitled to recover are the same in kind as if the building of the road was lawful. But it is said that being in the street unlawfully the obstruction is a public nuisance, subject to be abated and removed at any time, and therefore the recovery could only be had for dam-

ages to the time of bringing the suit. This position is based upon the proposition that a railroad unlawfully in a street is a public nuisance and liable as such to be abated at any time, and therefore a recovery for damages can only be had to the time of bringing the action, and hence a multiplicity of suits will become necessary to give the complainants a complete remedy. The position is untenable. The injury would be a continuing and permanent one, and therefore a single recovery can be had for the whole damages, present and future. *C. & E. I. R. R. Co. v. Loeb*, 118 Ill. 204, and authorities cited. *Gault v. C. & N. W. Ry. Co.*, 157 Ill. 125.

(Supreme Court of Illinois. *John W. Doane v. Lake Street Elevated Company*, 1 Chicago Law Journal Weekly 615.)

[Note in the case of *General Electric Railway Co. v. Chicago City Railway Co.*, 1 Chicago Law Journal Weekly 451; 6 STREET RAILWAY REVIEW 535, it was held that a court of equity will not interfere to prevent the construction in the streets of a city of a public railroad to be used equally for the benefit of all the public, but will remit the parties to a court of law, and such relief as that tribunal affords.

The foregoing cases therefore, overrule the contrary opinion in *Leiter v. Union Consolidated Elevated Railway Co.*, 1 Chicago Law Journal Weekly 262; 6 STREET RAILWAY REVIEW 404.—ED.]

#### *Injury at Street Crossing—Failure of Car to Stop When Passing Standing Car—Duty to Look and Listen—Care Required of Child.*

1. A street railway company propelling its cars by electricity along the public streets of a city owes a duty to the public which requires it to so regulate the movements of its cars at the intersection of such streets, when receiving or discharging passengers from a standing car, as not to unnecessarily expose pedestrians to the danger of collision with a passing car on the opposite track.

2. While a car of such a company was stopping at a street crossing to receive and discharge passengers, a boy of the age of seven years and eight months, who was walking across the street from behind the standing car was struck and killed by another of its cars passing from the opposite direction; the evidence tended to prove that the boy's view of the approaching car was obstructed until he had passed the standing car, that no bell or gong was sounding by the approaching car, which was going at the rate of six miles an hour, that the boy did not look for an approaching car before entering upon the track, where he was struck almost immediately upon stepping upon it, and carried a distance of thirty or forty feet before the car could be stopped, upon the trial of an action for damages against the company for negligently causing the death, the trial judge refused motions to nonsuit and to direct a verdict on the alleged grounds that there was no proof of negligence on the part of the company, and that contributory negligence was established on the part of the plaintiff's intestate, and ruled that the questions of negligence and contributory negligence were for the jury; held, that the judge committed no error in so ruling.

3. It was also held to be no error in the judge to refuse to charge that it was not the duty of the moving car to stop before passing the standing car, the judge having already charged the jury that it was for them to say under all the circumstances whether it was negligence upon the part of the motorman to run past that standing car at that time and place or not.

4. The rule requiring one to look and listen before crossing a steam railway, in order to be in the exercise of due care, does not apply with equal force to one crossing the

track of a street railway in a city street where the company and the public stand on an equal footing in the use of the highway, and it was held that it was not negligence per se in the plaintiff's intestate under the circumstances, in going upon the defendants' track without first looking for an approaching car, and the judge's refusal to so charge was sustained, he having fairly submitted the question of contributory negligence as a matter of fact for the jury to determine upon the facts in evidence.

5. When a child has reached the age of discretion and is considered sui juris as a matter of law, the degree of care and caution required of him will be no higher than such as is usually exercised by persons of similar age, judgment and experience, and whether that degree of care and caution has been exercised by the child in a given case is generally, if not always, a question for the jury.

(Court of Errors and Appeals New Jersey, Consolidated Traction Co. v. Scott, 13 National Corporation Reporter 105.)

*Injury to Boy "Hitching" on Car—Forced to Leave Car by Conductor—Struck by Car Coming in Opposite Direction.*

This was a suit by appellant to recover for personal injury sustained by him. At the conclusion of the plaintiff's case the court took the case from the jury by a peremptory instruction to find for the defendant, and a verdict being so returned and judgment rendered thereon, this appeal is prosecuted. The facts shown are that the plaintiff, then twelve or thirteen years of age, when returning from school jumped upon a projection from the rear end of a street car, and while hanging on, as he testified, rode about the length of the car, when the conductor came up and spit at him and "made a punch at his face," whereupon he jumped off, and at that instant another car drawn by horses on a parallel track, was approaching from the opposite direction to that in which the car upon which he was riding was going, and as he jumped off he staggered and run upon the other track, or close to it, and was struck by the approaching horses, knocked down and most severely hurt. It was an instance of what boys call "hitching," and it is not denied that appellant was a trespasser when upon the car.

Appellee insists that the evidence in behalf of appellant shows that the injury was attributable to the contributory negligence of appellant to such an extent as to preclude a recovery. The question of whether there was contributory negligence by the person injured is, as in the question of whether the one doing the injury was guilty of negligence, one of fact for the jury and not one of law for the court.

Of course, if the case as made by the plaintiff, showed such a degree of contributory negligence by him as would require the court to set aside any verdict which it might discover, then it would be proper to take the case from the jury. But a careful consideration of the testimony makes it quite clear that there was evidence tending to establish due care on the part of the plaintiff.

A person in the presence of imminent danger to his person is not required to act with all due care and caution that need reasonably be required of him under ordinary circumstances, and it remains for the jury to say whether he acted with undue rashness in attempting to escape from the known peril that came in front of him. Dunham T. W. Co. v. Dandelin, 143 Ill. 409; West Ch. St. Ry. Co. v. McNulty, 64 Ill. App. 519.

We do not discover in appellee's brief that any serious question is made, but that there was evidence tending to establish negligence on the part of appellee.

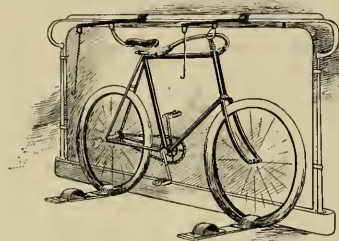
On the question of whether, under the proved facts, appellee was guilty of negligence we refer to North Ch. St. Ry. Co. v. Gasdka, 128 Ill. 613, which is almost precisely in point.

The judgment of the Superior court is reversed.

(Appellate Court of Illinois, first district. Hagestrom v. West Chicago Street Railway Co., 29 Chicago Legal News, 87.)

**BICYCLE-HOLDER ON STREET CARS.**

In order to accommodate cyclists who wish to reach the parks or ferry landings without riding their wheels through the business districts, the San Francisco street car companies have been experimenting with bicycle-holders. The illustration shows the holder recently tried on the Mission street line. It is attached to the back of the rear dashboard, and



BICYCLE HOLDER ON STREET CARS.

designed to carry two bicycles. Two swinging arms of wrought iron, each about a foot long, are secured to the upper edge of the dashboard, about two feet apart; from these depend leather lined hooks to receive the top bars of the frames. To the lower portion of the dashboard are attached two swing rests, to which the wheels are secured by straps across the rims. A single fare is charged for each bicycle carried.

**LORAIN FOUNDRY COMPANY.**

The Lorain Foundry Company, organized within the last year, at Lorain, O., has recently completed a plant which is a model of its kind. This company manufactures ingot molds, rolls and heavy castings up to 75,000 pounds, making a specialty of castings for rolling mill and blast furnace work. The main building is divided into three bays, the center one having a clear floor space of 10,000 square feet available for the molding and pouring of heavy castings. This bay is served by a 35-ton electric traveling crane. The side bays have each about half the floor area of the large one, one side being devoted to light molding and casting, the other containing the cupola, air furnaces and core ovens. The smaller bays are also provided with electric cranes, and every arrangement is made for the convenient charging of the furnaces and pouring of the metal. The officers of the company are Max M. Suppes, president; F. A. Smythe, vice-president; W. F. Saltmarsh, treasurer; Hugh H. Davis, superintendent.





By Robt. Kunstman.

To the visitor of a manufacturing town or district in our country, so rapidly leading others in enterprise and industry, a fine, tall and well proportioned chimney, rising in the midst, or on the flank of an extensive power house building, studded with glittering windows, ornamented with a symmetrical and imposing entablature and crowned with a flat or moderately rising roof, will be an appearance invariably giving delight and wonder with much cause for reflection.

The beauties of charming and classic architecture are here but rarely displayed, but the fascinating impressions which the observer nevertheless receives and will experience from such a structure, are more a feeling of admiration and respect for the wonderful industrial achievements which are marked by these monuments of our nineteenth century.

Gently escaping white clouds that may surround the uppermost crown of this modern obelisk make the whole appearance of the plant pleasingly complete and characteristic, and give us to understand that at the bottom of all is the precious black diamond which gives life and activity to hundreds of cars on many miles of track.

But alas! if instead of this, dense, black smoke is, with swift and apparent violence, bursting out of this elongated circular volcano, and is rolling far and far away over the country, indications then are at hand and before us, that nature's bountiful gifts and benefits are evidently not appreciated there, and are deplorably misused.

Here we discover that something must be radically wrong, repulsive to more than one of our senses and detrimental to economic principles, with a violation of the laws which scientific researches and exertions have discovered and established during recent years of advancement in perfecting the natural forces which are to serve mankind.

The one indication in our power house picture is, that therein a good and complete combustion of the available fuel for steam generation is achieved, while in the other all appearance points to the fact that an imperfect combustion, a careless and wasteful use of coal for the production of motive power for this plant, are the order of the day.

Both sights demonstrate at a glance the functions of the chimney which shall be the object of our consideration. We will therefore deal with:

1. The functions of the power house chimney as a means to effect good and economic combustion.
2. The use of the chimney as a conveyor of surplus products of combustion and obnoxious gases to the outer air.
3. The construction of a serviceable chimney in brick or iron.

As it cannot be the object of this article to deal with the

scientific rules that underlie the entire process of combustion in all its different stages and relations, as to evolution and complete combination of all the combustible elements of the different kinds of fuel for the purpose of producing heat and steam in an entire steam generating plant, we take only the chimney into consideration, as the second, an auxiliary, though highly important part of such a well constructed furnace, where the process of combustion is really performed, we will necessarily have to adopt and introduce many data given by experts and authorities that have already dealt specially and exhaustively with the subject.

Coal when thrown into a fireplace evolves among others the two principal combustibles, namely carbon and hydrogen, which uniting with the oxygen of the air produce heat. Oxygen, therefore is the indispensable element of combustion, its proper supply is the first important question for economic use of fuel and it can only be the oxygen of the air that surrounds us, which has to supply our wants for this yet somewhat complicated chemical problem.

In addition to oxygen, our surrounding atmospheric air contains also nitrogen, in the proportion of 1 pound of oxygen to  $3\frac{1}{2}$  pounds of nitrogen, or, by volume, 1 cubic foot of oxygen to 4 cubic feet of nitrogen, the latter being a neutral gas, so far as combustion is concerned, and is simply present as a diluent, for every cubic foot of oxygen required in combustion, five cubic feet of air must therefore be supplied.

We know that 160 cubic feet of air and weighing about 13 pounds, are necessary for the combustion of 1 pound of coal, though bituminous coal demands more air in proportion, according to the excess in volatile constituents, than anthracite; but it is necessary to admit a greater quantity of air than is chemically consumed, so that each particle of gaseous combustible matter should have its due equivalent of oxygen, and therefore close on 300 cubic feet or 24 pounds of air will be required to provide for the consumption of one pound of coal.

This means that we have to supply or draw a surplus of air through the furnace, which costs us about 10 per cent of the calorific value of every pound of coal.

The drawing in of this air and forcing it through the furnace is one of the principal functions of the chimney; the expression "draft" means the movement of a column of the outer and heavier (because colder) air, at say 62 degrees F., to the place where the lighter and heated gases emanating from the furnace leave for the chimney at a temperature of say 500 degrees F. The temperature of the products of combustion at the moment of their formation and after their service of generating steam, naturally varies with the quantity of air in dilution and with their more or less perfect utilization under the steam boiler.

The movement of draft is generally measured in inches of water pressure. Let a cubic foot of water at 62 degrees F. weigh 62.32 pounds, or in other words a column of water 12 inches high is exerting a pressure per square foot at its base of 62.32 pounds. One inch of water consequently means a pressure of 5.193 pounds on one square foot or 0.577 ounces on one square inch.

When one cubic foot of outer atmospheric air at a temperature of 62 degrees F. and weighing 0.075 pounds displaces hot gasses at 500 degrees F. of 0.04 pounds weight per cubic foot, a difference exists here of 0.035 pounds, which represents the upwards rising force or "draft" at the bottom of the chimney where the connection with the furnace is made. Let, for instance, the chimney be 150 feet high. We then get for every square foot of its cross section a draft pressure of 5.25 pounds or 0.81 inches expressed in water pressure.

The rising of a balloon filled with heated air is probably the simplest verification of this indisputable fact that heated air exerts a measureable force of rising beyond the cooler atmospheric air.

This result in our chimney, however, is not entirely true, and requires correction and modification on account of the gases within the chimney not being of the same specific gravity as the atmospheric air. The gases after leaving the furnace (still with the presumption that complete combustion took place) are a mixture of gaseous steam, nitrogen and carbonic acid gas, all of different specific gravity, and instead of dealing with gases of 500 degrees F. of 0.04 pounds weight per cubic foot, we have different weights in our component parts which will naturally cause variation in draft in a chimney of certain height, and supposing even that the temperatures are the same, the variation in the amounts of constituents of different coals will likewise influence the draft of the chimney.

To what extent the effect of different constituents of various kinds of coal exists may be seen when we quote from reliable investigations the analyses of two very different kinds of coal.

	Anthracite Coal.	Average Soft Bitu- minous Coal.
Fixed carbon.....	86.75	45.50
Volatile matter.....	6.20	37.25
Ash.....	5.25	10.75
Moisture.....	1.80	6.50

For 100 pounds coal burnt, the amount of air required for complete combustion is respectively as follows: 1374 and 1443 and the weight per cubic foot of chimney gases at 500 degrees F. would be for the one 0.0137 and 0.0116 for the other.

From this difference in weights of gases of combustion, different draft power of a chimney of say 100 feet high is the result even when the temperature of the gases and that of the atmospheric air is the same, but as the latter also depends upon the season, with prevailing cold or warm weather ranging from an average of say 0 degrees F. to 102 degrees F. the effect on the draft of chimney must also in this respect be taken into consideration and we learn that it is not infrequently to the amount of 50 per cent or even more.

For instance, with gases of combustion of the respective weights per cubic foot as previously stated, we quote the interesting results from "Helios," published by the Heine Safety Boiler Company.

FOR ANTHRACITE COAL.

	Draft power in inches.
Weight of 1 cubic foot air at.... 0 degrees F.....	0.086.....0.822
Weight of 1 cubic foot air at.... 62 degrees F.....	0.076.....0.624
Weight of 1 cubic foot air at.... 102 degrees F.....	0.070.....0.520

FOR AVERAGE SOFT, BITUMINOUS, COAL.

	Draft power in inches.
Weight of 1 cubic foot air at.... 0 degrees F.....	0.086.....0.863
Weight of 1 cubic foot air at.... 62 degrees F.....	0.076.....0.664
Weight of 1 cubic foot air at.... 102 degrees F.....	0.070.....0.560

More draft is required for anthracite than for soft coal.

The supply of the correct quantity of air is in practice a matter of considerable importance. Insufficiency of air results in an imperfect combustion and causes waste and loss of the volatile portion of the fuel, more carbonic oxide is then produced and only 8 parts of oxygen instead of 16 parts have united with six parts of carbon and too much carbon is passing off in a fine, unconsumed, state. By the color of the escaping smoke no doubt is left to the observer of the presence of plenty of matter that is still combustible, products of an incomplete combustion.

On the other hand in cases of too much surplus air having been admitted, the heat of the furnace is not only reduced but inactive quantities of air and a greater volume of gases are carried through the chimney. The efficiency of the chimney is thereby diminished through the reduced difference between the chimney temperature and the outside air; this may reach a condition when it will take too much fuel to heat the surplus air to the right temperature of the furnace and chimney gases; and great loss is also here to be expected.

To obtain the results of the velocity of the movement of gases per second within the chimney, various formulas are applied. All will more or less depend upon the difference of the height and weight of an enclosed column of the hot chimney gases and the weight of the outside air, its temperature and entrance velocity at the grate.

The former, as we have shown, can be expressed in inches of water, with a factor that varies according to the constituents and compositions of the gases from various coals.

In practice it will be found that much depends upon the construction of the boiler and flues, and upon the careful method of firing, or whether the bed of fuel in kept regular, as much draft will be expended in overcoming the friction and impediment to the velocity of entering air under the grate. This velocity should not fall below 10 to 20 feet per second, nor should the velocity of escaping chimney gases be less than 9 to 25 feet per second, so that with allowing for chimney friction we will have a draft power of from 0.4 to 0.6 inches water.

With the increase of the temperature of the chimney gases, say up to 800 degrees or 900 degrees, which means an accelerated process of firing, and consuming more coal with a quicker and hotter escape of gases, the velocity of draft can be increased, but this would certainly be done at much greater cost.

It is quite probable that while a chimney of 100 feet, with 500 degrees chimney gases required for the full work of drawing in the air and expelling it, 12 to 15 per cent of fuel was consumed, whereas at 900 degrees it required 25 per cent, with a loss or waste of 10 per cent. In such a case the remedy is to lengthen the chimney, as it was not high enough for the work expected from it.

How far, with the height of chimney as a constant, but with changes in temperature of chimney gases, a deviation in

the capacity takes place, is shown in the following comparison;

Temperature of chimney gases at.....	500° F. at 900° F.
Showing a draft pressure in inches.....	0.67    0.91
Percentage of fuel to secure this draft....	13%    25%
At 500° F. for same draft the height.....	100 ft.    140 ft.

The exact relation between area and height of a power house chimney are still a matter of much speculation, and the difficulties which exist to determine the one as well as the other from formulas, will yet remain on account of the absence of more exhaustive tests on the amount of the friction of air passing through grate and fuel bed, through boilers and flues, and on account of the different kinds and qualities of coal and the uncertain and irregular methods of firing.

Modern conditions have altered in recent years, the constants on which the results of such formulas have been depending; 50 per cent air space of grates has replaced that of 20 per cent to 30 per cent, a consumption of 10 pounds coal per hour per square foot is superseded by one of 20 to 40 pounds of coal.

Local circumstances and surrounding conditions will, in nearly all cases, to a great extent, determine the height of the chimney; it is quite obvious that the draft of a chimney will be seriously impaired if the wind comes from the direction of higher buildings or hills existing in the near vicinity.

For settling upon the area of a chimney a principal factor will always be the quantity of fuel consumed per hour indicating the horse-power capacity of engine or boiler. We will quote two formulas for determining area and height, namely, those of Kent and Gale, as they are considered the best, and give dimensions which are more suited to modern conditions and practice in the construction of a good steam producing plant. Still it is at all times necessary to consider the relation between height and area only as to certain limits and restrictions dictated by practical considerations. The two formulas are as follows:

<p>KENT.</p> $A = \frac{0.06 F}{\sqrt{h}}$ $h = \left( \frac{0.06 F}{A} \right)^2$	<p>GALE.</p> $A = 0.07 F \cdot \frac{3}{4}$ $h = \frac{180}{T} \left( \frac{F}{G} \right)^2$
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Here is A = area, h = height of chimney in feet, F = pounds of coal burnt per hour, T = temperature of chimney, G = grate area. It must be remembered that for Kent's formula A represents only the effective area, therefore, a ring, 2 inches wide, is to be added all round to correct the obtained result as no friction of gases with the sides is brought into consideration.

From the authority of J. J. deKinder, M. E., we learn that a height of 75 feet is a suitable one for a chimney for most free burning bituminous coals, 115 feet for slow burning bituminous, and from 125 to 150 feet for anthracite coals. According to the same authority 0.75 inches to 0.88 inches for anthracite is given as necessary draft pressure. He gives 20 to 25 pounds per hour as minimum rates of combustion and 40 per cent air space in grates for anthracite and 50 per cent for soft coal.

We will now introduce a table principally derived from this most excellent compilation of valuable information on the subject, namely from "Helios," showing to what extent capacity of a chimney may be obtained for horse-power

according to different heights with varying areas and diameters.

Height of Chimney in Feet.	Capacity for Horse-Power Ranging		With Area in Square Feet.		Diameter in Inches.	
	From	To	From	To	From	To
75	75	90	3.14	3.69	24	26
80	75	120	4.28	4.91	24	30
85	90	160	3.70	6.30	26	34
90	130	180	4.00	7.07	30	36
95	150	287	5.59	10.56	32	44
100	176	445	6.31	15.00	34	54
110	208	577	7.07	19.63	36	60
120	267	1,173	8.73	34.48	40	81
130	337	2,058	10.56	63.62	44	108
140	413	2,596	12.57	78.54	48	120
150	672	2,693	19.63	78.54	60	120
175	1,044	2,904	28.27	78.54	72	120
200	1,983	3,100	50.27	78.54	96	120

The length of flues from the furnace to the chimney in so far as this depends upon constructive and local conditions, will influence the drawing power of the chimney to a considerable extent and it is stated that flues from grate to inlet at base of chimney extending from 100 to 2000 feet, which latter may be found in some chemical and smelting works, will diminish the draft power of the chimney fully to the amount of 10 to 60 per cent.

It is obviously certain that deviations from the straight direction of flues through curves, angles or any downward directions should be avoided, otherwise sufficient allowance must be made for it in the height of chimney.

According to the statement previously made, another function of the chimney is to convey obnoxious gases which may be in the mixture of products of combustion, beyond the sphere of doing injury to human beings or vegetation, and this is of considerable importance when such chimneys are in connection with chemical works or metallurgical establishments.

The height in such cases depends chiefly upon the surroundings. To what height such lofty structures may become necessary can be seen from the following: The Townsend shaft, Port Dundas, Glasgow, reaches 468 feet, with a diameter of 32 feet at base; the Pollux shaft, Glasgow, 455 feet, 6 inches, the Fall River Manufacturing Company's shaft, Fall River, 341 feet, and Clark Company's shaft, Newark, N. J., 320 feet.

#### ON THE CONSTRUCTION OF A CHIMNEY IN IRON OR BRICK.

When the right locality and dimensions of the chimney are once determined, it is for the engineer to solve the problem of erecting it in connection with the furnace and in harmony with the buildings, for which its functions are to be put into requisition. Architectural embellishments are admissible only when the buildings are treated in such a character as will warrant putting it in harmony with them; plain and well proportioned outlines are the most appropriate and suitable features of a good chimney.

Nature's own works teach us the best lesson in a straight, gracefully erect and tall Californian or Norfolk pine tree, what the right relations and proportions between diameter and elongation have to be, in order to stand the side pressure of wind force.

The condition of the ground which will have to bear the structure exerting a pressure of from 1 to 2 or even 5 tons per square foot will next require the greatest care and consideration, while the construction of the foundation with best material and good workmanship only can secure unailing stability and permanency of the superstructure.



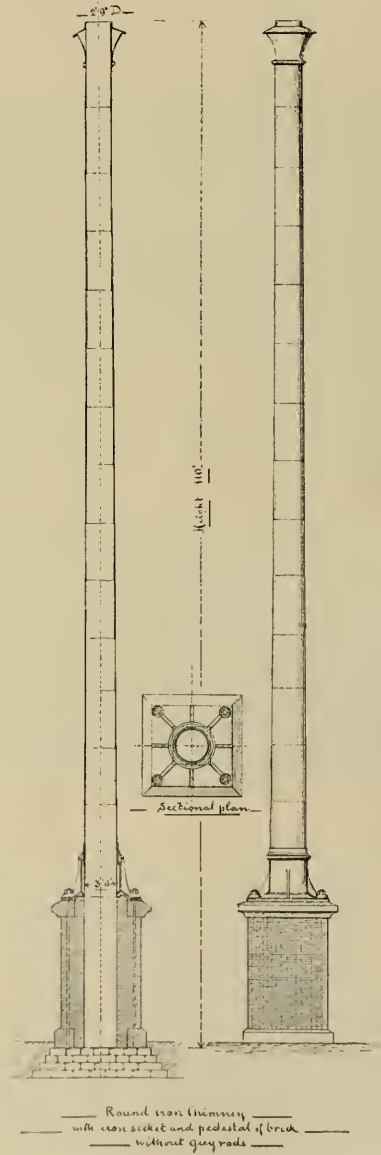
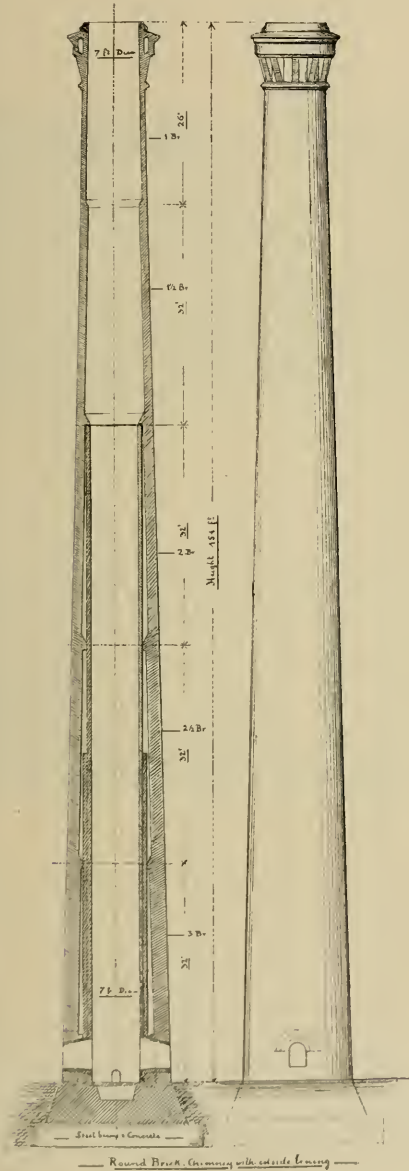
Iron chimneys are appropriate and useful up to certain heights and moderate diameters; chimneys of that description are made of boiler plate or steel plate on brick pedestals on solid stone foundations. A cast iron socket is to hold the flue. The former is bolted down with long, strong anchor bolts, reaching through brick pedestal and foundation. Such a chimney is easy to erect and requires no guy rods to hold the shaft upright. See sketch.

Iron chimneys of greater length and diameter may be also

constructed of steel plates and will then reach with extended and widened base, direct to the foundation.

A circular lining with firebrick, or ordinary well burnt segmental shaped brick, can be inserted inside from the bottom to top.

Brick chimneys are made square, hexagonal or octagonal and very frequently round. The latter kind is the best and strongest as to stability and the most economical with regard to material contained in its sectional area.



Round Brick Chimney with side lining

Round iron chimney with cast socket and pedestal of brick without guy rods

We give a sketch plan of a round stack built of brick of a height of say 154 feet and inside diameter of 7 feet of flue at grade and 7 feet diameter of flue at the mouth. This chimney will require from 450,000 to 500,000 brick on a foundation of steel beams and concrete. The pressure exerted upon the ground is about  $1\frac{3}{4}$  tons per square foot.

An inside lining or inner shell of two thicknesses of brick with air spaces behind is introduced over two thirds of the entire length. The inner shell or lining is built perfectly independent of the outer shell or shaft, the air spaces acting as the best nonconductors of heat to the outside and preventing equally well a chilling influence of low and cold temperature on the inner higher temperature of the heated air.

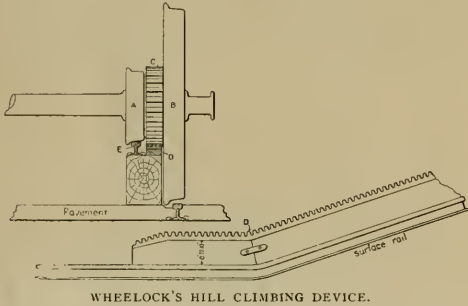
Such a chimney may be entirely built from inside without the use and erection of an outside scaffold; the correct dimensions are generally set out on flat ground in strings and from it straight edges are prepared to indicate the exact batter of the exterior face with plumb lines attached to it or used separately.

The chapter is made comparatively light and capped with a cast iron ring plate carefully secured with anchor bolts.

In a future issue we will treat more particularly upon the construction of power-house chimneys.

### WHELOCK'S HILL CLIMBING DEVICE.

F. H. Wheelock, of St. Paul, Minn., has applied for letters patent on the unique hill-climbing device for street cars which is shown in the illustration. It is designed for use on roads which have pieces of track so steep that auxiliaries in the way of racks or other devices are required. An eight or ten-inch timber is laid inside of each rail on the heavy grades so that the wheel flanges will clear it. On top of this sleeper



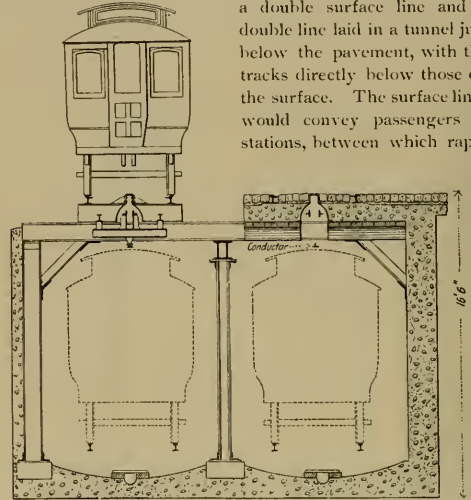
WHELOCK'S HILL CLIMBING DEVICE.

is laid a rail E and a rack D. The gear, B, is keyed on the axle close to the car wheels and gears with the rack. Just inside this gear the car axle carries a flanged wheel, A, of small diameter, on which the car is supported while on the incline, the rail E being placed at such a height that the large wheel, C, is lifted clear of the surface track. It is seen that this device not only provides a rack on the steep grades, but also gears down the motors so that the tractive force is greatly increased.

The New London, Conn., Street Railway, during the fiscal year just ended, earned \$52,661, from 1,136,548 passengers, at an expense of \$30,013. Net earnings were \$22,648, and dividends \$11,550.

### COMBINED SURFACE AND UNDERGROUND SYSTEM.

Our illustration, for which we are indebted to Engineering News, shows the scheme of a rapid transit system designed by Walton I. Aims, C. E., of 35 Broadway, New York. The system comprises a double surface line and a double line laid in a tunnel just below the pavement, with the tracks directly below those on the surface. The surface lines would convey passengers to stations, between which rapid



COMBINED SURFACE AND UNDERGROUND SYSTEM.

transit would be secured by express trains running underground.

Both lines would be operated by electricity, the surface cars taking current from conductors laid in a conduit opening directly into the subway and the underground cars by the overhead trolley system. The conduit being open at the bottom would be effectually drained and at the same time the slots in the conduits would serve to ventilate the tunnel. Should local conditions prevent the construction illustrated, the underground construction may be modified by depressing the subways, laying the track in circular shield tunnels if necessary.

This system furnishes a means of securing local and express service on parallel tracks, one of the requisites for satisfactory service in large cities, but has the disadvantage of running its local trains on the streets where they are subject to all sorts of delays. In addition, the surface cars are liable to be crowded with passengers who do not wish to use the express service, to the obvious disadvantage of those who do. It is apparent that both tracks must be operated by the same company in order to secure good results, and this may prove an obstacle to the introduction of the system where the streets are already occupied by surface roads.

### FINED FOR NICKELING.

The Bridgeport Traction Company has made an example of several conductors who had been several times inspected and reported on unfavorably. The case was brought in the city court, where the judge imposed a fine of \$5 and costs.

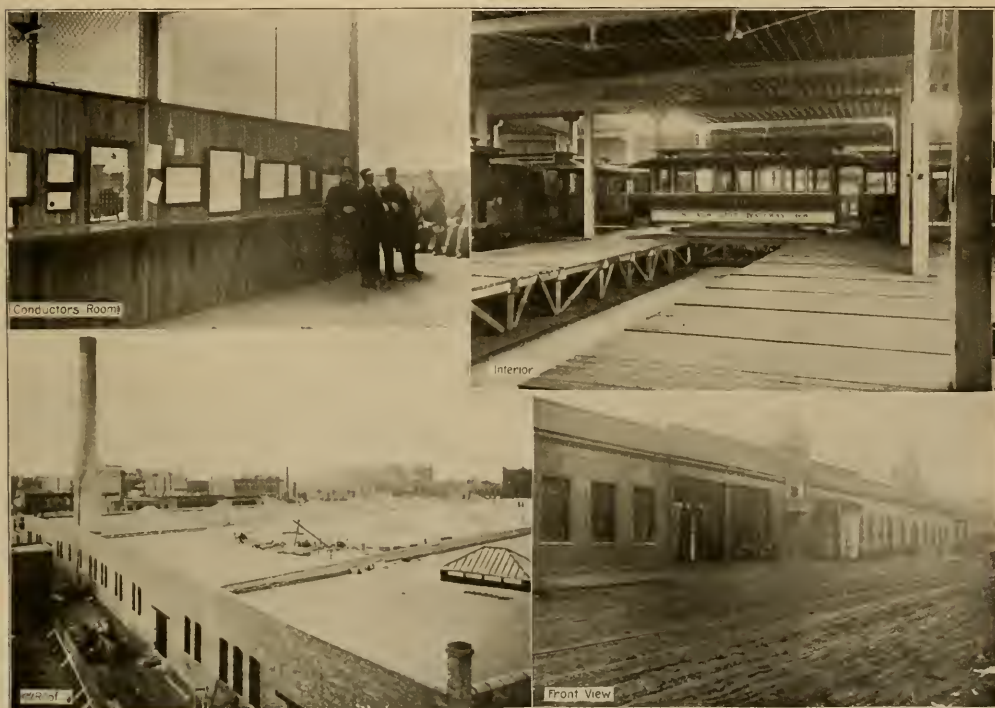
An appeal was taken from the decisions, though it is not expected the appeal cases will ever be brought to a hearing.

## ACRES OF BARN.

In August 1895 the Cottage Grove Avenue car barns of the Chicago City Railway Company were destroyed by fire, inflicting a loss of over a quarter of a million of dollars. The company has recently completed a new barn, several views of which we publish, together with line drawings showing the arrangement and some details of construction. The company owns a lot of  $3\frac{1}{2}$  acres fronting on Cottage Grove avenue between 38th and 39th streets, and the new car barn extends to the lot line everywhere except on the northwest corner, where on a triangle of about 3,000 square feet in area a stable has been erected for thirty or more horses.

located where it will be accessible at all times, for use in case of emergency.

In the southeast corner of bay No. 3 is the employes' club room, 23 by 50 feet, which, together with light and heat, is furnished by the company. Next to this is a room 18 by 28 feet in which are quartered the wreck wagon and its team of horses. The equipment of this room is all in the most approved fire department style. To the north of the wreck wagon is the office and conductors' room. Here lockers for the men are provided. The oil and lamp room 8 by 39 feet lies just south of the club room, with a small coal room in the rear. Oil is delivered to the storage tanks, which are below the floor level, through a hatchway in the sidewalk.



NEW CAR HOUSE, CHICAGO CITY RAILWAY.

The new barn is but one story in height with a frontage of 242 feet on Cottage Grove avenue. The front which is of red pressed brick with terra cotta trimmings is shown in one of our illustrations. The best idea of the extent of the building is to be had from the view of the roof. The general arrangement is shown by the floor plan. Two longitudinal brick walls divide the barn into three bays, which are in communication only at the transfer track, which extends clear across the barn about midway of its length. These openings in the dividing walls are each provided with two pairs of fire doors so that the bays may be isolated from each other. These doors roll upon inclined ways so that when released they will close of themselves. It is intended to arrange tripping devices with lead wires to a single lever,

The Pintsch gas which is used for lighting the cars is delivered to storage tanks located under the sidewalk by a pipe line from the gas plant of the Pintsch Company.

The entrance tracks are in the center of the second bay and between them is the train dispatcher's tower, the lower story of which serves as the sand reservoir. From his tower the train dispatcher has a clear view both ways on Cottage Grove avenue and also of the barn for its full length. In front are the levers controlling the semaphore signals and on the floor at one side the levers for throwing the track switches. The tower is connected by telephone or speaking tube with the office and the transfer track.

Cars run into the barn under their own momentum, but horses are required to take them out onto the tracks again.



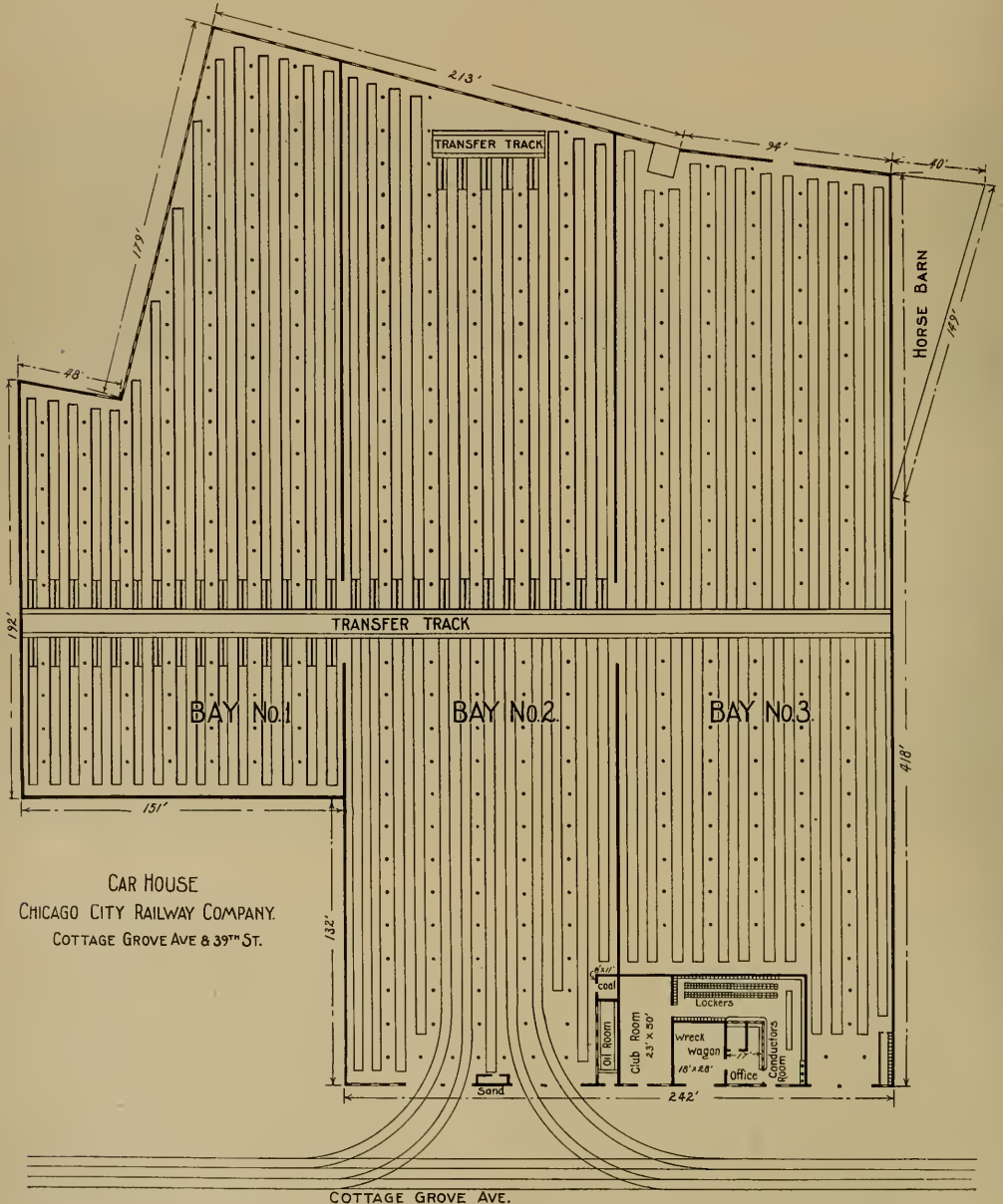
# Street Railway Review

The barn tracks are all level so that the cars are easily moved about and transferred to different tracks. The transfer tables are of wood and mounted on 30-inch wheels.

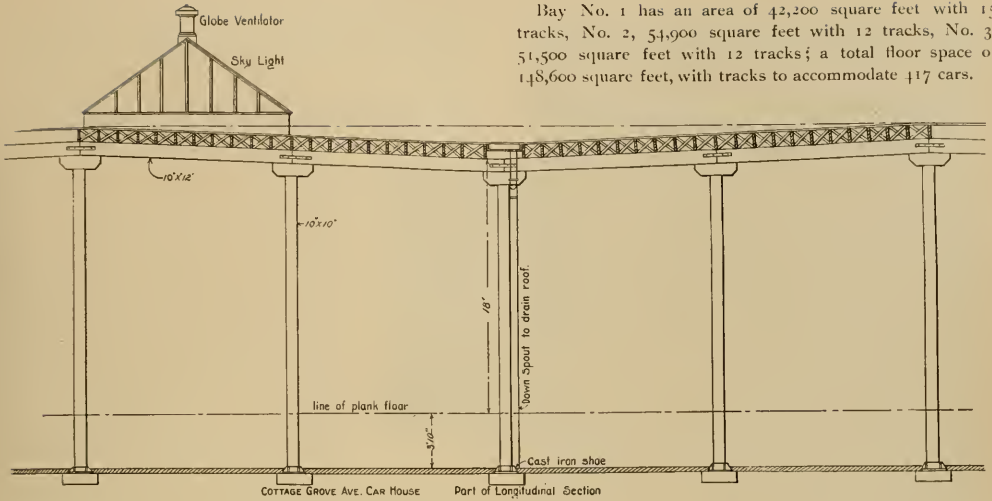
In bays 1 and 2, the earth has been excavated to a depth of about 4 feet below the tops of the rails, and a cement floor laid. Throughout bay 1, and in that portion of bay 2 back of the transfer track, only the spaces between the tracks are floored over, the space between the two rails of each track being open, except for a few feet on either side of

the transfer track. Over the pits thus formed the trucks may be easily examined and cleaned. Water connections are provided every 50 feet along each of these pits, with drains in the cement floor at the same intervals, furnishing the best facilities for washing cars. It is intended at some future time to excavate and put in a cement floor in bay 3, also.

The roof is supported on timber posts 10 inches square, spaced 15 feet apart lengthwise and 20 feet crosswise of the



Bay No. 1 has an area of 42,200 square feet with 15 tracks, No. 2, 54,900 square feet with 12 tracks, No. 3, 51,500 square feet with 12 tracks; a total floor space of 148,600 square feet, with tracks to accommodate 417 cars.



barn. The roof is divided for drainage into sections, 40 by 60 feet, sloping to the center, and each section provided with a drain pipe running down beside one of the supporting posts to a sewer connection. Each 40 by 60 foot section of the roof has a skylight 14 by 20 feet. In the rear of bay No. 1 are blacksmith and carpenter shops for making light repairs; also a crane for handling the grips when they are to be taken out or put into the cars.

The stack shown in the floor plan and in the photograph of the roof is that of the old barn, and is not now used for any purpose. As it was not injured in the fire it has been allowed to stand. No steam plant is now required as there are no elevators as in the old two-story barn, and the building with the exception of the offices, where stoves are used, is not heated. The cars are heated by their stoves, in which fire is kept up all night in cold weather, thus insuring comfortably heated cars even on the first trip out.

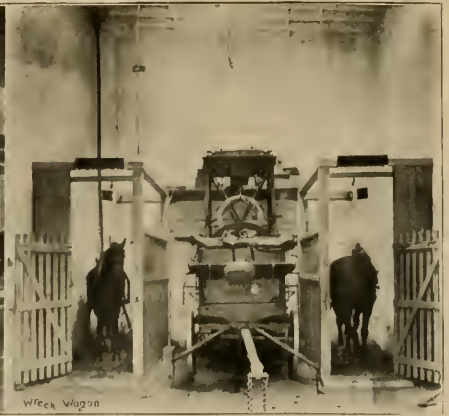
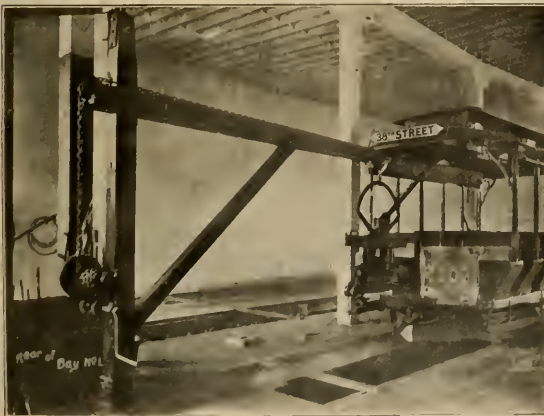
## AN IMPORTANT CASE.

Suit is brought against the Milwaukee Electric Railway & Light Company to restrain it from relaying its tracks on Washington avenue.

President Cromwell and Attorney George P. Miller will appear for the company, and maintain that as the rest of the road has been in constant operation, the franchise grants it the privilege of using the two squares in question.

It is claimed that the operation of a part is the operation of the whole, and if abandonment of a part means the abandonment of the whole, the franchise must be declared invalidated.

There are many interesting points that will arise in the argument, bearing upon the right of the city to control its streets where franchises have been granted to other parties.



CHICAGO CITY RAILWAY COTTAGE GROVE AVENUE CAR HOUSE.

## FOX RIVER INTERURBANS.

### The Joining of Chicago's Prosperous Outer Belt Towns.

For several years schemes have been on foot to build an interurban electric line to join the towns of Elgin, Geneva and Aurora (and incidentally a number of smaller towns lying near and between), but not until this year were these long-cherished plans carried out. These towns are all situated in the Fox river valley, about forty miles west of Chicago, and form a kind of outer belt line around that metropolis. The valley is thickly populated, and gave promise of a good paying traffic for an interurban electric line, which promise has been made good since the roads have been built.

There are two separate roads, owned and operated by different companies. That at the southern end, covering the territory between Aurora and Geneva, is owned by the Aurora & Geneva Railway. This line is not entirely completed, however, but will be the coming spring. Running north from Aurora this road first

touches North Aurora, with a population of 500. Seven miles from Aurora is Batavia, with a population of 5,000, which is the present terminus. Two and a half miles further north is Geneva (population, 2,500), which is the objective terminus. The line is built on the easterly side of the highway, between Batavia and Aurora, which highway follows the west bank of the river. The track is placed on a grade uniformly higher than the wagon road, and is gravel ballasted throughout. The rails are 60-pound T in 60-foot lengths, with six-bolt joints. The "horseshoe" rail bond is used. Oak and cedar hewn ties, 2,640 to the mile, were put in. It will be seen from this that the builders spared no money on good construction material. One of the bridges is shown in the engravings. It consists of two plate girders 50 feet long, with ties resting on the lower flange. The safe carrying capacity of this bridge is 50 tons moving load. It was made by the Wrought Iron Bridge Company, of Canton, O. The maximum grade is 2½ per cent, which occurs in four places, but only for a few hundred feet. There are about two miles



D. A. BELDEN.



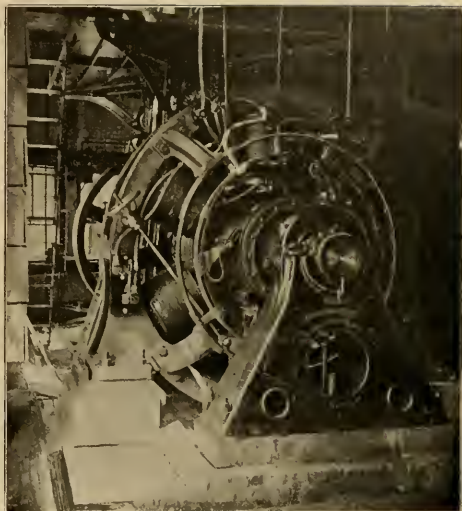
SCENE ALONG FOX RIVER.  
CULVERT AND CAR AT SULLIVAN'S CREEK, TWO MILES FROM AURORA.

STREET IN BATAVIA.  
BRIDGE AT MILL CREEK, THREE AND ONE-HALF MILES NORTH.



of level track and four miles of very light grades. Abrupt changes of grade are avoided. The line is free from bad curves. The shortest curve radius is 1,000 and the usual radius 2,000 to 3,000 feet. There is considerable masonry in the way of culverts, the largest being shown in one of the engravings. The pole line is flexible bracket construction except within the city limits of Aurora and Batavia. Round cedar poles, painted white, and Creaghead brackets were used, with a No. 00 round trolley wire. There are two No. 0000 feeders, one running about 1½ miles from the power house, and the other about 5 miles. These serve to keep the drop on average loads as low as 10 per cent at the end of the line. It is a single track road with turnouts 2½ miles apart.

The equipment at present consists of two 26-foot body, cross seat cars, with G. E. 1,000 motors. The cars seat 36 people, and are comfortably heated with National electric heaters. At present writing an hourly service is being given. The cars leave the Aurora terminus on the hour and the Batavia terminus on the half hour. The business has exceeded the company's expectations. The line was opened



DIRECT CONNECTED UNIT IN ELGIN POWER STATION.



SCENE ON MILL CREEK ON AURORA LINE.

for business October 21, and since that time one car on the interurban has earned more than any four cars on the Aurora Street Railway city lines, while costing no more to operate. A 10-cent fare is charged for the seven miles from Aurora to Batavia. This is just one-half the regular fare of the Chicago & Northwestern Railroad, which has of late been running trains almost as frequently as the electric road runs its cars. Next spring, in addition to building 2½ miles further, to Geneva, it is expected to obtain control of 100 acres of ground three and a half miles out of Aurora, at a beautiful spot where Mill creek empties into the Fox river. The winter travel of the road has so far exceeded expectations that it is believed the summer travel will be something remarkable. The Fox river is noted for its beauty, and in the summer there is much travel, not only by picnic parties, but by campers thickly scattered along the banks of this attractive river.

The officers of the Aurora & Geneva railway are William Palmestock, of New York, president; Robert B. Dodson, of New York, vice-president; and D. A. Belden, the well-known and able general manager of the Aurora Street Railway, secretary and general manager. Mr. Belden deserves

great credit for his persistent efforts in pushing through and securing capital for this undertaking, and the soundness of his judgment has already been demonstrated by the traffic.

The interurban route north of Geneva is owned by the Carpentersville, Elgin & Aurora Railway, of which the officers are J. B. Lane, president; D. B. Sherwood, secretary; and E. D. Waldron, treasurer. It was built last spring, and enjoys a fine traffic. There are practically two divisions of the road, one extending north from Elgin to Dundee and Carpentersville three miles, the other extending south to South Elgin, Coleman, St. Charles and Geneva, twelve miles.



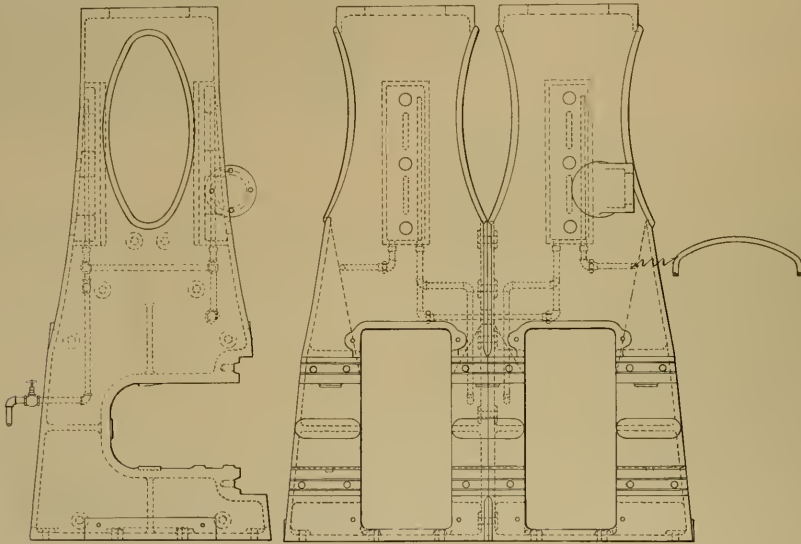
STANDARD BOILERS IN ELGIN POWER STATION.

making in all fifteen miles of valley supplied by the road. It is a single track road, gravel ballasted and laid with T-rails. Side pole construction is employed. Through Elgin the tracks of the Elgin City Railway are used. Upon completion of the Aurora & Geneva Railway to Geneva, next spring, there will be started a through baggage and express service, for which there will be specially built equipments.

The thing of greatest mechanical interest in connection with the equipment of this road is the Ball Engine Company's vertical cross compound direct connected engine in the power house. Its dimensions are 17 and 30 inches by 16-inch stroke, and it runs at 200 revolutions. Its rated horsepower when condensing, is 400. The shaft is extended out on each side to two outboard bearings, and on each end is a 225-kilowatt General Electric railway generator. The engine is 14 ft. feet high, 17 feet long and 9½ feet wide. The aim

## THE CONNECTICUT PARALLEL.

For many years the steam railroads have controlled the state legislature of Connecticut; hence there was little surprise, though much public dissatisfaction, when the railroad interest throttled electric interurbans. At first the fight was made at crossing points, where electric lines were obliged to cross the right of way of the steam lines. But failing here, the legislature was appealed to, in the effort to prevent this new and vigorous competition which was becoming stronger each year. In 1893 the famous statute against paralleling was passed, which reads "No street railway shall hereafter be built or extended from one town to another town in the public highways so as to parallel any other street railway or steam railroad, unless authorized by special charter prior to January 1, 1893, until



ELEVATION BALL ENGINE—CARPENTERSVILLE, ELGIN & AURORA RAILWAY.

of the designers of this engine was to build a high speed upright engine, with enclosed housings, double acting steam cylinders and easily accessible shaft boxing, a combination which would make a very desirable engine. The introduction of the shaft into this engine is accomplished by arranging the shaft boxes in a large jaw cutting into one side of the housing deep enough to bring the center of the shaft in a plane with the center of the housing, finished spots being provided to meet corresponding finished surfaces on the cast iron boxes. These boxes consist of one bottom, two quarter and one top box for each journal. Each of these are provided with removable babbit metal shells, upon which the journals bear. These shaft box jaws in the housing are closed by the use of heavy struts. As shown by the drawing these struts fit into V-shaped grooves, so that when bolted in tight the jaw is firmly closed and the mechanical circuit of the housing completed. These are but a few of the many good points of this engine which is worthy the special attention of all power house designers and engineers.

the company shall have applied to the superior court or any judge thereof, and shall have obtained a finding that public convenience and necessity require the construction of such street railway."

Under this statute the steam lines have practically had things their own way, for naturally the very centers of population which an electric line could profitably connect, were already united by a steam road; as for instance, Hartford and New Britain.

The steam roads in their opposition loudly wept for their own stockholders who were to be made penniless, and for those other stockholders who were likewise to put their faith and money in new electric enterprises which could never pay. The position was one which vigorously begged the question. Another claim for sympathy was based on a sort of 'auld lang syne,' in that the steam roads had been doing business so many years at the old stand, and it was cruel to try to part such old friends as the roads and their patrons of a generation.

But the people somehow could not see it that way. They saw in the new electric interurbans a more frequent service and lower rates than the steam roads could or did give, and where an electric line did squeeze in it immediately became popular with the public, who saw and appreciated its possibilities, and so it came to pass when the people wearied of a legislature devoted solely to the interests of the steam roads, that they gathered themselves together, held a caucus and elected a new legislature which will soon meet, and when it does the people will be likely to get a lot of trolley roads,

## PROGRESSING BACKWARDS.

Several years ago a charter was granted to a company to put down and operate street railway lines in Orlando, Florida. The road was built and afterward sold to a New England man, who made some improvements and additions. It proved to be a financial failure and has been abandoned for more than a year. The city council ordered the marshal to remove the tracks, as they had been permitted through neglect to become a nuisance.



VIEWS ON THE CARPENTERSVILLE, ELGIN & AURORA RAILWAY.

and if the steam roads in the nutmeg state want to do the local business they will have to do as steam roads in other states have had to do, and that is increase the service and reduce the rates. If the steam roads cannot do both, then where is their argument against the electric lines which have demonstrated that they can? The public are playing a winning game with nothing to lose, and in these days of progress and improvement the electric line, city and suburban, is destined to prove the most important factor in modern life.

A verdict for \$12,000 was given Ann McCormack recently against the Nassau Electric Railroad, Brooklyn, for the death of her husband, who was killed by one of the company's cars.

The Buffalo & Niagara Falls Electric Railway reports for the quarter ended September 30, 1896, gross earnings, \$51,527; operating expenses, \$18,591; fixed charges, \$13,323; net income, \$22,612.

## HOLYOKE STREET RAILWAY RELIEF ASSOCIATION.

For some time past whenever one of the employes of the Holyoke Street Railway Company would be sick, a collection would be taken up for him. The men felt the need of a definite plan and a firmer organization and a committee was appointed to draft by-laws for the association. Officers have been chosen and the organization will soon be on a firm basis.

The York (Pa.) Street Railway has suffered the loss of 600 feet of trolley wire and 400 pounds of bond wire by theft. The line will be protected by keeping the current on at night.

The Norwich Street Railway Company, Norwich, Conn., reports gross earnings of \$84,711 for the year. Operating expenses were \$55,359, dividends, \$12,500; car miles, 297,265; passengers, 1,987,519.



## THE LATEST AIR-BRAKE APPARATUS.

The Standard Air-Brake Company does not rest upon its laurels, but is always to be found in the van. Fully appreciating the great changes in rolling stock called for by electric traction, it has been earnestly working in order to meet every possible condition in which air-brakes will be required. While the company is making very large sales of its axle-driven compressor type of air-brake, it has recently brought out its motor-driven type to meet those cases in which it is not possible to find room on car axles, by reason of the motors taking all the space.

The latest apparatus of this company, which we illustrate herewith, solves the problem of furnishing an air compressor which is independent of the axle of a car. The 1-horse-power type occupies a space 22 inches long, 13 inches wide, and 17 inches high. The combined motor and compressor is exceedingly compact. The motor is iron-clad and securely protected against dust and moisture. It is of the slow-speed, series, multi-polar type. The brushes are easily accessible for inspection and renewal. The armature can be readily withdrawn by removing front head of motor. The motor frame is made of steel, which combines lightness with maximum capacity. The motor is insulated with extreme care to guard against possible grounding or breaking down of insulation. The armature is of the well-known drum type with the sections made separately and bedded in slots in the face of core. Damaged sections can be renewed in case of injury as is common in car motor armatures. The motor is guaranteed to develop a power above its rated capacity. The motor is protected against the ingress of oil from bearings and compressor.

The compressor is of the single-acting type, with double cylinders. These are placed vertical with trunk pistons connected directly to eccentrics in crank case. Pistons are carefully balanced to insure freedom from vibration and noise. The eccentrics are effectively lubricated by revolving in a closed chamber partly filled with oil, which is kept at such a height as to be always in contact with the sliding surfaces. The openings for intake and discharge are of ample capacity, and thereby the usual noise due to induction and discharge is effectively prevented. The compressor is bolted centrally with the motor and the shaft of compressor is a prolongation of the armature shaft, but it is not a part thereof. Bearings are made of phosphor bronze, and can be readily renewed without dismantling compressor. Pistons are made air tight in cylinders by the use of two piston rings of cast iron, with overlapping joints. Any vibration of compressor and motor is taken up by the rubber cushions which are interposed between motor-compressor and base, which latter is arranged in the form of a tray to catch any oil which may escape from bearings. Oil cups are suitably arranged, which, with occasional filling, maintain a regular height of oil in crank case.

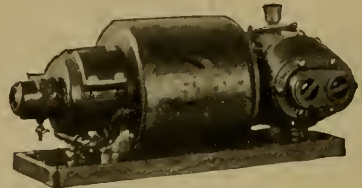
Recognizing the fact that it is most undesirable to compel a motorman to use a hand rheostat in order to make a motor-compressor operate, the company sometime since patented here and abroad, the apparatus shown in the cut. The



CONTROLLER.

automatic controller automatically maintains a practically uniform pressure in the air storage reservoirs under cars or elsewhere. By its use when the air supplied to reservoirs reaches a predetermined limit, the motor-compressor is entirely stopped. As long as air pressure in the reservoirs remains within eight or ten pounds (or any other adjustable limits) of the required maximum, the motor-compressor remains inoperative. Should pressure however be reduced below the minimum limit, the motor-compressor is immediately started (slowly at first and gradually increasing as the resistance is automatically removed from circuit) and continues operating until the maximum limit is reached, when it again immediately stops as before.

The motor is series-wound and when starting with empty reservoirs, would naturally "run-away"; but under such conditions, the resistance remains in the circuit and is only



STANDARD AIR BRAKE MOTOR-PUMP.

cut out as the pressure increases. The apparatus is equally applicable to a shunt-wound motor. The speed of motor-compressor is at all times automatically controlled by the amount of work required.

While the motor-compressor is in operation, if for any reason the line circuit should be interrupted, or if the trolley leaves the wire, or if the conductor changes the trolley, the resistance is thrown in circuit with motor-compressor simultaneously with the stopping of motor-car. When the current is again restored the motor-compressor resumes operation, gradually increasing speed in the way above indicated. The automatic controller not only controls this air-brake

motor-compressor, but is applicable to various forms of motor and power control, such as in electric and other elevator practice, hydraulic and other pumping, handling cranes, bridges, etc. It may be used in all places where it is desirable to start or stop motors, which, without its aid, would be well nigh inaccessible. For example; freight or passenger elevators may be operated from any one of the several landings by simply pressing one button for starting and another button for stopping.

The entire outfit only occupies a space of 9 by 10 by 14 inches. It is furnished with lock and key to be retained by proper custodian, so that tampering may be prevented. The company is to be commended for its foresight in thus meeting every situation.

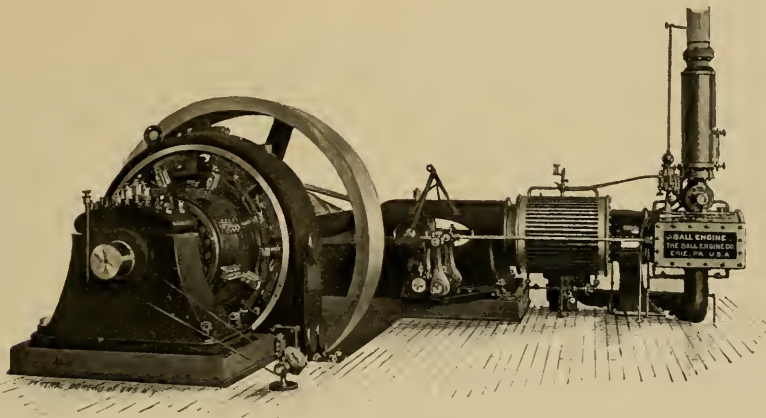


STANDARD AIR BRAKE AUTOMATIC REGULATOR.

John Gorman, convicted of stealing wire from the Washington, Arlington & Falls Church Railway Company, was, on second trial, sentenced to two months in jail.

## BALL SIDE CRANK MEDIUM SPEED ENGINE.

The Ball Engine Company, Erie, Pa., has recently placed on the market the engine which we illustrate. It is designed to meet the demand of many railways for engines direct connected to generators, and in view of the severe conditions of electric railway service all the parts have been made of liberal proportions and every refinement in adjustment and manipulation incorporated. The bed is symmetrical and an example of good designing. Toward the upper end the bed becomes a round hollow column, having on the top and bottom sides the guide surfaces which are bored at the same time that the casting is bored and faced for the reception of the cylinders. Elliptical openings at the sides render access to the crosshead easy. The crosshead is of the double plate pocket type, having taper shoes of cast iron with the rubbing surfaces spotted with genuine habbit metal. The shaft boxes are arranged in a deep jaw in the engine frame, good



BALL SIDE CRANK MEDIUM SPEED ENGINE.

bearing being secured by providing finished surfaces on the boxes and in the jaw. There are four boxes to the bearing, all of them being adjusted by means of wedges and set screws. The crank shaft is of 40-carbon open hearth steel, solid from end to end, forged and ground to a smooth running surface. The connecting rod is also of forged steel with the ends cut out to receive crank and crosshead boxes. The boxes on both ends are adjusted by wedges moved by set screws placed in the top of the rod. Both wedges move in the same direction so the length of the rod is not changed. The high pressure valve is of the double-face telescopic type, receiving the boiler pressure on the inside. The low pressure valve is of the common "D" type with a round relief area on the back. The outboard bearing has the same form of boxes and the same adjustments as the main bearing. Crucible steel is used for the piston rods, valve stem, rocker shafts and crank pins. The governor of the engine shown is in the fly wheel and is quiet and quick in action, and especially adapted to give good regulation under sudden changes in load.

## LAW AGAINST SPITTING.

The very unpleasant subject of expectorating in street cars has been referred to several times. It seems to have been a practice which was tolerated in the early horse car days, before the advent of heated cars, and when the floors were covered with hay, which was changed every day. At any rate, in these days, there seems to have been little attempt at reform in this direction. With modern cars, the disgusting practice is even more objectionable than before, though probably no less dangerous to health. With a view to eradicating the evil, many roads carry placards in all winter cars, couched in language, both persuasive and mandatory, forbidding spitting in cars. In New York city the health department took steps, last year, to put a stop to the evil in surface and elevated cars and ferries.

Now, the Chicago commissioner of health, proposes to try his hand, and bases his plans on an ordinance which reads: "Any person who shall commit any indecent, lewd or

filthy act, in any place in the city, shall be deemed a disorderly person, and upon conviction shall be fined \$5 or imprisoned in the house of correction six months, or both."

The Civic Federation and the Woman's Club promise their support, and a police order will be requested to enforce the law.

The movement is certainly a most commendable one. Our observation is that steady headway is being made in this direction, for in a number of places the street railways have succeeded in almost stamping out the practice.

## COMPRESSED AIR IN CHICAGO.

We are informed that the General Railway Company has arranged with the Illinois Compressed Air Company for tests of cars operated by the Hardie compressed air motor on the Kedzie street line. The compressor is in place, two cars have been built and are awaiting shipment, and as soon as the piping is installed the trial will be commenced. It is expected that the cars will begin running within sixty days.



SPECIAL CARS IN WILMINGTON.

The Jackson & Sharp Company, of Wilmington, Del., has recently built some special cars of beautiful design and having several novel features. C. F. Hutchings, superintendent of the Wilmington City Railway Company, has placed upon his roads some of these cars, which are used for ordinary traffic, but can be readily converted into party cars. The seats, lambrequins and trimmings can be quickly removed and the car fitted up as a special as shown by the accompanying engraving. The interior finish is of mahogany and the decoration, upholstery, draperies and carpet all combine to make the appearance very attractive. No sash is used for the window glass, which is of polished plate, and is imbedded with rubber between the posts in the woodwork surrounding the window opening. In this way any rattling, which would result from ordinary sash, is avoided. The curtains are made of Pantasote and fitted with Forsythe fixtures, and these, as well as the lambrequins, were furnished by the McKay Curtain Company. Comfortable rattan chairs of various styles and sizes are furnished, some of which have tufted hair cushions covered with plush. Special cars of suitable design and finish have been so costly in



SIDE SEATS REMOVED FOR "SPECIAL."

proportion to the limited demand that their use has been confined to comparatively few roads. This objection has been overcome as this car does not cost a great deal in excess of regular first-class cars and its earning capacity is much increased by its use both as a regular and a special.

The Steinway trolley road of Flushing, L. I., made a Christmas present of \$25 to each conductor and motorman who had handled their cars for a year without accident.

## INCLINED RAILWAYS.

At the November meeting of the Engineers' Society of Western Pennsylvania, an interesting paper on "Inclined Plane Railways" was read by Samuel Diescher. He said in part:

"The oldest type in use is the 'gravity incline' found in mines and quarries situated at altitudes much higher than the point where the products are to be delivered for consumption or further transportation. This type is used only for lowering the load, the weight of the material transported furnishing the motive power.

"The range of employment of cable railways with gripping devices is confined to grades on which the resistance from car and load does not exceed the friction in the grip and should further be confined to grades on which in case of emergency the car may depend upon its brakes.

"Recently another type was introduced which is a compromise between a gravity incline and an electric railway. It is built with single track as well as with double track. In street railway parlance it is known as the 'balance system.' It came into existence since the general adoption of electricity as motive power for street cars. So far as it has been used for transportation of electric street cars on grades too steep to be surmounted in the ordinary way. This type has no power plant of its own, but the operation is performed by the motor of the ascending car. To accomplish this the car is counterbalanced to the extent of its dead weight; in a single track plant this is attained by a properly balanced iron dummy car, traveling simultaneously with the motor car but in opposite direction. In case of a double track line, the necessary balance is established by another car traveling in opposite direction. The accord in travel between the one car and the dummy, or the two cars, is accomplished by the employment of a rope extending from one car to the other by way of a sheave located at the head of the incline. In the case of a double track the cars are temporarily connected with the opposite ends of the rope which they both drop upon their arrival at the respective terminals of the incline. With a single track and dummy one end of the rope is permanently connected with the latter and the other is picked up by the car when it enters the plane and is dropped again when it arrives at the point whence it can dispense with the help from the rope. As a matter of course, in the double track plant, schedules must be closely observed, else the travel will be very irregular and unsatisfactory to patrons. It is obvious that the operating expense of such an inclined plane is very small, and were it not for its limitations by length and grade, its applicability would be very extensive. It is also limited by the condition that the tractive effort that can be secured with the loaded car must exceed the resistance due to gravity. Inclined planes of this type are in successful operation at Seattle, Wash., Portland, Ore., San Francisco, Providence, Easton, Pa., and Beaver Falls, Pa."

One statement was made which needs correction, viz., that "the steepest grade on which an electric car can travel without auxiliaries, \* \* \* and to advantage, is 9 per cent." Many roads have much heavier grades; one in San Francisco, for instance, is 13 per cent, and we have there ridden on a car, loaded to the steps, and equipped with only two ordinary motors. With this load a speed on this grade of between four and five miles an hour was easily maintained and the operation has been continued.



### TUSCARAWUS RAILROAD COMPANY.

The Tuscarawus Railroad Company, of New Philadelphia, O., is perhaps the only street railway company which mines its own coal. This company operates 8½ miles of single track between New Philadelphia, a town of 6,000, and Urichsville with 4,500 inhabitants. This line connects at Urichsville with the United Electric Company's road to Dennison (4,500) two miles distant, and at New Philadelphia with the Tuscarawus Electric Company's street railway to Canal Dover (4,500) 3½ miles away. On the line are two smaller towns, Barnhill and Midvale. At Midvale which is the half-way point are located the car barn and power house shown in our illustration. To the rear of the power house is seen the opening of the company's coal mine. Coal (run of the mine) is delivered to the boiler room at an average cost of 40 cents per long ton, a low price for fuel. The power house is equipped with a 250-horse-power Erie-Ball

with electricity and the remainder in building extensions. Naugle, Holcomb & Co. have the work in charge, and are pushing it rapidly. George Weston is the engineer and superintendent.

A line will be built in Harrison street, running west from 48th street, where it connects with the Metropolitan Elevated to Harlem. Also a line beginning at Robinson avenue and Harrison street, running south on Robinson to 22nd street, west on 22nd to Harlem avenue, south on Harlem to 26th street, thence through Riverside, crossing the Desplains river north of the Chicago, Burlington & Quincy tracks, and thence in a westerly direction through Grossdale to Lagrange, comprising some 17 miles of double track in addition to the 13 miles of railroad leased from the Northern Pacific.

Later the line will be extended to Hinsdale in DuPage county. The overhead trolley will be used. There is already constructed track in Harrison street running from Harlem as



POWER HOUSE OF THE TUSCARAWUS RAILROAD COMPANY AT MIDVALE, O.

engine and four D-62 Thomson-Houston generators. The company owns five cars, built by the G. C. Kuhlman Company, of Cleveland, each equipped with two 30-horse-power Westinghouse 12-A motors and G. E. type K controllers. The line was opened for traffic on September 10, cars running on 60 minutes headway. Since cold weather a skating park with hand stand, etc., has been built on the open ground at the right of the car barn, which acts as a stimulant for traffic. The officers of the company are, president, William Christy, of Akron; vice-president and superintendent, C. E. Mitchner, of New Philadelphia; secretary and treasurer, C. H. Howland.

### CHICAGO SUBURBAN RAILWAY COMPANY.

The Suburban Railway Company, which has leased the Chicago, Harlem & Batavia and the Chicago & Southwestern divisions of the Chicago & Northern Pacific Railroad, on December 15, executed a \$3,000,000 mortgage; \$1,250,000 will be spent in equipping the Northern Pacific

far east as Central avenue, 1½ miles on Robinson avenue and 2½ miles running east from Lagrange.

The contract for the power house building was let to Scoullar & Bierwirth in the early part of this month, and ground was broken a week ago. The power house will be located on the northwest corner of Harlem avenue and 22nd street, with a frontage of 108 feet on Harlem and 96 feet on 22nd. The stack and building have been designed for a 2,000-horse-power plant, but the first installation will comprise only three 250-horse-power Stirling boilers and two tandem compound condensing Green engines, one of 560 and one of 210-horse-power. The stack is to be of steel, 96 inches in diameter and 150 feet high above the grates. A well will supply the condensing water, which will be cooled for re-use by means of a cooling tower or of an open pool and cooling troughs.

The Hornellsville, N. Y., Electric Railway was robbed of \$100 which was taken from a box in which the conductors on the late runs deposit their days receipts.

## CONCRETE WORK IN DETROIT.

By F. A. Little, Chief Engineer, The Detroit Railway.

When the Detroit Railway was granted a franchise to build and operate an electric railway in the streets of Detroit, Mich., it accepted, among many other things, that portion of the general street railway paving ordinance, which we will now quote:

"And the foundation for the pavement shall be constructed in the following manner, to wit: The roadway shall be excavated to a sufficient depth below the grade of the pavement to permit of the construction of a concrete foundation to a depth of six inches below the ties, and said foundation shall be composed of cement, sand and broken stone in the proportions and manner specified for pavements when a street is paved with a concrete foundation in the city of Detroit; upon this foundation the ties shall be placed and concreted in with the same kind of concrete to their full depth, and to such a height above their top surface as may be necessary to meet the cushion provided in the street paving specifications of the city of Detroit for the class or kind of service paving material to be used under this ordinance.

"Provided, that owing to the projecting of the ties beyond the lines of the outer rails of the track the street railway company operating such railway, shall maintain, until the repavement of the street, the pavement for a space of eighteen inches outside of the outer rails on either side to the satisfaction of the board of public works, against any damage thereto caused by the depression of the tracks or the movement of the ties or rails resulting from the operation of cars or trains thereon."

Also among the requirements was the provision that there should be one inch of sand under the tie, to form a cushion, and to better enable the track men to surface the track.

Before we enter into the discussion of the subject matter, we wish to say that whatever facts we shall present to you in this article are based on the construction of nearly fifty miles of track on a concrete foundation in the city of Detroit, and the figures that are given are the average as taken from prices of labor and material in Detroit.

The first thing that enters into the preparation of a road-bed is

### GRADATION.

According to the terms of our franchise, by using a 7-inch rail and a tie 5 inches in depth and 7 feet long, 1 inch of sand under the tie, 6 inches of concrete for the foundation, it is necessary to excavate 7 feet wide and 19 inches below the surface grade of the pavement or grade established by the city engineer.

The average cost of excavation through streets paved with cedar blocks laid on sand or plank, is 8 cents per lineal foot, and through streets with concrete foundation under the cedar block, it is from 12 to 15 cents.

### CONCRETE.

The concrete is usually laid in two courses, in order to facilitate construction. The first course is laid 6 inches deep and 7 feet wide. When it has set from five to seven days the track is laid, lifted and lined, and the second course of concrete is laid.

The second course of concrete varies in depth according to the kind of pavement that is to be used, as follows: With cedar block 7½ inches, brick, 8½ inches and asphalt

10½ inches. All 7 feet wide. For computation of quantities the space occupied by the ties is to be subtracted.

The composition, as required by the board of public works is as follows: "All concrete laid in the streets of the city of Detroit shall consist of Louisville cement one part, clean sand two parts and crushed stone four parts," or rather the formula that is used is,

- 2½ sacks of Louisville cement—(1¼ barrel or 2 barrows).
- 4 barrows clean sand.
- 8 barrows crushed stone, (a little over one cubic yard).

For one cubic yard of concrete it takes 1.616 cubic yards of the above proportion, or one cubic yard of crushed stone to 1.08 cubic yards of concrete.

In preparing for the first course of concrete, there are two men that go ahead and set small stakes with the top of the stake at grade for the upper surface of the first course of concrete. Then on a mixing board 10 to 12 feet square, the sand and cement are mixed quite thin with water, after which add the crushed stone (which should have been previously wet) and mix this compound thoroughly, but do not let it get thin enough to run, then shovel into the trench or excavation that has been prepared to receive it, keeping two men known as surface graders tamping the concrete to grade with wooden tampers 12 inches square.

When it comes to laying the second course of concrete, it has to be tamped under the ties and rail and for this tampers with 2 by 6 inch iron faces are used.

The second course is laid to a grade that meets the requirements of the kind of pavement that is to be used.

The labor may be itemized as follows:

1 foreman at \$2.00 per day.....	\$ 2.00
2 stake setters at \$1.50 per day.....	3.00
8 men on board at \$1.50 per day.....	12.00
3 men on stone at 1.50 per day.....	4.50
1 man on sand at \$1.50 per day.....	1.50
1 man on cement at \$1.50 per day.....	1.50
2 surface graders at \$1.65 per day.....	3.30
1 man from fire department to turn on water from fire department hydrant at \$1.75 per day.....	1.75
Total.....	\$29.55

The above men will lay an average of 400 lineal feet of concrete 7 feet wide and 6 inches deep, or 51.85 cubic yards per day of 10 hours. Equal to \$0.57 per cubic yard.

The cost of concrete per mile of single track for cedar block pavement may be summed up in this manner, viz:

1,540 barrels Louisville cement at 60 cents per barrel.....	\$ 924.00
630 cubic yards sand at 65 cents per cubic yard.....	409.50
1,260 cubic yards crushed stone at \$1.25 per cubic yard.....	1,575.00
Labor at \$1.50 per day.....	780.00
City inspection.....	40.00
Total.....	\$3,728.50
	or 70 cents per lineal foot,
and for brick pavement, 76 " " " " "	
" " asphalt " 88 " " " "	

### TRACK LAYING.

The ties used are No. 1 white oak, sawed from live white oak and are 7 feet long, 5 inches deep and 8 inches wide, and are not to vary over 2 inches in length.

The rail is the "Cambria" grooved, section \$14, 85 lbs. per yard, 7 inches high and 30 feet long. The special work is made from 7-inch Cambria & Wharton 90 lbs. per yard, with 3-inch tram to which is bolted a guard.

The ties are laid on the first course of concrete 2½ feet centers (although we have laid about 15 miles with 2 feet centers.)

The rail is laid and spiked, using 5 by  $\frac{9}{16}$ -inch spikes. After spiking, sand is tamped under the ties and the track brought to grade and lined. After this is done it is ready for the second course of concrete previously described. If the weather is at all warm it will be necessary to have a few men go just ahead of the concrete boards and keep the track in line.

### PAVEMENT.

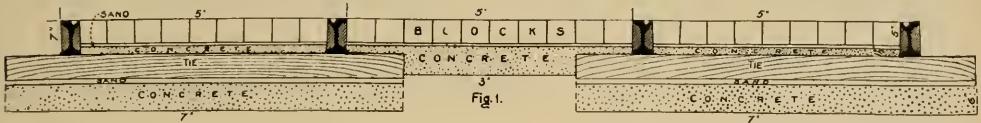
Cedar block is the leading pavement in Detroit, but brick, asphalt, Medina and cobble stone are used. The Detroit Railway has laid between its tracks within the city, and all on concrete, about 117,000 square yards of cedar block, 13,000 yards of brick, 1,100 yards of asphalt, and 140 yards of Medina block, and about 36,000 yards of cobble stone pavement on its suburban lines, the average cost per square yard being as follows:

Cedar block (with concrete laid).....	\$ .52 to \$ .55	per square yard
Brick " " " .....	1.15 to 1.20	" " "
Asphalt " " " .....	1.90 to 2.00	" " "
Medina block " " " .....	2.70 to 3.00	" " "
Cobble stone (no concrete used).....	.28 to .30	" " "

While cedar block does not make a lasting pavement, it is recommended as cheap pavement where the travel is not very heavy, lasts from five to seven years and is easy to keep in repair. The interest on the difference between the first cost of that and either asphalt or Medina block keeping it in repair. The itemized cost of it being:

Cedar block, at \$15 to \$20 per cord, sawed and culled, and 70 square yards per cord.....	.28 cents to 30 cents	per square yard
Gravel at \$1.15 per cubic yard.....	4 cents to 5	" " "
Tar at \$17.50 per ton.....	11 cents to 12	" " "
Labor at \$1.50 per day.....	9 cents to 10	" " "
Total.....	.52 cents to 57	" " "

We have not had occasion to use "headers" in unpaved streets, except in a very few instances, and then we used second-hand curb stones that cost us 20 cents per foot.



The rolling of the pavement, which is included in the above figures, costs about 1 cent per square yard.

Do not attempt to lay cedar block pavement without using either tie rods or tie plates, because the swelling of the blocks and the tamping of the gravel between the blocks will throw your tracks all out of gauge.

(See Fig. 1 for cross-section of track laid on concrete foundation.)

### RAIL JOINTS.

So far we have used nothing but the 36-inch ten-hole splices, with two rows of holes, with six on the lower and four on the upper row, using 1 by  $3\frac{1}{2}$ -inch bolts. When we are doing construction work we keep one man doing nothing else but inspecting the bolting, and in that way we are able to have every bolt drawn up tight, drawing the splice up so that the center of the arch is about  $\frac{1}{8}$  to  $\frac{3}{16}$  inch distant from the web of the rail. By having this inspection we are able to have the bolting done evenly, and so far we have not found any indication of low joints where the track has been laid on concrete foundation in paved streets.

We have had some experience with hot riveted and electric welded joints. Hot riveting gives fair satisfaction where it has been used on the Cleveland City Railway, Cleveland, Ohio. Although we think that the additional life of the joint is not great enough to warrant the extra expense. The electric weld seems to give the best all-around results where the breakage of joints is at a minimum, but the great cost of welding with the present methods, cause most companies to hesitate about trying it.

### BONDING.

Benedict & Burnham No. 00 bonds were used in most of our construction, although last year we used Chicago No. 0000 bonds of the "U" pattern, and bonded to the base of the rail. We have made no electrical tests of these bonds, but from tests made by others we think that the Chicago No. 0000 bond is among the best of the copper bonds that are in the market today.

However, we consider that the electric welded joint is the only bond that approximates perfection.

We are indebted to C. B. King, electrical superintendent of construction of the Detroit Citizens' Street Railway Company, for the following information in regard to their experience with the electric weld on Jefferson avenue.

He says that they consider the electrically welded joint the "ideal," it giving a perfect joint for the return current.

In four miles of this track 38 joints pulled apart last winter, but no others have been reported broken since.

No loss of current was apparent after these breaks, which is attributed to the fact that metal ties were used, and at intervals of about 500 feet, the rails were cross-bonded with a 1  $\frac{1}{2}$ -inch square bar of iron.

Last spring these breaks were repaired by using a special splice that fitted around the broken weld. Then bonding around the break with from four to six Chicago No. 0000 bonds.

He also says that the conductivity of this rail is perfect,

no greater loss of current can be detected at the joints than at the center of the rail. And a further test shows that the stray currents in the earth and from the water and gas pipes (which are connected at the power house with the negative pole of the dynamo) are all towards the rail, while that which is bonded with the best copper bonds, the current is towards the water and gas pipes, showing conclusively that the resistance in the electric weld joint is practically nil.

The cost per lineal feet of single track, concrete foundation, which includes the cost of excavation, laying, lifting and lining of track, cost of concrete and labor of mixing and tamping, and cost of pavement, may be summed up as follows:

Excavation, 10 inches deep by 7 feet wide.....	\$.80	per lineal foot
Track laying, lifting and lining.....	.10	" " "
Concrete, (cedar block).....	.70	" " "
Pavement, cedar block.....	.42	" " "
Total cost with cedar block pavement.....	\$1.30	" " "
" " " brick.....	1.80	" " "
" " " asphalt.....	2.45	" " "
" " " medina, or granite.....	3.20	" " "



## TRENCH WORK.

There is one other matter to which we wish to give some attention, and that is, construction on a concrete foundation, without ties, or as we call it "trench work."

When our work of construction began in streets paved with brick and asphalt laid on 6 inches of concrete, and our managers realized the great expense that would be attached to construction with ties, they began to look over the field for a cheaper method and decided on "trench work" without ties.

Before beginning this work it is necessary to have the line of the tracks run very carefully with a transit, giving "points" about every 50 feet.

From this line the gauge line of the tracks can be located, then with a chalk line, chalk a line 6 inches on either side of the gauge line. (This precision is to save cost of pavement and concrete that might be torn out by careless workmen); then the trench is excavated to a depth of 15 inches for a 7-inch rail and 12 inches wide, (see Fig. 2) using, to cut through asphalt, two-edged axes made by our blacksmith, and "stone" picks to get through the concrete.

the width of the channel corresponding to the width of the base of the rail, and the rail placed in the channel. Great care is taken to see that the track is to proper grade and line.

This completed, the track is ready for the grouting, or the second course of concrete. The composition of the grouting (see "A" in Fig. 2) being one part best Portland cement, one part clean sand, and three parts of fine gravel, thoroughly mixed with water, and then carefully tamped about the rail, bringing the grouting up to the proper height to meet the cushion for the pavement. The men are cautioned not to disturb the alignment of the track in any manner.

After this is allowed to set from eight to ten days it is ready for paving. If it is asphalt pavement we let it out by contract, but the brick paving we do ourselves. Instead of using tar for cement between brick, we use grouting composed of one part of Portland cement to three or four parts of clean sand, mixed thin with water, so that it will run readily. This is poured over the brick, and worked between the joints of the brick with a wire broom. This grouting permeates the sand cushion under the brick, and when once set, forms one solid mass of brick and concrete, shedding all

Sections of track laid in trenches without ties in streets paved with asphalt and brick on concrete foundation

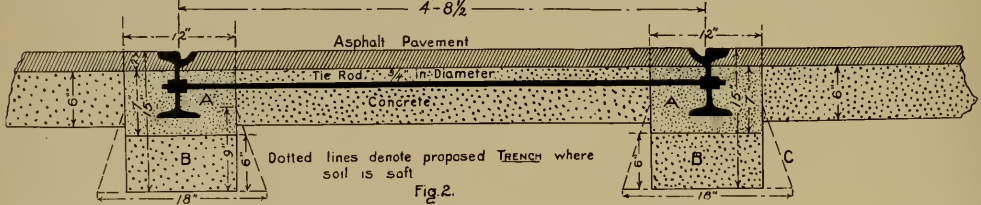


Fig. 2.

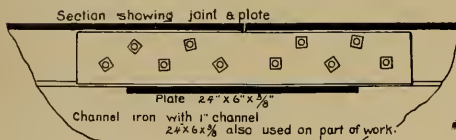


Fig. 3.

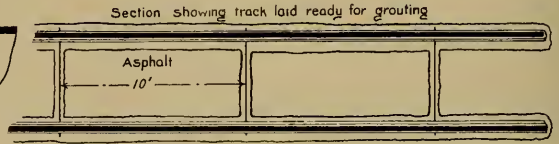


Fig. 4.

The first, or foundation course (see "B" Fig. 2) is prepared, using the regular concrete proportion of one, two and four, and adding one-fourth of one part of Portland cement. This is tamped into the bottom of the trench and should be allowed to set seven days.

The rails are then suspended over the trenches, the splices put on, the final bolting is done, and the rail dropped into the trench, laying with "broken" joints. The tie-rods (round, for asphalt and flat for brick) are put on every ten feet, and with tie-rod at every joint.

Where the tie-rods cross between rails a trench is cut about 4 inches wide and deep enough to allow the rod to go in and connect the rails without having any weight borne by it.

The rails are then drawn to gauge, the track lifted, or blocked up to grade, using oak "shims" for blocking. A plate 24 inches by 6 inches by 3/8 inch is placed under each joint (see Fig. 3) to give extra support, or what has given better satisfaction is channel iron, with a one inch flanges

water and holding the track in a vise which we believe will be as lasting as the rail.

We have used this construction on 90° curves, by making the trench 15 inches wide and laying the concrete so as to make a brace for the rail, and the curves appear to be as perfect today as they were on the day that they were laid.

In one or two instances we have noticed small depressions in the track where the street was paved with asphalt, caused by soft soil under the concrete and because the concrete under the asphalt did not support the foundation under the rail. We think that this can be remedied in future work by watching the character of the soil, and where it is soft excavate a little deeper and broaden the base (as shown in dotted lines "C" in Fig. 2) and tamp in crushed stone until a solid foundation is formed, and in fact we think that under a great many conditions a broader base is advisable in this kind of construction to insure a greater degree of stability.

The cost of construction with this method is much cheaper as the following comparison will show.

	Trench work per lineal foot.	With ties per lineal foot.
Excavation.....	\$0.10	\$0.15
Concrete (foundation course).....	.11	.35
Track laying, lifting and lining.....	.08	.10
Grouting, or second course.....	.18	.53
Paving with asphalt.....	.55	1.55
Ties and spikes, 2½ C. to C.....	.....	.17
Channel iron, "shims" etc.....	.03	.....
<b>Total</b>	<b>\$1.05</b>	<b>\$2.85</b>

A difference of \$1.80 per lineal foot in favor of "trench work."

The largest saving is in pavement and concrete as is shown in Fig. 4. While this track has only been laid for one and one-half years and consequently we are not prepared to give the life of it, yet our experience with it justifies us in recommending it to the consideration of all street railway managers who have roads to build in streets paved with brick or asphalt and on a concrete foundation.

In conclusion we wish to say that we are well satisfied with our methods of construction on concrete foundation in paved streets, but do not advise its use in streets that are not paved outside of tracks, because where we have tried it, unless we had the most perfect drainage, the winter's frost of this northern latitude was sure to heave and break the concrete to such an extent that the tracks needed to be soon repaired.

## AN ELECTRIC ROAD UP MT. TOM.

The project to build an electric road up Mt. Tom, Massachusetts, has taken definite form. The last state legislature granted a charter for the formation of a company which should operate such a road. It has been incorporated under the name of the Mount Tom Railroad Company.

The altitude of the mountain is 1,250 feet, and it is expected that the length of the road will be a little over a mile, with a grade from 14 to 24 per cent.

The equipment and construction of the road will be similar to that up Lookout Mountain, at Chattanooga, Tenn.

There will be two cars on the incline, one running up while the other is going down, and they will be connected by a cable which will pass over large drums at either end of the route.

There will be telephonic communication between the two cars to avoid trouble in starting and stopping, so that when the bell of one car rings the other one is also sounded. The electric motors on the cars furnish all the power, and it is estimated that, with this cable connection, the power required to take the cars up to the summit is not much greater than to move them on the level.

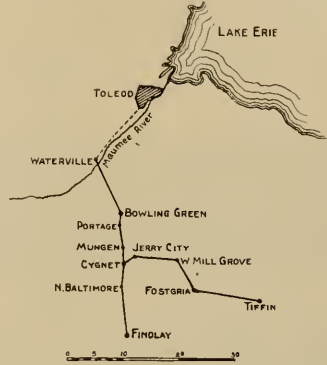
Motors of 75 or 100 horse-power will be used. Power will be furnished by the Holyoke Company. This road will make the mountain accessible to 150,000 people by street car ride. It is expected that \$100,000 will be spent before the road is completed next June.

President Loomis, of the Holyoke Company, is also the president of the Mt. Tom Company, W. R. Hill is treasurer of both concerns, and with one exception, the directors are the same.

Each of the married men, employed upon the Northeast Electric road of Kansas City, received a Christmas present of a large, fat turkey. Each of the single men received a silver dollar, with which he could buy a turkey or spend otherwise, as he saw fit.

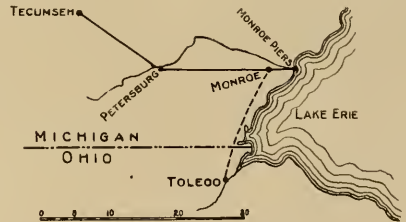
## NEW ELECTRIC LINES.

A new interurban electric line running through the oil country and connecting with Toledo is contemplated. C. T. Geddes who recently resigned his position as general manager of the Toledo, Bowling Green & Fremont Railroad Company, is the practical railroad man in the scheme. The



route is shown in our sketch. Lines from Tiffin and from Findlay meet a few miles south of Bowling Green and thence run via Bowling Green to Waterville on the Maumee river and down the west bank of the Maumee to Toledo. The territory through which the road will run is full of oil wells and it should prove a paying one.

Another line in which Mr. Geddes is interested is one to be built from Monroe Piers at the mouth of the Raisin river



to Tecumseh, Mich., via Monroe and Petersburg, with a possible connection from Monroe to Toledo. One of the features of this road will be its freight traffic, transporting the fine white sand which is found in abundance near Petersburg and is so desirable for glassmaking.

## FEED WIRE THIEVES.

The Traction Company, of Baltimore, Md., lost 1,200 feet of feed wire last August. After cutting down the line the robbers burned off the insulation and sold the wire for old copper. The expressman who carted away the wire was found and gave what information he could. Recently he notified the detectives that the same men had bargained with him again to haul some wire. Plans were carefully made and the two thieves arrested and now await trial in the criminal court. It is thought that they have been engaged in similar operations in Pennsylvania, Delaware and New Jersey.

## THE WARNER CAR HEATER.

The Ohio Brass Company, of Mansfield, O., has recently issued a catalogue describing a new electric heater for street cars. Either four or six heaters are used in each car, two adjustments being possible in the first case and three in the second.

The construction is simple and strong, two malleable iron castings being used for the casing. One supports the wires and is provided with lugs to fasten the heater in position, while the other protects the coils and is so formed as to insure a draft of air over the wires. A special grade of wire



is used, whose resistance does not vary even with high temperatures and is not readily oxidized. In a set of four heaters alternate sections are connected in series and by means of two switches the circuits are controlled independently. With one circuit in operation, 3 amperes are taken from a 500 volt circuit and with the two in parallel, 6 amperes are used.

When six heaters are in a set, the sections are so divided that one carries twice as much current as the other, and in this way, either 3, 6 or 9 amperes of current are consumed. The temperature of the car can be closely regulated and sufficient heat is generated even for the coldest weather.

Each heater is tested and guaranteed for two years, new coils being furnished to replace any that may be defective.

## BLIZZARD IN THE EAST.

A severe wind and snow storm, December 16, seriously interfered with all kinds of traffic in New York, Boston and cities along the New England coast. The trolley roads made a gallant fight to keep their tracks clear and generally succeeded by the vigorous use of their snow plows. In Brooklyn the mail cars were delayed for several hours. The underground trolley system was seriously affected by the snow drifting into the conduit and blocking the cars. On some of the suburban lines the wind piled the snow in drifts of from three to twelve feet deep. In one or two of the cities some short-sighted business men objected to the street car companies clearing their tracks, and threatened to shovel the snow back between the rails.

The Marietta Street Railway suspended operations because of the cost of street paving and the near approach of electric competition. It will be several weeks before the horse cars are superseded by the trolley.

## NEW OFFICIALS.

W. E. Hepperle, of Harrisburg, has recently been appointed superintendent of the Hagerstown Railway Company.

F. M. Talcott, of Richmond, Va., has taken the management of the Consolidated Street Railway, Dallas, Texas, in place of C. M. Ward, who has resigned.

E. W. Courtney, assistant electrician of the Washington, Alexandria and Mount Vernon Electric Railroad, has resigned to accept the position of general superintendent of the electric railroad in Frederick, Md.

Joseph T. Jones, of Buffalo, N. Y., was elected president of the Niagara Falls electric road, to succeed Colonel Gaskill. The new directors of the company are J. T. Jones, Charles A. Sweet, George L. Lewis, Harlow C. Curtis, William B. Rankine, Adelbert Moot, William H. Johnson, A. J. Porter and Charles B. Hill.

At the annual meeting of the Sherbrooke, Quebec, Street Railway Company, John W. Burke, of New York; J. E. Flood, of Sandy Hill, N. Y.; Wm. Morris, of Lennoxville; Walter Blue and F. J. Griffith were elected directors. At a subsequent meeting, John W. Burke was chosen president and F. J. Griffith secretary-treasurer.

At the last meeting of the Baltimore City Passenger Railway Company, Gabriel D. Clarke, Jr., was elected director to fill the vacancy caused by the recent death of his father. The present board of directors consists of Bernard Cohn, Austin L. Jenkins, O. A. Kirkland, Alexander Shaw, Walter S. Franklin, John W. Hale and Gabriel D. Clarke, Jr.

William J. Fransioli, who had been acting general manager of the Manhattan Elevated Railroad since the death of Colonel F. K. Hain, has been appointed permanent manager by the board of directors. Mr. Fransioli, though a young man, has been with the elevated company for sixteen years, the last five of which he has been Colonel Hains' assistant.

The Hamilton, Ontario, Street Railway Company held its annual meeting and elected Wm. Gibson, M. P., to succeed B. E. Charlton as president. The directors are: President Wm. Gibson, B. E. Charlton, E. Martin, Vice-President Isaiah Beer, W. J. Harris, F. W. Fearman, John A. Bruce, and J. B. Griffith, who continues to act as secretary and manager.

The annual meeting of the stockholders of the Washington & Great Falls Electric Railway was held, and the following directors elected: J. P. Clark, S. T. G. Morsell, Lee Hutchins, J. V. N. Huyck, Frank B. Clark, W. E. Lewis and E. C. Clark. The board then met and chose J. P. Clark for president, S. T. G. Morsell, vice-president and Lee Hutchins secretary and treasurer.

At a called meeting of the stockholders of the Chattanooga Electric Railway Company, the resignation of Captain C. A. Lyerly as president was accepted and the following officers elected: President, J. H. Warner; vice-president, Percy Warner; secretary and treasurer, E. D. Lilly. The new board of directors is composed of J. H. Warner, Percy Warner, Edwin Warner, W. T. Adams, C. A. Lyerly, T. D. Young and G. W. Meade.



## FIRE LOSSES DURING THE MONTH.

### BROOKLYN.

The car sheds and repair shops of the Brooklyn Heights Railway Company were damaged to the extent of \$40,000. The fire was supposed to have originated from a defective electric wire. The prompt action of the car employes saved all but fourteen of the two hundred cars stored in the barn. The loss is fully covered by insurance.

About a dozen cars were burned and the car sheds of the Nassau Electric Railroad damaged to the extent of \$35,000. One of the cars was turned in with a burnt out motor box and it is presumed that the fire was started by some of the wood work igniting from the heat of this box.

### JANESVILLE, WIS.

The Janesville Street Railway Company's power-house was destroyed by fire, the loss being \$12,000, partially covered by insurance. It is supposed that sparks from the generator ignited some waste and the fire was communicated to the oil cans in the engine room. When a stream of cold water struck the engine, the cylinder head blew out, injuring three persons.

### NEW BRUNSWICK.

Allens Theatre Building, containing the offices of the Brunswick Traction Company, was destroyed by fire. Loss \$300,000.

### AKRON, OHIO.

The Wooster avenue barns of the Akron Street Railway & Illuminating Company, with thirteen cars, were destroyed by fire. Loss \$10,000; insurance \$8,000.

### DUBUQUE, IOWA.

The quick response of the fire department prevented a very threatening fire in the power-house of the Light and Traction Company. The fire was beneath the engine and dynamo floor and was extinguished by cutting away the floor and using the "cellar nozzle." The only loss was the damage to the floor.

## FLEXIBLE TROLLEY SUSPENSION.

A new trolley suspension has recently been placed upon the market by Fletcher & Stone, of St. Louis. Great flexibility is claimed for this device when used either with the bracket or span wire styles of suspension. Difficulty has been experienced by the trolley pounding the line when running under a rigid car. This suspension obviates this difficulty, for it permits both vertical and transverse vibra-



tions, and in this way provides for the oscillation of the car and the pressure of the trolley. In case the trolley jumps the wire, the force of the blow given to the span wire is not transmitted to the line, and in this way many fractures of the wire are prevented. Being suspended in this way, the trolley wire is pliant throughout its length, and is free to permit any vibrations to pass. The Suburban Street Railway, of St. Louis, has adopted this suspension on the Locust street line.

## T. E. HUGHES.

T. E. Hughes is perhaps as well known to the street railway profession as any of our readers. For fifteen years he gave his attention to the manufacture and operation of street railway cables and of late years, since the advent of electrical traction, has made a study of the electric transmission of



T. A. HUGHES.

power for railways. After ten years' service as manager of the Washburn & Moen Manufacturing Company's warehouse at Pittsburg, he has accepted an offer of the Standard Underground Cable Company, of Pittsburg, to take charge of the sale of its insulated wires (other than lead covered cables) in the eastern states. Mr. Hughes will have headquarters at room 18, Times building, New York, where he will be glad to greet his friends, the old as

well as the new ones, which he has the faculty of making so easily. Geo. L. Wiley, who has been the manager of the New York office of this company, will continue in that capacity, giving special attention to lead covered cables, underground conduits and accessories.

## CALUMET BONDS CAUSE BANK FAILURE.

The National Bank of Illinois, this city, is in the hands of the national bank examiner. The bank had loaned \$2,400,000 on Calumet Electric Railway bonds, taking the bonds as collateral at 90 cents on the dollar. Some of the directors in the road are directors in the bank. Some people believe it is a step on the part of the Chicago City Railway to secure the Calumet.

## OBITUARY.

Daniel Moran, superintendent of the car house of the Quincy, Mass., Street Railway, died December 11. Mr. Moran had been sick but two days, a rush of blood to the brain causing his death.

Albert Maetzcke, of St. Louis, who invented a street car fender, committed suicide while mentally deranged. He was a man of fine education, but brooded over the alleged theft of one of his inventions until his mind gave way.

Benjamin F. Wallis, of Fitchburg, Mass., who was treasurer of the Fitchburg & Leominster Street Railway from 1886 to 1894, is dead. Two sons, William B. Wallis, of Boston and Robert N. Wallis, of Fitchburg, survive him.

Elias S. Ward, a director of the Bridgeport Traction Company and formerly its vice-president, died suddenly at his home in Newark, December 23. He was the owner of a large patent-leather tannery in Newark, a stockholder in the Prudential Insurance Company, the Newark & South Orange Street Railway. He was widely known for his charities and his kind, genial disposition. Mr Ward was about 50 years of age and leaves a widow and two sons,

### REVOLUTION INDICATOR.

We illustrate herewith a revolution indicator recently placed on the market by the Electro-Dynamic Company, of Philadelphia. The working of this indicator is electrical and is based on the principle that the voltage of the current generated by the revolution of an armature in a constant magnetic field is directly proportional to the speed. Figure 1 shows the generator, which is a magneto machine differing from a dynamo in having permanent magnets for the fields. This generator is belted to the shaft, or if extreme accuracy is desired it may be geared, whose speed is to be indicated. From it wires lead to the indicator dial, figure 2, which is a simple voltmeter with the scale graduated in revolutions per minute or miles per hour or whatever else may be the unit desired. It is evident that further additions may readily be made to the recording apparatus to suit peculiar conditions such as providing a dial and clock for a continuous record, or an alarm to attract attention when the maximum allowable speed is exceeded. There is no limit to the number of dials which may be connected with one generator and this feature makes the indicator well adapted for large plants, where the superintendent as well as the engineer will wish to keep in touch with the engine room. The apparatus is installed on the ships of the American line and numerous yachts, dials being placed in the chief engineer's room and on the bridge.

On twin-screw ships a reliable speed indicator enables the two engines to be kept quite near the same speed, permitting the rudder to be carried amidships and avoiding the drag which occurs when it is kept at an angle. One of the "greyhounds" reports a gain of two hours by its use. For railway work its advantage over the Boyer recorder with its complicated connections to the dial is evident.

This indicator shows the direction as well as the speed, since a reversal of the direction of motion of the armature

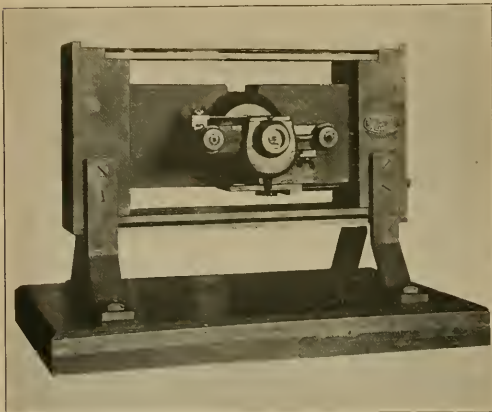


FIGURE 1—REVOLUTION INDICATOR MAGNETO MACHINE.

will reverse the current. The dial is graduated both ways from zero as is shown in the cut. In order that the voltage produced by the generator may be proportional to the speed the field must be of constant strength. To accomplish this a special grade of steel is used. The armature is of the

iron clad type and acts to some extent as a keeper for the fields. Should variation in the magnetism occur it may be corrected by an adjustable shunt in the air gap. Dial indi-



FIGURE 2—REVOLUTION INDICATOR—DIAL.

cators may also be easily adjusted. To standardize the instrument it is only necessary to compare the readings with an ordinary revolution counter.

### THE HUNT AIR BRAKE APPARATUS.

The Hunt Air-Brake Company, having its works at New Kensington, Pa., is making marked strides in the way of improvements and the orders and testimonials received are evidence that the Hunt air-brakes give satisfactory results in any service in connection with electric, elevated or cable roads. To be able to promptly fill orders the company has recently ordered sixty-four motors. The air pump and three-way valve used with the apparatus are eminently satisfactory in their working and trials in service show that with a fair voltage the air pressure may be raised from zero to seventy pounds in two minutes. This is an important factor, as the air pressure is raised so quickly that should the trolley jump the line after being on only a moment, the motorman would have sufficient air at his command to make several stops.

Among the recent improvements deserving of especial mention is the use of aluminum in the manufacture of the air brake equipment. Objection was made to the first design on the score of weight (the motor and pump being combined in one piece of apparatus), but in its present form the apparatus may be carried on the platform of almost any well built car. The aluminum is the product of the Pittsburgh Reduction Company with works at Niagara Falls and at New Kensington, adjoining the works of the Hunt Company. The manufacture of this metal has been so developed that its use for the brake castings is now practicable. All parts of the apparatus, other than the pump and motor castings, are of aluminum, the result being a handsome piece of machinery which is an ornament to the car,

Another improvement is the small compound combined pump-motor brake, specially designed for short cars and which can be carried under the seat or under the car. This type is of aluminum throughout except such parts as of necessity are made of brass or iron, and is very light. The space occupied is 32 inches long by 12 inches wide and 15 inches high.

Both of these combined motor brakes are controlled by a new automatic controller which is also of aluminum throughout except the points of contact. The casing is of aluminum with a glass face and occupies a space 14 by 7 $\frac{1}{4}$  by 3 $\frac{1}{2}$  inches. By this device the pump is absolutely automatically controlled, the maximum pressure being set, say, at 70 pounds and the minimum at 40 pounds. Should the trolley jump the wire the pump is automatically stopped until the trolley is readjusted and the car started. The motorman has no care of the apparatus and merely handles the air by means of the three-way cock which is directly in front of him. To avoid the possibility of an accident to the brake equipment by reason of excess current there is provided a "midget" cut-out by which the excess current is discharged. Every precaution has been taken to protect the apparatus from injury and to insure to the purchaser a reliable air brake. By attaching a hose to the combined motor-pump air may be used for cleaning the motors, controllers, seat cushions, etc.

The Hunt Air Brake Company now has its axle connected brake in successful operation on the Cleveland & Elyria, the Akron, Bedford & Cleveland, the Pottsville Electric Railway, the Norfolk & Ocean View, and the Binghamton Electric Railway. Orders are being filled for combined motor brakes for the Norfolk & Ocean View, the Cleveland & Elyria, the Elyria & Lorain, the Mt. Clemens Fast Line, the Saginaw & Bay City, and the Akron, Bedford & Cleveland. The new cars of the Wilkesbarre & Northern Railway have been equipped with the Hunt trail brakes and the company has orders from several roads in Pittsburgh, Buffalo and elsewhere for these brakes. The company is also furnishing some roads with combined motor-pumps for use in the power house for cleaning purposes. The pump may be mounted on wheels so as to be carried about the plant and connected up where most convenient.

## NEW MANAGEMENT FOR THE CINCINNATI, NEWPORT & COVINGTON RAILWAY.

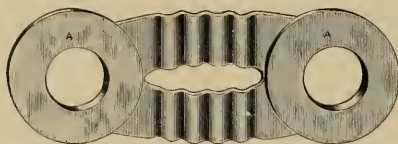
The temporary embarrassment of the Cincinnati, Newport & Covington Railway has been relieved by the issue of \$500,000 of second mortgage bonds, which will be sufficient to enable it to meet all obligations. The new board of directors, elected from the members of the syndicate whose bid was accepted, has taken possession of the business affairs. The advisory board will consist of the president, James C. Ernst, and four directors, Charles Fleischmann, Henry Pogue, Charles E. Orr and H. P. Eells. It is believed that this change will put the road on a paying basis, and as a result its stock has taken an upward turn.

At Allentown, Pa., a collision between a trolley car and a passenger train on the Central Railroad, of New Jersey, was caused by a broken switch and resulted in the motorman being killed and five passengers injured.

## SOME FURTHER NOTES ON THE ELECTRIC RAILWAY RETURN.

By H. S. Newton, Electric Engineer Syracuse Rapid Transit Railway Company.

I am encouraged by a fellow feeling which I invariably have aroused after reading accounts by others of the difficulties in railroad construction, to chronicle for the REVIEW the experience we have had in Syracuse in the matter of rail-bonds. This in its primary details has been so similar to the tribulations of Mr. Knox, in Chicago, that I am satisfied the trouble with riveted, upset and simple con-

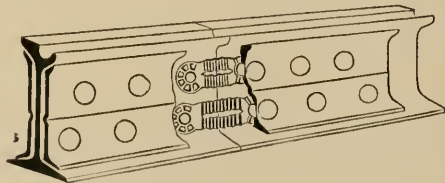


THE UNDER FISH PLATE BOND.

tact bonds cannot be confined to any one place but must be of common occurrence everywhere.

During the last two and a half years we have laid some thirty odd miles of double track nine inch girder and have passed through all the stages of bond practice from no bonds at all to the latest development in that line which we have worked out and which gives every indication of filling the bill. Previous to the installation of the heavy iron, and in fact on portions of our line at present, horse car rail of the flat "L" variety with iron plates at the joints does service with not a suspicion of a bond, occasional taps being made to a track feeder overhead. This is with a serious loss in the return, however, and is somewhat more to be condemned even than the use of the poor bond connections which we have used on other parts.

My attention was directed to the condition of the first bonds used in our new construction about six months after they were put in place on the occasion of our uncovering some track for paving purposes. The first bonds taken off revealed a mass of verdigris or oxide, which it was hard to realize could have collected in so short a time. Further research developed no improvement in the condition of the



UNDER THE FISH PLATE BOND ON RAIL.

bonds elsewhere and it was determined that a change to another bond or to some other method of taking back the return current was decidedly necessary.

To find a better bond was by no means an easy matter. The one we had been using was selected after careful inspection of the various devices on the market, had been approved by the superintendent and engineer of the water depart-

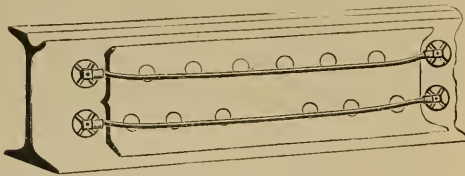


ment as proof against the productions of electrolysis in the water pipes and was supposed to be in all respects a superior article. The use of supplementary under ground wires, my own previous experience had proven to be a wasteful throwing away of good copper from the fact that the life of such wires was limited to a very few years.

Our first step in a new direction was to improve the bond we were using, an attempt which was only successful to a limited extent; our next was the trial and speedy adoption of an entirely new departure, a bond which solders fast to the rail. This bond we are using to-day, the last order having been for some seven thousand to be used two at a joint on sixty-foot rails. Our success with it has been so remarkable that I cannot refrain from explaining somewhat in detail its construction and the manner of putting it on, especially as by its simplicity and permanency it seems to me to have entirely solved the problem of obtaining a good return.

The process of soldering strips or small pieces of metal to a large mass of metal like a rail seems to have been looked upon by a great many engineers and mechanics as impracticable. The idea has seemed to prevail that it was necessary to get the whole of the greater mass as well as the smaller pieces to a temperature equal to that of the melted solder before it was possible to make them unite, whereas, as a matter of fact, if the immediate surfaces to which it is desired to have the solder adhere are only brought to the right heat the result is accomplished without trouble. To this fact the bond we are now using owes its success. The bond itself and the surface of the rail in immediate proximity to the bond and against which it is brought in contact are elevated to the temperature of melted solder. The solder which is left on the bond faces by the manufacturer in process of construction is interposed between the two faces and the joint is formed, a steady pressure on the bond at the same time prevents too thick a layer of solder forming, by squeezing the superfluous metal out at the sides of the contact plates.

The bond is manufactured in two forms, one placed around the fish plates, in plain sight when the track is



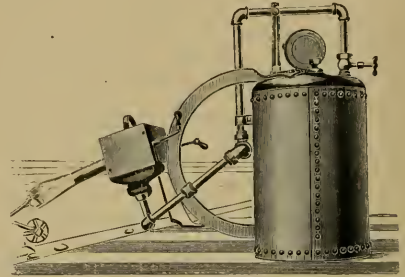
AROUND THE FISH PLATE BOND ON RAIL.

taken up for repairs; the other designed to be placed under the fish plate out of the way. The former has the advantage of being easy to inspect and well-designed for special work while the latter is the cheaper in cost, is a somewhat better conductor because shorter and is doubly secured by the fish plate bolts which reinforce the solder in holding it to place. The short bond consists of a single piece of metal, the long bond of a No. 0000 copper wire tipped at each end with contact plates.

The contact ends on both bonds are ground down perfectly true on a surface grinder and tinned before leaving the factory. In performing the latter operation care is taken to first carefully clean the surfaces with soldering salts

and then to dip them in the melted solder in such a way that the superfluous metal will run down and settle on the surface where the plate meets the steel of the rail.

Preparing the rail to receive the bond we have found to be a very simple matter. When the short bond is used a plug is inserted in the facer made for the purpose which fits the fish plate bolt holes. By the help of a ratchet drill stock, a space is then faced off clean around the last holes in the end of each rail. Some soldering salts are applied to these surfaces, the bonds are clamped in place and the gaso-



SOLDERING ON A BOND.

line torch used for the purpose applied. A moment's application of the heat completes the process. With the nine-inch rail we have found it thoroughly practicable to use as high as four bonds at each joint.

When we first began using the soldered bond a pair of ordinary lineman's torches were used for soldering. These we found got out of order easily, however, necessitating a considerable outlay of time and money for repairs. An improvement in this line was then looked for and found in a large brazier's furnace, which is provided with adjustable torches and holds five gallons of gasoline. With this instrument a man can solder on a bond in one minute's time, making a perfect joint.

The results of this kind of bonding are easy to see on all the track where the bond has been used. No difference of potential between rail and water pipes with the positive terminal of the voltmeter on the rail is observable. The bugbear of electrolysis in water and gas pipes I feel sure is killed, with nothing to fear for the future. We are approaching the period where the practice of neglecting the ground return in figuring power distribution may be followed with a little more chance of obtaining correct results. Our bonds are all tight. The number of loose ones found by the inspector when work was in progress this summer and fall was not more than one-half of one per cent. The short bonds when loose are exposed the moment the clamps are taken off, the long ones on taking a turn or two with a wrench. To correct the evil the rail must be faced again and the heat applied. With thoroughly trustworthy men we never find any loose bonds, however, and under any conditions the cost of rebonding is so slight as to be insignificant. The work can be done at a profit for ten cents a bond where delays are not necessary and for twelve where all hindrances are considered.

The Wilmington, Pa., City Railway Company has covered the safety gates on the platforms of the cars with canvas, thereby protecting the motormen's legs and feet,

## ELECTRIC LIGHT FROM THE CAR AXLE.

### Moskowitz System of Car Lighting.

A most satisfactory arrangement of providing electric light in railway coaches has been offered by the National Electric Car Lighting Company, of New York. The conception and construction of the whole apparatus is very ingenious.

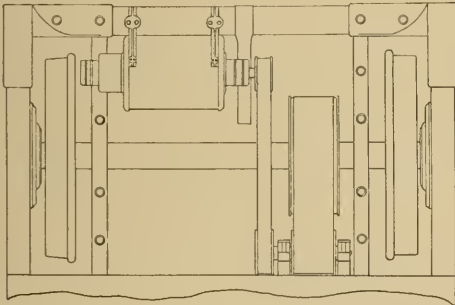
A four pole, iron-clad differential shunt and series wound dynamo, weighing about 350 pounds, is suspended from the truck of the coach.

A hard wood, split pulley on the car axle, drives a spring cushioned counter shaft which absorbs all the violent jarring.

The dynamo is belted to the counter shaft and makes  $3\frac{1}{2}$  revolutions to one of the car axle.

The commutator is quite large and the current is taken from it by two pairs of self lubricating carbon brushes.

The dynamo is designed to give from 35 to 40 volts with a current output of 25 to 30 amperes. The dynamo does not begin to operate until the speed is 250 r. p. m., or a train velocity of 8 miles an hour, and the differential winding prevents an excessive flow of current.



Two storage batteries of 32 cells each are placed under the car and absorb all the output of the dynamo which does not go to operate the lights.

When the dynamo is not running, the lights are supplied with current from the batteries, which have a capacity of 175 ampere hours.

The batteries are of the Plante type, but are credited with much longer life than ordinary cells, the positive plates lasting nearly three years.

All the wiring centers in a neat and compact switch board placed under lock and key in a little closet at one end of the car.

A small ammeter, a dimmer, switches to the lamp and dynamo circuits, and one regulating the storage batteries, are on the upper part of the board. Beneath are automatic electro-magnetic switches controlling the charging of the batteries and the reversal of current. The car is brilliantly lighted by twelve 16-candle-power lamps on the inside, with four lamps in the closets and vestibules.

The Pennsylvania Railroad Company has adopted this system for lighting some of its cars, and the Santa Fe is giving it a thorough trial at their own expense.

Messrs. Max E. Schmidt and Morris Moskowitz, who are representing the western interests, are confident that it will prove a great success.

## COMPRESSED AIR MOTORS.

Compressed air motors are still running in New York city. In some respects they are doing much better than was generally expected. The motor on 123rd street has run 17,373 miles and carried 107,529 passengers up to December 25, and the operators claim without delays or the expenditure of a cent for repairs. On the 3rd avenue system several motors are running steadily. These are all being operated by the American Air Power Company.

What is known as Whitney's company has incorporated for \$1,000,000, with one-half paid in, under the title of the Compressed Air Power Company. The directors named are: William C. Whitney, Thomas J. Ryan, Frederick S. Pearson, William W. Cook and William L. Elkins.

### "L" ROADS IN HARD LINES.

The cable in New York and the trolley in Brooklyn have played havoc with the "L" roads. The latter have been deferring action from month to month, vainly hoping for better earnings. There is now no alternative for them but to equip electrically. The comparison of passengers carried tells the story in a few words:

NEW YORK CITY.			
	1896.	1895.	1894.
Elevated roads.....	184,703,636	187,614,085	202,751,532
Surface roads.....	357,866,862	286,833,434	251,638,602
Total.....	542,510,498	474,448,419	454,390,434
BROOKLYN.			
	1896.	1895.	1894.
Elevated roads.....	50,626,512	53,251,922	48,705,847
Surface roads.....	170,946,251	153,420,570	143,131,063
Total.....	221,572,763	206,672,501	191,836,910

## WEST END STRIKE A FAILURE.

The West End, Boston, employes failed in their attempted strike, which was to force a recognition of the union. It was plainly the work of professional agitators, and the great majority of the men had little heart in it. On December 23, the president of the union issued an ultimatum to President Little, saying that a strike would be declared if the agreement presented by the men was not signed by 3 o'clock. President Little sent for the union officials and persuaded them to give him one week to consult the directors. In violation of this, 800 of the men went out on a strike the next morning. The officers of the road immediately took steps to supply the places of the strikers, and on Christmas day all the cars were running. Some of the old men were allowed to return.

People's Street Railway Company of Luzerne county, Pa., is granted permission by the court to change its name to "Scranton Railway Company."

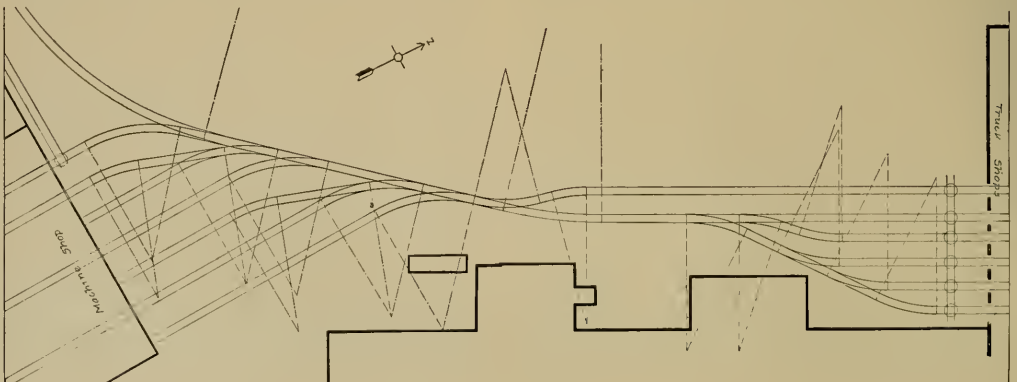
The Baltimore City Passenger Railway Company declared a semi-annual dividend of five per cent, payable on or after January 2. This makes ten per cent paid during the year which has been a very successful one under the management of Col. Walter S. Franklin.

## DORNER &amp; DUTTON FAILURE.

The Dorner & Dutton Manufacturing Company and the Dorner Foundry Company, of Cleveland, have failed. On January 2 judgments aggregating \$85,000 were entered. There was a big scramble among the attorneys, of whom thirty were in court at one time. On January 7, E. E. Strong was appointed receiver. The failure is a bad one, and the percentage likely to be paid to creditors is very small. When George A. Arthur entered the Manufacturing Company early last year, as vice-president and secretary, it was understood he would put additional capital into the business. It appears now the new money was chiefly used in the Foundry Company. Business depression, the management and the ruinous prices at which some lines of goods were sold, united to bring about the failure. There is a good deal of resentment among recent creditors, who now assert the company must have certainly known, fully two months prior to the crash that it could not possibly hope to pull out, but notwithstanding this went on and incurred further liabilities. What the salvage on the wreck will be, will largely be determined by the policy of the receiver. If a sale of the machinery of which there is considerable, and much of it, especially the gear cutters, comparatively new, should be forced, it would not bring much more than old iron. The Foundry Company is largely to blame for the failure.

## TRACK LAYOUT AT PULLMAN.

Our engraving shows the track layout recently installed in the yards of Pullman's Palace Car Company, at Pullman, Ill., by the Paige Iron Works, of Chicago. In order to furnish a means of transporting trucks and material between the truck shop and the machine shop, a distance of about 525 feet, the tracks shown were laid. Sixty-pound T-rails are used. The special feature about the construction is the use of street railway switches throughout, with a consequent great saving of space that would otherwise be required for the switch stands, throw rods, etc. There is also a saving of time because the switches may be thrown by the man pushing the truck. While the switches are all constructed for car wheels the curves are so sharp that only trucks or short four wheeled cars can be used. On the lead track, however, with its longer curves, locomotives and cars are used.



## A NEW ROAD.

Repeated calls upon the representatives of the Chicago Electric Street Railway Company have developed the fact that they are too much occupied to furnish any information as to their plans, and that they have even forgotten who are the financial backers of the concern. The company was, on January 9, enjoined from proceeding with the work of purchasing frontage consents. The information in chancery filed by the attorney-general alleges that none of the stockholders of the company have any money, and that their object is merely to speculate in articles of incorporation and force existing lines to buy them up.

## BIG STERLING CONTRACT.

The Sterling Supply & Manufacturing Co., New York, are to equip the 150 open cars now building at the Stephenson works for the Metropolitan Traction Co., New York city, with Sterling registers, Sterling sand boxes, Sterling fenders and Sterling safety brakes. These brakes are the same as already in use on the Broadway cable as their standard. The Metropolitan Traction has also ordered 600 Sterling sand boxes for cars now running on its lines. President Carson, of the Sterling Company, is evidently one of those prophets who are honored in their own country, and as the devices have been previously in use on the Metropolitan, the order is all the more pleasing to him as evidence of satisfactory performance on one of the best known roads in the world.

## DETROIT CITIZENS' CONTROLS BELLE ISLE.

Tom L. Johnson, Albert Pack and Henry A. Everett have purchased the Fort Wayne & Belle Isle Railway, for \$1,100,000, being par for nine-tenths of the bonds and \$175 per share for nine-tenths of the stock. Fares have been raised from eight tickets for a quarter to six for a quarter, with transfers to other lines.

The Camden (N. J.) & Suburban Railway Company, distributed \$500 among its conductors and motormen, Christmas, as a token of appreciation of exemplary conduct during the past three months.





# 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.

## Union Loop Power House.

We publish herewith the plans of the power-house of the Union Elevated Railroad Company, of Chicago. The tracks to be operated by power from this plant comprise the entire union loop. The volume of traffic will be very great. The number of trains now on the three elevated lines in operation is about 1,000 per day, and with the addition of trains from the north side it is probable that the number will not be less than 1,500. This station will be the most important one in the city, as all the elevated roads will receive a portion of the power from it, and will have a capacity of 10,000 horse-power. It is expected that it will be in operation about July 1.

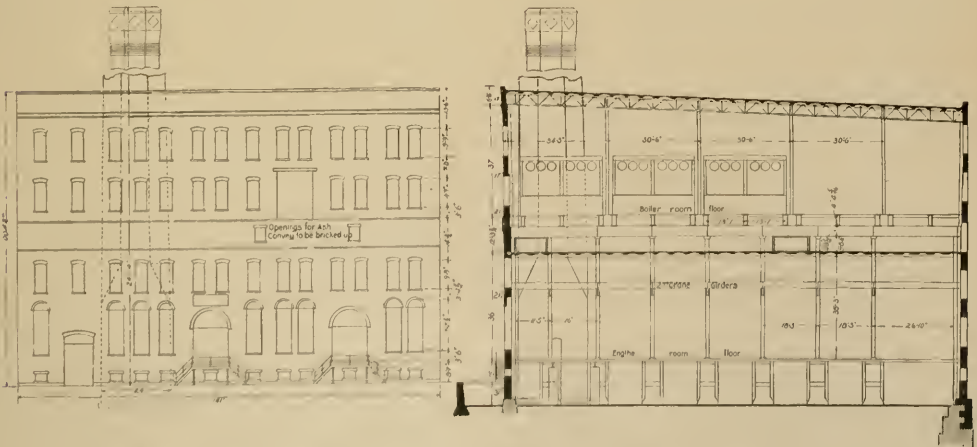
The power-house is on Market street, about 300 feet south of Van Buren street and extends to the river. The frontage is 141 feet on Market street and 63 feet on the river, the north lot line being 164 feet long. The building is two stories with a basement, the street front, which we show, being of pressed brick with stone trimmings. Up as far as the boiler room floor the walls are laid with Portland cement.

This is the only modern street railway power-house west of Philadelphia built on the double-deck plan. This type of construction was only adopted by force of necessity. It was originally intended to build a station with engines and boilers both on the ground floor, but it was found practically impossible to get any more land at that place and there seemed to be no other good location available, for suitable power-house sites are not easy to find in the heart of the business district of Chicago.

In the basement, which is 6 feet, 5 inches below the street grade, will be the condensers and circulating pumps. Wheeler surface condensers will be used. The large hatchways shown in the plan make the basement lighter and afford a ready access to the machinery. For handling the pumps and condensers an 8-ton post crane is provided at each hatchway.

Along the north side of the engine room, which is 8 feet, 7 inches above grade, are to be the engines. Provision is made for four horizontal corliss cross-compound condensing engines with cylinders 30 and 60 by 60 inches, running at 75 r. p. m.; three only will be installed at first, however. The fly wheels are 25 feet in diameter, with 100,000 pounds in the rim. The engines will be built by the George H. Corliss Company, of Providence, and each direct-connected to a 1,500 kilowatt generator built by the Siemens & Halske Company of America. The engine room will be served by a traveling crane with a span of 50 feet, 8 inches.

The boiler room floor is 48 feet, 3 inches above the engine room floor. The boilers rest on box girders  $41\frac{5}{8}$  inches deep, and these are carried by other girders of about the same depth, supported at intervals of 18 feet, 3 inches by columns. Twelve feet, 3 inches below the boiler room floor is a second floor of arched cement which forms the ceiling of the engine room. Between these two floors are the conveyors for handling the ashes. The boiler plant comprises sixteen 400-horse-power Babcock & Wilcox boilers, furnishing steam at 160 pounds pressure. Acme mechanical stokers made by the Falls Rivet & Machine Company will be used.



FRONT ELEVATION—ELECTRIC POWER HOUSE UNION ELEVATED RAILROAD, CHICAGO—LONGITUDINAL SECTION.



## PERSONAL.

Edwin L. Watson, president of the Worcester & Suburban Railway, has lately returned from an extended wedding tour.

T. R. Hull, superintendent of the Centerville (Conn.) Electric Road, was presented with a gold watch and chain by the directors of the company.

S. J. Wick, of the Electric Railway Equipment Company, Cincinnati, spent several days in Chicago last week, calling on his many friends in the trade.

O. M. Hubbard, of the Bradford Belting Company, Cincinnati, spent several days in Chicago last week. He reports business as good and improving.

Superintendent John Bushy, of the Wyandotte & Detroit River Electric Railway, was presented with a handsome cane chair for Christmas by the employes.

S. H. Bennett, secretary and treasurer of the Atlanta Railway Company, Atlanta, Ga., was given a very handsome umbrella on Christmas by his employes.

W. A. Satterlee, purchasing agent for the Metropolitan Street Railway, of Kansas City, has recently been to Florida looking after an orange grove, of which he is the possessor.

J. B. McClary, who has served so acceptably as superintendent of the Birmingham (Ala.) Railway & Electric Company, was also made general manager at the recent annual election. Our congratulations on deserved recognition.

Henry J. Davies, assistant secretary and treasurer of the Big Consolidated, Cleveland, O., was tendered a surprise party at his home recently, the occasion being the return from his bridal trip. A silver water service was presented to him.

E. Kessler, superintendent of the Richmond (Ind.) Traction Company, was on Christmas eve presented with a gold watch by the employes of the road. The gift was offered as a testimonial of the fair treatment which they had always received at his hands.

Wm. H. Ryan, who has heretofore been the western manager of the Engineering Magazine, with headquarters in the Modanock block, Chicago, will shortly remove to New York to take the position of business manager. The best wishes of his many friends go with him.

N. S. Wells, president, and W. S. Dimmock, superintendent of the Omaha & Council Bluffs Railway & Bridge Company, have returned from an inspection trip. The present intention is to erect a new plant before the opening of the Trans-Mississippi exposition, which will be held in Omaha in 1895.

Edward Caldwell, formerly with the Electrical World and the Street Railway Gazette, and for the past two years business manager of the Street Railway Journal, has accepted the position of manager of the Railway Advertising Company, of New York, which controls the privileges on the

Metropolitan system of that city, the Consolidated, of New Jersey, and the Union Traction Company, of Providence.

William P. Deppe, who held a responsible position as representative of the bondholders in the Cincinnati, Covington & Newport Street Railway, having completed his work, has accepted a desirable place as chief clerk in the office of the passenger traffic manager of the Big Four railroad. His many friends will wish him continued success.

The two sons of Eugene F. Phillips, president of the American Electrical Works, Phillipsdale, R. I., are now taking an active part in the management of the business; F. N. Phillips having assumed the position of treasurer, made vacant by the resignation of W. A. Hathaway, and E. Rowland Phillips having been appointed superintendent of the works.

## ELECTRIC TRACTION IN GLASGOW.

Another indication of the awakened interest in rapid transit throughout the cities in Great Britain was the recent visit to this country of J. Young, general manager, and W. Clark, engineer of the Tramway Department, of Glasgow, Scotland. They sailed from Liverpool, September 19, and in their seven weeks' trip, investigated the street railway systems of New York, Brooklyn, Jersey City, Staten Island, Philadelphia, Baltimore, Washington, Pittsburg, Cincinnati, Chicago, Detroit, Cleveland, Buffalo, Niagara, Toronto, Montreal and Boston. They made an exhaustive report, taking up every form of transit. They briefly considered the storage battery, oil and gas motors, compressed air and electromagnetic systems and found them wanting. Electric open conduit installations are so expensive as to be prohibitive and the cable system is too rigid and cumbersome in its operation besides being unsuited to suburban service.

The trolley system is then discussed at length and reported upon favorably. They take the testimony of railway men of America and conclude that all objections due to electrolysis in gas and water pipes and danger of rapid transit may be overcome. Speaking of the disfigurement of the streets by trolley poles they say, "Civilization demands that the aesthetic give place in many instances to the useful. When the four separate burghs now served by our tramway system are included, we have a population of 841,000 persons on an area of 14,661 acres, which gives 36,480 to the square mile. No one wishes our citizens to continue so closely packed together as they now are. In our humble opinion, and judging from what we have been privileged to see in America, the most powerful instrument which lies in the hand of the municipality for effecting this purpose is the best and cheapest possible tramway service radiating from the center of the city outwards in every direction."

The city owns its own tramways and is very conservative in making any alterations. The rate of fare is from one to five cents according to the distance traveled. The horse cars will be superseded by the trolley only on one line at first and future extensions will depend on its success on this line.

The Richmond (Ind.) Traction Company has for years made a practice of remembering its employes at Christmas by giving each one a present in cash or a turkey dinner, with the result of promoting good feeling between the employes and the management.



### THE CAST-WELD JOINT AS A CONDUCTOR.

"Verily, verily, I say unto you, he that tooteth not his own horn, the same shall not be tooted."

I was thrice amused in reading Harold P. Brown's article in the REVIEW of December 15, on the cast-weld joint.

First. Because he says "the joints were magnificent mechanically, making the smoothest riding track I have ever seen." This is a very frank admission.

Second. Because he claims the plastic alloy plug he sells will make the cast-weld joint absolutely perfect electrically. We shall see.

Third. Because he attempts to prove his assertions by showing pictures of defective joints, and acknowledges at the same time he is doing so.

We will quote Mr. Brown: "At Newark, N. J., the mechanical performance of the joints has been excellent. *It is hard to find the joints.* It is evident that there is sufficient clearance between rail and cast iron to allow for expansion and contraction, for very few of the joints have broken in winter, while during the heat of last summer \* \* \* these rails showed no signs of twisting." This is certainly strange—a condition both positive and negative, and opens a field for speculation and experiment.

He claims there is contraction and expansion and no open joints and, according to his argument, rails will shrink but not show it on the ends even where they have the opportunity of sliding in the joint, for he will not admit the contraction sometimes pulls the cast-weld joint apart. Perfectly nonsensical.

But look at Mr. Brown's reasoning: "The reason for this is plain. When the molten iron is poured around the steel the latter expands; as it is in the center it is the last to cool, and therefore remains expanded until the cast iron has set. When it resumes its former size there is a minute clearance left, through which water soon finds its way, leaving a high resistance coating of iron oxide which grows thicker as time passes."

If Mr. Brown had looked into the subject he would have found that the rail becomes heated to a welding point, during the pouring of the metal, and that a perfect cast-weld must take place, if the rail ends have been properly cleaned; of course it sometimes happens that imperfect joints are made, but these are few and are soon found out and broken off to be used for experimental purposes by competitors. By reason of contraction the rail will pull in a bad joint and in this way they are detected.

Mr. Brown should also know that the shrinkage of the joint begins from the outside and adds considerable inward pressure against the rail and as the welding has taken place there is no opportunity for the rail to leave the "sufficient clearance."

He says, " \* \* \* I found several broken joints that were being removed from the track and failed to discover any trace of 'welding.'" This may be true, for that is a good reason for removing them, but it is doubtful, as one of the engravings shown by him (Figure 1) shows a corner of the rail still attached to the joint, beyond a question welded. Considerable more than a "trace."

Again, he saw, "Joint of 78-pound rail taken from track of Missouri Railroad Company, after one and one-half days use, on account of breakage of rail through contraction."

Now, if Mr. Brown is truthful and correct and there is "sufficient clearance between rail and cast iron to allow for expansion and contraction," why did this rail break?

It is really too bad he did not begin his article with the

last paragraph, and add the price of the plug, for then the reader would readily understand his motive in condemning the Falk cast-weld joint as an electrical conductor and his engravings of defective joints would make more apparent his position; that rails will contract and expand in the cast-weld joint, that the plastic alloy plug will add to the conductivity of the joint; although the plug must necessarily follow one or the other end of the rails and thus break this beautiful brown connection. It is unjust, unfair and decidedly unprofessional for Mr. Brown to attempt to toot his own horn, at the expense of anyone but himself, and he who reads the article carefully to the end will see whose toot it is and Mr. Brown's reputation, as an engineer, will suffer.

Allow me to compare one of Mr. Brown's experiments "the result of this inexpensive bonding" (his plug) with one made by O. N. Rau, E. E. of the Milwaukee City Railway Company.

For electrical conductivity at the joint (cast-welded):

With the plug, 700 amperes, .012 volts drop; without the plug, 760 amperes, .0107 volts drop; while in the rail alone the drop was .0117 volts and the latter joint in question had been exposed to the weather for three years.

In conclusion, I desire to call Mr. Brown's attention to one or two extracts from undisputed authority.

M. K. Bowen, superintendent Chicago City Railway: "It is strong and substantial, as has been proved by its holding under the extreme changes in temperature for which Chicago is noted. Seventeen thousand joints were put in in 1895, and of these only 154 joints were lost. The joint in comparative tests has been shown to be far stronger than the rail itself, and such breakages as have occurred were due to a flaw in the metal. The metal cast around the joint has eight times the cross section area that the rail has. Hence, considering steel as four times as strong as cast iron, the joint is twice as strong as the rail. The metal in contact with the mold begins to cool and forms a crust while the interior remains molten. This crust continues to cool and at the same time contracts, forcing the molten metal strongly towards the center, which makes a solid and rigid joint. When the joints parts, it is for two or three inches, so that you can see them readily. If there is any oxidation between the joint and the rail, I hardly imagine it would do any harm unless it was sufficient to loosen the cast iron from the rail proper. In that case it would come apart three inches, due to the contraction of four or five blocks of steel."

Robt. McCulloch, general manager National Railway, St. Louis: "We have one piece of track which is thirteen miles long and all welded together, the most of it being sixty-foot rail. We have not an ounce of copper nor a bond of any kind on the entire track. We have made tests of all sorts, with delicate instruments, graded to the thousandth part of a volt, tested as long and short lengths as possible, sometimes a mile and sometimes a single joint, and have found in most instances that the carrying capacity of the joint was greater than that of the rail at any other place. We have found no necessity for bonding; our contact is perfect at the extreme ends of the rail; and I do not believe it is necessary to bond a welded track."

G. W. Knox, E. E., Chicago City Railway: "I wish to say before leaving the subject of the cast-weld joint, that with all the joints which I have tested I have found no appreciable drop across their parts. \* \* \*"

If more testimony is wanted to convince Mr. Brown that he has made a mistake, I can assure him it will be forthcoming.

HENRY R. KING.

## FOREIGN FACTS.

An inclined electric railway up Mont Blanc is talked of.

Dundalk, Ireland, has approved a scheme for an electric railway.

Marseilles Tramway Company is considering the adoption of electric traction.

The municipality of Braila, Roumania, will build an electric railway to Lacul Sarat.

Manchester's Carriage & Tramways Company will apply for the right to extend its line in Pendlebury.

Reading's Tramway Company invited the town council to inspect the electric railway at Bristol, England.

An electric railway in Hastings, Eng., is being promoted by Mr. Chadwell, C. E., of Richmond Chambers, Blackburn.

The Belfast council favors the equipment of the Belfast Tramway with the overhead trolley, as proposed by the company.

Application will be made to Parliament to empower a company to construct an electric railway between Cardiff and Penarth, Wales.

Right to construct a light electric railway between Cheltenham and Winchcombe, Eng., is asked by Mr. Nevins, of County Wexford, Ireland.

Yarmouth, Eng., is considering an electric railway project, promoted by H. Chamberlin, representing the British Thomson-Houston Company.

Whittaker Brothers, of Flamborough, England, are said to be interested in a proposed light electric railway between Bridlington and Flamborough.

A syndicate proposes to bore two 11-foot tunnels from Hammersmith, Broadway to Carmon street, London, a distance of six miles, for an electric railway.

Storage battery cars have been placed in operation on the steam railway at Paris, operated by the Compagnie des Tramways de Paris et du Department de la Seine.

Longton town council has approved the agreement of the British Electric Traction Company to build and operate a light railway from Longton to Trentham and Blyth Bridge.

Gustave Michelet, president of the Permanent International Tramway Union, died at Brussels, Belgium, November 4, after a long and painful illness. He was 59 years of age.

Tenders for permanent way construction of the Hartlepool Electric Railway are being received by J. Vincent Ketchener, London, for the British Electric Traction Company.

Electric traction will be installed on the steam railways of Charleroi, Belgium, bids for the work having been received by the Societe Nationale des Chemins de Fer Vicinaux, of Brussels.

The Imperial Tramways Company, of Middlesbrough, England, proposes to expend \$500,000 upon the conversion of its lines to electricity, their extension and the construction of five new lines.

Eight miles of electric railway is to be constructed in the city and county of Cork, Ireland, the scheme having received the approval of the Cork corporation, the Grand Jury and the Cork Harbor Board.

A trial is to be made in Paris, France, of the Westinghouse electric street railway system, with contacts on the level of pavement. The experimental line of about a third of a mile in length will be laid in the Rue Maubenge, starting from the Carrefour Chatsandun.

The London United Tramways Company will again apply for Parliamentary powers to substitute electric for horse traction on the lines from Hammersmith to Kew and Richmond, and from Uxbridge Road Station to Acton. It is believed the county council is now more favorable to the overhead trolley.

The British Electric Traction Company has been formed to succeed the Pioneer Company, which is closing its first year of successful working. At the special meeting of stockholders held to authorize the change, Sir C. Rivers Wilson, who presided, said that electric traction in England was entirely in its infancy, but they looked forward with satisfaction to the enormous field before them. He did not think it was to be regretted that so little had been done in this country, because they would be able to profit by the experience of other countries.

## HILLTOP RAILROAD OF PITTSBURG.

The Hilltop line, which is a branch of the Pittsburg & Birmingham Traction Company, has recently been opened. It connects the old city of Pittsburg with the districts situated on the southern shore of the Monongahela river. It crosses the river over the Smithfield street bridge and goes up a grade of 15 per cent on Brownsville avenue. By this road the suburb of Knoxville is brought into communication with the city. The line has been in great demand, as it now affords a rapid transit to about 50,000 people who have been dependent upon the inclines and such walking as unpaved streets afford. The Birmingham Traction Company operates on this line twenty-two cars, each equipped with two 50-horse-power Westinghouse motors and controllers. To provide for this increased demand for power the company has remodeled its station on 31st and Carson streets and put in an equipment of three 700-kilowatt Westinghouse generators.

## TOOK THE HINT.

When a crowd of people boarded the street car, the conductor took a large rag and assiduously cleaned the large sign at the end of the car.

He turned and smiled at an acquaintance, saying, "That's the only way I can get 'em."

Every one watched him, and as he stepped aside, read, "Gentlemen will please not spit upon the floor of this car."

It worked like a charm.

## MILWAUKEE MATTERS.

The Milwaukee Electric Railway & Lighting Company has purchased the Pabst power and lighting plants in Milwaukee and Wauwatosa and the Milwaukee-Wauwatosa electric line. Henry C. Payne remains as vice-president, and has appointed the following officers, separating, so far as operation is concerned, the railway and lighting departments:

## The Official Circular.

The Board of Directors has this day made the following appointments in the Railway, Lighting and Accounting departments of the company, viz:

General Superintendent of Railway Department—Thomas E. Mitten.

General Superintendent of Lighting Department.—W. L. Church.

## ACCOUNTING DEPARTMENT.

Comptroller and Auditor.—W. L. Mason.

Assistant Treasurer.—George O. Wheatcroft.

Cashier.—H. F. Boggis.

Chief Engineer of Power Plants.—W. H. Crawford.

Chief Electrician.—O. M. Rau.

Superintendent of Construction and Maintenance of Way.—A. W. Lynn.

Superintendent of Transportation.—George M. Kuemmerlein.

Superintendent of Maintenance of Rolling Stock.—E. W. Oulds.

Assistant Superintendent of Lighting Department.—S. G. Coleman.

Claim Agent.—E. R. Manhardt.

Storekeeper.—Charles P. Evans.

The office of purchasing agent is abolished. Mr. Vandenberg assigned to duty in the general manager's office.

All said officials will report to the general manager, except superintendents, who will report to the general superintendents of their departments.

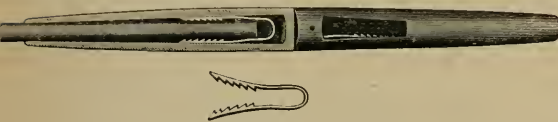
Until the office of general manager is filled, such reports shall be made to the vice-president.

H. C. PAYNE, Vice-president.

The Pabst properties are acquired under the title of a new company, the Milwaukee Light, Heat & Traction Company, with Mr. Payne as vice-president, and the same board as the big company.

## AUTOMATIC WIRE CONNECTOR.

The cut shows a new wire connector that has some original features worthy of mention. Inside of the shell is slipped a toothed spring and when the connector is shoved over the wire the teeth prevent its withdrawal. If the connector is to be taken off a small pin is inserted in the hole back of the spring which releases the spring and the wire is withdrawn. The connections can be instantly made with-



out the aid of a tool, and it can be taken down without injury to the wire or coupler. The Bradford Belting Company, of Cincinnati, is introducing the connector, which especially recommends itself for emergency work. The absence of solder, the good contact afforded, and the unquestioned strength of the device will at once suggest themselves as qualities particularly desirable. The spring can be removed, if desirable, but cannot fall out.

## THIRD AVENUE, NEW YORK, CONTRACTS.

The White-Crosby Company, 29 Broadway, New York City, will let contracts for equipment for the Kingsbridge extension of the Third Avenue railway of New York City.

The General Electric Company received the original contract and sub-let it to the White-Crosby Company who will purchase generators and motors of the General Electric Company. The road is to be  $3\frac{1}{2}$  miles double track, commencing at 162nd street and following Kingsbridge road to Spuyten Duyvil creek.

The Johnson Company are to furnish the rails which are to be 60 feet long, 106 $\frac{1}{2}$ -lb. girder of the Tribby pattern. All frogs, switches, crossings, etc., are to be Johnson's guaranteed special work.

Over-head wire is to be No. 0 hard drawn trolley wire.

Feeders and electric light wires are to be laid in conduits.

Center poles with ornamental pole tops are to be used and every other pole will support one 2,000-candle power electric light.

The generators will be built by the General Electric Company and will consist of one 800, one 500 and one 300-kilowatt. The General Electric Company will also furnish two 125-light Brush dynamos.

The power house is to be furnished with six water tube boilers in batteries of 2 each, of 500-horse-power for each battery.

Three of the generators are to be direct connected to the engines which will be horizontal cross compound condensing.

The lighting machines are to be direct coupled to high speed engines.

The power plant will be equipped with separators, heaters, economizers, condensing plant and a compressed air oiling system.

Joints are to be the Falk cast weld with bonds furnished by the White-Crosby Company.

## CORRESPONDENCE.

NORWAY, ME., Dec. 23, 1896.

EDITOR STREET RAILWAY REVIEW:

I think I can throw some light on the subject of wheel wear. Most of the trucks manufactured are not bolted together so as to be sufficiently rigid, and as a consequence the majority of them are out of square when put under the cars. I have remarked this with most of the standard trucks, and with the prevailing manner of putting them under cars it is unavoidable. If a square were placed on the trucks that go under our cars 75 per cent of them would be found out of line. One side of the truck should be clamped and the other side jacked into line, and the holes in the car body laid off from this position. The car springs will not then be continually forcing the truck to one side of the track, producing cars that are "hoodoos," running slow and causing excessive wheel wear, and every once in a while getting off the track in a mysterious manner. In testing cars I have found some as much as two inches out of line. In that case on one side the flanges would be found thin and on the other double grooves. If the trucks were squared up and braced before leaving the factory, and then after being put in place had the bracing removed, we should hear less of one-sided wheels.

F. B. LEE,

Superintendent Norway & Paris Street Railroad.





The Metropolitan Electric Company, of Chicago, reports a good demand for linemen's tools of which it carries a large stock.

The American Electrical Works, Providence, R. I., makers of bare and insulated wire, have issued a calendar with a view of their plant printed in colors.

The Mitchell Tempered Copper Company, Corry, Pa., is sending to its street railway friends a copper cow paper weight which is a very unique and novel affair.

McIntosh, Seymour & Company, Auburn, N. Y., report that their business has been good during 1896, and that the prospects for engine sales in 1897 are very good.

The Arnold Electric Power Station Company is completing the Englewood & Chicago storage battery plant and will have the station in operation in the near future.

The A. Mertes Manufacturing Company, Allegheny, Pa., calls the attention of the trade to its motor gears and pinions through a business card, to which is affixed a neat thermometer.

The R. D. Nuttall Company of Allegheny, Pa., has sent out a neatly designed calendar to remind its friends that the gears, bearings and machine work of this firm are as reliable as ever.

Wendell & McDuff, New York agents for the Taunton Locomotive Manufacturing Company, of Taunton, Mass., have moved into larger offices on the fifth floor of the Havemeyer building.

The Mica Insulator Company, of London, New York and Chicago, has removed its western headquarters to 117-119 Lake street, and is in a position to promptly fill all orders for micanite specialties.

H. B. Coho & Company, 203 Broadway, New York, handling light, heat and power machinery, report that they have been very busy with regular work and feel quite confident of good trade for 1897.

The Cutter Electrical & Manufacturing Company, Philadelphia, sends greeting to the trade and calls attention to its switches and circuit breakers by means of a calendar which bears an I-T-E circuit breaker, "proper."

The American Electrical Works of Providence, R. I., comes to the front and sustains its reputation for novelties, by extending Christmas greetings and calling attention to its bare and insulated wires in a Christmas pudding.

Wm. Wharton, Jr., & Co., of Philadelphia, and the Pennsylvania Steel Company, have been awarded the contract to supply rails for the conduit electric railway to be built in New York by the Metropolitan Street Railway Company.

Eugene Munsel & Co., miners and importers of mica, Chicago, have moved into new quarters at 117-119 Lake street, and will be enabled to carry larger stocks of mica and drop forged copper segments.

A. O. Schoonmaker, of New York, has lately opened a Chicago office at 1563 Monadnock building, in charge of John Child. A full stock of mica, uncut, cut to size, segments and rings for standard railway motors, will be kept on hand.

The Safety Car Heating & Lighting Company, of New York, has been given the contract to equip 150 cars for the Broadway Cable Road with its Pintsch gas light. The cars are being built by the John Stephenson Company, of the same city.

Jos. Dixon Crucible Company of Jersey City, N. J. has received many complimentary testimonials for its silica-graphite paint, which has been used extensively for telegraph and trolley poles, boiler front and all kinds of wood and metal work.

The Paige Iron Works, which make a practice of issuing bulletins illustrating work recently done by the company, will shortly send out to the trade leaflets showing the track layouts installed for Terre Haute, Ind., and North Chicago street railways.

The Hunt Air Brake Company, Pittsburg, has placed an order with the Story Motor & Tool Company, of Philadelphia, for 50 motors for its combined motor brake, which, with the previous order within a month, makes a total of 64 motors ordered.

Creditors of the Reliable Manufacturing Company hold their fourth meeting at Boston, Mass., January 15, to present their claims to the Court of Insolvency. Assignee Louis W. Hodges, of Foxboro, presents his final account at the same meeting.

The Bibber-White Company, 49 Federal street, Boston, announces to the trade that it has succeeded to the business of Bibber, White & Company, and of the New England Electric Supply Company and will carry a complete line of electrical supplies.

The Binghamton (N. Y.) Railroad Company recently received from the Laclede Car Company, of St. Louis, three new electric cars. They are furnished with vestibule fronts and sashes and doors of the latest pattern and are very handsome in appearance.

J. B. Walker has resigned the management of the Sioux City Traction Company to accept a very flattering offer from the Suburban Railroad of Chicago. The construction of the Suburban offers a splendid field for the exercise of Mr. Walker's well known ability as a practical electrician and street railway manager.

T. C. Rafferty, who is very well known in the electrical supply business, is now associated with the Metropolitan Electric Company, of Chicago, having disposed of all his other electrical interests. We wish him every success in his new work, and congratulate the Metropolitan Electric Company on their foresight in securing his services.

During the first week of the new year the the General Electric Company closed a contract with the Metropolitan Traction Company, of New York, for seven direct current 850-kilowatt generators and 600 motors, and contracts with the Third Avenue Railway, of New York, and with the St. Anthony Falls Power Company, of Minneapolis.

The Indiana Rubber & Insulated Wire Company, Jonesboro, Ind., has, during the past year, been running its factory on full time and has a nice list of orders to begin 1897 with. During 1896 the company has been making a specialty of telephone and telegraph cables, and at present is making a number of large cables to go to the Pacific coast.

The Clonbrock Steam Boiler Company, of Brooklyn, N. Y., have scored a victory for its Morrin Climax boiler over all others, in securing the entire boiler contract for the Tennessee Centennial Exposition to be held the first of May next. This is quite a triumph for the Climax boiler considering the merits of the boilers offered in competition.

The Western Electric Company, of Chicago, has been given the agency for the Lundell motors, and will keep on hand a full stock for prompt delivery. The Lundell is one of the best of the enclosed type of power motors for many uses requiring from one-sixteenth horse-power up. Prices and full information may be had on application.

J. P. Johnson, for some years with the Babcock & Wilcox Company, in its main office, and later salesman in the Pittsburgh office, on January 1 took charge of the Cleveland office for the Cahall sales department for the sale of Cahall vertical and Cahall-Babcock & Wilcox boilers, manufactured by the Aultman & Taylor Machinery Company, Mansfield, Ohio.

The Joseph Dixon Crucible Company, Jersey City, N. J., in a circular letter to the trade states that the volume of its business was not very much less for 1896 than for the previous year, and in some lines showed an increase. Collections are reported as good, and business prospects for 1897 as encouraging to manufacturers for both home and export trade.

The R. D. Nuttall Company, Allegheny, Pa., reports the general gear trade to be larger than ever before in its experience, and from the correspondence now being received, anticipates a very heavy trade during the coming year. During the dull season the company has laid in a good supply of standard gears and pinions, and is well prepared to promptly fill orders.

The Compressed Air Power Company has been incorporated in New York City, to introduce the Hoadley system of street car propulsion. The capital stock is \$1,000,000; and the directors are Joseph H. Hoadley, president, Almeric Hugh Paget, secretary, William C. Whitney, Thomas F. Ryan, William W. Cook, W. L. Elkins and Frederick S. Perkins.

Foreign agencies have been established by General Manager Wessels, of the Standard Air Brake Company, as follows: The Bergische Stahl-Industrie, Berlin and Remscheid, Germany, agents for continent of Europe.; Noyes Brothers, Sydney and Melbourne, Australia, agents for Australia; Lamar Lyndon, Yokohama, Japan, agent for Japan and China.

The Safford & Moore Railway Jack Company, of Chicago, has been reorganized, Mr. Safford being succeeded by J. M. Williams, and the company will now be known as the Williams & Moore Railway Jack Company. It is intended to place a new self-feeding railway drill upon the market within the next thirty days. Prospects are reported as extraordinarily good.

The Edison flexible solder-on unsoldered copper contacts, on bus bars, cable junctions, instrument terminals and for steel and copper contacts on rail bonds, rail feeders, pipe feeders, cable terminals for loops around switches, crossings and special work have been furnished and will be sent to the Edison Company of Philadelphia, the Chicago City Railway Company and others.

Geo. M. Boyd, 612 No. 225 Dearborn street, Chicago, represents wealthy planters who will shortly erect mills on their property, and build ten miles of single track electric road to cross their plantations and make a short cut between two steam roads. Freight and passengers will be carried. A fine water power is available for the generation of current for the road and mills.

Harold P. Brown sends information that the demand for the Edison-Brown plastic rail bond has been so great that the factory at Montclair, N. J., has been running at full capacity. During the winter, orders have been received from La Capital Tramways Company, of Buenos Ayres, two roads in New South Wales, the Fairmount Park Railway of Philadelphia and the Consolidated Traction Company of Newark.

Edward P. Sharp, of Buffalo, N. Y., says that his sale of railway motors and generators has been satisfactory for the past year. Although few orders have been received in December, the number of recent inquiries indicate a good trade in this line of material for the coming year. A large number of orders have been taken for the Macallen section and sheet mica strain insulators, the former having been adopted as standard by the Consolidated Traction Company and other roads in Pittsburg.

The Taunton Locomotive Manufacturing Company has introduced a street railway sprinkler which will wet down a single track or a 100-foot boulevard without the use of out rigging. This is accomplished by means of a direct current motor, running 1,100 revolutions, connected by a speed-reducing device to a pump shaft which runs 200 revolutions per minute. The outfit is placed on the platform of the tank car and the stream directed from a nozzle. The track is sprinkled by the usual perforated iron pipe in front and at the side of the car.

The Phoenix Iron Works Company, Meadville, Pa., reports a good prospect for 1897. This company has recently installed a pair of 125-horse-power simple engines at the bureau of engraving and printing, Washington; a pair of 125-horse-power compound engines at the state asylum, Polk, Pa.; and three 300-horse-power Strong boilers in the Great Northern building, Chicago. Orders have been received for direct connected engines for Chippewa Falls, Wis., and for Delavan, Wis., and an engine and boiler for Yokohama, Japan.

Kennedy Park, for ten years in the erecting department of the Babcock & Wilcox Company, of New York, and for the past five years superintendent of the New England erecting department for that company, has severed his connection with them and gone with the Aultman & Taylor Machinery Company, to take charge of the erecting department for Cahall vertical and Cahall-Babcock & Wilcox boilers in New England. Mr. Park's connection in the New England district for some years past has made for him many strong friends, who will be glad to know of his new position.

The executive committee of the National Association of Manufacturers met in Philadelphia on December 18, to make preparations for the annual convention to be held in that city January 26, 27 and 28, 1897. The following resolution was adopted by the committee:

"RESOLVED, That it is the sense of this executive committee that the tariff laws should be revised at the earliest possible moment, in order that uncertainty be removed, confidence restored, and business permitted to revive.

"That rates of duties should be made as low as possible, consistent with the fair protection of our industries and the labor they employ."

The Murray Iron Works Company, of Burlington, Iowa, which has been in business at that place for the past twenty-seven years, is of late making a specialty of high grade corliss engines for electric railways and light and power stations. The company is also giving particular attention to the building of high pressure steel boilers to engineers' specifications. The plant includes a large and finely equipped foundry, two complete machine shops—one of which is entirely devoted to the building of corliss engines and a modern boiler shop with hydraulic riveters, pneumatic appliances, etc.

F. E. Huntress and George C. Ewing have joined forces for the sale of electric railway equipment, and have opened an office at 8 Oliver street, Boston, for the purpose. They will deal in motors, both new and second-hand, and all lines of street railway supplies, iron, steel and general castings, and will also represent the Walker Company in New England. They will also contract for railway and lighting plants. Mr. Huntress remains president of the Neal Head-light Company and Mr. Ewing as secretary. Mr. Huntress was honored at the recent election by being elected to a seat in the house of representatives in Massachusetts.

A. H. Hackerman, general manager of the Fuel Economy Company, of Matteawan, N. Y., has this to say about business prospects for 1897. "We do not think that there will be any quick improvement for some time, but before the end of the year we believe that all the factories will be running on full time. Our conclusions about this are drawn from our own business as we are always late in feeling a revival of business. We feel that from the inquiries with the orders that our coming in, business must be reviving in other lines. Until, however, the finances of the government are set upon a more substantial basis than they are now, business will not be as good as we all wish."

The eighteen air brakes sold over eight months ago by the Standard Air Brake Company to the Washington, Alexandria & Mount Vernon Railroad Company have had a remarkably successful career. As many of our readers know, the road is a fast line. Recently four cars were run

as a train by superintendent of motive power, J. Colvin. A speed of over 60 miles per hour was made, and the Standard geared compressor type air brake worked perfectly. It is interesting to note that at that speed the pinion of compressor made 845 revolutions per minute, as the car wheel was but 24 inches in diameter. Nearly 15 revolutions per second is service that only a well constructed machine can stand.

J. S. Bradley, secretary of the New Haven Register Company, on being asked what was new, replied: "We are getting out a new single register, which is intended for all classes of trade which want a good reliable register at a very low figure, and while it does not contain all the features of the 'New Haven' register it does contain all the desirable features of all other registers on the market and is gotten up in elegant shape with enameled case in imitation of mahogany, with antique copper sash. As to the more prominent sales within the past few weeks, we have closed deals with two fine systems for our double machines and have several other large contracts for these under negotiation both in this and foreign countries."

During the month of December, 1896, the American Engine Company, Bound Brook, N. J., shipped 60-horse-power American-Ball engines to the Albany Journal and the Scranton Truth and motors and dynamos as follows: Western Newspaper Union, 50 and 12-horse-power motors; Chattanooga Daily News, one 100-light dynamo; Gazette Publishing Company, one 5-horse-power motor; Toledo Blade, one 12-horse-power motor; W. D. Boyce Company, one 12-horse-power motor; Age Herald Publishing Company, one 9-kilowatt dynamo; Dayton Journal, one 9-kilowatt dynamo; Indianapolis Sun, one 3-horse-power motor; Inquirer Company, one 75-kilowatt dynamo; Harrisburg Telegram, one 3-horse-power motor; Jarecki Manufacturing Company, one 9-kilowatt dynamo; Boston Herald, one 100-horse-power motor.

T. W. Meachem, president of the New Process Raw Hide Company, Syracuse, N. Y., on being questioned as to the new year said to a REVIEW representative: "Having, in the face of general business depression, increased our annual output 30 per cent during 1896, we naturally look forward to 1897 with serene confidence. We are getting out nothing new in the street railway line, but we are convincing street railway managers, one after another, that we already have something that it is to their interest to adopt, and the number using our pinions is larger than ever before. That business generally will steadily improve all during the coming year we think no one can doubt. We expect to profit especially from such improvement, for the reason that when times are hard the buyer is more apt to be influenced by first cost rather than intrinsic value."

The Ball Engine Company, Erie, Pa., reports it has been running its works until ten o'clock ever night since October 1. Among the engines it is just completing are a 450-horse-power vertical cross-compound engine direct connected to a Siemens-Halske generator to go to Russia, one of the same size and arrangement for the Schoenberger Steel Company, Pittsburg, Pa., one of 150 horse-power for the same company, and one 100-horse-power vertical tandem compound and four 200-horse-power vertical cross-compound engines, each direct connected to two General Electric generators, for



the Chicago Public Library. The company is also building a 350-horse-power vertical cross-compound direct connected to a G. E. alternating machine for the Apollo Iron & Steel Works, Vandergrift, Pa., and a 350-horse-power horizontal cross-compound for the Wilmington (N. C.) Electric Light Company.

The Standard Air-Brake Company has begun the new year well, as the first order it received was from Germany, through its general representative, the Bergische Stahl-Industrie, of Berlin and Remscheid, for air-brake equipments for 30 double-truck motor cars for the Oberschlesische Dampfstrassenbahn. The company's motor-compressor type will be furnished, and in addition to the 30 outfits there is another order for 30 more to follow, making 60 cars in all. The significance of this order is apparent, as this road has been a steam road all along, but is about to be electrified. The company's foreign business is very active, and within the past few days requests have been received for some three hundred additional equipments, for which it is expected contracts will be closed within a very short time. The company has not only increased its force, but has enlarged its facilities to meet the increased business.

The McGuire Manufacturing Company of this city reports a very satisfactory business during 1896, the sales showing an increase of 25 per cent over the previous year. The year was an especially good one in snow sweeper and stove lines. The published results of tests of coal v. electricity in car heating, and the fact that the Columbia heater is standard on many large and coaservative roads, has proven decidedly advantageous to the McGuire Company, and the stove department has been pushed to the limit, and even at this late date is running full force. The season in the sweeper department has been exceptionally good, and shows an increase over last year's business. Twenty-eight railroads already have the sweeper in use. The company has received its share of the truck orders the past year, and this department has been running steadily. The list of sales of its patented ratchet handles is assurance that they are being largely adopted.

The Weston Engine Company, Painted Post, N. Y., is again in full working order after the disastrous fire last summer. The new works were occupied about November 15, but were not fairly under way until December. The company is now working about 100 men, running the shops both night and day in order to fill orders which have been received within the last two months. Some of the prominent sales made are as follows: Presbyterian Board of Publication, Witherspoon building, Philadelphia, two 14 by 14 and one 12 by 12 Imperial engines arranged for direct connection to Siemens-Halske generators; Star Theatre, Philadelphia, one 12 by 12 Imperial engine, belted; J. W. Jackson, Philadelphia, one 13 by 14 Imperial engine, belted. The above was sold by representatives, the Reynolds-Lalor Company, 41 North 7th street Philadelphia. Other sales are, City of Brooklyn, one 7 by 8 Imperial engine, direct connected to Excelsior generator; New Amsterdam Hotel, New York City, one 9 by 10 Imperial engine, direct connected to General Electric generator; Meltzer Bros., brewers, Brooklyn, one 7 by 8 Imperial engine, belted; Hendey Machine Company, Torrington, Conn., one 11 by 12 Imperial engine; Brooklyn Music Hall, Brooklyn, one 12 by 12 Imperial

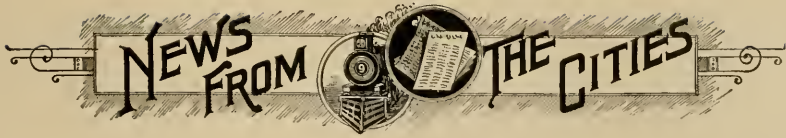
engine, belted; all sold by the New York managers. J. K. Fyfer, Centralia, Mo., has ordered one 11 by 12 Imperial, belted. Other orders include engines for small power, and sales of the standard Weston.

Clement C. Smith, superintendent of the Falk Manufacturing Company, Milwaukee, reports a contract for cast-welding the Third avenue line, New York, on which work will begin at once. The work at Lyons, France, is progressing satisfactorily, and arousing much interest abroad. In the way of special track work the company is getting out all the special work for the new line at Peoria, some for the West Chicago Street Railroad, and for Memphis. Mr. Smith adds: "As to our ideas of the prospects for 1897, we believe that our business in all departments will be much larger than ever. The success of the cast-welded joint has now been so indisputably demonstrated, and was so thoroughly discussed at the St. Louis convention and in the various street railway and electrical papers, that the demand for the joint this season will be very heavy. Our special work business is developing very nicely and as many of the roads have been holding back on expenses for the past year, or to anticipate election, they will now be forced to renew a good deal of their old work, and we shall receive our share of this business."

Eugene Munsell & Co., Chicago and New York, are naturally gratified at the following unsolicited letter from H. S. Cooper, superintendent of the Schenectady (N. Y.) Railway, under date of December 21, 1896: "In March, 1894, you put a full body and slot insulation of micanite on one of our Edison No. 16 street car armatures, and the same was wound at once and put in service, and has been pretty steadily running ever since, the car having made over 50,000 miles. The armature has never given us any trouble in 'body grounds' since it started, although it is of the 'ring' type, and is not protected by the motor frame, it being open to snow, slush or water from the wheels. The wiring on this armature has just been burned out by a severe and continued overload, so heavy as to not only char the insulation of the wire, but to melt some of the wires themselves. On stripping off the wires we were surprised to find the insulation of body and slots in apparently good order, and after fully stripping and testing, we find it absolutely perfect, mechanically and electrically, and are now rewinding it, having done nothing to the insulation but to give it a coat of varnish and bake it. We consider this so remarkable a record that we think it only justice to you to inform you of it. While the full micanite body insulation costs several times more than our previous method of cloth, mica and paper, the results in freedom from armature 'body grounds,' and the ability to re-use the insulation indefinitely, are points that will make us consider the use of micanite as essential in all our work for the future."

#### "BIG FOUR" INTERCHANGEABLE MILEAGE.

The interchangeable 1,000-mile tickets of the "Big Four Route" are indispensable to all business firms and commercial travelers. The lines of the "Big Four" penetrate all the big cities of Ohio, Indiana and Illinois, and a ticket which can be used to reach these cities as well as cities on principal connecting lines, is invaluable.



### Alabama.

MOBILE, ALA.—Ground has been broken for the Dauphin street extension of the Mobile Street Railway.

### Arkansas.

LITTLE ROCK, ARK.—Judgment in default for \$22,582 against the City Electric Street Railway was given, January 4, in favor of the Thomson-Houston Electric Company. The suit has been pending six years.

PINE BLUFF, ARK.—The Pine Bluff Power & Transit Company has been incorporated with a capital stock of \$100,000, for the purpose of operating water works, electric, steam or horse power street car lines. The officers and directors are W. H. Langford, president; J. B. Trulock, vice-president; D. C. Bell, secretary; W. L. DeWoody, treasurer; J. B. York, Simon Bloom, J. W. Withers, R. M. Galbraith and M. A. Austin.

### California.

LAKEPORT, CAL.—E. P. Clendenin asks an electric railway franchise.

SAN DIEGO, CAL.—Stockholders of the San Diego Electric Railway Company meet January 15, to authorize a \$400,000 mortgage.

SAN FRANCISCO, CAL.—It is said Behrend Joost proposes to redeem the San Francisco & San Mateo Street Railway, which was sold by a receiver.

SALINAS, CAL.—An electric railway company is organizing to build a line. The directors are J. D. Carr, William Vanderhurst, F. H. Lang, J. H. Menke, H. Corey, Henry Bardin and J. B. Iverson.

SANTA ANA, CAL.—The Santa Ana & Orange Motor Company has been incorporated to build five miles of road. Capital stock, \$20,000; incorporators, W. B. Henry, E. P. Nickey, M. A. Menges and D. H. Thomas.

SANTA CRUZ, CAL.—The Big Creek Company has contracted to supply power to the electric railway. It is said the Big Creek Company has already purchased a water wheel, generator and fifty-two miles of wire.

LOS ANGELES, CAL.—Citizens desire the conversion of the Glendale division of the Terminal Railway from steam to electricity, and have chosen W. G. Watson, W. S. Bullis and F. R. Warren, a committee to receive subscriptions to the subsidy required by the company.

### Chicago.

CHICAGO.—The petition of the Southwestern Street Railway Company for a franchise has been referred to a committee.

CHICAGO.—The Illinois & Michigan Canal Commissioners are said to have rescinded their grant of a franchise for an electric road on the towpath.

CHICAGO.—The Chicago & South Side Rapid Transit Elevated Railroad Company is making estimates of the cost of electrically equipping the Alley L.

CHICAGO.—The Suburban Electric Railroad Company has given a mortgage to secure \$3,000,000 of bonds, of which \$1,250,000 will be issued at present to cover the cost of construction.

CHICAGO.—The Suburban Electric Railroad Company, which is building a line, has been reorganized. The new directors are, Charles H. Crosette, president; H. K. Galpin, secretary; S. B. Shope, David B. Lyman and Herbert Hulcomb.

CHICAGO.—The Chicago, Lemont & Joliet Electric Railway Company has been incorporated to build and operate an electric road. Capital stock \$300,000; incorporators, E. H. Heilbroun, S. T. Hart, E. D. Hopkins, G. Lawrence Taylor and D. C. Baldwin.

### Connecticut.

EAST BERLIN, CONN.—Citizens are forming a company to build a trolley line to Berlin.

HARTFORD, CONN.—The Hartford Street Railway Company will apply for an amendment to its charter permitting extensions of its lines.

SOUTHINGTON, CONN.—An amendment to its charter permitting various extensions will be asked by the Southington & Plantsville Tramway Company.

BRISTOL, CONN.—The Bristol & Plainville Tramway Company will apply for the right to extend its tracks through Terryville to Plymouth and Thomaston.

SHELTON, CONN.—Franchises to build and operate in Bridgeport, Stratford, Trumbull and Huntington have been applied for by the Shelton Street Railway Company.

GREENWICH, CONN.—The Greenwich Tramway Company will apply for an amendment of its charter permitting extensions to Port Chester, N. Y., and Stamford, Conn.

NEW HAVEN, CONN.—Many extensions of its lines will be constructed by the New Haven Street Railway as soon as authority can be obtained from the State Assembly.

NEW HAVEN, CONN.—The New York, New Haven & Hartford Railroad is about to let contracts for two 850-kilowatt generators and other equipment for its power plant at Berlin, Conn.

PORTLAND, CONN.—John H. Sage and others, have petitioned for the incorporation of the Portland & East Hampton Street Railway Company, to build and operate through the towns of Portland and Chatham.

MILFORD, CONN.—J. D. Brown and others are forming the Milford Traction Company and will soon incorporate to build from Milford to Stratford, through Woodmont to Derby and through Orange to New Haven.

ROCKVILLE, CONN.—The franchise granted recently to the Rockville & Ellington Street Railway Company has been amended by striking out three streets. Windsor avenue was given the Hartford, Manchester & Rockville Tramway Company for its line to Talcottville.

NEW HAVEN, CONN.—A big electric railway scheme is backed by Morris F. Tyler, Dr. Thomas R. Russell, Dwight N. Clark, Robert Payne, Stiles Williams, Charles F. Walker, Rollin C. Newton, and Nathan P. Merwin. The line is to run from Westville, through Woodbridge and Seymour, to Naugatuck.

NEW HAVEN, CONN.—A lease of the New Haven & Centerville Electric Railway to the Fair Haven & Westville Street Railway Company, is being negotiated. Contracts have already been signed for the operation of the Centerville Company's cars with current from the Fair Haven Company's power station.

NORFOLK, CONN.—Samuel P. Williams, of Waterbury; Walter S. Judd, of Litchfield; John H. Wadhams, of Goshen, and T. H. McKenzie and others, are organizing a company to build 27 miles of electric railway from Watertown to Norfolk, by way of Morris, West Morris, Bantam, Litchfield, Goshen and South Norfolk.

DANBURY, CONN.—The old project of connecting Danbury with the Harlem road at Golden's Bridge has been revived with some prospects of a successful issue. Walsh & Purdy, attorneys, will petition the legislature for the incorporation of the Danbury & Golden's Bridge Street Railway Company. The road is to be 15 miles in length, with a power plant located centrally at North Salem. F. S. Wardwell, one of those interested, states that the capital has been subscribed, and the right of way given by property owners along the whole route.

### Delaware.

WILMINGTON, DEL.—John N. Carswell has been appointed receiver of the proposed Chester & Wilmington Electric Railway.

### District of Columbia.

WASHINGTON, D. C.—The Washington & Gettysburg Railway Company asks a charter to build and operate a trolley line to carry passengers and light freight. Incorporators, George W. Cissel, Charles Jacobson, Edgar P. Berry, John H. Gheen, George W. Harvey and James S. McIlhenny, of the District of Columbia, and Asa M. Stabler, John Miller, J. Enos Ray, Albert Gleason, R. G. Israel, N. W. Williams, Frank C. Drane, Ashley M. Gould, S. D. Waters, Francis Thomas, Rert H. Miller and O. A. Homer, of the State of Maryland, and T. William Harris, of the State of New York

### Georgia.

SAVANNAH, GA.—Herman Myers, of Savannah, and J. H. Fall, of Nashville, representing bondholders, bought the Electric Railway at auction, January 5, for \$210,000. When reorganized the company will purchase new equipment.

### Illinois.

ALTON, ILL.—An extension in Sixth street is contemplated by the Alton Railway & Illuminating Company.

OTTAWA, ILL.—Boston men are corresponding with R. C. Jordan with a view to taking hold of the Ottawa Street Railway.

EAST ST. LOUIS, ILL.—The ordinance granting the St. Louis Rapid Transit Company right of way for an electric road, from the Eads Bridge to Belleville, has been favorably reported on.

LAKE BLUFF, ILL.—C. E. Loss, the electric railway builder, of Chicago, has been granted a franchise for six miles of road in Lake Bluff, to connect with his line in Waukegan. Cars are required to be in operation by June 1.

WAUKEGAN, ILL.—The Bluff City Electric Street Railway Company has amended its charter "to construct, locate, maintain and operate electric street railroads in the several townships, cities and villages in the counties of Lake and Cook, in Illinois."

OSWEGO, ILL.—An electric railway scheme is quietly making progress. The prime mover is Hon. Fay P. Winslow, and he has associated with him U. P. Hord. Power will be supplied by the Oswego Water Power Company, which was recently purchased by Mr. Winslow. The line will carry freight and passengers between Aurora and a large district east and south of Oswego and Yorkville, besides catering to pleasure riders who would visit the most beautiful section of the Fox river.

### Indiana.

ANDERSON, IND.—Noah Clodfelter has had his electric railway franchise extended, after showing he had backing.

### Iowa.

OSKALOOSA, IA.—An election will be held to vote for or against electric cars.

BURLINGTON, IA.—Suit to foreclose \$300,000 first mortgage bonds of the Burlington Electric Street Railway has been brought by the American Loan & Trust Company, of New York.

BURLINGTON, IA.—The Burlington Railway & Light Company has been incorporated to purchase, own and operate the electric railway. Capital stock, \$1,250,000; incorporators, C. H. Walsh, J. J. Ransom and Col. George H. Higbee.

### Kansas.

LAWRENCE, KAN.—The receiver will sell the Lawrence Street Railway by order of court.

### Kentucky.

BOWLING GREEN, KY.—James H. Wilkerson is the receiver appointed for the Park City Railway.

COVINGTON, KY.—The South Covington & Cincinnati Street Railway has changed hands. The new officers are: president, J. C. Ernst, of Covington; vice president, Charles E. Orr, of Pittsburg; treasurer, H. P. Eells, of Cleveland; secretary, James H. Hoyt, of Cleveland.

### Louisiana.

NEW ORLEANS, LA.—The right to construct an electric railway in Napoleon avenue will be sold by auction by the city.

### Maine.

CALAIS, ME.—President George A. Curran contemplates extending the Calais Street Railway along the St. Croix river bank to Red Beach. The new line would be very attractive to pleasure riders.

BANGOR, ME.—Extensions of its electric lines to Eddington, Clifton, Holden, Dedham and Orrington and the construction of a great bridge over the Penobscot river are contemplated by the Bangor Public Works Company.

BANGOR, ME.—The Penobscot Central Railroad Company has applied to the railroad commissioners for an approval of their plan to build and operate an electric street railway from Bangor to Gardland by way of Glenburn, Kenduskeag, Levant, Corinth, Exeter and Charleston. Freight will be carried as well as passengers. Capital stock, \$250,000; incorporators, F. O. Beal, of Bangor; I. C. Libby, of Waterville; A. L. Gerald, Harrison T. Gould, of Kenduskeag, and C. E. Edmunds, of Corinth.

### Maryland.

BALTIMORE, MD.—The Central Railway and the City & Suburban Companies are both asking additional right of way.

BALTIMORE, MD.—Judge Dennis has decided that the City Passenger Railway Company has the right to install electricity on North Charles Street and the Blue Line Cable.

### Massachusetts.

BROCKTON, MASS.—The Brockton Street Railway Company asks the right to extend four lines.

MILLBURY, MASS.—The franchise of the Blackstone Valley Street Railway Company has been extended to December, 1897.

MILFORD, MASS.—The Milford, Holliston & Framingham Street Railway will probably accept the franchise recently granted.

NORTHAMPTON, MASS.—The Northampton Street Railway Company will extend its lines and add several cars to its equipment.

BOSTON, MASS.—The West End Street Railway Company has leased the Subway at a rental of 4% per cent on the cost of \$7,000,000.

BOSTON, MASS.—President W. B. Ferguson denies the report that the Gloucester, Essex & Beverly Street Railway had been sold to the West End Company.

HOLYOKE, MASS.—Directors of the Holyoke Street Railway have approved a lease of the Mt. Tom Railroad. The construction will be done by the latter company.

HOLYOKE, MASS.—The selectmen of South Hadley Falls have granted the franchise asked by the Holyoke Street Railway Company. Work will begin immediately.

HOLYOKE, MASS.—Directors of the Holyoke Street Railway have instructed President Loomis to ask a franchise in Chicopee, if the building of the road would be warranted.



**MANSFIELD, MASS.**—A portion of the capital stock of the Foxboro Union Street Railway Company has been subscribed. The line is to run between Foxboro and Mansfield.

**BOSTON, MASS.**—The Safety Electric Railway Company asks a charter to build an elevated railway in Boston and suburbs. Incorporators, Myron J. Ferren, Walter S. Keen, Frank E. Orcutt and A. W. Barrett.

**WORCESTER, MASS.**—Creditors of the Massachusetts Car Company held their second meeting January 5, at Worcester, to prove their claims. The assignees are George S. Forbush and W. G. Wheildon, 53 State street, Boston.

**MARLBORO, MASS.**—The Framingham, Southboro & Marlboro Street Railway Company has been organized to build nine miles of road. Capital stock, \$100,000; directors, S. H. Howe, of Marlboro; F. D. Newton and C. B. Sawin, of Southboro; J. R. Entwistle, of Framingham; W. B. Ferguson, of Malden; C. E. Barnes, of Plymouth, and C. E. Bresser, of Leominster. The stockholders include the above and M. F. Maher, of Framingham; C. W. Shippee, of Milford; W. S. Reed, of Leominster; Albert Stetson, of New York; J. M. Cunningham, of Chelsea; Frank E. Lowe, of Greenfield; A. B. Turner & Brother, of Boston; W. H. Gilman, of Boston.

## Michigan.

**DETROIT, MICH.**—Erin has granted John B. Dyar a franchise for his Detroit-Port Huron interurban.

**ST. CLAIR, MICH.**—John B. Dyar has been granted a franchise in St. Clair, making another link in his proposed Detroit-Port Huron interurban.

**MONROE, MICH.**—Another extension of the franchise of the Monroe, Dundee & Lake Erie Railway has been granted. President W. H. Cowles, who has deposited \$500 forfeit, claims that men with capital are interested. He expects to have the road to the lake completed by June 15.

**MUSKEGON, MICH.**—The Muskegon Street Railway, including 14 miles of line, power plant and pleasure resort, was sold under foreclosure of second mortgage, January 5, to Herbert Payson, of Portland, Me.; John Crosby, of Bangor, Me.; and Weston Thompson, of Brunswick, Me., who represent also the first mortgage bondholders. Receipts in 1896 were \$25,000 less than in 1892 and \$2,000 less than for the previous year. The road was well equipped and well managed, but its fixed charges were too heavy to be met by the decreasing earnings. The company will be reorganized on a paying basis.

**KALAMAZOO, MICH.**—The Michigan Traction Company has been incorporated with \$500,000 capital stock, by L. N. Downs, F. N. Rowley, E. E. Downs, of Kalamazoo, and George J. Kobusch and Otto Von Schrader, of St. Louis, Mo. The company will probably acquire the Citizens' Street Railway, of Kalamazoo, and build an interurban road 23 miles in length to connect with the Battle Creek Railway. Incorporators of the new company control the car lines of both cities. Franchises have been applied for in the intervening towns and villages, and arrangements are being made to commence construction early in the spring. It is expected the new road will be open for business about July 1.

## Minnesota.

**STILLWATER, MINN.**—Judge Williston has refused August Jesse's highest bid of \$2,300 for the street railway.

**MINNEAPOLIS, MINN.**—A. M. Allen's petition for an electric railway franchise to Lake Minnetonka has been denied by the county commissioners.

## Mississippi.

**MISSISSIPPI CITY, MISS.**—The application of George W. Pierce, Jr., for a street railway franchise, has been filed until March, when the original franchise expires.

## Missouri.

**ST. LOUIS, MO.**—The Suburban Electric Railway Company expects to have its Kirkwood extension in operation by April 15.

**ST. LOUIS, MO.**—Eugene H. Benoist, Breckenridge Jones, Fred E. Allen and Frederick Vierling are interested in a street railway project for which a franchise is asked.

**PEIRCE CITY, MO.**—The City Council has granted a franchise to the Peirce City & Monett Electric Railway Company, which is said to be backed by ex-Governor Fishback, of Arkansas.

**ST. LOUIS, MO.**—J. D. Houseman has taken possession of his line, the St. Louis & Kirkwood Electric Railroad, on a decision of the Supreme Court setting aside the appointment of a receiver.

**JOPLIN, MO.**—Judge George F. Davis, of Sarcoxie, who is interested in the proposed electric road between Sarcoxie and Joplin, has been corresponding with Little Rock, Ark., men who may furnish the capital.

**ST. LOUIS, MO.**—The People's Consolidated Railroad Company asks permission to acquire the People's Railroad, and the Fourth Street & Arsenal Railroad, and the right to construct lines on many streets.

**ST. LOUIS, MO.**—Farmers propose to construct an electric railway to convey their produce to the city. The route is from a point on the St. Louis & Kirkwood line, near Brentwood, through Des Peres, Manchester, Ballwin and Ellisville.

## Montana.

**BUTTE, MONT.**—The Butte Consolidated Railway Company writes that quotations are wanted on a car load of car wheels—about 300 to 330 pounds each, 30 inches diameter, 2¼-inch tread. Quote lowest cash price, f. o. b., Butte.

## New Hampshire.

**NEW LONDON, N. H.**—The New London & Potter Place Electric Railway Company will be incorporated.

**CHESTER, N. H.**—Those interested in the Chester & Derry Electric Railroad will apply for a charter to build a line connecting Chester and Exeter via Brentwood.

**PORTSMOUTH, N. H.**—Massachusetts men have purchased the franchise of the Kittery, Kittery Point & York Beach Electric Railroad Company and expect to begin construction very soon.

## New Jersey.

**BRIDGETON, N. J.**—The South Jersey Traction Company's property will be sold under foreclosure of mortgage.

**PLAINFIELD, N. J.**—Chandler Riker, of Newark, and capitalists of the city, plan a trolley line from Plainfield up Watchung Mountain.

**NEWARK, N. J.**—The South Orange & Maplewood Street Railroad Company has applied for right to extend.

## New York.

**BUFFALO, N. Y.**—The Buffalo Railway Company has issued \$1,000,000 bonds for betterments.

**BROOKLYN, N. Y.**—Fire, December 27, destroyed the Bushwick repair shops of the Brooklyn Heights Railroad.

**JEFFERSONVILLE, N. Y.**—Frank Loebler is promoting an electric railway between Jefferson and Liberty to cost \$115,000.

**HUDSON, N. Y.**—A receiver is asked for the Hudson Electric Railroad. Liabilities are estimated at \$90,000; and assets, \$70,000.

**ROME, N. Y.**—The Rome City Street Railway Company will soon consider a proposition to extend its line four miles to Lindale.

SYRACUSE, N. Y.—Plans and specifications are being prepared for bidders for the construction of the Syracuse & Suburban Railroad.

PORT RICHMOND, N. Y.—The plans of the Staten Island Electric Railroad Company for a trolley line in Richmond avenue have been approved.

TROY, N. Y.—The application of the Greenwich & Schuylerville Electric Railroad Company for permission to build has been granted by the state commissioners.

BROOKLYN, N. Y.—Fire broke out at 1:30 A. M., December 18, in the Rockaway avenue car sheds of the Nassau Electric Railroad. Nine open cars were burned. Loss, \$30,000.

CORTLAND, N. Y.—The Cortland & Homer Traction Company expects to make a survey for an extension of its line from McGrawville through Solon, Willet, Taylor, Pitcher and Cincinnati.

GARDINER, N. Y.—Charles E. Johnston, 43 John street, Kingston, is forming a company to build a trolley line between Pancake Hollow and Jenkintown, passing through Gahow, Tutletown and Ireland Corners.

NEW YORK, N. Y.—William G. E. See has been appointed receiver of the Fulton Construction Company, which built the Twenty-eighth & Twenty-ninth Streets Railroad. Mr. See will sell the assets, consisting principally of a number of street railway franchises.

NEW PALTZ, N. Y.—Promoter B. Van Steengber has sold his franchise for an electric railway between New Paltz and Highland, to Ferdinand McKeige, a capitalist of New York, who has engaged Attorney C. W. H. Arnold, of Poughkeepsie, to form a company to construct and operate the road. The sale includes the incomplete power station at Lloyd.

BUFFALO, N. Y.—The Buffalo, Kenmore & Tonawanda Electric Railroad Company will construct a line in Elmwood avenue to connect its road with that of the Buffalo Railway. The company's finances have improved recently. The road was built three years ago at a cost of \$153,000, of which \$63,000 remained unpaid when the Buffalo Traction Company obtained control. To clear the indebtedness, at a meeting December 21, the original stockholders subscribed \$20,200 and the Traction people \$42,800. A large pleasure traffic is expected the coming summer from visitors to the company's resort, the Kenmore Palace Park, where it is proposed to give summer operas at 10 cents admission.

GREENBUSH, N. Y.—Those interested in the proposed electric railway between Greenbush and Brainerds, a distance of 17 miles, have drawn up articles of incorporation of the Greenbush & Nassau Electric Railway & Power Company. The following directors have been chosen: William H. Nichols, John F. Lape, Fred Carr and Bradford Lansing, of Greenbush; Joel T. Morey, Gardner Morey and Thomas James, Nassau; James Gray, East Albany; C. J. Smith, Bath; W. D. Barnes, Brainerds; J. H. Finnerty and Dr. S. C. Curran, East Greenbush. The directors elected: William H. Nichols, president; Thomas E. James, vice-president; Dr. Curran, secretary; Fred Carr, treasurer John F. Lape, general manager, and John F. Lape, Thomas James and W. D. Barnes, executive committee.

### North Carolina.

RALEIGH, N. C.—Fire on the night of December 31 destroyed the power house and car shed of the Raleigh Electric Company. Loss, \$25,000; insurance, \$12,500. The plant will be rebuilt.

### Ohio.

DEFIANCE, OHIO.—W. R. Taben is the receiver appointed for the Defiance Light & Railway Company.

NILES, O.—The Mineral Ridge & Niles Electric Railroad Company has been incorporated with \$50,000 capital stock.

MARIETTA, O.—The Marietta Electric Company has absorbed the Marietta Street Railway with a view to equipping for electricity.

CINCINNATI, O.—Wyoming village has granted a franchise for another link in the Cincinnati, Middletown & Dayton Traction Company's line.

TOLEDO, O.—Bowling Green has finally granted the franchise asked by the Toledo, Bowling Green & Fremont Electric Railroad Company.

CINCINNATI, O.—The Mt. Auburn Electric Railway Company has accepted its franchise for a line to Reading, and received a bonus from the citizens.

YOUNGSTOWN, O.—The Mahoning Valley Electric Railway Company has given a mortgage for \$1,200,000 to the Central Trust Company, New York.

WARREN, O.—Motor equipments will be purchased very soon by the Trumbull Electric Street Railway. Next spring three new 46-foot cars will be added.

YOUNGSTOWN, O.—The Trumbull Electric Railway, of Warren, and the Youngstown Street Railroad have been consolidated as the Mahoning Valley Railway.

AKRON, O.—The Wooster avenue barns of the Akron Street Railway were burned at 2 o'clock on the morning of December 15, together with 13 cars. Loss, \$10,000; insurance \$8,000.

WESTERVILLE, O.—W. E. Hoyer and C. E. Burr, who are interested in the Worthington & Westerville Street Railway, have obtained an extension of time in which to complete the road.

CINCINNATI, O.—Contracts have been let by the Cincinnati & Miami Valley Traction Company for the erection of power houses at Franklin and Busenbark's station and a car barn at Middletown.

CINCINNATI, O.—The new Cincinnati, Hamilton & Dayton Traction Company has elected D. G. Edwards, president; C. G. Waldo, general manager; G. R. Balch, secretary, and F. H. Short, treasurer.

CLEVELAND, O.—The car barn and repair shop of the Cleveland, Painesville & Eastern Electric Railroad Company, at Willoughby, were burned on the evening of December 26. Loss, \$50,000; insured.

SANDUSKY, O.—A syndicate of New Yorkers is negotiating the purchase of the Sandusky, Milan & Norwalk Electric Railway, with a view to constructing a line connecting with the Cleveland road running to Elyria.

CINCINNATI, O.—The Cincinnati, Hamilton & Dayton Traction Company has been incorporated to construct a very extensive electric railway system. Incorporators, C. G. Waldo, D. G. Edwards, George R. Balch, R. P. Rifenberick and C. A. Wilson.

CHILLICOTHE, O.—Smiley Caldwell, president of the Highland Park Inn Company, who is interested in the electric road to Hillsboro, says it is expected to have the line completed by July 1. A party of surveyors, headed by H. M. Redd, is in the field.

CLEVELAND, O.—The completion of the Cleveland & Chagrin Falls line to the latter place will be pushed as fast as the weather will permit. Among those interested are R. L. Palmer, of Cleveland; L. M. Coe, F. D. Carpenter, and A. Hilliard, of Berea.

ASHLEY, O.—A. S. Shoemaker, of Ashley, is promoting an electric road between Mt. Vernon, Knox County, and Richwood, Marion County, passing through Sparta, Marengo, Ashley and Prospect. Forty business men of Ashley have agreed to pay for a survey of the route.

LIMA, O.—The Dayton Northern Railway Company has been incorporated to build a railroad, to be operated by steam or electricity, from Franklin to Lima. Incorporators, Walter B. Ritchie, J. E. Townsend, F. N. Haskell, E. R. Thomas, W. C. Brown and J. R. Mergue.

**MARIETTA, O.**—The Marietta & Western Bridge Company has been incorporated at Allegheny, Pa., to construct an electric railway and bridge between Marietta and Parkersburg, W. Va. The line will be twelve miles long. Capital stock, \$400,000; incorporators, William C. Jutte, August Jutte, C. M. Buchanan and C. Cramer, of Marietta.

**CLEVELAND, O.**—The franchise of the Cleveland, Wadsworth & Southern Electric Railway Company has been forfeited for non-compliance with conditions. The county commissioners have given a franchise over the same territory to the Cleveland & Southeastern Electric Railway Company. From Cleveland the line is to run to Wadsworth via Parma, Royalton, West Richfield, Bath, Ghent and Akron.

## Oregon.

**PORTLAND, ORE.**—C. E. Smith and others have been granted an extension of their franchise to build an electric road on First street.

## Pennsylvania.

**YORK, PA.**—Captain William H. Lanus has in contemplation the construction of five electric railroads, aggregating thirty-seven miles in length.

**BRADDOCK, PA.**—A bond for \$5,000 in acceptance of the Talbot avenue franchise has been filed by the Braddock & Homestead Street Railway Company.

**ALLEGHENY, PA.**—The Northside Traction Company has changed its plans for power supply, and now contemplates building a large power plant on the river bank. The company will relay with heavier rails and equip with new cars.

**MEDIA, PA.**—The Media, Middletown & Aston Electric Railway project, formed two years ago, is being revived. John B. Robinson, John E. Burnley and Samuel L. Kent have been appointed a committee to place the stock, if possible.

**PITTSBURG, PA.**—The Pittsburg & Mt. Washington Electric Street Railway Company has been incorporated to construct four miles of railway. Capital stock, \$24,000; president, Samuel Garrison; directors, W. C. Jutte, A. Jutte, George F. Williams, Pittsburg; Charles Cramer, Wilkinsburg.

**NEWTOWN, PA.**—The Newtown Electric Railway Company has been incorporated to build four miles of road. Capital stock, \$100,000; incorporators, Thomas P. Chambers, George C. Worstell, James C. Hutchison, Alexander Chambers, Ashbel W. Watson, Edward H. Buckman, George C. Blackfan, and Thaddeus S. Kenderline, all of Newtown, Bucks county; Henry Palmer, Henry Lovett, M. D., William B. Parry, Harvey H. Gillam, Harry W. Watson, all of Langhorne, Bucks county.

**SCRANTON, PA.**—A consolidation of the Scranton Traction Company, Valley Passenger Railway Company, Scranton Passenger Railway Company, Dunmore Street Railway Company and Scranton Suburban Railway Company, has been effected under the name of the Scranton Railway Company. Capital stock, \$2,500,000. Directors, Clarence M. Clark, president; J. P. Ilsley, vice-president; C. Ford Stevens, secretary and treasurer; E. W. Clark, Jr., Timothy Burke, Frank Silliman, Jr., and Horace E. Hand. All of the officers, with the exception of the last three, are Philadelphians.

**WEST CHESTER, PA.**—The Chester County Central Railroad Company has been incorporated to build a single track electric line for milk, produce and passengers. The charter was obtained under the steam railroad act, and the company will use the right of eminent domain, thereby conferring, to condemn a straight route between Philadelphia and West Chester. Capital stock, \$600,000; president, William S. Kirk, West Chester; secretary, John S. Love, Jr., and treasurer, A. Aylsworth Kite. The stockholders have organized the Columbia Construction Company to build the road.

## South Dakota.

**MADISON, S. D.**—A. L. Fuller has purchased the Madison motor line of Receiver Thompson, with the object of repairing and operating.

## Tennessee.

**CHATTANOOGA, TENN.**—The cable power house of the Lookout Mountain & Lula Lake Incline Railway was burned December 12.

**NASHVILLE, TENN.**—C. M. McGhee, of New York, has purchased the interest of Inman, Swan & Co., in the Nashville Street Railway.

**CHATTANOOGA, TENN.**—The reorganized Chattanooga Electric Railway Company has elected J. H. Warner, Edwin Warner, Percy Warner, W. T. Adams, T. D. Young, C. A. Lyster and George W. Meade, of Brooklyn, N. V., directors.

## Vermont.

**BENNINGTON, VT.**—A. B. Valentine, of Bennington, is interested in the proposed electric road to North Bennington.

**BELLOWS FALLS, VT.**—F. C. Kennedy, J. S. Pierson, John J. Flynn, A. O. Humphrey and Joel H. Holton, of Burlington, are negotiating for the franchise of the Bellows Falls & Saxton's River Electric Railway with a view to its immediate construction.

## Washington.

**WHATCOM, WASH.**—Affairs of the Fairhaven & New Whatcom Street Railway Company have been straightened out, and the receiver will be discharged.

**TACOMA, WASH.**—The foreclosure suit of the New York Guaranty & Indemnity Company against the Tacoma Railway & Motor Company has been decided in favor of plaintiff. The property is ordered sold.

**TACOMA, WASH.**—The Aman Lake Railroad, which was to have been equipped with electricity, has been torn up by the owners of the rails. It is expected that Robert Wiingate and John S. Baker, who hold the franchises, will nevertheless carry out the plan for electric equipment.

## West Virginia.

**BENWOOD, W. VA.**—The Benwood & Moundsville Street Railway Company has opened its line to Moundsville.

## Wisconsin.

**OSHKOSH, WIS.**—The Oshkosh Street Railroad Company has given a mortgage for \$50,000.

**JANESVILLE, WIS.**—The burned power house of the Janesville Street Railway will be rebuilt in time for the summer traffic. The owner is George W. Blabon, of Philadelphia.

**APPLETON, WIS.**—F. C. Rutan, of the Interurban Electric Railway, has again bobbed up. It is claimed the road will be built between Neenah and Appleton before July, 1897.

**MARINETTE, WIS.**—It is proposed to develop the water power of the Menomonee River, 7 miles above Marinette. The Marinette Gas, Electric Light & Street Railway Company is said to be interested.

**OSHKOSH, WIS.**—The Winnebago Construction Company has been incorporated to build the electric road for the Citizens' Traction Company. The capital stock is \$90,000. A site for a power house on the river front has been purchased.

**JANESVILLE, WIS.**—Fire, December 23, destroyed the power plant of the Janesville Street Railway. The flames spread with such rapidity that the engineer did not have time to save his coat, which hung almost within reach. Superintendent Cummins and Assistant Reader were both painfully burned in trying to save the office desk. Loss, \$15,000; insurance, \$5,000.

## Canada

**ROSSLAND, B. C.**—An electric mine railway is to be built at Red Mountain by the recently incorporated British Columbia Tunnelling & Developing Company.



MONTREAL, QUE.—The Temple Investment & Loan Company has been organized to build and operate street railways and lighting plants. Incorporators, S. A. Cox and J. W. Flavelle, of Toronto, and John Torrance and James McBride, of Montreal.

**Mexico.**

TAMPICO, MEX.—L. Goodman, of Nuevo Laredo, Mex., has been granted a franchise to build and operate street railway in Tampico, and is expected to be in the market for supplies.

**West Indies.**

KINGSTON, JAMAICA.—The Jamaica Street Car Company's application for a franchise has been denied. Offers from others will be considered by the Privy Council until April 15, 1897.

**THE EFFECT OF HARDENING PLASTIC RAIL BONDS.**

December 22, 1896.

Editor STREET RAILWAY REVIEW:

Dear Sir:—I have heard it recently stated as an objection to the Edison plastic rail bond that the amalgam would sometimes harden. As I had a very long experience with the earlier forms of this alloy designed by Mr. Edison, I wish to say that on a road in Orange the bonds were mixed so as to harden and had four or five years successful use.

If a connection jarred loose from any cause the heat produced by increased resistance quickly softened the amalgam and re-established the contact. In designing the more modern forms of this bond, it was decided to put in a slight excess of mercury and to allow sufficient room in the receptacle holding the alloy, to prevent its being put under pressure. This alloy when properly used, will remain plastic for years, as I can testify from long experience. If this alloy is put under pressure and the excess of mercury is forced out, it leaves a brilliant white metal of great density and of better conductivity than the plastic form. It readily softens under heat and will not be blackened by an arc. Roads whose joints are well maintained need not worry about contact if their plastic alloy is found hardened.

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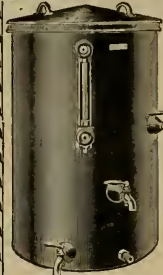
The cable railway up Highgate Hill, London, has been purchased by the Exploiters & Investors Syndicate, of Old Broad street, which proposes to place it in condition for operation.

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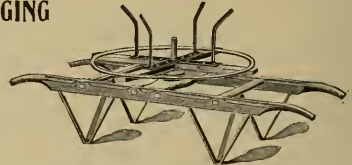
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*Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.*

**H. H. WINDSOR,** Editor. **F. S. KENFIELD,** Business Manager.

**CORRESPONDENCE.**

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This paper is a member of the Chicago Trade Press Association.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. FEBRUARY 15, 1897. NO. 2

As a result of that returning confidence, no doubt, the street railway managers who office in the House and Senate have now permitted the lines in Washington to speed up to 12 miles an hour.

THE annual report of the railroad commissioners of Connecticut, for the fiscal year ending September 30, 1896, is out, and contains some interesting and valuable figures. The report deals in totals but we have reduced these figures to expenses per car mile, putting it into shape for serviceable use for our readers. The article on Connecticut roads appears elsewhere in this issue.

THE article by James R. Chapman on current consumption with low potentials, presents some interesting points. The data shows that a street car motor will operate with less current at low voltage than at normal potential, a sacrifice in the speed of the car resulting. It is calculated that less energy is expended in running a car mile with low than high voltage. The saving amounts to 22 per cent in a reduction from 520 to 320 volts. However, other considerations, the speed of the cars, and the power transmission are to be taken into account, but Mr. Chapman's article offers food for thought to electrical railway men.

THE account in another column of the twelve years history of the Mutual Benefit Association in operation on the Washington-Georgetown road, offers food for thought. During that time the association has paid \$18,000 in sick claims and \$4,000 on deaths, and has to-day to its credit \$88,000. The cost per capita per year is a mere trifle and the good work is most commendable. The plan should commend itself to many other roads.

ONE of Pingree's underlings who rejoices in the strikingly American name of Petrowski, has introduced a bill in the Michigan legislature to provide for a street car service of not more than five minutes headway in all cities of 150,000 or more. This is a gentle compliment of Pingree to the city of which he is still mayor. There is one other little improvement which Petrowski seems to have overlooked and that is the bill should have provided that each passenger should be entitled to an entire car for his or her exclusive use on the payment of one cash fare.

THE attempt made by certain interested parties to have the franchise annulled for one of the lines in Milwaukee, on account of the temporary abandonment of two blocks of track which the company built but had not used for four years, was defeated in the Supreme Court. Recently the company desired to build the balance of the line which had been commenced but not used all the time since. Property owners first took an injunction and followed this up with a prayer to have the franchise annulled, as stated. The result is as important as it is interesting. The text of the decision will be found in this issue.

THE severe grades which can be easily surmounted by electric cars in these days, would hardly have been considered possible in the earlier days, although Leo Daft as long ago as 1888 operated on a 15 per cent grade in Pittsburg by means of a rack auxiliary. Grades that would make steam road construction practically impossible are becoming numerous in electric engineering, and without employing any auxiliary means. On another page we describe a 13 per cent grade 1,000 feet in length on which the electric cars operate without any trouble whatever. On another portion of the same road is an open cut grade on a sharp curve. This ability to climb and descend heavy grades is a most important feature in construction cost and means electric lines where steam roads cannot afford to build. Interurbans are, in point of numbers, only in their infancy, and the next five years will witness the construction of hundreds of miles of these lines.

THE daily press of the entire country with one accord has been repeating, until the statement has become a stereotyped one, "The price of everything except street car fares, has been reduced." Strangely, too, the public which has the fares to pay, neither originated the demand for lower fares or even joined in a protest

against the universal five cent fare. It has been the daily press and members of city councils, which have raised the cry. A bushel of corn today is practically just the same as a bushel of corn in 1887; a ton of rails weighs no more now than then, though admittedly of better quality; a ton of coal has not changed in quality or measure and a pound of sugar contained quite as much saccharine matter ten years ago, as now. The market price of all these commodities has fallen during that period. The argument then, that street car fares should be less to-day than in 1887 is in many respects a sound one, in which we fully concur. There is this vital difference, however, in the comparison; that while invention has greatly cheapened the cost of production of a ton of rails and a pound of sugar, there are no more ounces in a pound, or pounds in a ton now than there were then. On the other hand, while companies have made a reduction in the one item of power necessary to move a car, they have assumed large interest charges on the greatly increased investment made necessary to erect power houses, furnish better cars and lay the more expensive tracks required to carry these new cars. Where a 45-pound rail was sufficient in 1887, now a 60, a 70 or even a 100-pound rail must be laid. Wages have been very largely increased, and scores of repair accounts opened, which had no existence then. It is evident, therefore, that in furnishing a ride to-day, of as great length as that of ten years ago, the quality and quantity of service now rendered has so advanced as to be worth more money than was charged then, and yet the price has not been increased. Were there nothing further to offer as an explanation of why car fares remain at the five cent unit, the case is clear that the increased value now given for the old price is alone a reduction in price, fully equal to that of any other commodity. But our case does not rest here. The tables printed on another page, compiled from data gathered from every portion of the country, present results which will astonish even street railway experts. An average of all the cities tabulated shows the street car ride for five cents in 1897 to be an increase of 237.5 per cent over that of 1887; or in other words if companies were charging now on the basis of 1887 they should receive 16.85 cents where they are only charging 5 cents; a difference of almost 12 cents. And yet we hear that "The price of everything but street car fares, has been reduced."

THE call for a meeting of Street Railway Accountants, to be held in Cleveland, March 23-24, as published in our last issue has met with a most hearty and gratifying response. Upwards of 50 roads have already signified their intention to send delegates, while half as many more are in favor of the meeting and its purposes, and hope to be represented but could not promise definitely until a little later. In some cases an impression was had that this initial meeting was simply for the purpose of forming an organization and that the first practical work would not be taken up until the first annual meeting, which will be held at the same time and place as that of

the American Street Railway Association. While an organization will be a part of the object of the meeting, it will be seen by a glance at the program published elsewhere (and not yet fully complete) that there is a lot of very valuable work to be done at the Cleveland meeting. Committees also will be appointed to report on standardization and other matters at the October meeting, and will have the intervening months in which to work. No gathering of the men devoted to this important department of street railway work has ever been assembled as yet, and the need is urgent and pressing for immediately commencing the improvement of accounting. In the operating department, electric and mechanical engineers who have had experience on many roads have been called in to assist in the erection, installation and putting in working order of power houses and equipments. These experts have imparted their knowledge and experience to the operating department which takes the property when finished; and in many ways the operating department has had the benefit of what a large number of roads have done and are doing. All this time, and while most radical changes have been taking place in methods of operation, which mean corresponding changes in account keeping, the accountant has been practically neglected. Nobody ever seemed to think of him, or that he had any new problems; and as for going outside the office to see what others were doing was an unknown quantity. Now the accountants are going to help themselves. They will do as the operating departments have had to do; get together with others engaged in the same work, and by a general and mutual exchange of experiences and improvements, better and simplify their own work. The purpose is a most highly commendable one and deserves the support and representation of every road in the country.

#### GOOD IN AN OLD LAW.

About a year ago one John Werder was injured by a trolley car in Jersey City, and entered into a contract with a professional claim adjuster named Stanford, by which he agreed to do nothing without the consent of the latter, who was to advance funds for Werder's maintenance pending settlement, and receive one-half of the amount collected from the company. Werder effected a settlement without the knowledge of Stanford and the latter sued him for \$189.50 which had been advanced. Werder's defense was that the contract was void because it was "barratrous, champertous, for maintenance, and against public policy." The judge took the same view of it and Stanford was non-suited.

#### JOEL HURT REMAINS.

Joel Hurt, who has served, under protest, several terms as president of the Atlanta Consolidated Street Railway Company consented to accept the office again and was elected at the annual meeting of the board held January 20. The other officers were also continued for the coming year. The company has done a good business during 1896 and a dividend of 2 per cent was declared, payable April and October. This is the first dividend the company has earned.



CONCRETE WORK IN TRACK CONSTRUCTION.

When electric traction was adopted on our street railways an era of reconstruction was entered upon as a matter of necessity, and nowhere was reconstruction more imperative than in track work. The new motive power permitted higher speeds and economic operation compelled heavier cars; better service stimulated traffic and longer trains run on shorter headway resulted. The tracks which were built in the days of animal traction did not stand under the severe service, and a more permanent way became a necessity. Thus, track building became a matter for serious consideration, and continues to be so as the work of rebuilding lines and rectifying mistakes proceeds.

The first requisite for economic operation is that the rail shall present a good rolling surface to the wheel. This means the rail must be sufficiently heavy to prevent local deformation under load, and so well supported that it will not deflect by reason of the foundation settling. The heavy and deep rails now used are sufficiently strong as girders when supported at short intervals only, and no difficulty is experienced with tie construction where the roadbed has been properly tamped.

With pavements to be kept up, however, especially if the street traffic is heavy, a problem of no less importance is that of properly supporting the pavement. The advantage of solidity in track and pavement was perhaps as well appreciated in this country as abroad, but it was adopted first in England. The reasons for this are not far to seek. The

longitudinal) in the world with a minimum expense for maintenance.

A substratum of concrete is ideal for supporting the pavement, and hence, as the track must have as good or better foundation than the adjoining pavement, a large proportion of the newer track is put in on concrete foundation.

In the REVIEW for January F. A. Little presented the figures on cost of concrete foundations, based on the construction of nearly fifty miles of track in Detroit. In that article Mr. Little pointed out the advantage in cost which trench work has over the construction with ties, the difference in labor, paving, etc., when track is laid in a street

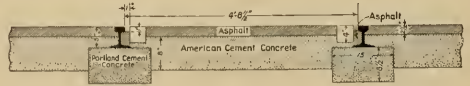


FIG. 1—TRENCH WORK—TWIN CITY RAPID TRANSIT COMPANY.

already paved with asphalt being \$1.05 as against \$2.85, a saving of 63.5 per cent.

By the courtesy of W. J. Hield, general manager of the Twin City Rapid Transit Company of Minneapolis, we are enabled to give some data on the cost of trench work in that city. Fig. 1 shows a section with dimensions and Fig. 2 a view from a photograph of a section of the track. The rails used are of the American Society of Civil Engineers' standard, weighing 80 lbs. to the yard and in 60 foot lengths, with the joints cast-welded. In Fig. 2 the section is taken through one of the joints. The flange way is formed by



FIG. 2—SECTION OF TRENCH WORK—TWIN CITY RAPID TRANSIT COMPANY.

roads and pavements in England were better built than here, and the street railway is an American institution. We have had to try all kinds of experimental construction in order to determine what was best suited to our needs, and often when we knew that it was poor, yet it was good enough for an ill-paved street. On the other hand, the Briton had good roads and well-paved streets, and with his proverbial conservatism and distrust of all that is new, he was very adverse to having his pavements torn up. Franchises were difficult to secure, and when the tracks were laid repairs were expensive to make; as a consequence only the best construction could be afforded. That this is really the cheapest is well shown in Liverpool, where tracks and pavement have endured what is, perhaps, the heaviest traffic (both cross and

granite blocks 4 to 4½ inches deep laid against a wooden form 1 inch thick. After the cement has set, the form is removed and the spaces between the rails and the granite blocks filled to within an inch of the top with asphalt.

The city ordinances of Minneapolis provide that the railway company shall pave between the rails and between the lines of double track. The paving was done by contract and in settling with the contractor it was agreed that the company should pay the price of asphalt pavement from outside rail to outside rail, the granite stretchers being furnished by the contractor and figured at the same price and no allowance made for the space occupied by the rails. The pavement is laid on domestic concrete which was included in contract price of \$2.45 per square yard.

The following extract from the paving ordinance will explain the method of mixing and laying:

"Upon the sub-grade will be evenly spread a layer of hydraulic cement concrete six inches in thickness to be made as follows:

"One measure of hydraulic cement and two of clean sharp sand, will be thoroughly mixed dry and then made into mortar with the least possible amount of water. Crushed rock of a quality to be accepted by the city engineer and of such dimensions that the various stones will not exceed two and one-half inches in any direction, clean from dust and dirt, drenched with water, but containing no loose water in the heap, will be incorporated immediately with the mortar in such quantity as will give a surplus of mortar when rammed. This proportion, when ascertained, will be regulated by measure.

"Each batch of concrete will be thoroughly mixed. The mixing will be continued until each piece of stone is completely coated with mortar, it will then be spread and at once thoroughly compacted until free mortar appears upon the surface. The whole operation of mixing and laying each batch will be performed as expeditiously as possible and with the use of sufficient number of skilled men. The upper surface will be made exactly parallel with the surface of the pavement to be laid, and when in place, all wheeling, working or walking on it must be prevented until sufficiently set."

The Portland cement for the beams is composed of two and one-half parts sand to one of cement. As much stone is used as this will cover, and the concrete is mixed and laid in the manner described for domestic concrete. Like the paving the trench work was done by contract, so that in the statement below, the concrete and labor of excavating are not to be separated. It is the experience of Mr. Hield that liberal allowance for contingencies must be made in estimating the item of labor, because of the fact that city employes, sub-contractors, plumbers, gas fitters, telegraph and telephone companies, and others, are all working in the street at the same time, and delays which cannot be anticipated, are bound to occur.

The cost of a mile of single track is itemized as follows:

	Per Mile.	Per Foot.
Rails, 125.71 tons at \$32.00.....	\$ 4,022.72	\$ .762
Cast-welded joints, 176 at \$2.84.....	499.84	.095
Concrete beams.....	2,640.00	.500
Labor.....	2,640.00	.500
Tie bars (every 12 feet), spikes, ties and copper cross bonds (every 150 feet).....	325.00	.043
Paving, asphalt on 6-inch American concrete.....	10,869.84	2.059
Total.....	\$20,897.40	\$ 3.959

Deducting the rails and joints we have for the cost of single track, \$3.10 per linear foot, which shows that where the railway company is required to put in the pavement there is but little difference in first cost between tie work and trench work on concrete foundations.

As before stated, if the street is already paved with asphalt there is a great saving by the use of trench work. And when the track is to be rebuilt the economy of trench work is apparent. There are no ties to be dug up and replaced, and consequently the sub-grade need not be disturbed, it only being necessary to remove the pavement and the domestic concrete about the base of the rails and lay the new rails upon the old Portland concrete beams.

## A NEW ELECTRIC LINE FOR CARRYING FREIGHT.

Surveys and plans have been completed for the construction of the Oxford (Me.) Central Railway, and active operations will begin about the first of April. The road with three branches will be 31 miles in length, and will connect Oxford, Norway, Waterford, Harrison, Bisbee Town, North Waterford, Lynchville, East Stoneham, and other settlements and villages in this locality. This country is heavily timbered, and it is expected that the saw mills will furnish much of the traffic for the line. Already 30,000 tons of freight business per year have been guaranteed by 26 different firms. The power house will be located at Rice's Junction, where the road branches. The equipment will consist of 2 large passenger cars, 8 wheels, 45 feet over all; 4 G. E. 50 motors speeded to 50 miles an hour; 4 observation cars, carrying 100 to 125 passengers, and several 36-foot freight cars. The guaranteed business of the road is now \$42,810, and with an estimated operating expense of \$16,792, this will leave a fair profit on the investment of \$260,000, which the road will cost.

## THE CALUMET ELECTRIC STREET RAILWAY.

It has been rumored that the South Chicago City Railway was to absorb the Calumet Electric, but this has been strenuously denied by the officials, who say that no negotiations of any kind are pending. The fact that the company has been reorganized indicates that no sale is imminent. John Farson has been re-elected president and H. M. Sloan general manager. The National Bank of Illinois now has a controlling influence in the board of directors. George C. Prussing, John C. McKeon, James R. Mann and George E. Adams have been chosen to fill the vacancies left by F. W. Leach, Carl Moll, Robert Berger and H. B. White. It is believed that with proper management much can be accomplished. The road operates 70 miles of track and touches many of the suburbs and small towns south of Chicago. It is well equipped, and in the summer time the capacity of the road is taxed to the utmost.

## ST. LOUIS STOPS AT FAR CROSSING.

One by one the several cities which inaugurated the near crossing stop to receive and discharge passengers have returned to the time honored system of stopping at the far crossing. St. Louis has now returned to the old way as did Baltimore, Chicago, Cleveland and the others. We have never been able to see any advantage in the near stop while the disadvantages are many and evident. The annoyance of either alighting in the street 20 feet from crossing or curb, or else passing out through the front door and motor-man's platform, is great, particularly in stormy weather. Strangers accustomed to the far stop at home usually miss a car in learning the exception to the general rule, when in other cities. Much time is lost also in allowing teams on cross streets to pull in ahead of the car.

Ostend and Middlekerke, Belgium, will be connected by electric railway, the executors of the late Col. North having determined to carry out his plans.

## THE REDUCTION IN STREET CAR FARES.

The daily press from the Atlantic to the Pacific, in daily, weekly, Sunday and extras, has shouted itself hoarse in the assertion that everything has been cheapened in price, but street car fares alone remain the same.

The reader would naturally suppose from the decided and authoritative declaration so often made, that the daily press had studied the question carefully, and based its assertions on evidence which can be put in figures. But if one analyzes the problem he will find quite the contrary to be the fact.

Very much of what goes to produce one ride in a street car has "not decreased in price." Certainly the car itself has not cheapened. Any boy could answer that after one glance at the old bobtail and two-horse cars, and the present type of rolling stock. In replacing the narrow platforms with capacious ones; in substituting electric and hard coal heaters for the damp hay which formerly covered the floor; in brilliantly lighting the modern car like a drawing room, where once a little foul smelling oil lamp hid in a box at one end of the car leaked oil on the passenger below:—in none of these respects has the cost of producing a car ride cheapened. The old time tracks which were used until reduced to little more than a streak of rust, would not carry the modern electric car a single block. The new and heavy and easy riding equipment requires tracks which are heavy and strong and smooth, and which costs from two to three times as much to build as in the old horse days. The car windows must be large and of good quality glass; the car must be warm; it must be kept clean; while the old style wooden seats with sometimes a bit of thin carpet tacked on, would hardly meet the fastidious demand of a public which has been cushioned on plush and springs. The wages paid the motormen and conductors are certainly no less than was paid in ante-electric days; with scarcely an exception the wages now paid are very much higher. Where then is the "great reduction in the prices of everything" of which we hear so much?

But taking the question as first stated, that car fares alone have not suffered in the general slump in values of the past ten years, let us see what are facts and what is history. The statement, undoubtedly, has been generally accepted without question because there has not been the same opportunity to deny it.

We assert now, as we have previously, that the price of car fares not only has been reduced, but that no other article of as common use has been as greatly reduced in price. The position of the street railway of today is very like that of a tailor, who ten years ago, made the clothes for a boy, and who today, the boy grown to manhood, is still making the suit for the same person, only of vastly better quality and workmanship, for the same price he received then. The riding public has demanded better cars, longer cars, faster cars, more frequent cars, earlier cars, later cars, all night cars; all these have been given but with no advance in the price of a ride. The public has asked each year to have the ride lengthened a little, with no similar elongation in fares, until in many instances the increased ride is now longer than the original haul. All this the street railway companies have done. Then the public wanted free transfers to other lines where ten years ago an extra fare was cheerfully paid, and all over the country, wherever it was possible to do so this privilege has been granted. It is even possible in one

city under the (too) liberal transfer system for a passenger to ride 100 miles in one day on a 5-cent fare.

And yet we hear it said "prices of everything but car fares have been reduced."

Thus far the reader has simply our assertion for the above statements, though it is but fair to presume our statements regarding the industry to which this magazine is devoted are reliable. But we propose to submit specific cases, selected at random from all parts of the country, from the Atlantic to the Pacific, and we believe even street railway managers will be surprised to see what has been the increase in service rendered, without any increase in compensation; indeed, not a few roads which were getting 10 cents for a given ride 10 years ago, are now hauling over the same route with increased distance added, for one five cent fare.

We have selected both large and small cities, without any previous specific knowledge whatever as to what was their increase in ride, and the results are simply astounding.

These 28 cities show an average increase in the length of a 5-cent ride in 1897 as against the ride in 1887, of 237.5 per cent. Another way of stating the same thing is that on the basis of charge then, the company should now receive 16.85 cents instead of the five cents it does receive. There is no other commodity of general use which begins to show the reduction in price that car fares show.

We shall not attempt now to elaborate on the financial benefits which have accrued to individual property owners; to city revenues through increased taxation resulting from enhanced value of real estate, and the new life which came to slow towns with the advent of electric cars. These advantages alone should entitle the street railways to great consideration, for no other element was ever introduced in metropolitan life which has had so extensive and beneficial an effect. This time we shall deal simply with the abstract proposition that the street car fares have been reduced, and reduced to an extent which would bankrupt any manufacturer to meet in producing the necessities of life.

The reduction in price has been in three ways: First, by making a straight 5-cent fare over single routes where formerly 10 cents was charged, (5 cents on each division). Second, by extensions of old lines by which in many cases the haul was doubled and even trebled, but making the entire haul at the old fare rate. Third, by issuing free transfers which gives the passenger a ride on one or more connecting lines at the price formerly charged on each of those lines. A single illustration of this latter concession will illustrate. The Chicago City Railway, which has a very liberal transfer system, issues daily an average of 290,000 transfers. If on changing cars the passenger paid his fare in cash instead of with the transfer ticket, the company would receive \$1,500 per day more than it now does. Of course there is a small per cent of pleasure and visiting riding, which it would not receive but for the transfer system, for people would not go as often on unnecessary errands where the round trip was 20 cents per passenger instead of 10 cents; but the proportion which comes under this head is only a small fraction.

It may also be urged that the free transfer is used to compete with steam roads, but that does not alter the fact that the public receives extra return without any additional expense, nor that were there no street railways there would be no competition. There is no dodging the fact that street car rides have been enormously enlarged, but the price remains the same, or is even less than before.



# Street Railway Review

The first case we will examine is an abnormal one, and tells where we can ride

100 MILES FOR 5 CENTS.

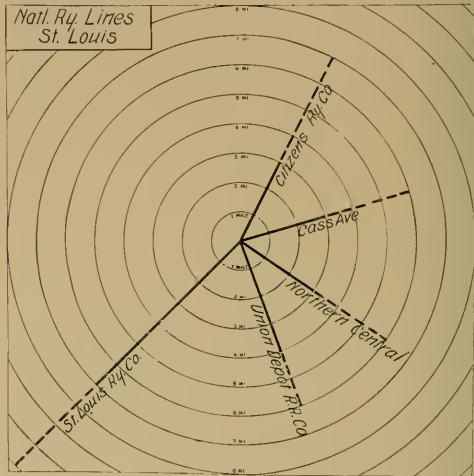
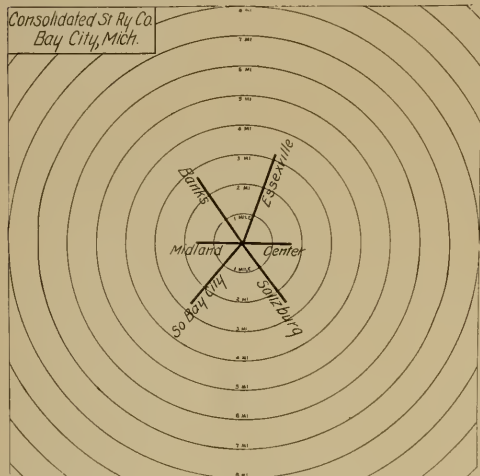
T. J. Minary, general manager of the Louisville Railway Company, advises us as follows:

"We have more than doubled the number of transfers we made in '87, thus giving the public the benefit of six or seven continuous routes, where one can ride from seven to nine miles; in 1887 we only had two. We adopted a universal transfer system, making it at all points where the public would be benefitted, having about ninety different transfers

In Bay City, Mich., the fare was straight 5 cents as far as the center on each of the lines shown up to 1892. Now, for a single fare one may ride from the end of any line to the end of any other, the maximum ride being 189 per cent of what it was prior to 1892.

In Atlanta, Ga., the Consolidated Street Railway Company, in addition to extending all of its lines as shown in the diagram, making them on an average 147 per cent longer than in 1887, has reduced the fare on the Atlanta & Decatur line from 10 cents to 5 cents.

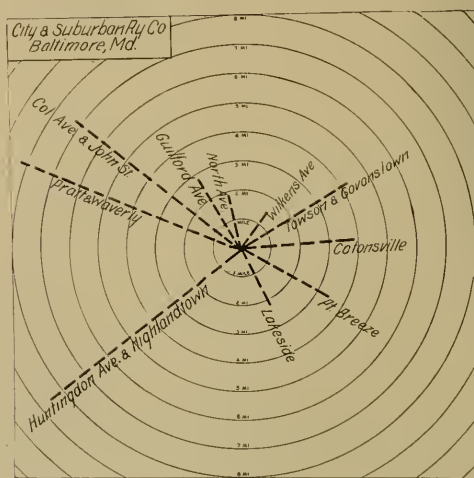
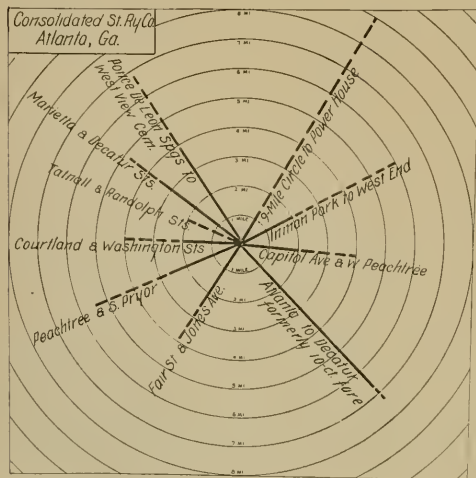
The combined effect of extensions and transfers is well shown in the case of the National Railway lines of St.



Twenty-five per cent of our passengers take advantage of the transfer system, and you may know this is liberal, when I say they can, by going a little out of the way, repeat the transfers with us, and if they so desire, can ride all day, or 100 miles for five cents."

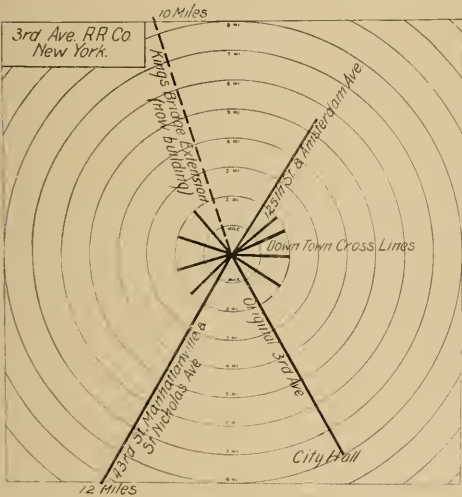
In all of the diagrams the full lines represent the road in 1887 and the dotted lines the extensions made since that time.

Louis. In comparing the conditions of ten years ago and today, General Manager McCulloch says; "1887—speed 6 miles per hour, small cars, rough track, cars not warmed and no transfers; 1897—speed 12 miles per hour, large cars, smooth track, cars heated and a transfer system, doubling and trebling the present increased length of roads. Fare five cents including transfer." This makes the 5-cent ride 257 per cent of what it was in 1887.



The chart represents the hauls on the different lines of the City & Suburban Railway Company of Baltimore. All the companies give free transfers good on any line operated by the company within the city limits, which practically doubles the service given for 5 cents. J. F. Heyward, general manager of this company writes: "I can testify that the Baltimore companies are giving a great deal more to the public than formerly, and would state that on summer evenings we carry passengers a distance of 16 miles for a single city fare. This only went into effect last year and is one more concession added to the many received by the public. There can be no argument made to hold the position that prices of everything except car fares have been reduced in the past few years."

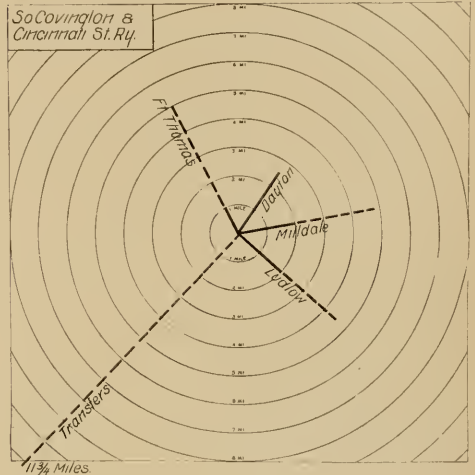
The layout of the Third avenue line and its connections is such that it is difficult to make it clear without a map of the city. The cut however, shows in a diagrammatic way the mileage of the original line which runs from Broadway and Park Row to 131st street, and of the connecting lines. The 43rd street, Manhattanville & St. Nicholas avenue system



with 12 miles of tracks, intersects 3rd avenue at 42nd street and 110th street, giving two cross lines and two lines running by different routes between 42nd street and Manhattanville. From 125th street and 3rd avenue the 125th street and Amsterdam avenue line runs north to 216th street. The Kingsbridge extension, now building, will have 10 miles of track and runs from 116th street north. In the down town districts, between the city hall and 18th street, the 3rd avenue line is intersected by several lines of the Central Cross-town and the Dry Dock Railway Companies, with an aggregate of 16 miles of track. All track mileage is of double track.

In the diagram, all other lines are shown as connecting with the 3rd avenue line at its northern terminus, which is not the case. This arrangement is adopted to bring out the better facilities now afforded to patrons. Prior to 1895 no transfers were given, so that the original 8 miles on 3rd avenue was the 5-cent ride at that time. In that year the present system of transfers was inaugurated on the lines

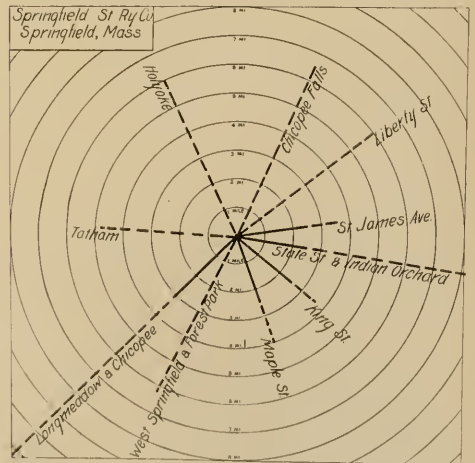
shown and the 5-cent ride has now a maximum length of 18 miles as opposed to 8 miles two years ago, with the additional advantage to patrons that it may commence almost any



place and end any other place, the maximum ride for 5 cents being 225 per cent of what it was in 1894.

The diagram shows the track extensions of the South Covington & Cincinnati Street Railway since 1887, the present maximum haul being 4½ times what it then was. In 1887 the fare was uniformly 10 cents with no transfers, now it is 5 cents with transfers, giving the patrons 9 times as much for the same money as was done 10 years ago. In addition electricity has replaced horses as motive power.

Springfield, Mass., is another city that has received the

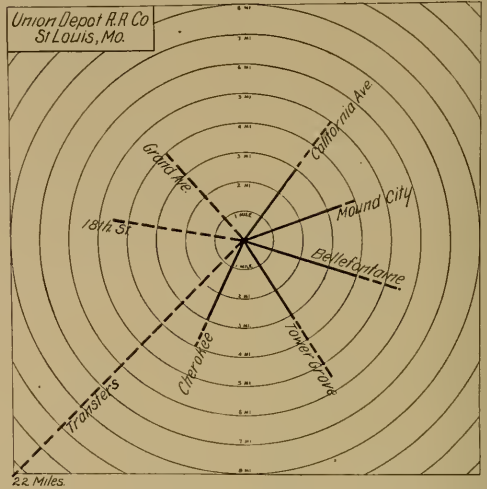
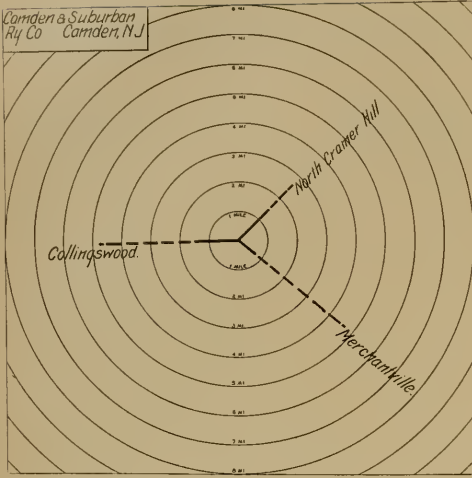


advantages of a reduced fare as well as a longer haul for one fare. In 1887 the fare on the Springfield Street Railway was 6 cents, and the greatest distance that a pas-

# Street Railway Review

sions, as shown on the diagram, the Camden & Suburban Railway Company has 5 lines which run by different routes to the same points, with free transfers over all lines. The fare to any point is 5 cents. The longest haul now is three times what it was ten years ago.

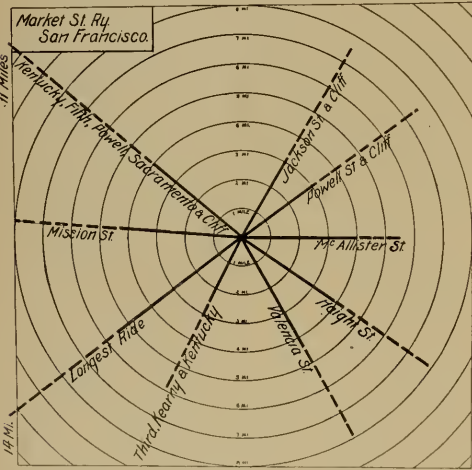
In San Francisco the Market Street Railway Company



senger could ride for one fare was about 3 miles, including transfer. At the present time the fare is 5 cents and the greatest distance for one fare, including transfer, is about 17 miles, or  $5\frac{1}{2}$  times as much ride for one fare. When, to

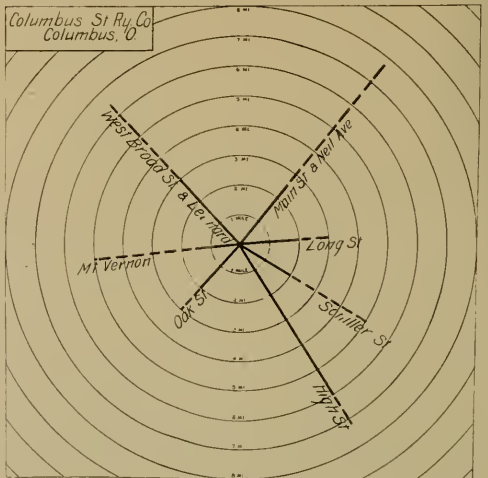
has succeeded to thirteen other transportation companies, and has increased the length of haul by extending lines, by introducing a transfer system and in addition has reduced the fare from 10 to 5 cents. The longest haul today is 14 miles, as compared with  $5\frac{1}{2}$  miles ten years ago, and this is given for one-half the money.

The relative length of street car rides for a single fare in Brooklyn is partially shown by the diagram, in which the dotted lines show four of the hauls made at the present time over the lines operated by the Brooklyn Heights Railroad Company, and the full lines show four of the long hauls



revert to the terms made so familiar to us during the past year, the purchasing power is considered, the patron gets 6.8 times as much for his money.

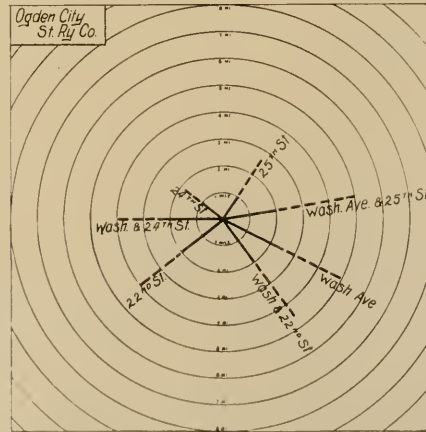
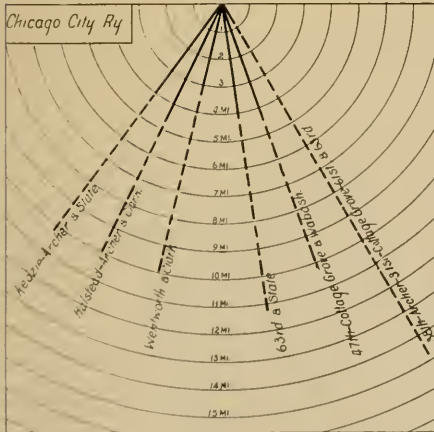
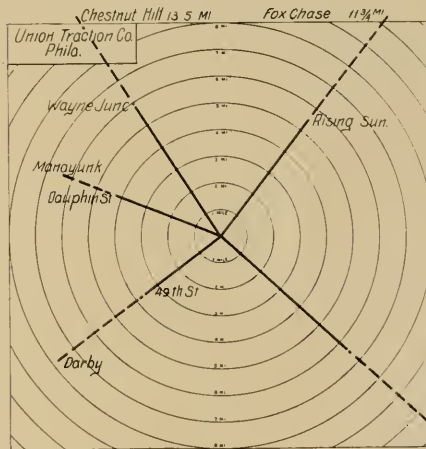
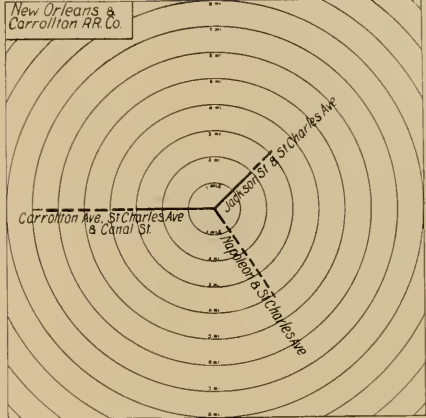
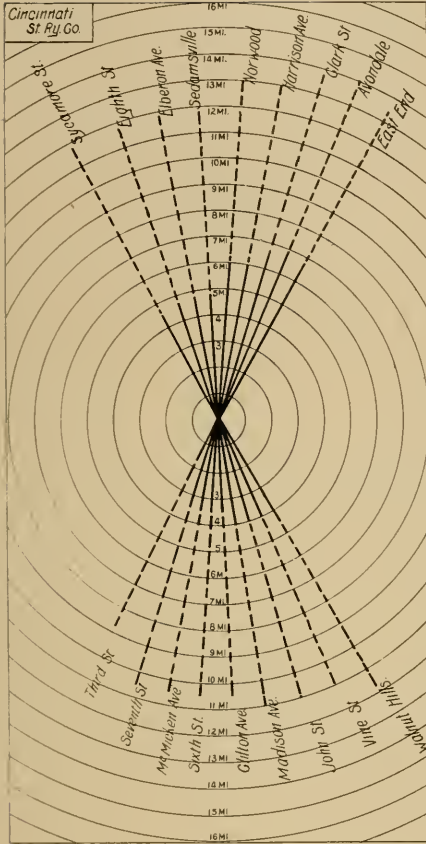
In addition to increasing the track mileage on the divi-



1887	Rochester Ry Co., Rochester, N.Y.	3 Miles	
1897			Miles 7.3
1887	Paterson Ry Co., Paterson, N.J.	2 Miles	
1897			8 Miles
1887	Lindell Ry Co., St. Louis, Mo.	5 Miles	
1897			14 Miles
1887	Wilmington City Ry Co., Wilmington, Del.	1.69 Miles	
1897			5 Miles

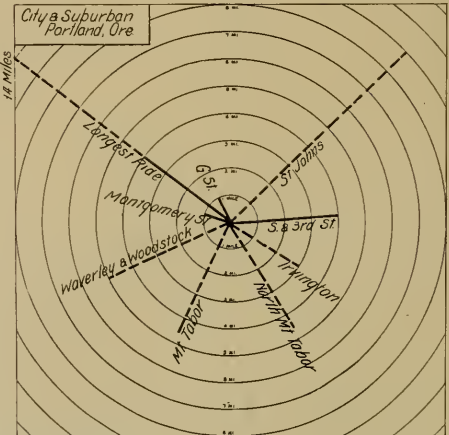
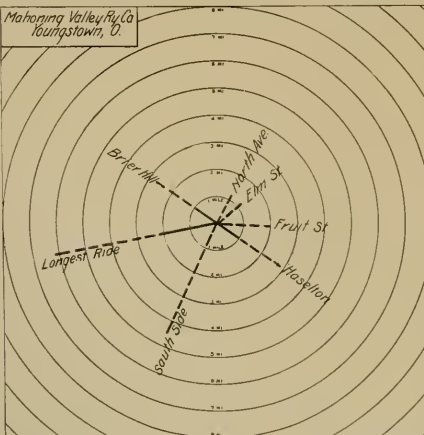
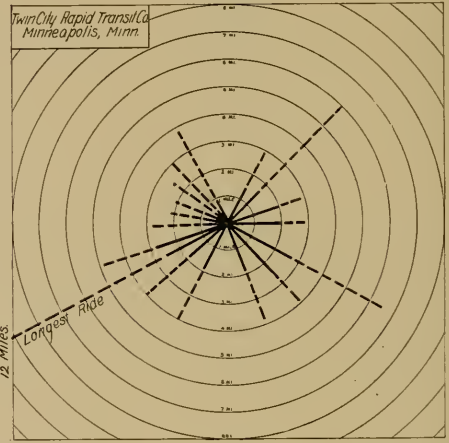
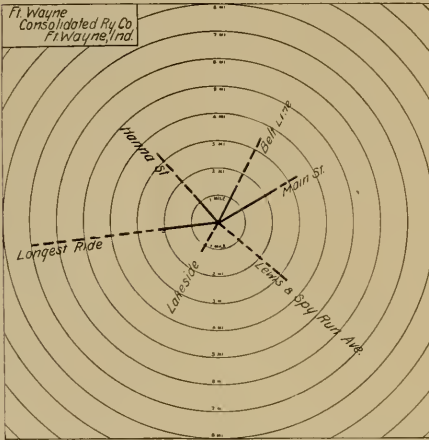
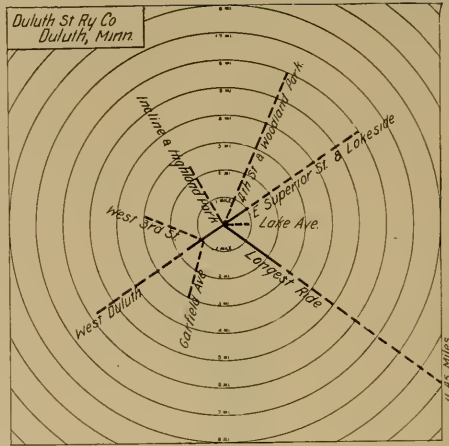
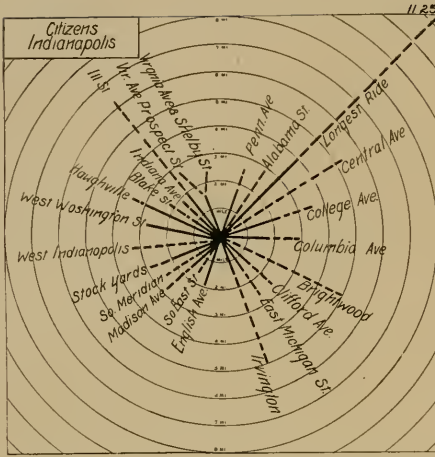


# Street Railway Review



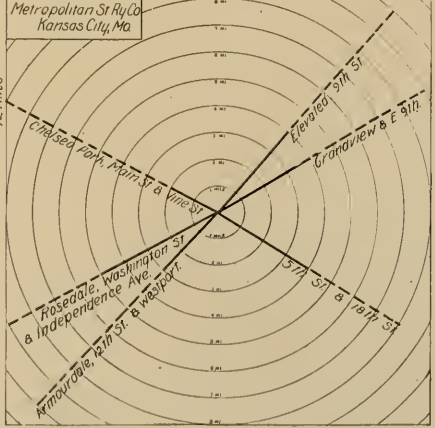
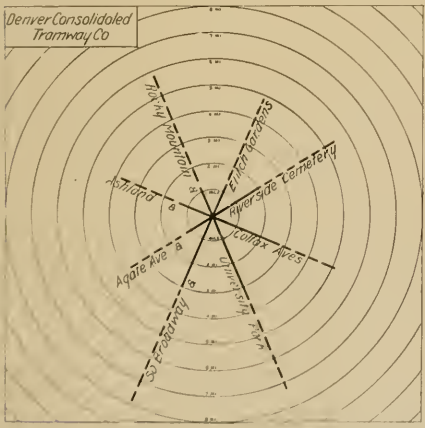
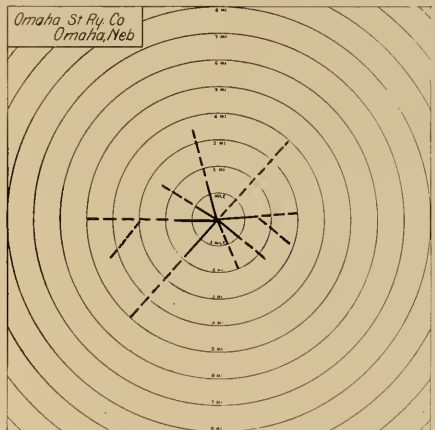
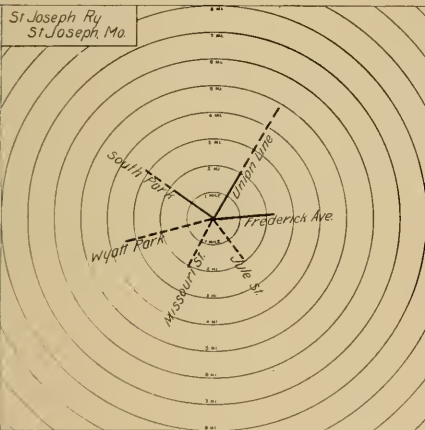
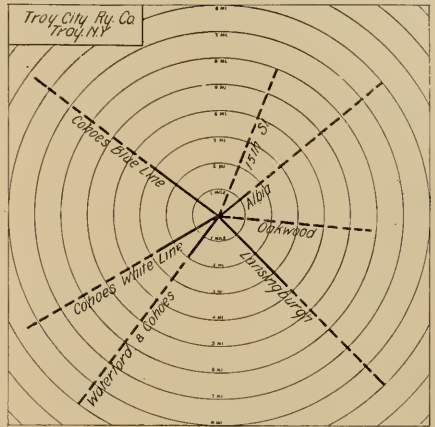
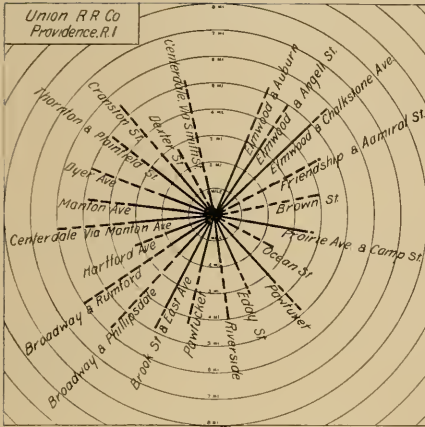
— Ride for 5 cents in 1887  
- - - Ride for 5 cents in 1897

# Street Railway Review



———— Ride for 5 cents in 1887.  
 - - - - - Ride for 5 cents in 1897.

# Street Railway Review



— Ride for 5 cents in 1907  
- - - Ride for 3 cents in 1897



# Street Railway Review

made in 1887. In connection with this diagram President Rossiter says: "Further than shown, a man by our system of transfers from one route to another may ride for the period of his natural life, if he bring his food with him."

On the Union Depot Railroad (St. Louis) Company's lines, in addition to the extensions shown there is a system of transfers by which the passenger may ride for 22 miles

largely due to the transfer privilege which is being extended every year. In 1897 the maximum ride for 5 cents is 243 per cent of what it was in 1887 when transfers were unknown.

On the Paterson (N. J.) Railway the present maximum is four times as long as in 1887.

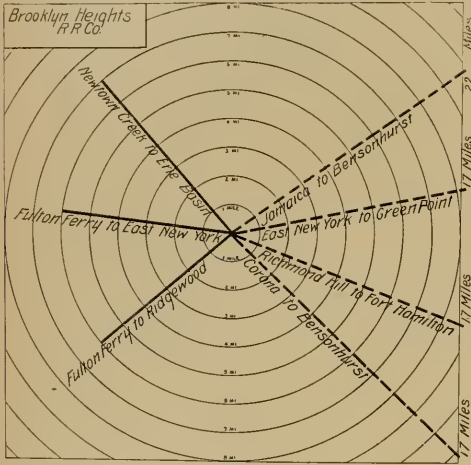
The Lindell Railway Company of St. Louis gives a haul that is 280 per cent of what it was in 1887 and in addition gives transfers at almost all intersections.

C. F. Hutchings, superintendent of the Wilmington (Del.) City Railway Company, writes:

"We originally had two lines in the town and no transfers, so the longest ride for 5 cents was the length of one line which was 1.89 miles. All the lines are now run by one company with full privilege of transfers which gives the longest ride 5 miles for five cents."

The diagrams for railways in 17 cities which are shown in pages 79, 80 and 81 scarcely need any detailed comment. For the purposes of comparison the ratio between longest 5-cent ride in 1897 and in 1887 has been computed for the 30 roads for which sufficient data was furnished, and the results shown graphically in the diagram.

There are instances in which the comparison between the longest rides in 1887 and 1897 fails to convey an adequate idea of the improvement in transportation facilities that has really been effected. Such, for instance, is the case in Providence, R. I., where the length of the longest line is now



in one direction for a single 5-cent fare. In 1887 there were no transfers.

Several roads have submitted diagrams of their lines showing the maximum hauls only, and these have been brought together in the accompanying figure.

In Rochester, N. Y., the increased length of haul is

## PURCHASING POWER OF MONEY IN 1896 COMPARED WITH 1886

1886	what a unit would buy	100%
1896	what the same unit would buy	
	Street Car Ride	337.5
	Bricks	178
	Steel Rails	174
	Silver	145
	Sugar	137
	Portland Cement	136
	Wheat	134
	Corn	131
	Cotton	122
	Coal	118
	Salt Pork	85

LONGEST RIDE FOR 5 CENTS IN 1897 AS COMPARED WITH 1887

1887	All roads	100%
1897	Bay City (Mich) Consolidated	189%
	Cincinnati St Ry	200
	Ogden City (Utah) Ry	200
	Philadelphia Traction Co	208
	New Orleans & Carrollton Ry	217
	St Joseph (Mo) Ry	222
	Third Ave, New York	223
	Metropolitan Ry, Kansas City	240
	Troy (N.Y) Ry	240
	Rochester (N.Y) Ry	243
	National Ry Lines, St. Louis	257
	Wilmington (Del) City Ry	265
	Consolidated Atlanta	270
	Consolidated Denver	274
	Lincoln Ry Co, St. Louis	280
	Consolidated Ft Wayne	280
	Citizens Indianapolis	281
	Mahoning Valley, Youngstown, O.	295
	Carmden (N.J) & Suburban	300
	Brooklyn Heights R.R.	314
	City & Suburban Portland Ore	350
	Chicago City Ry	373
	Paterson (N.J) Ry	600
	Duluth (Minn) St Ry	632
	Omaha (Nebr) St Ry	630
	San Francisco	680
	Minneapolis	680
	Market St Ry, San Francisco	510
	Union Depot R.R. St. Louis	550
	Springfield (Mass) R. Ry	680
	South Covington & Cin	900
	Average	337.5

\* Not including the transfers which are allowed on all times  
 \*\* Fare in 1887 was 10 cents  
 † Fare in 1887 was 6 cents

only 20 per cent more than that of the longest line in 1887. However, there are now 22 lines with an average length of 4.58 miles, and then there were 18 lines with an average length of but 2.76 miles.

Also in Columbus, O., ten years ago, there were 8 lines, average length 2.63 miles with very limited transfers, while in 1897 there are 7 lines, average length 5.06 miles, with universal transfer system.

It will be remarked that in the foregoing diagram there is no definite relation between the population and the increase in length of haulage; New York and Philadelphia are among the low ones and Chicago and Brooklyn near the top. In a single instance only is the 5-cent ride less than twice as long as it was ten years ago, and the average for the 30 roads shows it to be just 33 3/4 times as great. If one were to make allowance for the continuous trips as provided for on the Brooklyn and Louisville roads this latter figure might be indefinitely increased.

Having shown what the street railway companies are now furnishing for 5 cents and how it compares with the service rendered in the good old days, we shall conclude with a com-

parison between the power of money to purchase street car rides and some of the other necessities of the patrons and also of the car companies, which is self explanatory.

Labor was not included in the foregoing table for the reason that complete statistics for the roads shown were not at hand. Such incomplete data as we have, indicate that labor has not shared in the general decline but, that wages are higher, absolutely, than ten years ago. On one of the large Chicago lines the trainmen's wages have been increased 80 per cent since 1887. Labor, however, is the most important item in the expenses of street railways as will be seen by examining the reports of the Connecticut street railways shown on another page, where the item of wages is on an average 37.9 per cent of the total operating expenses which amount to 70.4 per cent of the gross receipts. Be it well understood that the item wages does not include salaries, the latter being for the Connecticut roads 9 per cent of the operating expenses.

### ACCOUNTANTS' ASSOCIATION NEXT MONTH.

The indications are for a large attendance at the meeting of the street railway accountants in Cleveland, March 23-24. Acceptances from upwards of 50 roads are already received, with 20 more which hope to send delegates but cannot absolutely promise so far ahead. The letters from officials are with one single exception very urgently in favor of the new work. The one road in question considers its system perfect and could not expect to learn anything new by coming, which latter statement is undoubtedly true in the case of the person who holds such views.

The meeting is an assured success and will prove one of the most helpful and interesting assemblages of street railway men ever held. Among the subjects for papers are the following:

#### FROM HORSE CAR TO ELECTRIC ACCOUNTS.

Showing the almost entire transformation brought about by change in power.

#### STATISTICAL REPORTS IN A NUTSHELL.

Showing time and manner of making complete, yet condensed, weekly, monthly and annual reports, requiring but a few minutes time of the busy officer or stockholder to get at the cream.

#### USEFUL AND USELESS CLASSIFICATIONS.

Showing how little division of accounts may be used to accomplish excellent results, and how much has and can be done to wear out the patience of the auditing department and owners of the property to get at what is wanted.

#### MONTHLY CLOSING OF ACCOUNTS.

Showing how creditors may be required to present bills promptly when material or labor is furnished and present statement of account on the first of each month; how bills may be certified to by heads of department when received and turn same over to auditor; and all other matters relative to the month's business.

#### EARNINGS; HANDLING AND ACCOUNTING.

The care and handling of the fares received from passengers from the time they are collected by the conductor until they are deposited by the treasurer. This paper to embrace the registration and recording of fares and depositing of same by conductors, the form of trip card, the making up of the

daily receipts on the books in the office, the method of counting and checking same with forms of register records, cash balance sheets, short lists, etc., etc.

#### STANDARDIZING ACCOUNTS.

A standard system of accounts; classification of operation expense accounts, and form of report that will admit of comparison and diffuse information between companies.

#### NAMING AND STANDARDIZING APPARATUS.

The necessity of, and assistance to the accounting department, of the naming and standardizing of apparatus and appliances used in the operating department.

#### TRANSFER TICKETS.

From the time they are printed until they are destroyed; keeping in stock; issuing to conductors; collections; checking with trip reports; records.

#### INTER-URBAN ACCOUNTING.

A system of accounts for interurban lines; differential rates of fare; pro-rating fares with city lines used; keeping record of mileage run on city lines used; registering or receipting fares.

There will be one or two trolley rides about the city with probably a run out on one of the several interesting interurbans for which Cleveland is famous.

Officers who intend being present are requested to make notes of such points as they especially desire discussed and hand them in the first day. It is suggested also that each one bring a complete set of his forms and blanks for comparison and study. There can be no question that at this meeting many a tough problem which has caused endless worry and study will be found to have been successfully worked out by some one.

The Hollenden hotel will be headquarters, and a spacious room, well lighted, has been placed at the disposal of the association for its sessions. The accountant who fails to attend this meeting will miss something he cannot afford to lose.

### TOO LOW A FARE IN BROOKLYN.

The Nassau Electric Railroad Company of Brooklyn, has been enjoined from carrying passengers from the Brooklyn Bridge to Coney Island for five cents, and may have to charge to cents. The restraining order was issued by Judge Dickey of the Supreme Court, at the instance of the Brooklyn Elevated Railroad Company, which complained that in reducing the fare the Nassau Company had violated an agreement and in consequence the elevated road had suffered a reduction of \$15,000 in receipts. The court ordered the Nassau Company to pay this amount. The company will appeal the case.

### MIGHT TRY WIND NOW.

The Oswego, N. Y., electric lines are in grief. In October the road went into the hands of a receiver, has been losing money since, as before, and is behind in its pay roll over \$1,600. The reserve engine at the power plant was wrecked by an accident and the water power which has furnished power most of the time failed by reason of the water in the hydraulic canal being drawn off to permit the annual repairs. Fire and water having failed there seems but one of nature's forces left untried, and we mildly suggest trying a wind-mill.

## CONDUCTOR'S RECORDS IN MILWAUKEE.

A set of blanks and a system by which conductors can conveniently keep trip accounts and records of accidents is absolutely essential to a railway of any magnitude, and the more complete the records can be made the more valuable will they be to the auditing and claim departments. The

**Conductors put the numbers of their Transfers commencing and ending here, as follows:**

TIME ON	NUMBER COMMENCING	NUMBER ENDING	Total Number of Transfers Issued	TIME OFF

Date.....189

Run..... Badge..... Route.....

	No. Car	Time	5 Cts.	3 Cts.	Tickets	Transfer Tickets	D. R.	Tot. Pass.	Total Cash
1	N								
	S								
2	N								
	S								
3	N								
	S								
14	N								
	S								
15	N								
	S								
<b>Total</b>									

Conductor.....

Motorman.....

FIGURE 1.

**Conductors put their Register Readings here.**

CAR	REGISTER	TIME
	In	
	Out	
	In	
	Out	

FIGURE 2.

blanks, which we illustrate, are those used by the Milwaukee Street Railway Company. They were adopted several months ago and have been found to serve the intended purpose, without imposing too much clerical work on the conductors.

Each conductor is provided with a cloth portfolio, 9 inches long by 4¼ inches wide, in which are carried three forms; the trip record blank of which Fig. 1 shows the front and Fig. 2 the back, a defect card and an "accident" form. The

trip record and the defect card are each about 4 by 9 inches, the latter red in color, and the accident form is 8 by 9 inches and folded.

The trip record as shown in Figs. 1 and 2 provides for a record of the time and fares collected on one side, and for register readings and transfers issued on the other. One side of the portfolio when opened shows a sample trip record slip properly filled in for the instruction of the conductor. On the other side are instructions

### WHAT TO DO IN CASE OF ACCIDENT.

The motorman will: Stop the car. Go to the assistance of the injured person. Secure his name and address.

The conductor will: Secure names and addresses of all available witnesses whether passengers or bystanders. If accident is serious, notify telephone No. —.

If property has been damaged: The motorman will assist conductor in securing name and address of owner. Name and address of witnesses. The extent of the damage. Also in making out report. Notify inspector as soon as possible.

Form #1  
Milwaukee Street Railway Co.

**ACCIDENT NO.** .....

Name of Injured Person: .....

Address of same: .....

Property damaged: .....

Name of Owner: .....

Address of Owner: .....

Car No. ....

Line .....

Report Filed .....

City Agent .....

HOW THE ACCIDENT OCCURRED.

I certify that the above is a true statement of the occurrence.

Conductor .....

189

To Superintendent  
Dear Sir:—I have to report the following accident which took place in connection with my car this day, as follows:

Car No. .... Line .....

Conductor .....

Exact Place .....

Car Going .....

Badge No. ....

Motorman .....

Exact Time .....

Sped .....

NAME	ADDRESS	NATURE OF INJURY OR DAMAGE

NAME OF WITNESS	ADDRESS	WHERE STANDING AT TIME OF ACCIDENT

FIGURE 3—FORM FOR REPORT OF ACCIDENT—FIGURE 4.



The conductor will report on accident blank: Injury to person or property occurring in connection with or caused by his car. Falling of passenger when taking or leaving car, no matter how slight the injury. Ejection of passengers. Turn over report to station master before going off duty.

Wire down. When first car arrives at break, motorman will immediately take charge of the prostrate wire, warning all persons away from it, until relieved by another representative of the company. The conductor will run to the nearest telephone and notify No. ——. When necessary to pay toll it will be returned upon application to the station master.

The instructions above given serve to fully explain the accident form, shown in Figs. 3 and 4.

The defect card is a printed form on which is to be reported any damages sustained by the car. The back of this form is to be filled in by the inspector who investigates the case and when the superintendent has passed upon it the card bears a complete record of the case.

## ELECTRIC TRACTION IN LYONS.

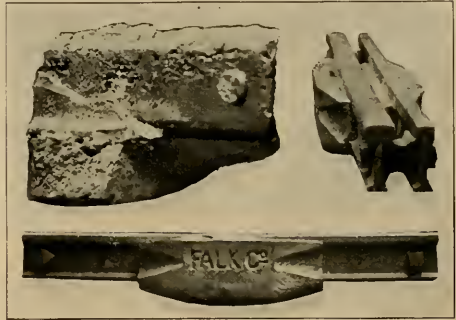
BY EMANUEL KUHNE.

The introduction of electric traction on the street railways of Lyons is due to the energy and progressive spirit of Monsieur Bonnet, director of la Compagnie des Omnibus et Tramways de Lyon, through whose efforts the Oullins line of this company was equipped with electricity in the early part of 1894, the French Thomson-Houston company having charge of the installation. Because of the excellent results obtained with the new motive power, a second line, the Lyon-St. Fons-Venissieux, was also changed from horses, the transformation being completed in August, 1895. Each of these lines is about 5½ miles long and has its separate power plant.

All the old tracks in Lyons, as throughout France, are laid with what is known as the "Marsillon" rail which, as is shown in the illustrations, comprises two rails, the rail proper and the guard rail. The rails are about 4 inches high and together weigh but 60 pounds per yard. The running rail is of the same dimensions as the guard rail except that the head is 1¾ in. wide instead of 1 in., thus making it really about a 35-pound rail that is used. These rails are supported in chairs 6½ in. deep, bolted to cross ties placed 4 ft. apart. The distance between the rail and the guard is 1½ in., which

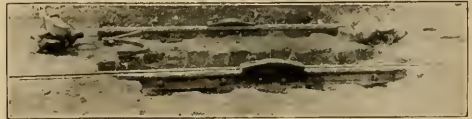
is maintained by bolts and filler pieces spaced about 2 ft. apart.

As might have been expected the new service proved too severe for the old tracks and the joints were so bad at the



JOINT, BROKEN TO SHOW WELD; THE FINISHED JOINT.

end of a month that the company decided not to equip its other lines electrically until financial conditions should permit the rebuilding of the tracks and the substitution of a heavier rail, which appeared to be in the far future. Fortunately a satisfactory substitute for rebuilding was found in the cast-welded joint, which has proved to be so efficient in



MOLDS TO FORM FLANGE WAY.

America. The work of cast-welding the joints on the lines already electrified was begun in December last under the supervision of Mr. Hoffman of the Falk Manufacturing Company of Milwaukee, U. S. A. Since commencing, the joints have been cast at the rate of from 70 to 80 per night, for all the work is done at night so as not to interfere with traffic. One of the illustrations shows the cupola and the pouring of a joint. Because of the narrow streets the screen, which is seen in the foreground, is placed in front of the joint as it is poured to protect passers by from the possible splashing metal. The views of the finished joints will serve to give a better idea of the rails which were previously described. Notwithstanding the rails have been laid for years no difficulty is experienced in securing a perfect weld, the joint being stronger than the rail.

The cast-welded joints proved to be so efficient that when three miles of track had been welded, the Falk company was awarded the contract for welding all the track of the Compagnie des Omnibus et Tramways de Lyon, about 33 miles. This is to be equipped electrically and the company expects to have it so operated by the fall of 1897.

The new central power station, now building, about 1½ miles from the center of the city, is well under way. The generating plant will comprise four 400-k-w Thomson-Houston (of Paris) generators, direct connected to horizon-



POURING A JOINT.



A CONDENSING TANK.

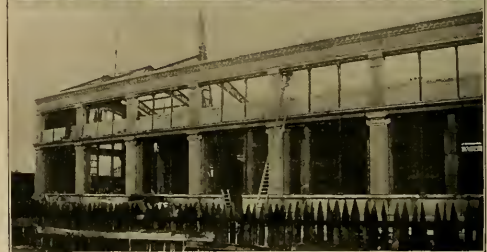
tal steam engines, by Piguët of Lyons. Steam will be furnished by semi-tubular boilers. Water for condensing the steam is supplied by two large wells. The method of condensing in tanks so common in France is shown in one of the illustrations. The walls of the building are of concrete consisting of two parts cinders and one part cement. The photographs show exterior and interior views of the boiler house.

Current will be conveyed to the cars by an overhead trolley wire except for about three-fourths of a mile in the heart of the city where a system of surface contacts will be used. The trolley wire is to be supported on ornamental poles available for street lamps. As several of the lines of the company are distant from the central station it is necessary to use heavy feeders. These are the ordinary armored cables and are laid in the ground, no tile or other conduit being used. To protect the cables from accident when excavating in the street at any time in the future, a strip of wire netting is laid a few inches above the cable, so that when it is reached the men may know that the cable is near and avoid injuring it.

The rolling stock will consist of 150 cars, 50 of them the old double-decked horse cars transformed, and 100 new ones of the type shown; all will be equipped with the G. E. 800 motors by the Thomson-Houston company of Paris. The old cars seat 60 and the new ones 50 passengers each. Municipal regulations require that each car have a speed indicator, and a simple one designed by Monsieur Abdank, directeur of the Volta laboratory, has been adopted.

Other tramway companies in France have been awaiting

the outcome of the Lyons experiment and as a result the Falk Manufacturing Company is now building five cupolas which are to be used in Paris, Marseilles and other cities contemplating a change in tractive power, and there is no doubt but that during the current year there will be an enor-



VIEWS OF POWER STATION, NOW BUILDING.



CAR USED AT LYONS.

mous increase in the use of electricity as a tractive power in Europe.

Mr. Hoffman, who is now in the United States will return about the middle of March and in addition to the Falk company will represent several large American supply houses. This field is now much more promising than in America.

"Cahall-Babcock & Wilcox Boilers" is the title of a very handsomely illustrated sixteen-page pamphlet, issued by the Cahall sales department, Pittsburg, Pa., describing this type of boiler. Accompanying it is the report of efficiency and capacity tests of these boilers made by J. M. Whitman, of Philadelphia, which show excellent results to have been obtained.

## DOUBLE GRIP POLE JOINT.

A pole joint is being exploited by John Spencer, of Wadnesbury, England, for use in building up tubular electric railway poles. It consists simply of a sleeve upset at the



ends to prevent telescoping. Some large contracts are being filled with this device. The inner tube is hung upon the outer one and all are shrunk together, making a compact and rigid joint.

## CURRENT CONSUMPTION OF MOTOR CARS UNDER VARIOUS POTENTIALS.

By James R. Chapman, Manager Electrical Department North and West Chicago Street Railroads.

Having observed that operating men generally believe that as the potential on a line decreases the amperes used by motor cars increase, some experiments were made with a view to ascertaining the relation between the two measures of energy in terms of car-miles. The results are tabulated below and show plainly that, at low voltage, the ordinary street car motor consumes less volume of current than when operated at normal potential. Further, that the energy required to move a car a mile—as measured by watt-minutes—is less at low potential than at normal, while the ampere minutes per car-mile increased as the potential drops. The natural deduction is that cars can be operated more cheaply with a 500-volt station potential than with 550, provided of course that the slight loss in speed does not require more cars to be operated to maintain the same schedule.

It is of course understood that slightly different results might be obtained in commercial service, but the experimental method adopted is the only one wherein the same results can be obtained twice in succession under precisely the same conditions. It is possible that some manager having a switch-board watt-meter will take this matter up and give average results between operating his station at 500 volts for a period and then at 550, watching weather and all such governing conditions, so as to give fair results in both cases.

Many 500-volt stations, built six or seven years ago, have been speeded up so as to run at a switch-board potential of 550 volts. Unless the operating schedule has been changed so as to increase the number of miles per car per day, it would seem as if this higher potential were a mistake, as viewed from the standpoint of fuel per car-mile.

### GENERAL DATA.

Date.	December 16, 1896.
Kind of Car.	Twenty-one-foot body. Thirty feet over all
Truck.	Four 33-inch wheels, 8 feet, 6 inches base.
Motors.	G. E. 800. K 2 Controllers.
Instruments.	Weston, round pattern, fixtures in the car.
Watt-meter.	Thompson Recording, 150-ampere capacity, portable pattern.
Length of Run.	2.01 miles.
Character of Track.	Level, straight.
Rail.	86-lb., surface dry, some little dust.

### NOTES.

In each case run was made without stop, on 8th point of controller (loop not used). Special track was encountered twice in each run, requiring current to be cut off and speed checked to about eight miles per hour.

All calculations based on 10-second reading of indicating instruments; comparison, however, was made at the end of each run with recording watt-meter, the rate of variation being practically the same for each run, and the watt-meter always lower than the product of the volt ampere readings.

The low potential was obtained after regular operating hours by bringing current from a distant power house, via a circuitous feeder route, and switching on car heaters in barns along the route until the desired potential was obtained.

Average Run.	Average Voltage.	Average Amperes.	Time Used.	Total Watt-Minutes.	Watt-Minutes per mile.	Total Ampere-Minutes.	Ampere-Minutes per mile.
1.	521.37	29.59	6 min. 40 sec.	102,847	51,168	197.27	89.14
2.	509.74	31.75	6 min. 30 sec.	105,196	52,336	206.37	102.67
3.	493.83	29.66	7 min.	102,520	51,009	207.62	103.29
4.	401.85	27.37	7 min. 30 sec.	82,490	41,039	222.45	110.67
5.	320.07	26.12	9 min. 30 sec.	79,422	39,513	248.14	123.45

## WIRE THIEVES IN TROUBLE.

The Chicago City Railway had indictments for malicious mischief and grand larceny brought against the four men who attempted to steal a thousand feet of copper cable. Between 11 and 1 o'clock at night these men cut the line which forms the return circuit to the new power house on 47th street and Oakley avenue. They climbed a telegraph post, adjoining the street railway lines, and by means of two old saws and a hammer, severed the cable. Cutting it into 100 foot lengths they dragged it across the fields to the railroad. Here they coiled it up and hid the wire expecting to remove it at their leisure and sell it for old copper. It was insulated cable of 49 strands of No. 16 wire and worth about 16 cents a foot. The employes soon discovered the theft and detectives were put on the track of the guilty parties. They were soon captured and tools found in their possession which indicated that the men made a regular business of stealing car brasses, bearings, etc., and selling them for scrap. It is the intention of the company to make an example of these men and prosecute them to the full limit of the law.

## CARE OF MOTOR CARS.

It has been the policy of the West Chicago Street Railway to prohibit the motormen and conductors from tampering with the electrical machinery. The superintendent believes that a "little knowledge is a dangerous thing" and so has not given a course in electricity to his motormen. A motorman has only to manipulate his controller and replace a blown fuse. A thorough system of inspection is carried on, each motor being overhauled, cleaned and painted every 90 days. Few accidents have occurred and the number of burnt out fields and armatures is surprisingly small. One winder, working two days a week, is able to keep 100 motor cars in perfect order. This result seems to justify this system.

Glasgow's street railway committee has voted to send the manager and engineer-in-chief of the city lines to the United States to learn the latest and best electric railway practice.



## PRACTICE IN ELECTRIC RAILWAY POWER DISTRIBUTION IN EASTERN MASSACHUSETTS.

Considerable has been written in the past on the theory of power distribution for electric railways. The arrangement of feed lines for various requirements and the possible uses of boosters, three wire systems and alternating current transmissions have been enlarged on until there is little need to tell the well posted railway electrician what the possibilities are.

The present article is intended only to deal with work that has actually been done on some of the extensive network of lines covering the entire eastern part of the state of Massachusetts. In the locality mentioned nearly every variety of problem in electric railway feeding presents itself, and the solutions adopted by the progressive electrical engineers of those roads will no doubt be of interest to others. Moreover there may be those who are hesitating about trying some of the experiments that have there been tried and a knowledge of the success of these experiments will enable such to go ahead confidently with the improvements contemplated. Eastern Massachusetts has electric roads of all varieties, from the crowded city lines of the West End Street Railway of Boston, to the long interurban lines of light traffic owned by other companies in the surrounding region. We will take up first the peculiar features in the feeding system of the

### LYNN & BOSTON RAILROAD,

which operates an extensive interurban trackage as well as the city lines in several municipalities. E. C. Foster is general manager and the electrical problems have been worked out by the company's very progressive electrical engineer, Maurice Hoopes, who is we believe the originator of several important innovations in electric railway feeding practice.

This road was one of the pioneers in adopting the plan of connecting its power stations in regular operation for the purpose of equalizing the load between them. This plan is one which was looked upon as a doubtful experiment by many outsiders when it was first tried but it has never given any trouble and is a decided advantage in several respects. The way this connecting together is accomplished is by simply taking out or "jumping" the section insulators between adjacent sections formerly fed from two different stations.

This plan is shown conventionally in Figure 1, which represents a straight line of road of a length requiring it to be fed by two power stations 1 and 2. It is divided into sections a, b, c and d. When the common plan is employed of

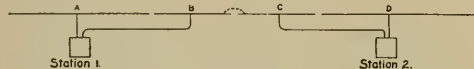


FIGURE 1.

operating the two power plants entirely independent of each other, section b is fed from station 1 and section c from station 2. To connect the stations together to operate successfully it is only necessary to put a "jumper" over the section insulator at x. The practical result is that when the load on section b is light and that on c heavy, station 1 helps station 2 pull the load on section c. In other words the neutral point between the stations is constantly shifting according to the location of the heavy loads.

The value of this arrangement from the standpoint of economy and reliability lies in two facts, one of which relates to the economy of operation and the other to reliability and to the investment necessary to secure reliability. It tends to improve the economy of the stations so connected because the load is not so fluctuating on any one station, and the more constant the load the greater the economy of the steam plant. To take an extreme example, suppose on the road indicated in Figure 1 the cars become bunched on sections a and b, leaving none on c and d. If the stations are not connected to help each other, station 1 will have an enormous overload and station 2 no load whatever. But if they are connected at x, station 2 can take a good proportion of the load and both stations will work economically and without undue strain. In such a case as that just assumed station 2 would not naturally take half the total load, because of the greater resistance of the feeders between it and the sections where the load was, but by raising its voltage sufficiently above that of station 1 its load could be made equal to that on station 1.

Another economical advantage will be spoken of in connection with the West End system. The second advantage, that of reliability with a minimum investment, is readily apparent when it is seen that reserve apparatus at one station is available to help the other station or stations in case of breakdown. Thus, when there are a number of stations tied together there need be but one reserve unit in one of the stations, whereas if they were operating independently, each station would have to have its reserve unit to say nothing of the fact that each station would have to be provided with apparatus to take care of a greater maximum load because it could not receive help from the other stations. It is a well known and understood fact that two machines running in multiple can take care of more cars on a road than the same two machines operating independently. It is but a logical carrying out of this that two power stations in multiple can pull more cars than the same power stations operating independently. It is desirable though, not absolutely necessary to have direct telephone communication between stations when such an arrangement is to be practiced.

One of the first questions that the practical station operator will ask about such a plan is regarding the current for which the circuit breakers are set on the feeders that are supplied from both stations. It is the custom on the Lynn & Boston road to set the circuit breakers on sections which are common to both stations so that they will only go out on a very heavy current a little less than the current required to open the generator circuit breakers of the entire station. Of course this means that it will require a very heavy short circuit on the line to open the breakers, but that is but a slight objection and weighs little beside the advantages of the system.

The accompanying map, Figure 2, shows the Lynn & Boston system. It will be seen by reference to the key that quite an extensive network of lines is connected to both the Lynn and Chelsea stations. This network really constitutes one big section common to the two stations and is made by connecting together four regular sections. Each of these four sections has its individual feeders and the connection between sections is made by long stretches of No. 0 trolley wire over single track. This arrangement makes possible a rather peculiar practice which is resorted to in order to keep cars moving in case of short circuit on one of the sections.

In event of trouble on one of the four connected sections its feeder switch in the station is left open and the resistance of the trolley wire connecting that section with the others is such that it is possible to keep in the circuit breakers on the other feeders and operate the other sections. This compensates for the disadvantages of having so large a mileage of trolley wire connected together.

Much use of boosters and high voltage feeders is made on this system. One part of the network fed by both Chelsea and Lynn stations is fed by a booster in the Chelsea station as indicated on the map. The practicability of feeding part of a network by booster and part by direct 550-volts, has been questioned, but it is working with perfect success.

two posts on this board. One of the field connections is connected to one end of the shunt. The other is attached to a clamp that can be fastened at any point desired along the german silver strip. This booster, which has a rated capacity of 550 amperes as a generator, is adjusted to give 30 volts for every 100 amperes passing through it, or 165 volts when its rated current is flowing through it. However, as high as 900 amperes are sometimes temporarily passed through it, giving 270 volts rise—a total pressure at the power house on the booster feeder of 800 volts.

As previously mentioned, this road also adopted the plan in a few cases of running some feeders at a higher voltage than others. What is of special interest regarding this plan

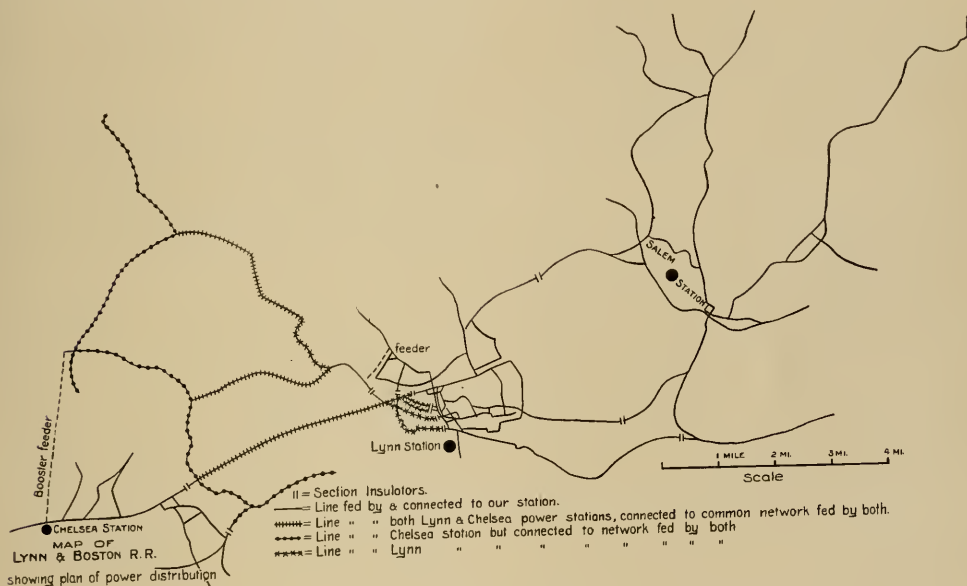


FIGURE 2.

The booster feeder is 4 miles long and the position of the road which it feeds reaches a point  $9\frac{1}{2}$  miles from the power house.

The booster used is a regular m. p. 300 kilowatt railway generator with the shunt field dead and a german silver shunt around the series field. It was found that this machine when run as a booster with the full series fields as used for the ordinary railway work would give as high as 400 volts, with the total rated current of the machine flowing through it, and consequently it was necessary to put a shunt across the series fields to keep the voltage down to the desired amount. The high voltage produced by the series field when working alone as compared with the comparatively small rise in voltage it gives when run as a compound winding when the shunt field coils are in action, is accounted for by the fact that the current in the series coils of a generator with the shunt field excited act on field magnets that are brought nearly up to saturation already by the shunt coils and consequently their effect is small. The german silver shunt around the series coils is mounted on a board fastened to the machine. The german silver conductor is stretched between

as used here is that some of these high voltage feeders feed into the same sections that are fed by the regular 550 volts at points nearer the station. This plan has given no trouble whatever as there is no possibility of the high voltage machines feeding back into the power station and running the lower voltage generators as motors except when there is no load on the line—in which case the high voltage is not needed.

Some of the schemes used for connecting up boosters and high voltage machines to the switchboard will be of interest to those contemplating similar work. It is a simple matter to design an entirely new board to take care of such things compared to what it is to plan desirable ways of accomplishing the same results temporarily or with the existing switchboards. Figure 3 shows the method used for connecting in any machine desired as a booster without altering the permanent switchboard connections. It leaves the booster free to be used as an ordinary generator any time desired. Two feeder panels of the ordinary type are shown, including single pole switch, ammeter and circuit breaker. One generator panel is also shown with a three pole switch and the

connections of the generator to the switch. The other connections on the generator panel are not given as they are not used when the generator is run as a booster and, the three pole switch being open, they are entirely out of circuit. The

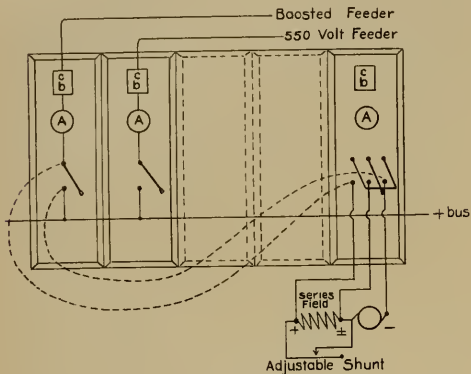


FIGURE 3.

generator with its series field is shown, as is also the adjustable german silver shunt around the series field. To connect the machine in as a booster, flexible cables are used, which have terminals on their ends that fit in between the jaws of the switches on the board. These cables are indicated by the dotted lines, and of course are run in front of the board. It would be possible of course to run these connections back of the board, but as there would then be nothing to indicate that such connections were made there would be more liability of a mismove on the part of the switchboard attendant that would result in a bad short circuit. With the present arrangement the switches can not be closed to make the ordinary connections without removing the booster connections. The same arrangement can be made with any modern type of switchboard as the equalizer connection is left open.

The board at the Lynn power station is being changed over so that any generator can be run on the high voltage bus bar at 650 volts or on the low voltage at 550 volts. The board is of the early panel type put out by the General Electric Company, having the equalizer run behind the panels. Figure 4a shows the generator connections to the switchboard as they now exist, and Figure 4b shows the

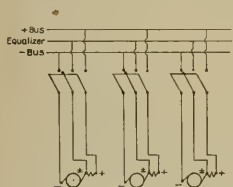


FIGURE 4A.

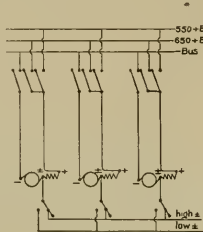


FIGURE 4B.

connections after the change is made. In the final outcome what was formerly the equalizer bus on the switchboard is changed to the high voltage bus and the equalizer is not brought to the switchboard but is simply run along the row

of generators. Of course with the new arrangement two equalizers are necessary, one for high voltage, the other for low. At each machine a double throw equalizer switch is provided so that it can be connected to either equalizer at pleasure. The negative connections of the machine to the switchboard remains the same. Instead of a three pole main switch three single pole switches are put in. The equalizer wire to the generator is taken out and what was formerly the equalizer terminal from the generator is connected as indicated to the positive terminal so that there are practically two positive switches on the board. One of these however is for use when the generator is running at 550 volts, the other for 650 volts. The equalizer bus on the board being now a high voltage bus the middle of the three single pole switches on each panel is closed to connect the generator if it is to be run on high voltage, and the right hand switch as indicated in the diagram to connect it for low voltage.

Voltmeter plugs are being put in all the feeder panels on this road for the purpose of quickly testing the insulation resistance of each feeder before shutting down at night and before turning on current in the morning. There are two of these plugs and they are connected in as shown in Figure 5, where  $P_1$  represents one plug receptacle and  $P_2$  the other. By plugging the voltmeter in  $P_1$  before the feeder switch is closed and when current is on the other sections next to the

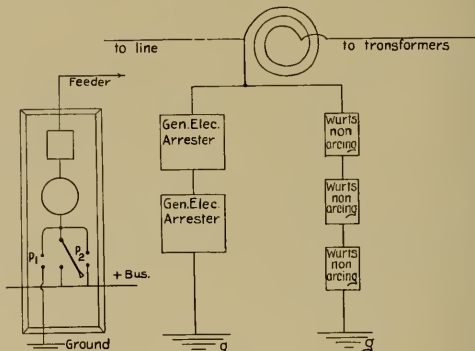


FIGURE 5.

FIGURE 6.

section under consideration the insulation resistance of the section insulators and other insulating devices between it and the other surrounding sections and feeders is determined. By plugging the voltmeter in at  $P_2$  when the feeder switch is open and the positive bus alive the insulation resistance between the feeder and trolley section and ground is determined. The formula for calculating insulation resistance in ohms from such voltmeter tests can be found on page 4 of our January, 1896, issue.

### THE LOWELL & SUBURBAN RAILWAY,

of which P. F. Sullivan is general manager, has attracted national interest among street railway men and electrical engineers in general, because of its rather bold move in putting in a three phase transmission at 5,000 volts to transmit power from its steam driven power station at Lowell to Nashua for running the road in and near the latter city. The main features of the scheme as originally carried out were as follows: In the power station at Lowell were placed three generators, which were similar in construction to a rotary



converter. At one end they gave a three phase 375-volt alternating current, and at the other direct current at 500 volts. The latter was used for exciting the fields and for helping the station when needed. These generators were rated at 120 kilowatts each. The alternating current was transformed up to 5,000 volts, and conducted over three No. 00 wires to a sub-station ten miles away, where it was transformed down again to 375 volts, and by rotary converters changed to a 500-volt direct current. Five miles further on was another sub-station with a similar equipment of static transformers and rotary converters, with the exception that the transformers were wound for a slightly different ratio of conversion to compensate for the additional line drop between it and the other sub-station, for both sub-stations were fed from the same mains. Transformers were connected delta fashion between the three mains, and six are ordinarily used (two groups of three in parallel), but twelve can be switched in if desired.

Since the alternating plant was first put in some changes have been made, and practical experience has taught lessons that theory could not foresee, although considering the novelty of the installation, it has been remarkably successful and free from trouble. Owing to light traffic the sub-station farthest from Lowell is not now being used, as it is found cheaper to supply the territory all from one sub-station and do away with the labor expense of the other. Should traffic require it, the abandoned sub-station would be again started. But the most important change made is in the generating machinery. After much trial it has been found impracticable on account of armature reaction or allied phenomena to run a self-exciting three phase generator, because the voltage will not hold up under heavy load, and the machines originally installed, which gave both direct and alternating current, are being replaced by larger separately excited machines which give nothing but three phase alternating current.

Lightning has in times past wrought considerable havoc among the high voltage static transformers, but that difficulty has now been conquered. As soon as one transformer is burned out by lightning, it short circuits all the others in the bank and they are soon ruined also. This is made possible by the fact that there are no fuses whatever in the high pressure side of the circuit and the low pressure side is very heavily fused. Fuses on the high pressure side are not considered practicable. The lightning difficulty has been overcome by a very thorough system of lightning arresters. Arresters are placed at three places: at the power station, the sub-station and about midway between. They are not placed oftener because an effective bank of lightning arresters for a high voltage circuit of this kind is an imposing array of apparatus and requires a building. On each of the three wires is connected a combination as indicated in Figure 6. There are practically two sets of arresters. One set is composed of two General Electric arresters in series and the other set of three non-arcing Wurts in series. A choke coil is placed between the arresters and transformers.

As stated before there are no fuses in the 5,000-volt circuits, and the high pressure circuit is never opened when there is current on it owing to the enormous arc that would take place. All the switch jaws and terminals on the high pressure circuits are placed on hard rubber pillars which elevate them from the surface of the slate switch board. All the necessary switching is done on the low pressure side of the transformers, but even there the circuit is not opened

with the load on except when absolutely necessary, because the inductive effects are liable to produce a bad arc. Consequently nearly all the control is accomplished in the field exciter circuits. Of course the alternating generators are run in parallel.

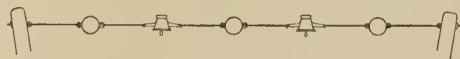
While the change of generators was being made in the power station recently a very interesting makeshift was employed to run the lines ordinarily supplied by the 5,000-



volt transmission. It was nothing less than a booster to raise the direct current to 1,000 volts. This enormous "boost" in voltage was made necessary by the fact that the feeding had to be done over the transmission line which was designed for 5,000 volts. Of course direct feeding run at 1,000 volts would have been impracticable at any time except when the traffic was light. The booster is a 300-ampere multipolar General Electric railway generator with the shunt fields cut out and enough added to the series field coils so that it will give 500 volts at 300 amperes. The insulation around the booster and its switchboard, of course, has to be very good. It goes without saying that a booster to compensate for 100 per cent drop in voltage is not an economical apparatus, but to tide over an emergency in this case it proved very useful.

The three wire system is used on this road in summer to take care of a distant portion of the line on which the pleasure traffic is very heavy. The section so fed consists of a double track line two miles long. The distance from the power house to the middle of the three wire section is five miles. The line is sectioned so as to make half of each track positive and half of each track negative as indicated in Figure 7. The line work for the three wire system is carried out in a substantial manner and a strain insulator is put in the middle of each span wire as in Figure 8 to help insulate against the 1,000 volts between the trolley wires. The usual strain insulators at the ends are also used.

At the station switchboard connections are made so that one generator can be put on the negative side of the three wire service if desired and the switches arranged so that the three wire system can be started up or discontinued at a moment's notice. It is not used during the winter. The plan used in connecting a generator on the negative side of the three wire system is to disconnect its positive from the station bus bar and its equalizer from the station equalizer



and then reverse its field connections with a special switch provided for the purpose. Its polarity being thereby reversed, its former positive pole, which becomes negative by reversing the fields is connected to the negative feeder on the three wire system. The negative side of the generator becoming positive is connected to the negative station bus (which is the neutral of the three wire system) by simply closing the switch on the generator panel. Switches for mak-

## CHICAGO CITY RAILWAY IN 1896.

ing these connections are put on a special panel. This special panel is used and the field connections reversed instead of employing a double throw main switch on the regular generator panel, because the special panel obviates the use of two bus bars near together with 1,000 volts between them and nothing but proverbially leaky slate to keep up the insulation.

## THE WEST END STREET RAILWAY

of Boston, also has adopted the practice of operating all of its power stations in multiple. This plan is of even more importance on an immense city system of this kind than on an interurban. That some idea may be had of the scale on which this scheme is operated the following enumeration of the power stations of the road is given:

Central Power Station; six 1,200-k-w, two 1,500-k-w, and 40 D-62 generators.

East Cambridge Power Station; seven 500-k-w generators.

Charlestown Power Station; two 800-k-w generators. Dorchester Power Station; two 1,000-k-w generators.

Allston Power Station; twelve 62-k-w generators. East Boston Power Station; three 250-k-w generators.

All these power stations are connected together through the medium of "jumped" section insulators. All stations are in direct telephonic communication with the Central power station and the operation of all the stations is superintended by the chief at the Central station. This plan of operating is of great importance in the economy of the West End road. In the first place it makes it possible to work the apparatus in all the power stations at somewhere near a full and economical load. Every power house engineer operating large units knows that there are often times when, for example, it is necessary to run two machines underloaded, because there is just a little too much for one. If, however, the plant is being run in multiple with others, it can give away a small portion of its load to the others and run one unit on a full and economical load. Where there are a large number of stations, as at Boston, it is a simple matter for the chief at the central plant to order the running of such machines as will distribute the load properly among the stations and at the same time keep what machines there are loaded fully. Then too, during the latter part of the night, the whole road can be run from the central station. C. F. Baker, master mechanic of the road, made the statement to the writer that were it not for this plan of running stations in multiple, the company would be obliged to build another power station. In this case therefore, the plan not only means economy in operating, but a great saving in investment, due to the fact that the surplus power house investment at one point can help at points where there is a temporary shortage of power instead of confining its operation rigidly to its own immediate territory.

Johannesburg, South Africa, has granted a concession for a complete electric railway system with branches to populous suburbs.

Workmen's cars, with 2 cents fare for 4 miles ride, have been running over the Kingswood line of the Bristol Tramway Company. Where two cars sufficed at the beginning, seven are now in use. Electricity, with its low operating expense, has made it possible to place a ride within the means of a great many men who formerly walked.

The annual meeting of the Chicago City Railway resulted in a re-election of old directors and officers, and furnishes some interesting figures. The road earned from passengers, \$4,761,945; from mail cars, \$1,139; and from other sources, chiefly advertising in cars, \$45,781; a total of \$4,808,866. The operating expenses for all systems, including insurance and taxes, were, \$2,977,208, or 62.52 per cent of passenger earnings.

The revenue car-miles run aggregated 24,552,000, a net increase of 2,611,000 miles, divided as follows: Cable, 13,908,190, (decrease, 964,390); electric, 10,018,020, (increase, 4,491,260); horse, 626,690, (decrease, 915,870). On all lines 95,238,915 revenue passengers were carried; 46,435,411 on cable lines, (48.76 per cent); on horse lines 2,874,631, (3.02 per cent); and on electric, 45,928,873, (48.22 per cent). The electric lines show an increase of over 17,000,000, while the cable decreased 6,924,000, and the horse lines decreased 4,043,985 passengers. These figures are for cash passengers, and do not include the extra transfer rides, which amount probably to 40 per cent more. The decrease on horse and cable lines is due to the substitution of electricity, for the daily receipts, which were \$13,010, show an increase of \$845 per day over '95. Operating expenses were \$8,134, an increase of \$442 per day. The horse lines, including owl cars, show a net loss on the year of \$18,510, a decrease in loss, however, over '95 of \$103,731.

Operating expenses in cents, per car-mile, were:

	1895.	1896.
Cable lines.....	10.240	10.540
Horse lines.....	30.550	25.889
Electric lines.....	14.776	13.467
All.....	12.796	12.126

Present trackage is, cable, 34.92 miles; electric, 141.76 miles; horse, 7.54 miles: a total of 184 miles single track measure. The passenger equipment numbers 1,735 cars--grip, motor and trailers. The company has only 231 horses, of which 136 are on teaming work, as against some 3,000 head a few years ago.

During the year 13,477 of the Falk cast-welded joints were laid, on which the breakage was only  $\frac{1}{8}$  of one per cent.

After paying 12 per cent dividends on \$10,750,000 of stock, and 4½ per cent interest on \$4,619,500 of bonds, there was a surplus of \$152,425. Altogether the showing, both in the aggregate and in detail, is a very creditable one.

## THIS BREAD WAS WATERLOGGED.

Undoubtedly more of human nature, the real genuine article, can be found and studied on a street car than anywhere in the world. Judge B. is one of the presiding judges in an Ohio city, and also a stockholder in the street railway there. His good wife makes frequent pilgrimages to a charitable institution, going in the street cars. Recently returning from her errand of mercy, she discovered on boarding the car that in her generosity she had not left so much as one stray nickel. So she inquired of the gentleman sitting next to her, if he knew the judge. Of course he did, for everybody knows the judge; so she said she was judge's wife, temporarily without funds, and borrowed the needful nickel. She took his address, and the following

day the judge called on him, expressed his thanks and returned the loan. A few days later the party called at the judge's office, and said he was down without funds and asked the loan of a dollar. But the dollar never came back.

Moral: Ladies when riding in a street car, and finding themselves without funds, should allow some gallant to pay, but don't take his address.

### A VISIT FROM A FRENCH STREET RAILWAY ENGINEER.

Charles Le Blanc, chief engineer of the Compagnie Generale de Traction & d'Electricite of Paris, spent a day in Chicago recently in search of street railway ideas. Mr. Le Blanc, in spite of his name and prominence in French companies, is of American extraction. After completing his education at Washington, D. C., he was placed in charge of the electric plant on the cruiser Atlanta. Resigning this position he took up street railway work with the Sprague Company and installed the first electric road in Boston. Later he was employed by the Edison and General Electric companies, becoming chief engineer for the latter in Pittsburg. In May of 1893, his labors in foreign fields commenced and the French companies received the benefit of his varied experience in operating electric roads in Boston, St. Paul, Minneapolis, Portland and other American cities. He is now chief engineer of the largest electric construction company in France, and consulting engineer for several others.

At the present time, street railway work is receiving a great impetus in France, in fact, all over Europe, for the people are becoming awakened to the blessings of rapid transit. The Compagnie Generale de Traction & d'Electricite alone has 31 franchises granted in as many cities in France, with a number of others pending.

It is the policy of this company to build and equip the railways and either guarantee the operating expenses or run the roads for the profit derived from them. American methods have been carefully studied and every detail of power house and railway economy worked out. The guarantee is 5 cents per car-kilometer and some of the roads have gone as low as 3.6 cents. Condensers are used in all cases, cooling tanks catching the water, sprayed by centrifugal pumps and used over and over again in the boilers. In a 900-ft station in Paris only 5 to 6 cubic meters, or about 500 gallons of water are consumed per day. Coal costs \$4.50 a ton and every device is used to make its consumption economical.

Many regulations and restrictions are placed upon the street railway companies by the government authorities. The trolley poles and street construction are made ornamental, the speed of the cars are regulated to 15 kilometers per hour in the city, and such precautions are taken in running, that very seldom an accident occurs. A car run averages about 175 kilometers per day.

Compressed air is recognized as a failure in Paris, the cars being too cumbersome and the machinery requiring constant attention and repairs. The operating expense is about 17 cents per kilometer and there is little profit for the companies. Electricity is coming into favor for rapid transit. One line of surface contact, seven miles in length, runs between the Place de la Republique and Romainville, and has given satisfaction.

Another company has been authorized to construct a trolley road for trial. The tendency at the present time is to adopt the mixed system, using the trolley in the suburbs and the accumulators in the densely settled portion of the city. Hamburg, Dresden and one or two other cities in Germany have adopted this system. When the car is running, lightly loaded, in the outskirts of the city, the accumulators are being charged and are ready for operating the motors when the end of the trolley line is reached. Feeders to the line are unnecessary, for if the voltage drops or power is inadequate for a steep grade, the storage batteries are automatically thrown into the circuit and help drive the motors. The accumulators on one car weigh about 2,000 pounds and run the car for 14 miles without difficulty.

The problem that brought Mr. Le Blanc on his flying trip to America, was the rule in some of the French cities that there should not be a drop from the end of the track to the station of over 5 volts. Believing that this requirement could be met by the three wire direct current system he has been to St. Louis to study operation there, and is going to Bangor, Me., in search of further facts. During his journey he left an order for 40 tons of trolley wire, part of which is to be used in the Brussels street railway, running to the Exposition. There will be 8 miles of double track upon which 40 cars will operate.

The Thomson-Houston Company has furnished the electrical machinery for fourteen roads, including those at Havre and Rouen. American machinery is receiving just recognition and favor, especially the street car motors, which are not equalled by those of any European make.

Mr. Le Blanc, after a visit to Boston, sailed from New York, February 6 for Paris and Brussels. Thence he will go to Alexandria, Egypt, to attend to street railway interests.

### RELATION OF TEMPERATURE TO POWER.

C. S. Sergeant, general manager of the West End system of Boston, has to show some very interesting records on the relation of power output to the temperature of the weather. It is found that there is a direct relation between power and temperature, and that it takes more power to run a given number of cars in proportion to the coldness of the weather. This is not due to passenger travel, because travel is less on a cold day. The cause of this increase of power is probably to be explained by the presence of frozen mud on the track (which fact makes itself very evident to the car); by the decreased conductivity of the earth, and by the stiffness of the grease in all journal boxes. The electrical economy of the generators, motors and feeders is, of course, higher in cold weather than in warm, and that the lower mechanical efficiency more than overcomes this in cold weather goes to show that there must be a decided drop in mechanical efficiency in cold weather. Mr. Sergeant thinks that enough allowance has not usually been made in the past for the increased power that cold weather requires. His conclusions are based on careful daily records of several months duration.

The officials of the St. Helens, Eng., tramways are contemplating asking the corporation to supply them electrical power on the basis of 6 cents per kilowatt hour. As now operated by steam engines the operating expenses of the tramways are 77.4 per cent of the gross receipts.

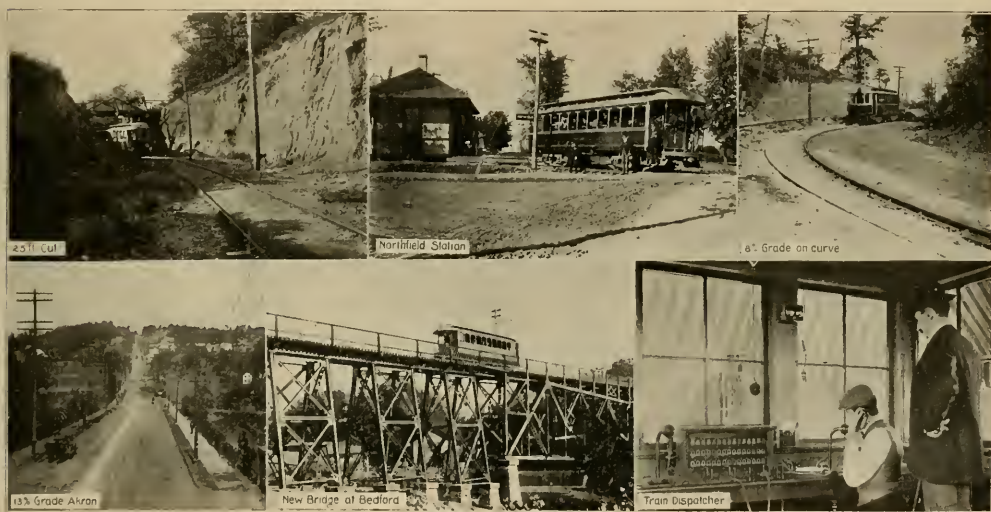




## THE AKRON, BEDFORD & CLEVELAND.

Through the courtesy of Wm. Christy, general manager, and Frank J. J. Sloat, superintendent, we are enabled to present some views from photographs taken along the line of the Akron, Bedford & Cleveland Railroad, the road that has a 40-mile an hour record. This road was built in the summer of 1895, and opened for traffic on September 1 of that year. The main line is 27 miles long, extending from Newburg Station to Cuyahoga Falls, passing through Bedford and Northfield. From Newburg Station the cars are run over the lines of the Cleveland Electric Railway to the public square in Cleveland, a distance of 6 miles. From Cuyahoga Falls the southern terminus of the A., B. & C., the tracks of the Akron Street Railway are used to connect with Akron, the county seat of Summit County, 5½ miles away.

There are two power houses, one located at Cuyahoga Falls and the other at Bedford, 18 miles distant. At Cuyahoga Falls are installed four 250-horse-power Stirling boilers, supplying steam at 120 pounds pressure, to two 28 by 42-inch simple non-condensing Allis-Corliss engines. The boiler plant is equipped with Rose shaking grates and a Berryman feed-water heater. The stack is of steel plate, self-supporting and 120 feet high above the grates. The engines run at 82 revolutions per minute and are belted to Tesla-Schmid, double-end type, d. c., a. c., 250-kilowatt generators, built by the Westinghouse Company. At present the current is taken from the commutators, but it is intended at some future time to centralize the power plant at the Cuyahoga Falls station and use alternating current with a transformer station at Bedford. The engine fly-wheels are 17 feet in diameter and weigh 20



SCENES ON THE AKRON, BEDFORD & CLEVELAND.

The main line is laid with 60-pound T-rails on white oak ties spaced 20 inches between centers and ballasted with gravel. It is difficult to detect low joints when riding over the road. The line is single track with switches about four miles apart. The trolley wire is of No. 0000 hard drawn copper, suspended from iron pipe brackets. There are three feeders, two of 300,000 circular mils, and one of 200,000 circular mils, whose aggregate length is nearly 26 miles. The track is bonded with the Benedict & Burnham bond, one to each joint, with 300,000 circular mil cables at switches etc., two such cables being used at all broken connections.

The route is through a rolling country and it was necessary to do considerable cutting and filling to bring the grades down to something within reason. On the main line the maximum grade is 6½ per cent, but on the line of the Akron connection there is one grade of 13 per cent, 1,000 feet long, and another of 8 per cent on a sharp curve. The outer rail is elevated at all curves and a guard rail laid so that the curves may be safely taken at a 30 mile speed.

The belts are double, short lap, and 32 inch wide. From center of engine shaft to generator shaft is 36 feet. The plant at Bedford differs from this one only in having three instead of four 250-horse-power boilers. During the year that these stations have been in operation not the slightest trouble has been experienced with the machinery, which is an enviable record for any power plant.

The company owns twenty-one cars, all of its standard type, 41 feet over all, seating 42 people, mounted on two trucks, and equipped with two Westinghouse 38-A 50-horse-power motors with G. E. special controller. The cars are from the Jackson & Sharp Company, and on Jackson & Sharp and Dornier & Dutton trucks. The cars are designed to run in one direction only and the front platform is protected by a permanent vestibule. With a view to securing greater adhesion when the car is heavily loaded and also of providing a pilot truck for the car, both motors are mounted on the rear truck. For turning the cars Y's are provided at

Newburg, Bedford, Cuyahoga Falls and Akron; at Cleveland the car runs around a loop.

All cars are equipped with air brakes, eleven having the Standard Air Brake Company's geared compressor; and ten the Hunt eccentric compressor.

At the present season only eight cars are kept on the road, the schedule time from Newburg to Cuyahoga Falls, 26 miles, being 70 minutes, or from Cleveland to Akron, 37½ miles, 2 hours and 15 minutes. The last trip at night is scheduled for 1 hour and 50 minutes. Along the line stations are built at all cross-roads, which afford shelter to patrons in bad weather. At each switch is a telephone box, so that the conductor can readily communicate with the train dispatcher who has his office at Cuyahoga Falls. When trains are running regularly the conductor only calls up the dispatcher's office when at the half-way point, but in case of delay he must do so at every switch, and thus keep the dispatcher informed as to his location. Trains carry signal flags by day and lamps by night.

At Cuyahoga Falls are located the shops of the company,



INTERIOR OF CUYAHOGA FALLS POWER HOUSE—A., B. & C. R. R.

where all repairs are made, and in addition the wheel work of the Cleveland Electric Railway. The company has just completed a large double-truck snow plow equipped with four 50-horse-power motors, which will serve as a switch engine for transferring coal, etc. In summer this plow will be used as a locomotive to transfer excursion trains on the Cleveland, Akron & Columbus Railroad to Silver Lake, one of the most noted resorts in northern Ohio, a distance of ¾-mile via the Akron, Bedford & Cleveland.

The Imperial Tramway's Company, of Stockton, Eng., has applied to the Board of Trade for Parliamentary sanction to build a trolley road. It is proposed to make the gauge 3 feet, 6 inches, in order to offer as little obstruction as possible in narrow streets. The council considered the petition and imposed some conditions upon the granting of a franchise. The trolley poles are to be constructed so that they can be used for lighting purposes; the streets are to be paved at the expense of the company; when the franchise expires the corporation will have the option of buying the system.

## ELECTRIC HEATER CONTROL AT SOUTH CHICAGO.

B. J. Jones, superintendent of the South Chicago City Railway, has adopted the plan of having the inspectors that travel on the road regulate the electric heaters on the various cars. That is, the controlling switch which changes the connections of the heaters so as to give varying degrees of heat is locked up so as to be accessible only to the inspectors.

There are two reasons for this practice. One is that the conductors are liable to be poor judges of what is the right temperature for a car, or often careless about seeing that the right temperature is maintained. The other reason is, that in turning the ordinary heater controller switch a conductor with little knowledge of electricity or the knack of breaking arcs, is liable to turn the switch so as to draw an arc that will ruin it. Consequently the control of these switches is put entirely in the hands of the inspectors. There is, however, a main switch in the heater circuit whereby the conductors can shut off the heaters entirely. A switch suitable for the

purpose of breaking 12 amperes at 500 volts must be of different construction from the ordinary run of switches, but one has been found that answers the requirements.

## CABLE CARS FOR EDINBURGH.

Work was commenced last September and has been progressing through the winter months, changing most of the horse tramways in Edinburgh to the cable system. Ultimately 37 miles of cable track will be constructed which will give the city a modern and complete system of street railways. This alteration is being made so that it does not interfere with the daily traffic. Sections of about 300 yards of track and conduit are laid at a time and the horse cars continue operations. From the suburbs, Gorgie, Newington, Morningside and Murrayfield, progress is being made to the center of the city. It is expected that the work will be completed by the latter part of this year.

Electricity is proposed as a substitute for steam on the railways connecting Turin with Gassino and Moncalieri, Italy.



## OPERATING EXPENSES OF CONNECTICUT ROADS IN 1896.

The Railroad Commissioners of Connecticut have made their annual report of the earnings and expenses of all street railways in the state, for the fiscal year ending September 30, 1896.

The past year has been a very quiet one with the Connecticut railways and few additions have been made either to track mileage or equipment. With one exception all the roads paid operating expenses. Twenty-seven companies reported, two more than the previous year. The entire cost of the 351.92 miles of tracks has been \$16,538,223 and of the equipment, \$2,047,937. The gross earnings, for last year, amounted to \$2,589,619, being \$.2056 per car-mile and the operating expenses \$1,704,725 or \$.1353 per car-mile. An average dividend of 3.7 per cent was earned. From the tables, it appears that the large roads have not a great advantage over the small ones in expenses and earnings per car-mile. The greatest earning was reported from a road 4.7 miles in length, while the Bridgeport Company has the smallest expense account per car-mile. The following tables indicate the itemized operating expense account in dollars per car-mile. In all cases figures given below referring to miles of track are for the number of miles of single track.

### 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 45 closed, 71 open cars, 7 snow plows, 2 sweepers and 1 sprinkler; employs 200 men and carried 6,383,503 passengers with a car mileage of 1,721,147. The expense items were:

Repairs of roadbed and track.....	.0005
Repairs, buildings.....	.0004
Repairs, electric line construction.....	.0002
Removal of snow and ice.....	.0006
Repairs of cars.....	.0063
Harness, hay, etc.....	.0010
Electric motive power.....	.0111
Wages for transportation.....	.0535
Damages, gratuities to persons, etc.....	.0010
Insurance, accident and fire.....	.0113
Salaries.....	.0049
General expense account.....	.0060
Total expenses per car-mile.....	.0686
Gross earnings per car-mile.....	.1866

### CENTRAL RAILWAY AND ELECTRIC COMPANY OF NEW BRITAIN.

This company owns 12 closed cars, 20 open ones and 3 snow plows; employs 65 persons and has 13.65 miles of track. During the past year 2,600,458 passengers were carried and 401,284 miles run.

Repairs of road bed and track.....	.0081
Repairs of buildings.....	.0004
Repairs of electric line construction.....	.0035
Removal of snow and ice.....	.0010
Repairs of cars.....	.0091
Repairs of electric car equipment.....	.0032
Expense of horses.....	.0006
Electric motive power.....	.0300
Wages.....	.0575
Damages, losses, etc.....	.0007
Insurance.....	.0099
Salaries.....	.0073
Legal expenses.....	.0063
Other operating expenses.....	.0127
Total expense per car-mile.....	.1503
Earnings per car-mile.....	.2130

### DANBURY & BETHEL STREET RAILWAY COMPANY.

The equipment consists of 11 closed cars, 2 open cars, 2 snow plows and 1 sprinkler; 11.15 miles track; 1,661,703 passengers were carried; 359,635 car-miles run. There are 45 persons regularly employed.

Repairs of roadbed and track.....	.0035
Repairs of electric line construction.....	.0009
Removal of snow and ice.....	.0004
Repair of cars.....	.0050
Repairs of car equipment.....	.0037
Blacksmithing.....	.0025
Headlights and fires.....	.0023
Electric motive power.....	.0297
Wages.....	.0479
Insurance.....	.0066
Salaries.....	.0108
Legal expenses, etc.....	.0051
Total expenses per car-mile.....	.1187
Gross earnings per car-mile.....	.1860

### 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 1,049,044 fares, and 267,229 car-miles run; 30 persons employed. There are 6.29 miles track.

Repairs of road bed and track.....	.0017
Repairs of buildings and fixtures.....	.0025
Repairs of electrical line construction.....	.0016
Removal of ice and snow.....	.0002
Repair of cars.....	.0128
Repair of car equipment.....	.0065
Electric motive power.....	.0132
Wages.....	.0569
Damages, etc.....	.0028
Insurance.....	.0011
Salaries.....	.0201
Transportation expenses.....	.0093
Park expenses.....	.0316
Total expenses per car-mile.....	.1603
Earnings per car-mile.....	.2091

### FAIR HAVEN & WESTVILLE RAILROAD COMPANY.

This company operates 53 closed and 46 open cars, 2 snow plows and 1 sweeper on 20.56 miles of track; employs 186 men, carried 5,538,585 passengers, with a car mileage of 1,308,660.

Repairs of roadbed and track.....	.0258
Repairs of buildings and fixtures.....	.0011
Repairs of electric line construction.....	.0033
Removal of snow and ice.....	.0009
Repairs of cars.....	.0090
Repairs of car equipment.....	.0041
Care of horses.....	.0003
Electric motive power.....	.0126
Wages.....	.0587
Damages.....	.0009
Insurance.....	.0009
Salaries.....	.0157
Sundries.....	.0235
Total expenses per car mile.....	.1568
Earnings per car-mile.....	.2148

### HARTFORD STREET RAILWAY COMPANY.

This company has 89 open, 78 closed cars, 18 sweepers and snow plows, running on 64.71 miles of track; employs 170 men, carried 10,851,971 passengers, with 2,814,072 car-miles run.

Repairs of roadbed and track.....	.0095
Repairs of plant, tools, etc.....	.0010
Repairs of buildings and fixtures.....	.0005

## Street Railway Review

Repairs of line construction.....	.0015
Removal of snow and ice.....	.0020
Repairs of cars.....	.0084
Repairs of car equipment.....	.0068
Care of horses.....	.0015
Electric motive power.....	.0191
Wages.....	.0621
Damages, etc.....	.0037
Insurance.....	.0009
Salaries.....	.0052
Incidental expenses.....	.0045
Printing.....	.0011
Legal expenses.....	.0004
Car supplies.....	.0022
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Total expenses per car-mile.....	.1304
Earnings per car-mile.....	.1888

### HARTFORD, MANCHESTER & ROCKVILLE RAILROAD COMPANY.

There are 15 open and 12 closed cars and 2 snow plows, run on 12.93 miles of tracks. There were 631,836 passengers carried and 254,835 car-miles run. Employees, 60.

Repairs of roadbed and track.....	.0111
Repairs of buildings and fixtures.....	.0036
Repairs of line construction.....	.0049
Removal of snow and ice.....	.0005
Repairs of cars.....	.0131
Repairs of car equipment.....	.0110
Electric motive power.....	.0336
Damages, etc.....	.0030
Insurance.....	.0039
Wages.....	.0596
Salaries.....	.0248
Rent.....	.0023
Operating expenses.....	.0200
Tool repairs.....	.0005
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Total expenses, per car-mile.....	.1919
Earnings per car-mile.....	.2128

### 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 629,655 passengers with a car mileage of 337,260. Employees, 24.

Repairs of road bed and track.....	.0068
Repairs of line construction.....	.0004
Repairs of cars.....	.0009
Repairs of car equipment.....	.0035
Electric motive power.....	.0242
Wages.....	.0371
Insurance.....	.0021
Salaries.....	.0027
Rent of other roads.....	.0349
General expense.....	.0007
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Total expenses per car-mile.....	.1213
Earnings per car-mile.....	.1545

### MERIDEN ELECTRIC RAILROAD COMPANY.

The road is equipped as follows: 25 open and 21 closed cars and 4 snow plows, operating on 17 miles of track. The passengers carried numbered 2,061,094 with a car mileage of 583,951. Employees, 75.

Repairs of roadbed and track.....	.0079
Repairs of buildings and fixtures.....	.0002
Repairs of line construction.....	.0026
Repairs of cars.....	.0037
Repairs of car equipment.....	.0086
Electric motive power.....	.0239
Wages.....	.0532

Damages, etc.....	.0029
Insurance.....	.0085
Miscellaneous operating expenses.....	.0186
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Total expenses, per car-mile.....	.1202
Earnings per car-mile.....	.1792

### MIDDLETOWN STREET RAILWAY COMPANY.

There are 9 open and 4 closed cars with 1 snow plow running on 4.75 miles of tracks. The road carried 487,951 passengers with a car mileage of 117,598. Employees, 15.

Repairs of roadbed and track.....	.0037
Repairs of electric line construction.....	.0013
Removal of snow and ice.....	.0007
Repairs of cars.....	.0063
Repairs of car equipment.....	.0024
Care of horses.....	.0009
Electric motive power.....	.0409
Wages.....	.0532
Damages, etc.....	.0001
Insurance.....	.0011
Salaries.....	.0127
Car house account.....	.0118
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Total expense per car-mile.....	.1351
Earnings per car-mile.....	.1984

### NEW HAVEN & CENTERVILLE STREET RAILWAY COMPANY.

This company owns 10 open and 10 closed cars, 1 snow plow and 11.25 miles of track. There were carried 1,181,558 passengers, and 300,408 car-miles run. Employees, 33.

Repairs of roadbed and track.....	.0001
Repairs of buildings and fixtures.....	.0001
Repairs of line construction.....	.0047
Removal of snow and ice.....	.0003
Repairs of cars.....	.0015
Repairs of car equipment.....	.0013
Electric motive power.....	.0336
Wages.....	.0595
Damages.....	.0003
Insurance.....	.0017
Salaries.....	.0133
Miscellaneous.....	.0010
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Total expenses per car-mile.....	.1174
Earnings per car-mile.....	.1916

### NEW HAVEN STREET RAILWAY COMPANY.

There are 39 open and 34 closed cars belonging to this company, also 4 snow plows and 25.5 miles of track. Last year 4,466,080 passengers were carried and 1,181,206 car-miles were run. There are 165 persons employed.

Repairs of roadbed and track.....	.0052
Repairs of machinery.....	.0015
Repairs of line construction.....	.0009
Removal of snow and ice.....	.0006
Repairs of cars.....	.0065
Repairs of car equipment.....	.0048
Wages.....	.0522
Damages, etc.....	.0005
Insurance.....	.0016
Salaries.....	.0045
Sundries.....	.0053
Boiler and engine room service.....	.0220
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Total expenses per car-mile.....	.1056
Earnings per car mile.....	.1860

### NEW LONDON STREET RAILWAY COMPANY.

This company operates 16 open, 6 closed cars and 1 snow plow on 7.2 miles of track. Last year 1,136,548 fares were collected and 212,323 car-miles run. Employees, 23.

Repairs of roadbed and track.....	.0074
Repairs of buildings and fixtures.....	.0010
Repairs of line construction.....	.0008

Repairs of cars.....	.0064
Repairs of car equipment.....	.0040
Electric motive power.....	.0366
Wages.....	.0494
Insurance.....	.0080
Salaries.....	.0178
Miscellaneous.....	.0093

Total expenses per car-mile.....	.1407
Earnings per car-mile.....	.2480

NORWALK STREET RAILWAY COMPANY.

This company owns 9 open, 9 closed cars, 1 sprinkler and 1 snow plow, together with 7.25 miles of track. Last year 1,099,843 passengers were carried and 241,532 car-miles run. Employees, 27.

Repairs of roadbed and track.....	.0088
Repairs of buildings and fixtures.....	.0003
Repairs of line construction.....	.0009
Removal of snow and ice.....	.0002
Repairs of cars.....	.0071
Electric motive power.....	.0290
Wages.....	.0622
Damages, etc.....	.0113
Insurance.....	.0011
Salaries.....	.0212
Miscellaneous.....	.0281

Total expenses per car-mile.....	.1625
Earnings per car-mile.....	.2216

NORWALK TRAMWAY COMPANY.

This company owns 16 open, 8 closed cars, 1 snow plow and 16.85 miles of track. Last year 1,126,875 fares were collected, and 289,290 car-miles run. Thirty employees.

Repairs of road bed and track.....	.0059
Repairs of buildings and fixtures.....	.0002
Repairs of line construction.....	.0037
Removal of snow and ice.....	.0005
Repairs of cars.....	.0034
Repairs of car equipment.....	.0032
Office expense.....	.0046
Legal expense.....	.0004
Contingent.....	.0007
Electric motive power.....	.0247
Wages.....	.0458
Damages, etc.....	.0009
Insurance.....	.0058
Salaries.....	.0060
Car house.....	.0054
Miscellaneous.....	.0027

Total expenses per car-mile.....	.1130
Earnings per car-mile.....	.1734

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 1,987,519 passengers were carried and 297,265 car-miles run. Employees, 45.

Repairs of roadbed and track.....	.0163
Repairs of buildings.....	.0004
Repairs of line construction.....	.0010
Removal of snow and ice.....	.0006
Repairs of cars.....	.0049
Repairs of car equipment.....	.0101
Electric motive power.....	.0378
Wages.....	.0620
Insurance.....	.0083
Salaries.....	.0226
Operating expenses.....	.0201

Total expenses per car-mile.....	.1862
Earnings per car-mile.....	.2852

SOUTHINGTON & PLANTSVILLE TRAMWAY COMPANY.

The 7 employes of this road operate 3 closed cars on 1.5 miles of tracks. Last year 101,958 passengers were carried and 49,385 car-miles made.

Repairs of road bed and track.....	.0061
Repairs of buildings.....	.0025
Repairs of line construction.....	.0021
Removal of snow and ice.....	.0003
Repairs of cars.....	.0049
Repairs of car equipment.....	.0024
Wages.....	.0293
Insurance.....	.0010
Salary.....	.0325
Coal.....	.0200
Supplies.....	.0016
General expense.....	.0055

Total expenses per car-mile.....	.1001
Earnings per car-mile.....	.1048

STAMFORD STREET RAILROAD COMPANY.

The company runs 7 open and 6 closed cars on 10.24 miles of track. Last year 629,082 passengers were carried and 183,060 car-miles run. There are 27 employees.

Repairs of roadbed and track.....	.0041
Repairs of buildings.....	.0001
Repairs of electric line construction.....	.0012
Removal of snow and ice.....	.0007
Repairs of cars.....	.0019
Repairs of car equipment.....	.0027
Care of horses.....	.0038
Electric motive power.....	.0438
Wages.....	.0443
Damages, etc.....	.0003
Insurance.....	.0042
Salaries.....	.0072
Other expenses.....	.0190

Total expenses per car-mile.....	.1345
Earnings per car-mile.....	.1661

WATERBURY TRACTION COMPANY.

This company operates 26 open, 20 closed cars, 1 sweeper and 2 snow plows on 11.46 miles of track. Last year 2,823,684 fares were collected and 490,056 car-miles run. The employes number 75.

Repairs of roadbed and track.....	.0077
Repairs of line construction.....	.0021
Removal of snow and ice.....	.0007
Repairs of cars.....	.0087
Repairs of car equipment.....	.0026
Team of horses.....	.0011
Electric motive power.....	.0208
Wages.....	.0713
Damages.....	.0004
Insurance.....	.0028
Salaries.....	.0072
Transportation.....	.0080
Legal expenses.....	.0038
General expenses.....	.0010

Total expenses per car-mile.....	.1472
Earnings per car-mile.....	.2801

WESTPORT & SAUGATUCK STREET RAILWAY COMPANY.

This company owns 2 open, 3 closed cars and 5.25 miles of track. Last year 157,555 persons were carried and 61,320 car-miles run. Employees number 8.

Repairs of roadbed and track.....	.0155
Repairs of buildings.....	.0001
Repairs of line construction.....	.0019
Removal of snow and ice.....	.0010
Care of horses.....	.0009



Electric motive power.....	.0210
Wages.....	.0516
Insurance.....	.0005
Total expenses per car-mile.....	
Earnings per car-mile.....	.1068

WEST SHORE STREET RAILWAY COMPANY OF WEST HAVEN.

The company runs 2 open and 3 closed cars on 4.11 miles of track. Last year 6,669 fares were collected and 3,916 car-miles run. Employs number 5.

Repairs electric line construction.....	.0081
Electric motive power.....	.0357
Wages.....	.0632
Insurance.....	.0184
General expenses.....	.1737
Total operating expenses per car-mile.....	
Earnings per car-mile.....	.3309

WINCHESTER AVENUE RAILROAD COMPANY, WEST HAVEN.

This company owns 52 open, 39 closed cars, 4 snow plows and 16.77 miles of track; 5,345,848 passengers were carried and 921,468 car-miles run; 150 men are employed.

Repairs of roadbed and track.....	.0038
Repairs of buildings.....	.0004
Repairs of line construction.....	.0020
Removal of snow and ice.....	.0002
Repairs of cars.....	.0068
Repairs of car equipment.....	.0059
Care of horses.....	.0014
Electric motive power.....	.0205
Wages.....	.0728
Damages, etc.....	.0007
Insurance.....	.0053
Salaries.....	.0123
Transportation.....	.0110
Maintenance.....	.0114
General expense.....	.0109
Total expenses per car-mile.....	
Earnings per car-mile.....	.1663
Earnings per car-mile.....	
	.2739

## OVERHEAD TROLLEY IN ELEVATED RAILWAY SHOPS.

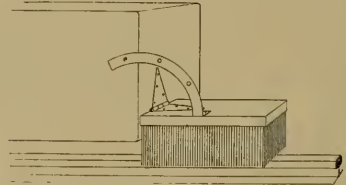
Considerable trouble has been experienced in the shops of the Lake Street Elevated, in this city, in handling the cars for repair work. The third rail, which carries the current, was a constant menace to the workmen and a source of trouble from short circuits by some one dropping iron tools



TROLLEY ATTACHMENT.

upon the rails. To obviate this difficulty, Mr. Tabbot, the electrician, designed a very ingenious trolley device which is now in operation.

The accompanying cut shows the arrangement of trolley and how it is applied. The overhead wires are about ten inches apart and both of the same potential. The cable is joined to the trolley carriage by a universal joint. At the



ICE BRUSH ON THIRD RAIL.

other end connection is made by a male and female joint to the motors by means of the line which is usually used to carry the current to heat the cars. This connection can be quickly and easily made or broken and the cars can be moved from place to place without danger or difficulty.

A simple contrivance has been put upon the elevated cars to free the third rail from ice or dirt. A small wire brush is fastened on the box in front of the contact shoe by means of a hinge. Whenever there is need of its use, it is let down upon the rail and held in place by a set screw as shown in the illustration.

## ELECTRIC TRACTION.

"Electric Traction" was the subject of a paper read by Edward Barrington before the Western Society of Engineers, at Chicago. In it some interesting figures are given on the cost, mileage, traffic and equipment of the railways of the country. The trolley system receives much attention and some adverse criticism. Favorable comment is made upon the storage battery and conduit lines, the "button" and "Tesla" systems of the Westinghouse company.

The use of electric traction by the Baltimore & Ohio, the New York & New Haven Railroads, the design of the Baldwin-Westinghouse electric locomotives and several other examples of electricity applied to steam roads were given. This part of the paper was especially singled out for a target in the discussion and the points brought out were of much value and interest. In regard to the use of electricity instead of steam for handling modern or suburban traffic, John F. Wallace said: "Treating the question of the substitution of one power for the other, while electric power may be deemed more desirable for various reasons that can not be demonstrated by dollars and cents, still the main underlying feature must, after all, be that of economy. The problem which the railroad manager has to face in considering the matter is, will the interest on the cost of construction of the new application, plus operating and maintenance charges, be less than the cost of steam power plus operation and maintenance expenses. In considering any individual application, while the question might be answered in favor of electricity on a new installation, the problem is complicated by the difficulty of making satisfactory disposition of the existing steam plants with which suburban railroad lines are now equipped. When it comes to sacrificing

the value of the present property, the cost of an electrical application is much enhanced.

"I do not understand that any application has been long enough in use to determine all the elements of cost that enter into the adoption of electric traction, in order that careful comparisons may be made with the well-known elements of cost surrounding the use of steam. Sufficient data also have not been obtained to enable railroad men to arrive at a definite opinion as to what system of electric transportation is best; whether it is better to use large, powerful, independent motors hauling trailers, or whether it is better to use combination motor and passenger cars with a large number of transportation units. While on lines of light and regular traffic, motor cars which carry from 75 to 100 passengers and leave at frequent intervals may fulfill the requirements of that business, on the other hand this business may be so heavy and irregular that units of this character running even one minute apart may not be able to properly take care of it; or, the requirements of speed may be such that it would not be safe to run the small units of transportation so close together. Therefore the use of transportation units that would enable from 500 to 1,000 passengers to be carried on each train, leaving at slightly longer intervals during the busy hours of the day, might be absolutely essential.

"A number of railroads having a large suburban business have been watching the development of electric traction for years, and there is but little question that they would be willing to substitute this power for steam if the questions that suggest themselves to railroad managers could be accurately and satisfactorily answered.

"In reference to special applications, probably the railroad most favorably situated for the adoption of electric power for handling its heavy suburban traffic, is the Illinois Central Railroad.

"The writer of the original paper hinted at a few foundation principles which may be formulated in the general proposition that the field for electric power lies where the service to be performed consists of small and frequent units of transportation moved over short distances, and that steam is more desirable for large and heavy units of transportation, moved infrequently over long distances and at high speeds."

Mr. Brinckerhoff said in part:

"I think an examination of the third rail system of the Metropolitan will show that we have handled the question of continuous contact in as complicated track layouts as occur in any surface work. I do not pretend to say that just as it stands this would make the ideal surface equipment, but I cannot see why we should feel that having gone so far successfully, we need fear that surface railroad conditions will introduce complications that are beyond the ingenuity of man to overcome.

"As to the system of automatic block signals, that is a serious matter. I can say, however, that we are operating at present a continuous block signal system with an independent wire circuit which does not conflict with our track return. These signals make about 35,000 movements per day and are giving satisfactory service. The question of practicability of handling the suburban passenger service of some of the largest steam railroads coming into Chicago, is really not doubted by railway engineers, and many of them would admit, if they felt it policy to do so, that they could operate cheaper with such an equipment. The most of them are, I should judge, in this position—they have now a large and expensive steam equipment which they would be

obliged to discard, and until this must be renewed or they are forced to make a change by the competition of competing lines, they do not feel justified to go into such large expense. To my mind this question has ceased to be one of engineering; it is rather in the hands of the business managers; when they say the word, the engineers I think can attend to the details without any very great departure from present methods.

"We have demonstrated to the other elevated roads in Chicago that we are making a very considerable saving over steam. They have either changed or are contemplating changing their motive power."

After mentioning the cost of cable and electric systems and observing that an electrical engineer could accomplish almost anything in power transmission if allowed unlimited means, Mr. Summers spoke as follows:

"The New York, New Haven & Hartford Railroad on its Nantasket Beach division in the summer of '95 equipped the division with electricity; it ran an average of 150 trains per day. It made, at that time, something of a radical departure in substituting the Figure 8 trolley wire, which has since been frequently used, the idea being to prevent any jumping of the trolley, which is one of the principal difficulties in high speed trolley service. The fact is, quite significant that when the service was extended the third rail system was used the rail being put in the center of the track; it cleared the pilots about 2½ inches. It was found occasionally an engine would go over the road with some part hanging low, and the result was the electric trains stopped until the steam engine got off the section. In order that the short circuits occurring on this division should not affect the rest of the system a separate feeder system was used, equipped with magnetic circuit breakers. The third rail was discontinued at crossings and the current carried on by means of an insulated cable, the trains being carried over by momentum. There have been many suggestions made as to carrying a connection through the train and keeping one contact until the next is made. The third rail service system is entirely experimental, and I do not think there is any evidence to show that it is as yet practicable."

Mr. Lundie: "Traction in its very nature is mechanical, and I simply make this remark to lead on to the fact that this whole question is one of transmission of energy from a central power station. In a central power station by using large units you can get out of a pound of coal a great many more foot-pounds of energy than you get out of the same amount of coal out on the road in a locomotive. Mr. Barrington gives an illustration of a central station where 2.89 pounds of coal were required per electrical horse-power-hour when the engines were running condensing as designed. When they were operating non-condensing, owing to the lack of water, they required 3.93 pounds of coal to produce the same energy. Say then, that the average of 3.4 pounds of coal are required to develop an electrical horse-power-hour. This would probably be equivalent to 5 pounds of this coal out on the road per brake horse-power-hour. Now, then, let me quote from Mr. Goss' experiments on his locomotive at Purdue. These are probably as reliable experiments as we have. Mr. Goss, out of a series of twenty tests, gives an average of 5.3 pounds coal actually used per indicated horse-power-hour. We may then figure on 6½ pounds of coal developing a horse-power-hour at the rim of the wheel, so that you have 5 pounds in one case and 6½ in another, or 1½ pounds saving in favor of the central sta-

tion. Against this pound and a half you have to consider the capital invested in the power house, and the transmission system. You must also take into account the depreciation in the transmission system."

Mr. Coster, manager of the Chicago office of the Westinghouse Electric & Manufacturing Company: "I only wish to say a few words. I am not going to discuss Mr. Barrington's paper, but I am desirous of giving a few facts which I just penciled out while listening to some of the discussions. I think you are right, Mr. President, in your opening remarks when you said that if the electric companies could prove to the railway companies that there was economy in installing an electric plant to take the place of the steam plant, they would do so. Now let us take, for instance, the Illinois Central Railroad, which is very near to our hearts, as we all use it very often. It has a very excellent locomotive equipment for the suburban service. This equipment, I suppose, cost a good deal of money; if it were to do away with this equipment and replace it by electric power, I suppose the locomotives could not be used for the cross-country service. In that case the electric companies would be at a disadvantage, and I do not blame the Illinois Central for not substituting electric traction at the present time, for it would not pay it as long as it had these elegant locomotives. They will have to be worn out first. If, on the other hand, the Illinois Central Railroad equipping its roads afresh today, I am sure that several companies could demonstrate to its satisfaction that it could operate the road cheaper by electricity than by steam. That is, not the entire road, but only the suburban traffic of the road."

Mr. Arnold: "The question which, it seems to me, the steam railroads must meet, is not a question of whether they can operate cheaper than electric roads can, but whether they can hold their present traffic in competition with electric roads which have already paralleled them in many instances, and will continue to do so, although they may not parallel them for great distances for some time to come. They will parallel them, however, for suburban service and between county seats, as in the case mentioned by the chairman, where there are a number of cities of from three to five or six thousand people, varying from six to twenty miles apart. This affects a certain portion of the steam railroad traffic, or draws from it, but for through traffic lines I am not of the opinion that the electric motor for heavy traffic can at present compete with the steam locomotive for economy, if it is judged entirely from the standpoint of fuel consumption where the interest on the investment is considered. The figures given here tonight we have seen check out very closely. The electric advocate gives the cost per horse-power-hour as .2 of a cent at the power station; the locomotive man gives it as .26 of a cent at the locomotive, with a simple engine, while with a compound engine he gives it 20 per cent better; that brings it to pretty nearly to .2 of a cent per horse power hour delivered at the locomotive. This being the case, you cannot expect to produce a horse-power-hour in a power station at .2 of a cent and deliver it to an electric locomotive some miles away for .26 of a cent, and effect a saving, for the reason that the difference of .06 of a cent per horse power hour must pay the interest on the extra cost of the electrical equipment of a road over its present cost as operated by steam, which I do not think it can do on roads operating few and heavy trains at long intervals, in accordance with the present standard system of railroading.

This is the comparison that it gives with a heavy freight or passenger service, but when you come to the condition of handling small trains at short intervals, I think that the electric trains will supersede the steam trains in almost every instance, and the prominent case that we have in mind is the Illinois Central right here near us. I understand by reading over the discussion which took place here a week ago that the officials of the road are willing, or rather have expressed an indication that they might adopt electricity if they could be convinced of the economy of it. If I read the figures correctly which were handed me a couple of hours ago of the operating expenses of the Illinois Central road, and the estimated cost of operating it by electricity made by their own engineers, I figure out a saving of something like \$250 per day from their own figures. If that is the case, the question, it seems to me, is decided in favor of electricity. These figures include interest against the cost of both locomotive equipment and the electrical equipment, and therefore take in the whole question."

#### CHARLES BRYANT FAIRCHILD.

The extensive experience and knowledge of street railway affairs of Mr. Fairchild will, hereafter, be used to promote the interests of the Standard Air Brake Company.

Mr. Fairchild was born at Monterey, Mass., January 4, 1842. His early education was received at the public schools near Binghamton, N. Y., where his family had removed, and Susquehanna Seminary.

His course was brought to an abrupt close by the opening of the war. He enlisted in the twenty-seventh regiment of New York volunteers, was captured and confined in rebel prisons for nearly a year. After his release, he received the commission of first lieutenant and assigned to duty in the Kanawha Valley, W. Va.

When the war closed a course of study was taken up at the State Normal School at Brookport, N. Y., and soon after his graduation here, he took the degree of A. M. from Amherst College. A professorship was tendered him in the Normal school and he held this position until January, 1871. His health having failed he engaged in horticulture and farming pursuits near Raleigh, N. C., for nine years. He then removed to New York city where he taught in the grammar schools.

Not until 1885 was his attention given to street railway work. Then a cable railway scheme was invented but did not prove to be a great success. The Street Railway Journal secured his services in 1889, first as associate editor and one year after, as editor.

Two books, "History of the Twenty-seventh Regiment, N. Y. Volunteers" and "Street Railways," are the products of his pen.

In 1895 his editorial duties ended and his attention was given to the development of an emergency pavement brake for street railways. On December 4, 1896, Mr. Fairchild entered the service of the Standard Air-Brake Company and his brake will be manufactured by this concern.



C. B. FAIRCHILD.



## SUCCESSFUL BENEFIT ASSOCIATION.

**In Existence 12 Years—Has Now a Trust Fund of \$88,000—  
\$22,000 Paid Death and Sick Claims.**

Nearly twelve years ago there was formed in this city one of the best benefit societies today existing in America. When the twelve hour law relating to street railroads went into effect, May, 1886, the conductors and drivers of the Washington & Georgetown Railroad Company, now the Capital Traction Company, celebrated the happy event by decorating their horses and cars with flags and bunting. At the same time Mr. Hurt, the then president of the company, congratulated his subordinates on their success by presenting them with his personal check for \$500. On being asked the best disposition to make of this money Mr. Hurt suggested the formation of a relief association, a proposition that at once met with the approval of all parties interested. A constitution and by-laws were drafted by Mr. Hurt, and after a few preliminary meetings a permanent organization was effected August 2, the same year. John Larowe and Mr. Hurt were elected president and secretary respectively. The society was barely organized when the Washington & Georgetown Company came to its assistance with the substantial donation of \$5,000.

Only employes of the road are eligible for membership and when they leave the service of the company their membership ceases.

The prime object of the Washington & Georgetown Railroad Employes' Relief Association is the immediate payment of sick and death benefits to members. As it now exists the association is similar to no other organization in the world, but embodies the features of many. It may very properly be termed a savings bank, life insurance company, mutual benefit association and is not unlike a building society. It is necessarily more prosperous today than ever, and during its existence, by safe and judicious investment, now has a capital of \$88,283. On January 1, of this year, there was on hand in cash, \$3,853 and secured outstanding notes for \$84,430. The total charge against each account for the same time was \$6.58 which was offset by \$4.22 received for interest, leaving a net individual expense of \$2.36. The average annual expense to each member is not more than \$2. Up to January 1, 1897, there has been paid in sick benefits \$18,030 and \$4,000 on account of deaths.

The monthly dues are \$1.00 and on the death of a member an assessment of 50 cents is levied. The decease of a member's wife calls for an assessment of 25 cents. During sickness or other disability \$6 a week is paid during illness. There is no limit to the amount of the latter and one member who is yet drawing this weekly stipend received on the same account last year \$137. On the demise of a member his family receives \$100. The death of a member's wife entitles him to \$50, although no monthly dues have been paid for her. The advantage of the organization was practically demonstrated not long after its inception, on the death of a young Englishman employed on the road. He had no friends in this country. Had he not been a member of the association it is not difficult to say what disposition would have been made of his body. Probably Potter's field would have kept it for a few hours and subsequently a dissecting table. As it is his remains now peacefully rest in Oak Hill cemetery on the banks of picturesque Rock Creek,

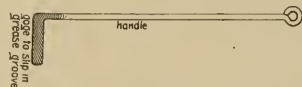
for which the railroad company is responsible, are safely invested at six per cent. This interest is semi-annually credited each member pro rata. At a low rate members can borrow from the association on good security. Many members make deposits and get six per cent. In some instances their savings represent a snug sum. On withdrawal a member receives his dividend. One such who entered the association at its birth left the service of the company this month. He had paid in a total of \$120, and had enjoyed several sick benefits. On his severance he drew out \$110.67. In another case a member had paid in \$11.63, received \$11.00 in sick benefits and leaving the road drew out \$8.50. And yet there are men in the employ of the company who are not members of the association. On more than one occasion such men have been buried by the generosity of their associates. It is not necessary to state that such charity is not naturally extended with that free heartedness that would obtain under other circumstances.

Every month the secretary of the association prepares a balance sheet that is conspicuously posted in the office for the benefit of members. The books of the society are at all times open for inspection, and the officers serve without compensation. The current expenses for 1896 were \$196.39. January 1, 1897, the membership amounted to 475, in which is included officers and directors of the road.

Much credit is due Mr. Hurt for the admirable success of the association, of which he is practically the father.

## A CLEARANCE DETERMINER FOR GENERAL ELECTRIC MOTORS.

It has always been somewhat of a problem to determine satisfactorily the clearance between armature and fields in the G. E. 800 motor. Indeed, some prefer to relin the armature bearings much more frequently than is necessary rather than run the risk that attaches to depending on available methods of measurement. A little device that originated



on the Lyon & Boston system solves this problem as satisfactorily as any, and with it the measurement of clearance is made very easy. It is simply an L-shaped gage of the general form as shown in the accompanying engraving. The dimensions of course are varied to suit the motor equipment, and the thinness to which it is thought desirable to wear the bearings. This gage is thrust down into the grease cup and a dangerously small clearance is discovered by entering the lower shank of the L into the groove that is cut lengthwise of the bearing for grease. This groove being always the same depth the clearance is accurately found.

A locomotive of the N. Y., N. H. & H. R. R. collided with an electric car at Broad Cove Crossing, Somerset, Mass. The electric car was smashed into splinters and the locomotive, together with two coaches, was derailed, but miraculously no one was seriously injured. A snow storm was raging at the time which prevented the motorman and conductor from seeing the train until it was upon them and they jumped, saving their lives.

### THE REPAIR SHOPS OF THE NORTH CHICAGO STREET RAILROAD.

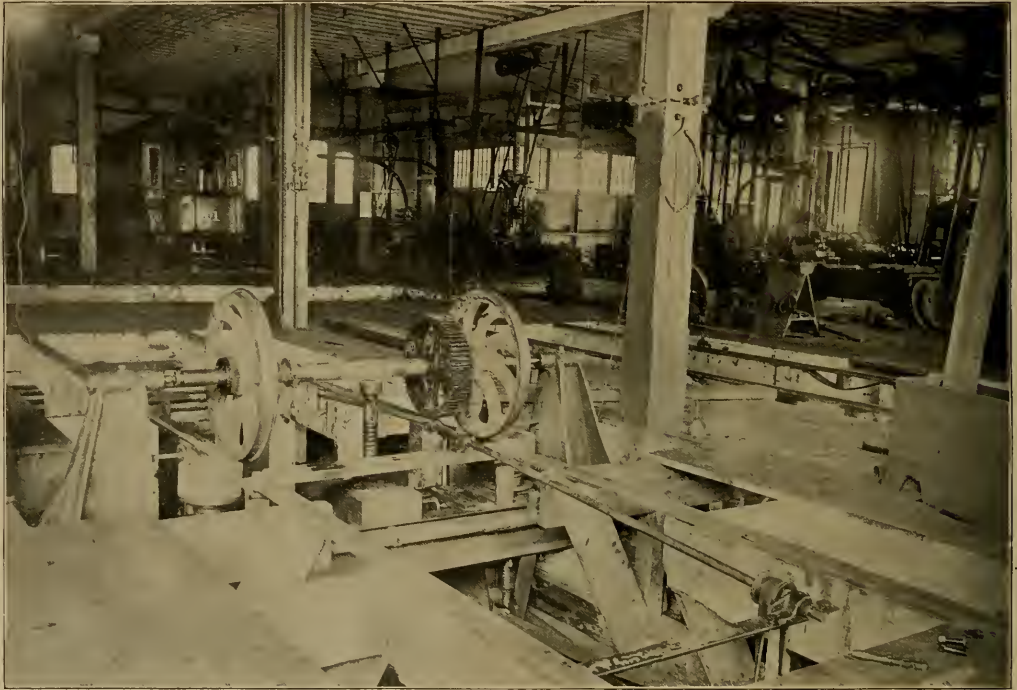
The North Chicago Street Railroad has well equipped its repair shop and inaugurated a system of daily inspection, so that a defective part in any machine receives immediate attention. About 16 men attend to 200 motor cars, besides looking after the shop repairs of the cable grips, road, track and power house. The shop is under the management of Mr. Lynch, who is constantly making improvements and adding labor saving devices.

Our illustration, furnished by the Paige Iron Works, represents a part of the shop. In the foreground is an emery wheel for grinding flattened car wheels. The axle

ing, and to swing them around to the lathe at the rear or transfer them from the track to the traveling crane overhead. On this lathe a hammered steel shaft is bored out and cut off with proper dimensions for the motor pinions. The teeth are then cut on a planer from which the head stock has been removed and a special device fitted for holding the cutter. In this way 6 pinions or 10 gears can be cut at one time.

Whenever it is necessary to take out the axles and wheels the car is run on a track over the pits and a removable piece of track is taken out. The wheels are let down on a truck which runs along an 18-inch tramway on the floor of the pit.

The whole shop is conducted in an able manner and is a model of its kind.



WHEEL GRINDER—NORTH CHICAGO STREET RAILWAY SHOPS.

and wheels, as shown, are removed from the truck, but this is unnecessary for the operation of the machine. A car is transferred to the track, jacked up, the axle placed in the centres, the gear case removed and the pinion of the grinding machine thrown in the motor gear as indicated. The two cup shaped emery wheels are adjusted by a screw to the proper height and so as to slightly cone the tread of the wheels, then operations begin. A large belt drives a jack shaft under the floor which runs the vertical shafts bearing the emery wheels at 850 r. p. m. The speed of the pinion is such that the wheels are turned around about five times a minute. The machine requires from 1 to 10 hours to put a set of flat wheels in proper condition.

The two curved pipes in the back ground of the cut are used as cranes to hold armatures or other parts needing turn-

### WILL NOT USE CONDUCTORS.

A few months ago we published a list of conductorless roads. In most cases it had become a physical impossibility to continue operations without cutting out this expense. The report on each case showed that it was possible to do this and still not increase the accident account.

The Petersburg, Va., Electric Railway has now dropped its conductors. An ordinance has been introduced at Pueblo, Col., to allow the company to operate without conductors. Dover, N. H., lines are now operating with cars in charge of the motormen.

The Leeds Corporation Tramway's Committee has decided to renew the rails on three of the tramway routes.

## STREET RAILWAY LAW.

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

*Negligence in Boarding Moving Electric Car.*

It is not negligence per se to board or alight from an electric car while in motion, and in an action for injuries sustained thereby the questions of negligence and contributory negligence are for the jury.

The doctrine of comparative negligence does not now exist in Illinois.

In its opinion the Court said:

The courts of other states have adopted the same rule, that it is negligence for a passenger to alight from a moving train of cars, the motive power of which is steam. The rule as applicable to steam railways is relaxed when applied to horse cars or street railways. *Railroad Co. v. Buck*, 96 Ind. 346; *Stoner v. Pennsylvania Co.*, 98 Ind. 384. *Beach on Contributory Negligence* (section 90) says: "It is well settled that it is not contributory negligence per se for one to alight from or to board a moving street car, and here, again, we find the severity of the rule as applicable to steam railways essentially relaxed." *Booth on Street Railway Law* (section 336) lays down the same rule in the following language: "Although the act of boarding a car while in motion is always attended with some risks, the rules applicable to persons entering cars operated by steam are not usually applied with the same strictness to street railways operated by horse power. It is a general rule, established by numerous decisions, that if a person who has the free use of his faculties and limbs has given proper notice of his desire to be taken up, and the speed of the car has been slackened in the usual manner, it is not negligence per se to attempt to get on while it is moving slowly, and that, if a person is injured under such circumstances, the question of his contributory negligence is ordinarily one of fact for the jury."

The doctrine is established in nearly all of the states where the question has arisen, that it is not negligence per se for a passenger to board or alight from a street car operated by horse power, and the question of contributory negligence is one of fact for the jury. *McDonough v. Railroad Co.*, 137 Mass. 210, 21 Am. & Eng. Cas. 354; *Eppendorf v. Railroad Co.*, 69 N. Y. 195; *Ganiard v. Railroad Co.*, 50 Hun. (N. Y.) 22; *Morrison v. Railroad Co.*, 130 N. Y. 166; *Railway Co. v. Green*, 56 Md. 84; *Railway Co. v. Williams*, 140 Ill. 275. In the case of *Sahlgaard v. Railway Co.*, 48 Minn. 232, where the motive power of the car was a cable, the same rule as above stated was held also to be applicable. In large and populous cities, where many cars are passing, and constantly receiving and discharging passengers at crossings, it is a well known fact that many of such passengers board cars and alight therefrom before the car has come to a full stop, and that they do so usually with perfect safety. It is well known, also, that street car companies tacitly invite many passengers to board and alight from their cars by checking up to a slow rate of speed and immediately starting up at a greater speed when the passenger is safely aboard or has alighted. It would be impossible for a court to lay down the rules as to what particular rate of speed would be sufficient notice to a passenger that, if he attempted to get on or off, he would be held guilty of contributory negligence. It would also be a great hardship, and unjust to lay down a general rule that a passenger attempting to

board any street car while in motion at all should be held in contributory negligence. Every person is supposed to know that the boarding of a moving train or car is attended with the danger of a misstep or fall, and a fall beside a moving car is liable to bring some part of the body or limbs in danger of being crushed. It is the duty of those having control and management of cars designated for traffic on the public streets to bring such cars to a full stop at such places as are convenient and necessary for the purpose of discharging and receiving passengers, and it is no less the duty of passengers in getting off such cars to observe due precaution for their own safety. We cannot say, however, that it is inconsistent with ordinary care and caution for a person to board a street car while in motion. Whether one has not exercised due care or caution in so doing is to be determined by the particular circumstances in each case, and is, therefore, a question of fact to be submitted to the jury.

The cases heretofore cited in which it has been held that it is not negligence per se for a person to board or alight from a street car while in motion, have reference in a great degree to horse cars. As we have stated, there is a wide distinction in cases of such motive power, as the act is not in itself negligence, while in cars propelled by steam it is negligence to do so. Where the motive power is electricity, a question not entirely free from difficulty is presented. The modern progress of methods of transportation, the recent discoveries of the possibilities of electricity as a motive power, and the perfection which it has within a few years developed and attained, have demonstrated a power popular as a method of transit. The purpose to which a power of this character is applied must to some extent be considered. Where horses were formerly used, electricity has now in a measure superseded. The same style and often the same cars are used, the same streets are traveled, and a like number of stops, and in like places, are made, to receive and deliver passengers. Electricity as a motive power, while stronger and more powerful and with possibilities of a greater speed, is at the same time more nearly under the control of the person in charge than horse power. The strict rule in force regarding the negligence of a person alighting or boarding an ordinary train of steam cars had for it many good and sufficient reasons, which are not applicable to the electric car as in general use. In the latter case stops are frequent, and opportunity for great speed is not presented. Steps for passengers are near the ground, and the chances of a misstep or fall are not so great as in steam cars as constructed. Streets on such lines are generally paved, and in that respect passengers may safely depart or board such cars in one place as another, whereas, in the case of steam cars, platforms are generally provided. While in electric cars the possibilities of speed are greater than in the case of horse cars, yet the general operation and management of such cars so nearly approaches to that of horse cars that it must be held that the same rule of law which, in the cases cited and a long line of other cases, holds that it is not negligence per se to board or depart from such cars while in motion is also applicable to electric cars.

(Supreme Court of Illinois, *Cicero & Proviso Street Railway Company vs. Meixner*, 4 American and English Railroad Cases (N. S.) 246; 160 Illinois Reports 320.)



(NOTE. In *Omaha Street Railway Company vs. Martin*, 4 American & English Railroad Cases (N. S.) 1, the Supreme Court of Nebraska reached the same conclusion holding that whether the act of a person in attempting to board a moving street car is negligence or not, is generally a fact to be determined by the jury taking into consideration all the circumstances in evidence in the case.—E.D.)

*Riding Bicycle on Cable Car Track—Injury by Car Approaching From Behind.*

There was evidence that plaintiff was riding on a bicycle upon the "slot" between the rails of a cable car track, and was knocked down by a car that approached from behind, without warning, by sounding of the gong, or otherwise. *Held*, that he was lawfully upon the track; that although, being in a place of danger, he was bound to exercise corresponding care, he was not under a duty as matter of law to look behind, and that there was enough to go to the jury on the questions of the cause of the accident, defendant's negligence and plaintiff's freedom from contributory negligence.

(Supreme Court of New York. *James H. Rooks vs. the Houston, West Street & Pavonia Ferry Railroad Company*; 29 Chicago Legal News 118.)

*Injury to Persons Driving Upon Track—Rights of Street Railway Company in Street—Duty of Motorman and of Persons in the Street—Greater Speed Than Permitted by Ordinance.*

Plaintiff emerged from an alley way, driving his team into an open street, upon which defendant ran its car. Immediately after leaving the alley, he looked in the direction from which the car came, and in consequence of trees and poles, saw none, and then approached the track. Before crossing it he made no particular effort to see whether a car was coming, and it was possible that the poles might have obstructed the view between him and the car. The car was running at the rate of 25 or 30 miles an hour, and no gong was sounded until just before the collision occurred in which plaintiff was injured. *Held*, that a nonsuit was improperly granted.

A street railway company has no superior right on a public street to that of the public at large, except the right to lay its track and operate cars; and if it adopts a dangerous propelling power it must be held to a degree of care proportionate to the increase of danger to the public.

A street car has the right of way in case of meeting a person or vehicle, but each party, in order to avoid accident, must exercise ordinary care and such reasonable prudence as the surrounding circumstances require; and what may be considered ordinary care in one case may amount to culpable negligence in another. The existence of negligence in each case must depend on the circumstances peculiar to it.

It is the duty of a motorman to notice whether or not the track is clear when he approaches a public crossing, and to sound the gong as warning.

While some courts hold that, where the speed is greater than that permitted by the ordinance, it is negligence per se, yet the better rule appears to be that it is a circumstance from which negligence may be inferred, and is always proper to be considered by the jury.

Persons traveling on a public street, along or across a street, are not held to the exercise of the same degree of care as when traveling along, or upon, or across, an ordinary steam railroad.

When the injured party was negligent in the first instance, such negligence will not defeat his action, if it be shown

that the defendant might have avoided the injury by the exercise of ordinary care and reasonable prudence.

As to whose negligence was the proximate cause of the accident is a question of fact for the jury.

Supreme Court of Utah. *Hall vs. Ogden City Street Railway Company*, 1 American and English Railway cases (N. S.) 77.

*Failure to Plead Improper Remarks of Counsel—Setting Aside Verdict—Verdict of Fifty Thousand Dollars.*

In a court of record the plaintiff, for the validity of his judgment, must see to it that the defendant is brought, or comes into court, and also that there are written pleadings showing a cause of action over which the court has jurisdiction. Thus, jurisdiction over the person and subject matter is made to appear.

The defendant is not called upon to do anything to show jurisdiction. If he is brought or comes into court, jurisdiction over him is obtained; his plea confers no jurisdiction, and his failure to plead deprives the court of no right; on the contrary it confers a right to enter his default, or, to speak more accurately, he has deprived himself of a right he otherwise had.

Proceeding to trial as if an issue had been made up, when there has been a failure to make an issue, is a waiver of the formal issue, and the trial will be treated as though an issue by plea had been formally tendered.

When verdict will be set aside therefor.—Under our system of practice there is, practically nothing which the court can do to remove the poison engendered by a maliciously unfair and unjust statement of counsel, save to grant a new trial. Whether the court will for such cause grant a new trial, is a matter of discretion. If, from all that was done, as well as from the verdict, the court is of the opinion that the jury were not thus improperly influenced, and that the verdict is, in no measure, the result of such unfair means, and that the parties have had the trial by jury which, under the constitution and law of this state is their right, the verdict should not, for the misconduct of counsel be set aside.

The very large and most unusual verdict rendered in this case was the result, in some measure, of the inflammatory and improper address of counsel. So believing, the court feel compelled to set aside the judgment.

(Appellate Court of Illinois, First District, *West Chicago Street Railway Company vs. Jesse Krueger*, 29 Chicago Legal News, 179.)

(NOTE.—In a similar case the same court, speaking by Shepherd J., of the improper remarks of counsel said: The effectual and perhaps only practicable remedy in ordinary cases, is for trial judges to impose the penalty of a new trial upon counsel who attempt to subvert justice by appeals to the sympathies and prejudices of a jury, in trials where such feelings may be easily aroused, and trial courts should not hesitate to use that authority in this regard.)

(North Chicago Street Railroad vs. Leonard, 29 Chicago Legal News 181. Ed.)

*Snow Piled on Side of Street by Street Car Company—Injury Caused Thereby to Conveyance on Street.*

1. In an action for damages, caused for personal injuries sustained by plaintiff through defendant's negligence, an averment in the petition, "that he was exercising due care in driving along said street, and but for the existence of said mass of snow so piled in said street, could have controlled and stopped his team, and his buggy would not have been overturned or any injury sustained by him," states facts suffi-

ciently to justify a submission to a jury of the question as to whether, under all the circumstances, the mass of hardened snow negligently piled upon the highway, was not the legal cause of the accident, which resulted in an injury to the plaintiff.

2. A street railway company, which, in removing the snow from its tracks, piles it up in the part of the street outside such tracks, and suffers it to remain there in masses, which constitutes an obstruction to travel, in violation of its general duty and of a local ordinance, is responsible for the injuries suffered by a traveler on the street whose carriage is upset by coming in contact with such mass of snow before he was able to regain control of the horses.

3. It is not, in itself, negligence to start an electric street car in the ordinary manner, and in the ordinary course of the operation of such car, while a team of horses, which manifest no symptoms of fright, is being driven past it.

(United States Circuit Court of Appeals, Sixth Circuit, McDonald v. Toledo Consolidated Street Railway Company, 29 Chicago Legal News 35.)

### MECHANICAL TRACTION IN PARIS.

(From Our Own Correspondent.)

Among the best known systems for street car traction in Paris the Rowan is first in popularity. The cars are the most comfortable and smooth in movement, and in winter the ample supply of hot water from the condensers heats them so admirably that it is no surprise to find them always crowded. Also they are very quick to start and speedy on the road, and in all respects far more agreeable to the public than the awkward trail cars drawn by the Mekarski six-wheeled compressed-air locomotives over the same line from the Louvre to Auteuil.

As will be seen by the description which follows, the

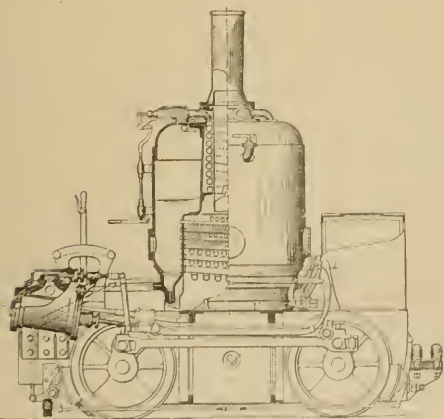


FIGURE 1—SINGLE BOILER ROWAN MOTOR.

boiler and motor, though apparently built in the car, in no way communicate any vibration to the vehicle, as is so uncomfortably noticeable in other forms of auto-cars (save electric) used in Paris. These cars are thus a luxury for the public, which has, after all, some claim to consideration as well as the shareholders.

There are two types of boilers in regular use with these cars—single vertical and twin vertical. Figure 1 shows the single boiler type of motor. The inner shell of the boiler is made square for a distance above the fire box, and has horizontal water tubes extending across it in both directions. These tubes are of different diameters, the largest being in

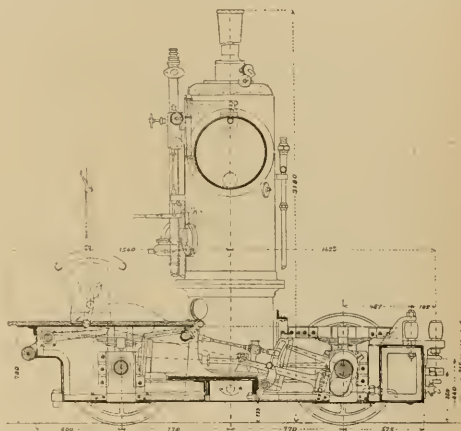


FIGURE 2—TWIN-BOILER ROWAN MOTOR—LONGITUDINAL SECTION.

the bottom row. Above this square chamber the inner shell of the boiler is conical and contains a worm in which the steam is superheated. The superheating coil is, by its position, protected from cold air currents. The upper portion of the boiler is bolted to the fire box-shell by means of flanges on both, so that the water tubes are readily accessible for cleaning and examination.

The cylinders and moving parts are perfectly protected from dust and mud by a casing which is not shown in the illustration. The motor is placed at the front end of the truck, where it will be under the driver's eye, and the truck balanced at the other end by a feed water tank.

In Figures 2, 3 and 4 are shown a longitudinal section, a plan and a transverse section of the twin-boiler motor. The boiler is similar to two single boilers coupled by a transverse trunk. When it is desired to inspect the tubes the outer shells, with the trunk, may be lifted clear of the lower parts of the boilers as with the single boiler.

As the public-way regulations often prescribe the width of the frames and outside cylinders are not always easy to restrict within the given limits, it becomes necessary to place the cylinders within the frame. This is the arrangement on the Paris city cars, and, as will be seen from the illustrations, all of the motor is comprised between the axles and the fire-boxes and the steel case which excludes mud and dust and serves as the frame. It also carries a feed water tank which is placed at the end opposite to the motor. Instead of entering their guides from the bottom, as is usually the case, the axle boxes slide in from the top. Doors in the upper side only, enable the driver to readily inspect the moving parts from his usual position on the foot plate. Upon each side of the frame, equidistant from the two axles, is riveted a channeled plate bent to the arc of a circle with the center of the truck as its center (see Figures 3 and 6). The forward

end of the car is carried on two leaf springs which have at their extremities shoes sliding in the semicircular channels. By this means free movement of the forward truck is allowed on the sharpest curves, of which there are some of 48 feet radius. It is a matter of but a few minutes to lift the car body, draw out the motor truck and put another in its place, if it is not desired to have the car lie idle while cleaning or repairing the motor. The construction of the

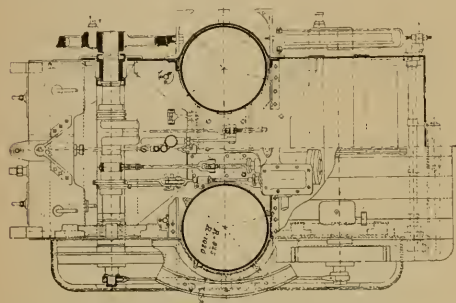


FIGURE 3—TWIN-BOILER ROWAN MOTOR—PLAN.

pony truck at the rear end of the car will be understood from Fig. 5.

The motor shown in Figures 2, 3 and 4 weighs 13,000 pounds empty, can evaporate 1,830 pounds of water per hour and exerts a tractive effort of 2,200 pounds. The adhesion of the drivers being augmented by the weight on the front bearings of the car body, is sufficient for such a draw-bar pull, even on muddy rails. An auto-car motor has the advantage that it may be made 2½ times lighter than an independent locomotive.

The surface condensers, placed upon the car roof, consist of a series of chambers formed by two thin sheets of cor-

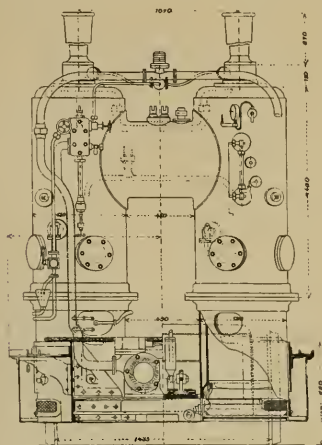


FIGURE 4—TWIN-BOILER ROWAN MOTOR—TRANSVERSE SECTION.

rugated copper riveted together, forming thus cavities ¾-inch in diameter. These chambers, placed side by side and hidden by the name board on the roof, are connected together at one end by the exhaust steam pipe, and at the other by a

collecting tube, which receives the water of condensation and leads it to the tanks underneath the car body. A rubber hose connects these tanks with the feed water tank in the engine frame and keeps the latter always supplied. The injector and pumps are contained in this latter tank.

In addition to the economy effected in the cost of heating the cars during the winter months, these condensing cars save in fuel from 2¾ to 3½ pounds of coke per mile run, or about \$200 per year, reckoning the annual mileage at 22,500 and coke at \$6 per ton of 2,240 pounds. Besides this economy there is the usual advantage of condensation, pure water and little boiler incrustation. In case the condensing water becomes highly heated and the engine is working at full power on an up grade, all of the steam may not be condensed. In this event it is led from the condenser into the upper part of the fire box, and there becoming super-heated escapes invisible into the outer atmosphere. The

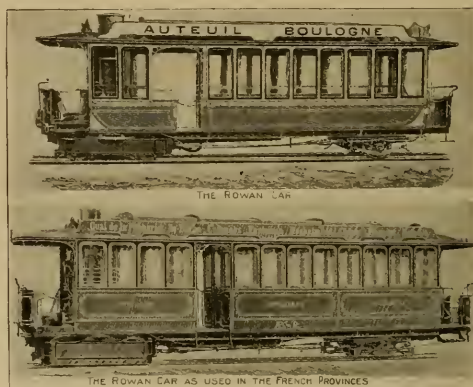


FIGURE 5 AND 6—THE ROWAN CAR.

double boilers have but one water gage and one pressure gage, and the car is easily managed by one driver in the most crowded streets.

Since the introduction of the Serpollet cars and the Romainville electric cars there has been more claim to elegance of appearance in Paris street cars, but until now the Rowan bogie cars remain the most handsome of any employed. The "galloping" movement of the first named, and of others, is entirely absent in the latter, because of the long wheel base. These cars haul a trailer with seats for 50 with ease, and can run a whole day without need of taking water. They burn about 6½ pounds of coke per mile run. The coke is carried in a number of little buckets at the driver's hand. With a full load of 50 passengers the car weighs about 28,000 pounds.

Friends of J. M. Atkinson, this city, will regret to learn of the death of his sister, who died in Chicago. He went east with the remains, for burial at Richmond, Va.

Albert M. King, superintendent of the Jackson & Sharp Company's car works, at Wilmington, Del., died January 1, of heart disease. He was 48 years of age. During his 18 years' service as superintendent Mr. King was brought into contact with many railroad men who will remember him with pleasure and regret his sad and sudden death.



## THE STREET RAILWAYS HAVE TO CONTEND WITH SNOW STORMS.

Street railway companies have learned that snow storms are very troublesome and costly experiences. The delay or stoppage of regular traffic causes not only a loss in fares but also of public prestige. So that much attention has been given to plows, brushes and sweepers and all companies are now more or less thoroughly prepared for such emergencies. These appliances have received a severe test during the past month for snow or sleet storms and intense cold weather have prevailed almost throughout the country. One source of trouble has been the packing of dry snow and dirt on the rails and the consequent damage to commutators and armature by careless use of the controllers. In the cities the frequent passage of cars together with a liberal use of salt and sand kept the rails in fair condition. The suburban and interurban lines had to contend with heavy drifts which in some cuts reached a depth of 6 feet. In Chicago, the roads were very successful in keeping the tracks clear even in the outlying districts. On one branch of the Calumet Electric the deep drifts and sunken rails prevented the operation of the line for half a day.

In New York City, Col. Waring entered into an agreement with the Metropolitan, the Third avenue, the Forty second street, Manhattanville & St. Nicholas avenue, the Dry Dock, the East Broadway & Battery, the Second avenue, the Central Crosstown, the Union railways, and all lines controlled by them. The arrangement was that each company should assume responsibility for a certain street area, from curb to curb, instead of only on its own tracks, while the city street cleaning department clears the snow from the remainder of the streets through which the companies' tracks pass. This has worked with satisfaction both to the public and the companies, the snow being removed so quickly that neither the street nor railway traffic was obstructed.

In New Britain, Conn., considerable difficulty was experienced from the snow being packed on and between the rails of the East Main street line by cabs which had taken guests home from entertainments the night before. The snow plows were supplemented by force of 30 men and 10 teams. It cost the Central Railway about \$600 to keep the system in operation and the effort called forth favorable comment from the press.

At Springfield, Mass., the snow storm gave employment to upwards of 500 idle men, which cost the city and street railway company about \$1,500. The work of removing snow was carried on with vigor and little inconvenience to patrons resulted.

The New Utrecht & Gravesend (N. Y.) trolley line was unable to cope with the big drifts on the tracks and traffic was suspended for nearly two days. Four cars and a plough were stalled in the snow banks on the West End line at Coney Island, causing great inconvenience to the patrons.

The Omaha Street Railway Company placed all the sweepers on the tracks as soon as the snow began to fall and kept the cars running at frequent intervals, a very effective method.

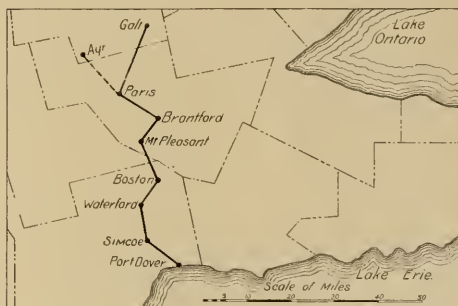
At Westchester, Pa., ice on the trolley wire and rails caused no end of trouble especially on the grades where the wheels would spin on the slippery tracks.

## GOOD RECORD FOR A CABLE.

The Melbourne Tramway & Omnibus Company, Melbourne, Australia, on December 10, 1896, replaced a wire cable on the Collins street line, which had been in use since December 8, 1895, 52 weeks and 4 days, running at 10 miles per hour. This cable was manufactured by George Cradock & Company, Wakefield, England, and was between 17,000 and 18,000 feet in length and  $3\frac{3}{4}$  inches in circumference. The railway company was well satisfied with this Cradock cable, as the average life of the last three ropes, all by other makers, used on this line was but 16 weeks and  $\frac{1}{3}$  day.

## NEW LINE IN CANADA.

A company known as the Brantford, Port Dover & Galt Electric Radial Railway Company has been organized at Brantford, Ont. As shown on the map the line will run south from Brantford to Port Dover on Lake Erie via Mt. Pleasant, Boston, Waterford and Simcoe, with about 40 miles of track, and in a northwesterly direction from Brantford to Paris and thence to Gault or Ayr, about 25 miles. It has not yet been definitely decided whether Gault or Ayr will be



made the northern terminus. The company will carry passengers and light freight, and should the demand justify it a heavy freight service will be added. This line will run through a very rich agricultural country and connect a large number of small towns, to which such a service as that contemplated will be very advantageous, and there is every indication that the venture will be a paying one. It is intended that the roadbed and equipment shall be up to the standard for interurban lines.

## PENNSYLVANIA STREET RAILWAYS.

The total number of miles of street railway in operation in this state is 1,562, being an increase for the year of 253 miles. There are 3,319 motor cars in service, of which the Union Traction Company of Philadelphia owns 1,153. The men employed number 8,394, but this is believed to be considerably short of the actual figures, as many of the companies failed to report the exact number of their employes. The railways carried 376,502,551 passengers, the receipts being \$18,791,553, leaving for dividends \$3,518,053. The capitalization per mile of road averages about \$112,000.



# 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 West End Street Railway of Boston, is adopting a plan long advocated by the REVIEW, viz., electrical driving for its boiler feed water pumps in its largest power station at Albany street. The arrangement is a very simple and economical one. Two old D62 generators have been set up to operate as motors and are belted to a line shaft. Either one of these machines is large enough to operate all the pumps, so that one is held as a reserve. To the line shaft are belted six quadruple cylinder feed pumps. The line shaft runs at 160 r. p. m. and the pumps at 30. The pumps have fast and loose belt pulleys for starting and stopping independently, and are provided with fly wheels. The pumps are all alike, each having four single acting cylinders, 6 inches in diameter by 6 inch stroke. As many pumps will be run at a time as the load of the station requires. The plant has a maximum rated output of over 13,000 horse-power. It is expected that the new plan will be a decided economy over the old one of feeding by wasteful direct acting steam pumps, not only in the way of fuel but in repairs and attendance. A direct acting steam pump that makes no use of the expansion of the steam it uses, and gives an indicator diagram resembling the cross section of a dry goods box, is not a very difficult thing to beat in the way of economy even through the medium of a dynamo and motor. It might be argued that a steam engine driving the line shaft which drives the pumps would be more economical than the more roundabout power transmission employing an electric motor. But this is not likely to be the case, for the poor economy of the small steam engine as compared with the large compound condensing corliss engines with which the direct connected generators are driven will compensate for the transformation of power from steam to electricity. Then too, the steam engine would require more attention and repair than the motor, to say nothing of the fact that the motor being scrap machinery cost the company nothing, while a steam engine would have had to be purchased. The adoption of this plan by the largest power station in the country will, we trust, induce other companies to throw aside conservatism in this matter and follow the example already set by several English railway power stations.

\* \* \*

In view of the power plant performance tests that have previously appeared in this department the results of a test made in the South Chicago City Railway power station the past fall, furnished us through the courtesy of B. J. Jones, superintendent, are of interest. The test was made to determine the working efficiency of a new direct connected cross-compound condensing corliss, but included the whole plant from coal pile to switchboard. The showing is a splendid one for the general efficiency of the plant and is nearly equal to the best of the twenty electric railway power plant performances summarized in our April 1896 issue. The test lasted 24

hours, from 5 a. m. to the same time the following morning. The results are as follows:

Total watt-hours.....	5,260,000
Total pounds of coal used.....	27,100
Total pounds of water used.....	145,700
Water evaporated per pound of coal (actual condition.) lbs.....	5.37
Water per kilowatt-hour, lbs.....	27.69
Water per electrical horse-power-hour.....	20.65
Coal per kilowatt-hour.....	5.15
Coal per electrical horse-power-hour.....	3.84
Cost of fuel per day.....	\$ 12.87
Cost of fuel per ton.....	.95
Cost of fuel per kilowatt-hour.....	.0024
Cost of fuel per electrical horse-power hour.....	.0018
Cost of evaporating 1,000 pounds of water (actual conditions).....	.0883

The boilers are the Stirling water tube type and Green economizers are employed.

\* \* \*

The want of accuracy in water meters is proverbial and few power plant engineers that have any regard for the truth depend on them for keeping record of the evaporative efficiency of their boilers. The only sure way is to actually weigh or measure the water used for feeding. To measure the water in any quantity requires a large tank, but unless the plant is very much crowded such a tank is usually desirable, not only because it affords an accurate means of measuring water but because it affords water storage to tide over any brief shutting off of the source of supply. The Lynn & Boston Railroad, at its Lynn station, has an iron tank, the capacity of which is accurately calculated from its dimensions. This tank stands on waste land back of the station and contains when full about enough for a day's supply. It is filled every day from the city mains, and the amount of water used is determined by a gauge showing the height of water in the tank. If it becomes necessary to use more water than a tankfull in a day, more is run in and account of it is kept by a water meter. The amount so measured is so small a part of the whole usually, that a considerable error in the meter could cause only a small per cent of error in the total result. However the water meter is calibrated every day by running water through it to fill the tank so that even this small error is eliminated.

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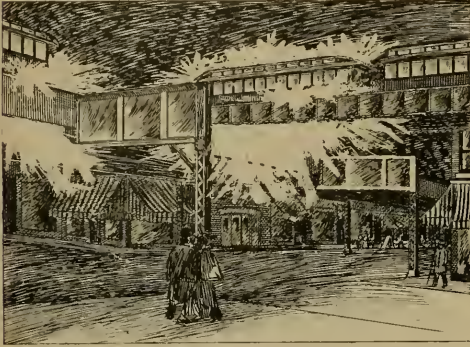
For some years the West End road of Boston, has been hampered in getting coal to its largest power station because the power house is on the opposite side of a public street from the coal docks where fuel is landed. Up to this winter the method has been to load the coal into one horse dump carts and haul it across the street, where after much fuss and backing and slipping on grades it was finally landed in front of the boilers. Conveyers have not been put in as at the other plants of this company because permission could not be obtained to cross the street with conveyors either overhead or underground. Recently, however, the great expense for





### PYROTECHNIC DISPLAY BY THE LAKE STREET ELEVATED.

During the recent snow storm in Chicago, the rails of the elevated roads were covered with sleet and snow. More than the usual amount of arcing and sparking was caused. Whenever a train of cars passed it left a shower of sparks.



These descended to the street or on the tops of the surface cars. People looked upon the spectacle with wonder and suspicion and gave the incandescent particles a wide berth. However it proved to be perfectly harmless, possible small particles of iron and dirt being the cause. Neither the rails nor contact shoes showed any evil effect from the illumination. The flashes were almost continuous and could be seen for blocks, and hundreds watched the display.

### A SELF-FEEDING RAIL DRILL.

The Williams & Moore Railway Jack Company, 90 East Ohio street, Chicago, has recently put on the market the self-feeding rail drill which we illustrate herewith. In it, the inventor, Mr. Moore, has developed a mechanically efficient drill which is compact in form and easily manipulated. The

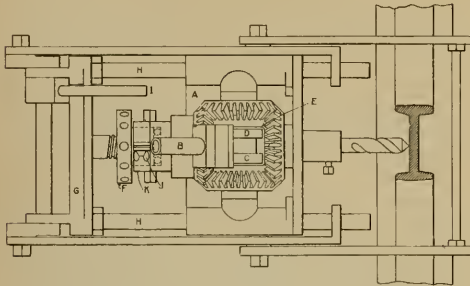


FIG. 1—MOORE'S SELF FEEDING RAIL DRILL.

illustrations which we publish show the construction. Fig. 1 is a plan and Fig. 2 an elevation of the drill when in position.

Rotary motion is transmitted to the drill through the four bevel gears, which are supported in the principal casting A, and operated by the hand lever B, a double ratchet, which engages the wheel C on the forward stroke and

D on the return, thus giving a continuous application of power to the drill. The thrust of the drill is transmitted from the lower bevel gear, the shaft of which serves to hold the drill, through an inner frame E (which is not very clearly shown) and is finally received on the steel nut F, carried on the screw as shown. Ball bearings are provided between the gears and the inner frame E, and also where the outer gear bears on the nut F (this latter ball bearing is shown by dotted lines in Fig. 1) and by this means the friction due to thrust is cut down to a minimum.

The screw is firmly set in the yoke G, as are the guides H I L, which serve to keep the main casting A in line. The arrangement of the side straps and the hooks which grip the rail is readily seen. By lifting the lever I, the side straps are thrust forward and the hooks pushed out so that they may be thrown back and permit a train to pass without moving the drill. It should be mentioned that the hooks may be adjusted so as to pass under the rail as well as over it.

The automatic feed is secured by means of the split collar K, which is fastened to and turns with the shaft of the outer gear. When the thumb screw J is loosened the nut F remains stationary and the feed is by hand, but when the thumb screw is tightened the collar bears on the lower portion of the nut (shown dotted) and causes the latter to turn, giving an automatic feed. As the only connection

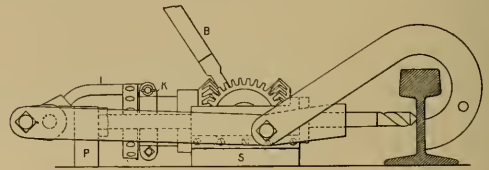


FIG. 2—ELEVATION.

between the collar and the nut is through friction the speed of the feed depends upon how tightly the nut is gripped.

The drill is 11 inches wide by 24 inches long and  $6\frac{3}{4}$  inches high. When in position it rests upon a foot piece P, and the shield S, which protects the gears from contact with the ground.

### THE NEW ORLEANS TRACTION COMPANY.

The New Orleans Traction Company, which has heretofore rented its power from the Louisiana Light & Power Company, has purchased from the latter company one-half of its plant, comprising eighteen boilers, three large engines and generators. Several improvements in the plant are contemplated, and the capacity will be increased by adding a 1,000-h-p. cross-compound Allis engine direct connected to an 800-k-w generator. The company has made arrangements for the summer season at its West End resort. Among the attractions is Phinney's United States band of Chicago, which has been secured for two months. It will be remembered that it is this company which recently secured the able services of C. D. Wyman, late of Milwaukee, as general manager.

The Tramways Committee of Dover, England, has decided to make some improvements. A new car shed is to be constructed, new rails laid, the road-bed improved and additions made to the equipment.

## BAD MONEY.

## How It Comes to Street Railways and What is Done With It.

Whenever a man finds that some one has passed a counterfeit nickel, dime or quarter on him, he has a very vindictive feeling. However honest he may be, it is a great temptation to either drop the bad coin in the collection box or give it to some unsuspecting street car conductor. Most of the street railway companies have had to make rules in regard to receiving this kind of coin, leaving the conductors to bear the responsibility of such dishonesty. Perhaps their stories would be of more interest than those from the treasurers of the companies. While pursuing this investigation the writer had a practical example of how this matter is treated. Some evil disposed person left a poor sample of a counterfeit half dollar with a Chicago conductor. No doubt the conductor felt that there were two parties involved, himself and the public and he was the injured one. Retribution was his right and he slipped the counterfeit into the hand of the next unsophisticated person needing change. This is the every day method of solving the problem.

However, in spite of vigilance, the companies find themselves in the possession of some bad money. A short time ago the Citizens Street Railroad Company of Indianapolis, turned over to the United States treasury agent about three years accumulation of counterfeit money which was forwarded to Washington to be destroyed. The coins are mostly of small denomination, but one very poor counterfeit of a \$5 gold piece was among them. It was made of composition metal, imperfectly stamped and gold plated. Two \$3 silver certificates, known as Windom-head notes were also sent to Washington. The rest of the collection was made up of 28 dollars, mostly cast and of poor quality, 18 half dollars, 46 quarters, 384 dimes, 936 nickels and 1,390 coppers. We have received numerous letters from street railway treasurers who make the following reports:

The Consolidated Traction Company, of Jersey City, says: "Our receivers have orders not to accept any mutilated or counterfeit coins. If they do so, they are obliged to make good the amount."

The Chicago City Railway Company says: "In regard to bad money, will make the following answers: We accept only current money from conductors. About twenty dollars slips through all hands annually. That we do get, we destroy. We find that dollars predominate in counterfeits."

The Tri-City Railway Company of Davenport, Iowa, answers: "We do not accept it from conductors. They must stand any loss from this source. Receivers report counterfeit silver dollars occasionally and some plugged nickels. Very little trouble from this source."

Denver Consolidated Tramway Company says: "We accept no counterfeits. If a bad coin is turned in, it is held back and given to the secret service agent. The conductor must pay a good coin in its place. For 1896, about \$20.80 was received which is about the average. The counterfeits are mostly dollar and half dollar pieces. Conductors have the privilege of going to secret service agents and finding out about all new counterfeits. Notices of new counterfeits are often sent to conductors."

The New Orleans Traction Company has this to say: "Touching bad money, counterfeit coins received from conductors are retained by us, and the value they were intended to represent, collected from the conductor. We receive

monthly an average of about \$12.00 counterfeit money. By request of the special agent of the Treasury, counterfeit coins are turned over to the Government monthly, and a receipt taken for the amount. The denominations usually received are dollars and quarters, principally quarters."

The West End Street Railway Company of Boston, says: "Replying to yours of the 13th would say that our rule regarding counterfeit currency, is to charge it to the conductor turning it in. We keep no account of the total amount turned in but I should say that in round numbers it amounts to \$1,000 per annum out of gross receipts of some \$8,000,000. Quarters and halves predominate in amount but nickels are received in the greater number. The Government compels us to keep the counterfeit currency until it is called for by an inspector and it is then carried away by him in the lump. Under the laws we are held liable as issuers of counterfeit money, if any is returned by the company to the conductors turning it in."

Twin City Rapid Transit Company, of Minneapolis, says: "Previous to 1894, our conductors deposited the receipts in an envelope at the end of each trip. Under this system there was received fully \$100 per year bad money, and about \$600 in mutilated coin. The bad money was charged up to the conductors, and turned over to the United States Government Agent who collected it once a month. The mutilated coin was returned to the conductor to be redeemed by them. Our experience has been that the spurious coin predominates in the dollar, and the mutilated coin in the subsidiary coin. Under our present system our conductors settle at the close of each day with the settling clerks at the stations, and any bad or mutilated coin is not accepted in settlement. The bulk of our silver is shipped direct to the Sub-Treasury in Chicago, and they are very particular regarding mutilated coins, and coin that passes current here, or at any of the banks, is refused by them. We get back from these Sub-Treasuries not over \$50 a year. We can sell our mutilated coin in open market at 40 cents on the dollar. There is, however, a party in Chicago who calls here once a month and pays us 50 cents on the dollar. Just what disposition he makes of it, I do not know."

## THE VESTIBULE QUESTION ON THE COVINGTON &amp; NEWPORT LINES.

Superintendent T. M. Jenkins, of the South Covington and Cincinnati systems, thinks that his scheme of caring for his motormen during the cold weather is better than those generally in vogue and disposes of the vestibule problem which has recently been agitated there. Extra men are put on the cars to take the place of the regular motormen at every other trip across the suspension and Newport Central bridges. Not only is this done but a supply of hot coffee and substantial lunch is on hand at the different bridges and waiting stations where the men make their shifts. This is served free to the motormen and conductors. None of the men relieved have deductions made in their wages for the time spent off their cars.

Mr. Jenkins maintains that this plan is not a matter of economy but that it is most satisfactory and has been in operation for three years. There are also fewer accidents for there are no vestibules to obstruct the sight and hearing of the motormen.

THE LONDON TRAMWAYS.

"The London Tramways" was the subject of a lecture delivered by J. Allen Baker, in connection with the London Reform Union, on November 26. The extreme poverty of London in regard to this cheap and efficient mode of transportation was well presented in the following table, in which comparisons are made with other cities in Great Britain, on the Continent, and in America:

TOWN.	Population.	Length of Tramways.	Miles in London if there was the same Proportion.
Glasgow ... ..	750,000	40 miles ... ..	280
Leeds ... ..	400,000	24 miles ... ..	300
Dublin and Kingstown ...	300,000	40 miles ... ..	400
Huddersfield ... ..	100,000	20 miles ... ..	1,000
Hamburg (Germany) ...	650,000	60 miles ... ..	480
Hanover (Germany) ...	166,000	40 miles ... ..	1,200
New York ... ..	2,000,000	{ Street miles, say 250 800 single miles	625
Brooklyn ... ..	1,000,000	{ Street miles, 200 600 miles track	1,000
Boston (suburbs) ...	900,000	{ Street miles, 250 Track miles, 428	1,875
Philadelphia (suburbs) ...	1,200,000	{ Street miles, 280 Track miles, 470	1,120
Washington ... ..	250,000	{ Street miles, 75 Track miles, 144	1,500
Chicago ... ..	1,900,000	{ Street miles, 450 Track miles, 780 Electric, 680 Cable, 85 Horse, 17	1,300
St. Louis ... ..	645,000	{ Street miles, 175 Track miles, 335	1,300

London, with a population of from four and a half to five millions has but 141 street miles of track of which one quarter is single.

In London, wages are lower and horses and fodder higher than elsewhere, and because of these conditions mechanical traction would give correspondingly higher profits, or what is perhaps of more importance to patrons, more extended, better and cheaper service with no diminution of the profits of the companies. As it is, London imports horses from Canada, a country which, of 462 miles of street railway, has but 12 operated by animal traction.

ELECTRICITY ON THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD.

N. H. Heft, chief of the electrical department of this road, writes us that the work on the power house at Berlin, Conn., is progressing favorably. This station will furnish current to the Berlin branch of the New England railroad between New Britain and Hartford. The third rail conductor to be used is similar to that employed on the Nantasket Beach road which has been described in a former issue. The station is to be equipped with 10 horizontal tubular boilers, made by Edward Kendall & Sons of Cambridgeport, Mass., 2 cross-compound condensing engines of the improved Green type, made by the Providence Steam Engine Company, and 2 direct connected generators of 850 K-W capacity each.

The street car lines of Christiania, Norway, have passed into the hands of a German syndicate, the Berliner Gesellschaft fuer Electricische Unternehmungen. The new proprietors, no doubt, contemplate displacing the horse with the electric motor.

ALLEY "L" OFFICERS.

The reorganization of the Alley "L," under the title of the South Side Elevated Railroad, was effected in the latter part of January, and the new company assumed control in the early part of this month. The company has made a provisional contract with the Union Loop Company and will pay 1/2 cent for every passenger carried with a minimum charge of \$62,500 per annum. The officers are Leslie Carter, president; William Flemming, vice-president; Marcellus Hopkins, late the receiver, general manager; John H. Glade, secretary and treasurer.

ANOTHER ACCIDENT FRAUD.

A short time ago a man fell off a White line car in Baltimore and seemed to be badly injured. He pretended to be in great pain and was removed to the city hospital, but refused to permit a physician to examine him. Later two witnesses turned up and the company compromised with him for \$60. Not long afterwards another man went through the same performance on the same line. The manager of the street car company became suspicious and set a detective to work. The man finally confessed that he was not hurt and made his escape as soon as the detective left him.

BALL AT BINGHAMTON.

On February 4, the members of the Employees Aid Association of the Binghamton Railroad Company, entertained their friends at the second annual ball of the association, which was held at Bennet Hall, and proved a most enjoyable entertainment. The bulletin board called for two trips with a lay-off of 60 minutes when supper was served at the Delmon'co. After the signal of "All right—go ahead," the program commenced with a waltz, "Get your fairs ready, please," "A regular armature winder," and "Step lively, please, we're late" were later ones and the last dance was "All out here."

INTERURBAN FARES ON THE LOWELL, LAWRENCE & HAVERHILL.

The Lowell, Lawrence & Haverhill Street Railway has a very simple plan of collecting fares on its lines and one which seems to be as secure as any. On the line from Lowell to Lawrence through cars are run and the fare for the whole trip is 15 cents. The line is divided into three divisions on each of which a 5-cent fare is charged. When a passenger gets on at one end of the line and pays the full fare of 15 cents to the other end the conductor rings it up as a 5-cent fare and hands the passenger two tickets or checks good for a 5-cent ride each. When the next section of the road is reached the conductor goes through the car again, collecting a fare from every one in it. The passengers having checks turn them in, of course, as fares, and the conductor rings them up as such. The same operation is gone through with on the third division of the road. The conductor must therefore at all times be able to show cash for the fares he has rung up and the checks he has issued. The plan amounts to a collection of cash fares on each division, except that through passengers are given change in the shape of checks instead of cash.



## TEMPORARY ABANDONMENT OF TRACKS DOES NOT WORK FORFEITURE.

The Milwaukee Electric Railway & Light Company won a notable victory in the suit brought by the 27th street property owners to restrain it from laying its tracks. It was claimed that abandonment of certain tracks annulled the franchise, but the decision of the Supreme Court as delivered by Justice Winslow does not sustain the stand. It further settles all questions as to a franchise being a contract and asserts that it is granted by the state through the medium of the city and any action affecting it must be brought by the attorney-general, after obtaining the consent of the Supreme Court. Justice Winslow further says:

"By the acceptance of the terms of the ordinance the railroad company assumed a public trust; it undertook to serve the public by affording it rapid transit and it became its duty to continue that service not simply because it had contracted so to do, but because it had become charged with such duty by legislative grant. It could not lay down the burden when it chose nor emancipate itself by merely ceasing to operate its cars. In case of an attempt on its part to so shirk its duty as to a part of its road it could doubtless be compelled in proper proceeding to resume its operation and carry out the public duty which it voluntarily assumed. (*Attorney-general v. West Wis. Railroad Company*, 36 Wis. 466, 497). Certainly in such case action could be brought by the state to forfeit its franchises and vacate its charter for failure to exercise its public powers and perform its duties.

"Coming now to the question whether the franchise has been extinguished in the case before us it is quite apparent that there are only four ways in which it can be claimed that such extinguishment could take place, viz: First, by operation of some self-executing forfeiture clause in the grant; second, by surrender of the franchise and acceptance of such surrender on the part of the state; third, by the decree of a court of competent jurisdiction on an action brought for the purpose; fourth, by abandonment or non-user for so long a period that a surrender and acceptance will be presumed. There are no facts in the case upon which it can be claimed that the franchise has been extinguished in either of the first three ways above mentioned. There was no self-acting forfeiture clause in the ordinance which granted the franchise; there has been no surrender thereof and acceptance of such surrender by the state, and no action has been brought to declare and enforce the forfeiture. There remains then for consideration only the question whether it has been wiped out by nonuser for more than four years. It is argued that from this fact an abandonment of the franchise has resulted. It is evident that the term abandonment as applied to a corporate franchise of this kind is a misnomer. A mere privilege or right may perhaps be properly said to be abandoned in a proper case, although even in that case there must be something more than mere nonuser to constitute such abandonment; there must also be an act clearly indicating an intention to abandon. (*Washburne on Easements*, 3d ed. p. 661.)

"But while a mere easement or right may be abandoned, the word is plainly applicable to a duty owing to the state. A public duty is not to be laid down at will. In the case of a mere easement there is but one party interested and he may voluntarily abandon his right, but in case of a public duty there are two parties beneficially interested, i. e., the

party who owes the duty and the state to which the duty is owing. The necessary result must be that, in order to extinguish the duty, there must be concurrence on the part of the state.

"The period of nonuse was about four years and eight months. It was a period of great industrial depression and of extraordinary financial difficulties on the part of the various corporations which successively owned the franchise; the old track became by reason of the change in means of locomotion, practically worthless, and its entire reconstruction a necessity, it appears by affidavits of officials of the roads that it was always the intention to resume operation of these two blocks as soon as the financial atmosphere cleared.

"This then is the situation: There has been no cesser to use accompanied by any act clearly indicating an intention to abandon the right; even if it could be said that there was any such act there has been no consent on the part of the public to such abandonment nor acceptance of a surrender; the nonuse has not existed for such a length of time nor under such circumstances that a surrender and acceptance of the franchise can be presumed.

"It follows that when the plaintiffs commenced their action the franchise was still in existence and consequently the injunctive order was erroneous.

"By the court: Order reversed and action remanded for further proceedings according to law."

## NEW TRACTION ON THE CINCINNATI, HAMILTON & DAYTON.

The Cincinnati, Hamilton & Dayton Railroad Company had decided to adopt some other tractive power than steam on its branch line between Middletown and Hamilton and is considering propositions from several electric companies and also one from the American Air Power Company of New York for a system of compressed air. John W. Hill, consulting engineer, has been retained by the company to advise it as to the practicability of using compressed air. If it is possible to do so this system will be adopted, in order that the overhead installation incident to electricity may be avoided. The track on this division is in exceptionally fine shape and no changes will be made in it. The car equipment will be of the best and designed especially for interurban service. This line of steam road is to be operated in connection with the Middletown Street Railway, making together 26 miles of track.

## "ELECTRIC GRASS."

One of our electrical friends who operates a road in a swamp country was surprised one day last summer on finding that there was an appreciable difference of potential between the different parts of the lawn in front of the power station. Thus, if a rod was stuck into the sod at one spot on the lawn and another rod at another point, a deflection could be obtained on a low reading voltmeter connected between them. This was a somewhat startling discovery even to the electrician himself, but when one of the clerks learned of the fact he (the clerk) seemed to have a great light dawn upon him. "I've noticed," he said, "that the grass on that lawn seemed to grow remarkably well. Don't you suppose that the electricity helps it grow. You know they have been making plants grow by electric light recently."

## THE STREET RAILWAY AT ATHENS, GA.

### Water Power Replaces Steam—An Interesting Plant.

Two and a half years ago the present owners of the street railway of Athens, Georgia, purchased the plant from the receiver who had operated it for eight months under the orders of the Superior Court. The outfit consisted of the steam generating plant, six miles of track, four or five second hand cars with old fashioned electrical equipment and a twelve acre park. The business grew amazingly from the start and improvements were made as rapidly as the receipts would allow.

After a year's ownership, about 18 months ago, the company took up the question of running the railway by water power, and finally determined to purchase the shoals and property of the Oconee Mills Company, which had for a half century operated a grist mill on the Middle Oconee river, two and a half miles from Athens.

The development of this power gave the company a surplus beyond their need for the railway, and as a consequence, it was determined to install a light and power plant to operate in connection with the railway. A contract was made with the Stilwell-Bierce & Smith-Vaile Company of Dayton, Ohio, for an equipment of one pair of 39-inch horizon-



RACE AND GATES.

tal wheels and one 33-inch horizontal wheel, together with the flume and gate work for another 33-inch wheel to be put in at a later date if necessary.

Much preliminary work was necessary in the building of the dam, a timber structure 400 feet long, the blasting out of the head and tail races and wheel pit and the necessary masonry for the foundations and race walls; all of which were built in the most substantial and lasting manner.

The head race, protected by massive pine gates, is 175 ft. long, 33 ft. wide and 12 ft. deep, and the wall on the river side and the abutments are built of rock, laid in the best Portland cement, 13 ft. thick at the base and 5 ft. thick at the top. After escaping from the wheel pit, the waste water is carried through a practically natural canal 500 ft. long to a point on the shoals 6 ft. below the level of the river at the station, from which for 100 ft. the race is separated by a dam of timber covered with loose rock.

Upon the completion of the foundations, the Stilwell-Bierce & Smith-Vaile Company sent its representative,

W. B. Reynolds, to install the wheel work and in 30 days this portion of the work was completed in a most satisfactory manner and the construction of the building begun.



STATION AND TAIL RACE.

The most important feature of the whole work, perhaps, was the Giesler governor, upon which depended the success of the installation and the completion of the contract and guarantee.

The condition under which the railway governor works are unusually trying, owing to the fact that the two lines of the system meet at a junction point, and all cars stop and practically start at the same time, making the changes from no load to full load and vice versa, frequent. Under these conditions the governor regulates very satisfactorily.

The 33-inch wheel is belted direct on the railway generator, which was removed from the old steam plant. In the center of the generator floor, the General Electric Company installed one of the latest improved 250 k-w. mono-cyclic generators belted by a 34-inch belt from the shaft of the 39-inch wheel with a handsome marble switch board and all



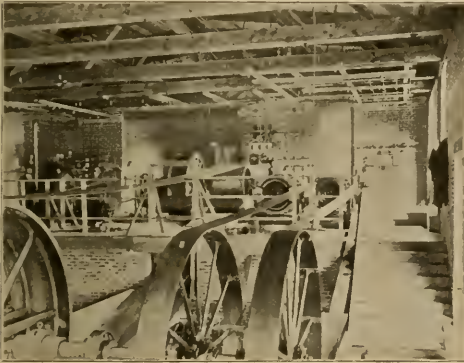
RAILWAY WHEEL AND GOVERNOR.

necessary instruments. From this machine three wires are carried to the center of distribution in the city, two of them for lighting and the third, a teaser, being called in play for motors of the induction type.

This, being almost the first mono-cyclic installation in the south, has attracted great attention and interest throughout this and neighboring states, where water-powers abound and have for years, run to waste; and its success, which is practically assured, points to the development of many similar powers and the growth of small and large industries under the fostering care of cheap power.

On November the first, the company secured the city lighting and moved to its station the two 50-light T-II arc machines owned by the city. These are driven from the shaft of the 39-inch wheels by Medart clutch pulleys, and the steadiness of the city lights has caused unusual comment and expressions of satisfaction from the city fathers.

The building, covering the wheels and generators, is 75 by 52 ft., built of stone and brick with metal covered roof. The generator floor is raised 8 ft. above the floor of the wheel room, in order to avoid any possibility of danger from high water, and an engine room has been built and engine and boilers installed for use in case of emergency. From the station to the center of distribution the wires are carried in almost an air line on heavy cedar poles, and from the center, four circuits radiate to different portions of the city, giving the best possible effect and an unvarying voltage



GENERATOR FLOOR.

in the secondary lines. The new type H transformer of the General Electric Company has been installed and has proved very efficient. The railway equipment of the company has been greatly improved by new cars and equipment and during this winter the electrical heating of the cars has been tried and proved a paying investment to the company and an appreciated comfort to its patrons. An extension of the plant is contemplated to the Seaboard Air Line and North Eastern Railway stations and eventually to the power station, where the company owns sufficient land for a large park and an attractive stretch of water for boating and sailing.

When this plan is carried out, the chute and other attractions would be moved from the present park in the city and a very enticing pleasure resort laid out. The officers of the company are; W. S. Holman, president; J. Y. Carithers, vice-president; W. T. Bryan, secretary and treasurer, and C. D. Flanigen, superintendent and purchasing agent. These officers with A. P. Dearing, form the board of directors.

## THE CHICAGO METROPOLITAN ELEVATED.

Plans for reorganizing the company have been formulated by Walter G. Oakman, Samuel Thorne and Frederic P. Olcott. It is intended that one-half of the \$15,000,000 of bonds be converted into preferred stock. The fixed charges then on \$7,500,000 of bonds would be \$375,000 which is \$55,000 more than the net earnings in 1896. About 53,000 passengers were carried a day in January. It is expected that with the Union Loop in operation the traffic will greatly increase and the earnings will be sufficient to cover the full fixed charges. Robert E. Jenkins is president and William E. Baker has been elected vice-president and general manager. The road is being operated under the receivership of Dickinson MacAllister.

## HOT WATER ON STEAM ROAD.

Not having a legislature which would give it an "anti-electric law" such as obtains in Connecticut, the Chicago & Northwestern Railroad found it necessary to resort to hot water as a preventive. This road had obtained an injunction to prevent the Milwaukee, Racine & Kenosha Electric Company crossing its tracks at South Milwaukee, which was dissolved on January 9, and the electric company at once proceeded to attempt to lay the crossing. In addition to sending its men to guard the track, stealing the tools of the rival company and running a switch engine back and forth over the crossing, the Northwestern people attached a hose to the boiler and threw hot water on the street railway men. As a result of this latter President Slush, of the Milwaukee, Racine & Kenosha has brought a personal injury suit against the Railroad Company.

## ELECTRIC RAILWAYS IN EUROPE.

The Journal des Transports has published some statistics showing the rapid development of electric street railways in Europe during 1896, the number having increased from 70 to 111, with a total length now of 561 miles as against 437½ a year ago. The trolley, in spite of the many objections we hear urged against it by property owners and in some cases by public authorities, is so far in the lead that there can scarcely be said to be a second. Of the 111 lines 91 are operated on the overhead trolley system, 9 have a central rail, 8 accumulators, and 3 an underground current. The geographical distribution of the lines is as follows: Germany, 255 miles and 857 motor cars; France, 82½ miles and 233 cars; England, 67 miles and 168 cars; Switzerland 29½ miles and 86 cars. Bulgaria and Denmark are the only countries which have no line worked by electricity.

The Blackburn, Eng., Tramways Company has voted to equip with electricity those portions of its lines now operated with horses. The city has offered to build the plant and furnish current at 6 cents per car-mile.

The rewards for the competitive designs of the Jungfrau Railway have been given, the Swiss and German firms receiving the major share. One American and one English concern submitted plans and received prizes.



## NEW RAILWAYS IN JAPAN.

In the adoption of modern methods of manufacture and transportation Japan is not neglecting the street railway. We learn that among the lines recently proposed are the three following, with an aggregate capital of about three and one-half million dollars. The Fushimi Electric Railway, with a capital of 900,000 yen and promoted by Okubo Yoshio of Tokio and others, is a line  $28\frac{1}{2}$  miles long running from Fushimi to Nishinomiya, via Nasso, Todaiji, Koriyama and Itami. A company with 33,000 yen capital proposes a tramway  $5\frac{1}{2}$  miles long between Inamimachi and Demachi in Tomachi district, Toyama-Ken. The Tokio Circuit Tramway, with a capital of 2,500,000 yen will build a line  $44\frac{1}{2}$  miles long in Tokio.

## ANNUAL REPORT OF THE COLUMBUS, (O.) STREET RAILWAY COMPANY.

President Emerson McMillin has presented a report for the fiscal year ending December 31, 1896. The road has felt the effects of business depression, but good management and harmonious relations between the officers and employes of the company have combined to make operating expenses very low. A great deal of extra patronage was received by the opening of Olentangy Park, which is an amusement ground.

The number of passengers carried in 1896 was 13,810,455, which is about 30,000 less than the previous year. Car-miles run in 1896, 3,860,540; 1895, 3,592,333. Earnings per car mile in 1896, 16.2 cents; 1895, 17.4 cents. Expenses per car mile in 1896, 8 cents; 1895, 8.7 cents. Operating expenses in 1896 were 49.2 per cent of total receipts; in 1895, 49.7 per cent.

Dover, England, proposes to employ automobile vehicles for street scavenging in place of the present horse-drawn carts.

Vienna engineers have been granted a franchise to construct an electric railway between Arnau and Koniginhof, Austria.

Manchester local authorities have been asked to permit the construction of electric railways. The promoters are represented by Andrews & Butterworth, surveyors, and Joseph Sampson, solicitor.

Electric locomotives will be tried on the lines running from St. Petersburg to Moscow and Warsaw, Russia. The experiment is said to be in charge of the Ministry of Ways and Communications.

The Oberschlesische Dampfstrassenbahn Company will soon be supplied with air brakes from the Standard Air Brake Company, New York. The order is for equipping 30 double truck motor cars.

It seems probable that Barcelona, Spain, will soon enjoy the blessings of electric traction. Plans have been laid before the Commission of Public Works to construct an electric tramway and these have been accepted with certain conditions. The speed of the cars is regulated to  $7\frac{1}{2}$  miles an hour when carrying passengers and  $9\frac{1}{2}$  miles when empty.

## REDUCED STREET CAR FARES.

By J. P. E. Clark, General Manager Binghamton Railway.

There has been a marked disposition of late on the part of municipal and state legislators throughout the country to enforce a lower standard rate of street car fare than now exists. They have been warmly seconded in their efforts in this direction by the press.

The sole arguments advanced in favor of the proposed reduction is "prices of everything except car fares have been reduced in the past few years." Conceding the truth of the common argument, there are innumerable advantages and privileges afforded the street car rider of the present day that have evidently been overlooked by our friends, the legislators and the press, and when carefully considered will offset the argument advanced and demonstrate beyond question that, notwithstanding the standard 5-cent fare has not been reduced, the increased length of ride and general efficiency of service of the present day afford largely enhanced facilities and conveniences and much better returns for the nickel expended than in days of old, when horses and mules were the propelling power of street surface railroads and the numerous improvements of the present day were unknown.

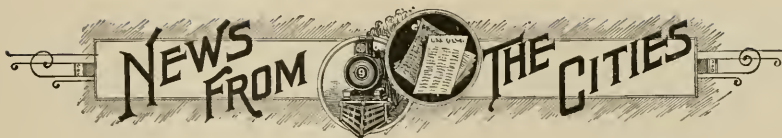
In nearly every city and large town throughout the United States the street car lines have been extended and new divisions added and with the general system of free transfer almost universally adopted in the past few years.

In many cities where several roads have been merged into one, the companies could, under their original charters, charge double fares, but have waived their privilege, establishing a universal 5-cent fare, with free transfers to all parts of the city.

The demands made of a street railroad company today are greatly in excess of those of a few years ago. The cars must be new and up to date, thoroughly cleaned, heated and in charge of competent well dressed crews. All modern appliances for heating and the comfort of passengers are expected as soon as invented and their practicability demonstrated, and cars must be operated more frequently. To accomplish all this means much larger investments than in the old horse car days and largely increased expense of operation and maintenance. Of course receipts are greater; were they not, the street railroad organizations could not pay operating expenses, to say nothing of interest or profit. The increased liability of accident to persons and property under the present system of electric and cable service is an important item of expense manifest to all street railroad officials, but apparently lost sight of by the legislators and press.

When taking into consideration that in many of the larger cities a person, by the use of the transfer system, can spend almost an entire day on a street car upon the payment of a nickel, and in smaller cities reach any point he may desire for 5 cents, boarding a large, airy, well appointed car at his convenience, and comparing the same with the stuffy, foul smelling old horse car of a few years ago, to say nothing in relation to the rapid transit and saving of time thereby, the people of the present day should be eminently satisfied with a 5-cent fare.

Upon looking at the increased facilities and advantages furnished under the improved system of street railway service of the present day, the street car rider should pay his 5-cent piece cheerfully and thank his lucky stars that he lives in a progressive age.



### Arkansas.

EUREKA SPRINGS, ARK.—Local men have subscribed enough stock, it is said, to insure the construction of the Berryville & Eureka Springs Electric Railroad.

### California.

OAKLAND, CAL.—J. J. Lamping has petitioned for a street railway franchise.

SAN DIEGO, CAL.—The Citizens' Traction Company has been attached by the Risdon Iron Works for \$2,400 for material supplied.

OAKLAND, CAL.—A consolidation of all Oakland car lines is being engineered by William Henshaw, manager of the Union Savings Bank.

SANTA ANA, CAL.—The city trustees consented to the transfer of the motor railway franchise from E. I. Tolle to the Santa Ana and Orange Motor Company.

SAN FRANCISCO, CAL.—The Market Street Railway Company petitioned the board of supervisors for a 50-year franchise to run a single or double track railway along Masonic avenue and other streets.

SAN DIEGO, CAL.—A. D. Norman has been appointed receiver of the Citizen's Traction Company upon petition of the Union Savings Bank and Trust Company of Cincinnati; mortgage indebtedness amounts to \$80,000 and a floating indebtedness of \$20,000, monthly receipts, \$16,000. The road will continue operations.

### Chicago.

CHICAGO.—The Inter-Ocean Electric Railway Company has amended its charter to decrease capital stock.

CHICAGO.—The General Electric Railway Company has been granted right to construct conduit roads on thirty miles of south side streets.

CHICAGO.—Negotiations are pending for a reorganization of the Calumet Electric Street Railway, its consolidation with the South Chicago City Railway, and the construction of additional lines.

CHICAGO.—The Chicago General Street Railway and the West Chicago Street Railroad have buried the hatchet. The Chicago General is given right to operate over the West Chicago's right of way to the stock yards at a rental of \$200 monthly.

CHICAGO.—Dickinson MacAllister has been appointed receiver of the Metropolitan Elevated Railroad. The line is a new one, 16 miles in length and cost \$14,000,000 to build. On this investment there has been issued \$15,000,000 of bonds and about the same sum in stock. After paying operating expenses of \$500,000 annually, the road has only \$400,000 with which to meet fixed charges of \$750,000.

CHICAGO, ILL.—Judge Showalter entered an order extending the receivership of G. H. Condict, of the Englewood & Chicago Electric Street Railway to a bill for foreclosure. The bill was filed by Stephen D. Bayer, who bought the creditor's bill upon which the receiver was appointed two weeks ago. It is the intention to have the court issue receivers' certificates, equip it with storage battery cars and then sell it.

CHICAGO.—The South Side Elevated Railroad Company has been incorporated to acquire the reorganized Alley Elevated Railroad, build extensions and equip electrically. Capital stock, \$10,323,800; directors, Byron L. Smith, W. B. Walker, A. O. Slaughter, Joseph Leiter, L. J. Gage, George E. Adams, Chauncey J. Blair, E. L. Lobbell, T. J. Lefens, E. Buckingham, William Fleming, and Leslie Carter.

### Connecticut.

FARMINGTON, CONN.—An electric line connecting Farmington and Torrington is being surveyed by T. H. McKenzie, 38 Ballerstein building, Hartford.

EAST WINDSOR, CONN.—The East Windsor Electric Railway has been incorporated to build a connection of the Hartford Street Railway and the Enfield Street Railway. Incorporators, J. H. Simonds, C. G. Harrison, S. D. Rockwell, L. B. Griffin, C. E. Woodward, G. A. Ellis, E. F. Thompson, John Mason and G. S. Phelps.

TORRINGTON, CONN.—Among the incorporators of the proposed electric road to Harwinton are the following: From Farmington—Senator Erastus Gay, A. R. Wadsworth and E. C. Ayer; Burlington—John A. Reeve (judge of probate and town clerk), Adrian Moses, Lester A. Lowrey and Edwin N. Gillett. Harwinton—Lewis Catlin, Sylvanus Smith, Albert G. Wilson, Elijah G. Gibbs, A. E. Bartholomew and Charles S. Birge. Torrington—D. W. Clark, W. V. Barber and H. M. White.

### District of Columbia.

WASHINGTON, D. C.—The district commissioners propose to sell the Anacostia Railroad on claims for paving.

WASHINGTON, D. C.—Right to erect a trolley line along the Anacostia Railway is asked by President A. E. Randle of the Capital Railway Company.

### Georgia.

ATLANTA, GA.—The Consolidated Street Railway will relay 100 tons of 70-pound rail on creosoted ties.

ATLANTA, GA.—The Consolidated Street Railway Company is considering the extension and improvement of its suburban lines.

ATLANTA, GA.—It is practically settled that the Chattahoochee River Electric Railway will be extended to Marietta by the Collins Park & Belt Railway Company, C. J. Simmons, president.

SAVANNAH, GA.—The Savannah Traction Company has been incorporated by the purchasers of the electric railway. Herman Myers of Savannah, paid \$211,000 for the road at the recent judicial sale. His associates will expend \$75,000 to 100,000 additional to equip the power plant for commercial lighting as well as railway work.

### Illinois.

LINCOLN, ILL.—W. H. Traner has been appointed receiver of the Lincoln Electric Street Railway.

WAUKEGAN, ILL.—A franchise through Highland Park has been granted the Bluff City Street Railway.

EAST ST. LOUIS, ILL.—The council has granted a franchise for 14 miles of electric railway connecting East St. Louis and Belleville.

PARIS, ILL.—Capt. M. Evinger, of Terre Haute, Ind., is interested in the Enterprise Electric Railway Company, organized to build a line in Paris.

LINCOLN, ILL.—The Lincoln Street Railway, of which W. H. Patterson is president, has suspended operation owing to inability to pay for labor.

OTTAWA, ILL.—A franchise was granted by the council to the Ottawa Street Railway Company. The management expects to build lines along the frontage petitioned for and rebuild.

PARIS, ILL.—The stockholders of the Enterprise Electric Railway Company elected Morris S. Evinger, of Terre Haute, Ind., president. The 100 shares of \$100,000 stock was delivered at the office in Terre Haute. A franchise will be asked to operate a line here.

OTTAWA, ILL.—The Ottawa Electric Street Railway Company has been reorganized by George J. Paul, of Chicago. The capital stock of the new company is \$100,000, and the officers are W. P. Ellis, of Boston, president; M. T. Moloney, of Ottawa, vice-president; George J. Paul, secretary and general manager, and Al. F. Schoch, of Ottawa, treasurer.

### Indiana.

MARION, IND.—Superintendent C. W. McWhinney says the Marion City Railway will be extended to Fairmont as soon as the weather will permit.

COLUMBUS, IND.—John S. Crump's electric car line and lighting plant has suspended operation owing to dull business, and the doubling of the insurance rate on all buildings lighted from the trolley circuit.

MARION, IND.—David Overman and John McDonnell have revived their Marion, Hackleman & Independence Electric Railway scheme, which has been slumbering for 2 years. They are getting farmers' consents.

HARTFORD CITY, IND.—The scheme to connect a number of small towns in the vicinity by electric railroad is being revived by Muncie, Hartford City and Monepelier capitalists. R. H. Howe, of Indianapolis, is consulting with the parties interested and is making an effort to furnish the rolling stock.

### Iowa.

COLESBURG, IOWA.—Hon. F. A. Grimes, of Colesburg, is promoting an electric railway to connect with Manchester.

### Kentucky.

FRANKFORT, KY.—Special Commissioner T. N. Lindsey will sell the Capital City Street Railway at an upset price of \$12,000, by order of Judge Barr.

OWENSBORO, KY.—The barns of the Owensboro City Railroad were burned at 10 o'clock a. m., January 5, together with four open cars valued at \$7,200; four trail cars valued at \$2,000; one mule car, valued at \$250; repair supplies valued at \$500, and four motor equipments valued at \$1,600. The total loss is \$12,150, and the insurance \$3,000. Owing to excessive premiums the company had reduced its line of insurance. Operation continues as usual, and orders will be placed very soon for new summer cars in place of those burned.

### Maine.

KITTERY, ME.—The Kittery & Eliot Street Railway Company has been incorporated with \$300,000 capital stock by Frank E. Rowell, Horace Mitchell and others.

SANFORD, ME.—The Mousam River Railroad (electric) may be extended to Kennebunkport and Cape Porpoise by Boston men who are negotiating a purchase of the property.

NORWAY, ME.—The Oxford Central Electric Railway Company proposes to build 31 miles of road, connecting Waterford, Norway, Stoneham, Harrison and Bridgeton. Among those interested are E. W. Eastman, of Auburn; John D. Clifford, of Lewiston, and L. H. Burnham, of Albany.

### Maryland.

BALTIMORE, MD.—The Baltimore Traction Company has obtained control of the Windsor Heights Line, which will probably be extended to Wetheredville.

BALTIMORE, MD.—The Maryland Traction Company has been incorporated with \$1,000,000 capital, by George R. Week, R. Harry Cox, Wallace King and John Cowan.

BALTIMORE, M. D.—The Falls Road Electric Railway Company was granted permission to extend its tracks on Lafayette avenue, and also to extend proposed line in the annex between Woodberry and Mt. Washington.

HAGERSTOWN, MD.—Receipts of the Hagerstown Railway during the first five months of its operation have averaged \$85 daily, or more

than enough to pay expenses and interest on bonds. Their judgment having been vindicated, the officers will now go ahead with the proposed extension to Funkstown.

MYERSVILLE, MD.—The Myersville & Catoctin Railway Company has been formed to build 8 miles of electric road, connecting with, but independent of the Frederick & Middletown Electric Railway. Capital stock, \$100,000; incorporators, Col. David C. Winebreuer, of Frederick, president; Reno S. Harp, of Frederick, secretary; George W. Wachtel, of Myersville, treasurer; Cyrus F. Flook, of Frederick; Maurice E. Brightbill, of Annville, Pa.; and John C. Leatherman and George D. Toms, of Myersville.

### Massachusetts.

SCITUATE, MASS.—The Norwell & Scituate Street Railway Company has accepted its franchises.

HANOVER, MASS.—The Hanover Street Railway Company will begin work this spring on a 10-mile extension to Scituate.

MILFORD, MASS.—A Boston syndicate petitions for a franchise to connect Milford with Upton and Farnumville by electric railway.

BEVERLY, MASS.—The Lynn & Boston Street Railway Company has been granted a franchise to install electricity on the Cove branch.

BOSTON, MASS.—Tucker, Anthony & Company, of Boston, are taking bids on material for the construction of the street railway at Shrewsbury.

BROOKFIELD, MASS.—Superintendent C. A. Jeffs, of the Warren Brookfield & Spencer Street Railway, writes that he wants a filter for boiler feed water.

BRIDGEWATER, MASS.—The Bridgewater, Whitman & Rockland Street Railway Company proposes to build an extension of the Hanover Street Railway.

FITCHBURG, MASS.—It is stated that the franchise for the electric railway, Westminster, has been accepted and work will begin as soon as the weather will permit.

ORANGE, MASS.—Senator J. B. Farley is interested in a plan to build an electric road to Millers Falls, by way of Wendell Depot, Erving and Farley, a distance of 10 miles.

BOSTON, MASS.—The West End Street Railway Company has let contracts for the electrical installation of the Boston subway and work will commence in 10 days under the direction of E. K. Turner.

BARNSTABLE, MASS.—The Barnstable County Street Railway has been organized, and A. D. Makepeace, of West Barnstable, chosen president; Willard Howland, of Boston, secretary; E. C. Perkins, of Boston, treasurer.

NORTHAMPTON, MASS.—The Northampton Street Railway Company has an option on several acres for a pleasure resort to be equipped with merry-go-round, etc. Permission to purchase is asked of the railroad commission.

BOSTON, MASS.—The contract for the electrical equipment and apparatus for the Worcester & Marlboro road, amounting to \$50,000, has been given to the General Electric Company. The company will erect an 800-horse-power-house at Northboro.

BARRE, MASS.—The Barre Street Railway Company has been incorporated to build and operate a street railway to carry freight and passengers and supply electric light. Capital stock, \$50,000; incorporators, George W. Cook, Charles H. Follansby, Charles F. Atwood, F. A. Rich and Dr. George A. Brown.

CAMBRIDGE, MASS.—The Citizens of Cambridge intend to form a corporation with a capital stock of \$50,000 to construct five miles of street railway extending from Mount Auburn, Cambridge, to Belmont and Waverly. Among those interested are A. O. Davidson, Watertown; E. C. Benton, Belmont; Edward B. Stearns, Cambridge; Thomas L. Sauter, Watertown; John C. Watson, Cambridge; Frank Chandler, Belmont, and Ashley Watson, Cambridge.



WORCESTER, MASS.—Charles A. Richardson, president of the Worcester Construction Company signed a contract with Tucker, Anthony & Co., of Boston, agreeing to do the work of constructing the electric road between Worcester and Marlboro. This includes the building of the power house and the company is negotiating for supplies of the new road which will be 20 miles long and will use 45,000 ties, 7 feet long with 6-inch face and thickness, and 1,000 poles 28 feet long with 7-inch tops.

## Michigan.

DETROIT, MICH.—Gus F. Smith, of Detroit, asks a street railway franchise.

DETROIT, MICH.—A franchise through Monguagon is asked by the Detroit & Toledo Electric Railway Company.

BENTON HARBOR MICH.—The Benton Harbor & Eastern Electric Railway & Transit Company has been incorporated to build to Sister Lakes and Dowagiac.

PONTIAC, MICH.—Directors of the Pontiac & Sylvan Lake Railway are considering whether an extension of a mile to Cass Lake would not convert their line into a paying enterprise.

CARLETON, MICH.—A franchise is asked for a line in Carleton to connect with the Detroit & Toledo Electric. Those interested in the Carleton division are: G. F. Smith, George M. Hendrie, W. C. Sterling, of Monroe, Mich., Cameron Currie, J. L. Carleton, S. Hendrie, F. T. Lodge, T. Newberry.

HOLLAND, MICH.—Chas. W. Humphrey, of Ironwood, Mich., presented to the council a petition asking for a franchise from the Chicago & West Michigan Railroad, crossing west on Main street to the river. The harbor shore will be followed 6 miles to Macatawa Park and the Lake Michigan shore 7 miles to Saugatuck.

KALAMAZOO, MICH.—The Michigan Traction Company has been granted right of way through Charleston and Augusta. The report that the road would connect with Lansing is said by General Manager E. E. Downs to be entirely groundless. The proposed road is 23 miles long, with a loop of 2 miles, taking in Gull Lake.

MUSKEGON, MICH.—The Muskegon Railway, recently foreclosed, has been reorganized as the Muskegon Street Railway Company, with John L. Crosby, of Bangor, Me., president; Weston Thompson, of Brunswick, vice-president; Herbert Payson, Portland, Me., treasurer, and F. A. Nims, of Muskegon, secretary and managing director. Improvements of various kinds are planned for Lake Michigan Park, which is owned by the company and which will make this one of the leading summer resorts.

## Minnesota.

MINNEAPOLIS, MINN.—Fire at Robbinsdale, January 14, destroyed two gasoline motor cars and car shed owned by A. B. Robbins. New gasoline motors will be secured at once. Loss, \$4,000; partly insured.

## Mississippi.

VICKSBURG, MISS.—Jos. Hirsch and J. J. Hays are interested in getting the citizens to subscribe \$20,000 of the \$100,000 stock that will likely be issued to build a street railway system in this city.

## Missouri.

WARRENSBURG, MO.—The street railway has been sold for scrap iron.

SHELBYNA, MO.—Dr. J. M. McCully, president of the Shelby County Electric Railway Company, has placed his proposition before eastern men who expect to furnish three-fourths of the capital for construction. The road would cost \$60,000.

KANSAS CITY, MO.—The American Railway Construction Company of Chicago has been awarded the contract for building the Wyandotte street electric line by the West Side Railway Company. The road will be a fine example of modern railway construction, 103-pound rail will be laid in cement and cast welded. The contract price is \$110,000.

ST. LOUIS, MO.—The North St. Louis Improvement Association decided to organize a company to build a street car line on North Market street, connecting the wharf with all other lines by transfer. Messrs. Gundlach, Cummings, Weneker, St. Clair, Kolmer, Rubelman, Lucas, Mannist and Burghoff subscribed for stock in the new company.

KANSAS CITY, MO.—The Metropolitan Street Railway has let the contract for the electrical equipment of the Rosedale line, costing \$70,000, to the Electrical Insulation Company, of Chicago, the work beginning March 1 and ending May 1. About 350,000 pounds of copper will be used in the overhead work. This same company has received the contract of the West Side Railway Company to equip the Wyandotte street line.

## New Hampshire.

PORTSMOUTH, N. H.—I. C. Libby, of Waterville, Me., and A. F. Gerald, of Fairfield, Me., have purchased the franchise of the Portsmouth Electric Railway. The same parties recently acquired the charter of the Kittery & York Beach Electric Railroad. Work on the latter will begin immediately, piles having to be driven to cross a marsh a mile wide. At the Portsmouth end the material will be placed in readiness to begin construction as soon as the frost leaves the ground. The line will be 25 miles long and equipped in the best style.

HAVERHILL, N. H.—Thomas Sanders, of Haverhill, asks the incorporation by the New Hampshire legislature of four companies to build various lines which, when connected, would form one continuous electric railway from Massachusetts to Canada. One charter is for the Nashua, Salem & Haverhill Street Railway, to have a capital stock of \$200,000 and to run from Nashua south through Hudson, Windham, Derry and Salem to the boundary line between Massachusetts and New Hampshire; a second to incorporate the Nashua, Manchester & Concord Electric Street Railway, with a capital stock of \$600,000, to run from Nashua to Concord through the towns of Hudson, Litchfield, Merrimac, Londonderry, Bedford, Manchester, Hooksett, Suncook, Allenstown and Bow; the third to incorporate the Manchester, Chester & Haverhill Street Railway, capital stock not to exceed \$400,000, to run from Manchester through Auburn, Chester, Sandown, Hampstead and Plaistow to the Massachusetts line; the fourth to incorporate the Merrimac Valley & St. Lawrence Street Railway, with a capital stock of \$900,000, to run from Concord through Canterbury, Boscawan, Northfield, Franklin, Sanbornton, Hill, Tilton, Alexandria, Bristol, New Hampton, Bridgewater, Plymouth, Ashland, Holderness, Campton, Center Harbor, Moultonboro, Sandwich, Meredith, Thornton, Woodstock, Lincoln, Franconia, Bethlehem, Carroll, Low and Burbank's Grant, Jefferson, Randolph, Berlin, Kilkenny, Milan, Stark, Dummer, Odell, Millsfield, Dixville, Clarksville, Carlisle, Webster, Hubbard and Pittsburg, to the boundary line between the United States and the Dominion of Canada.

## New Jersey.

EATONTOWN, N. J.—Joseph Johnson's mill property is to be converted into a power plant for the Long Branch electric road.

NEWARK, N. J.—Belleville township has granted a franchise to the Passaic & Newark Electric Railway Company to operate a double track line.

BOUND BROOK, N. J.—A franchise for a line between Bound Brook and New Brunswick is asked by the Philadelphia & New York Traction Company.

LONG BRANCH, N. J.—The Atlantic Highlands, Red Bank & Long Branch Electric Railway Company is asking consents with a view to renewing its application for a franchise.

ATLANTIC CITY, N. J.—Receiver C. D. V. Joline sold the line and steamboats of the Brigantine Trolley Company, February 5. It will require \$20,000 to repair the damage wrought by recent storms to the piers and roadbeds.

SOMERSET, N. J.—The County Board of Freeholders granted a permit to the New York & Philadelphia Traction Company to enter this town, assurances being given that the line between this place and Bound Brook will be in operation by May 1.

ELIZABETH, N. J.—The Elizabeth & Westfield Railway Company will be incorporated with about \$200,000 capital stock to construct a trolley line. Back of the company are Bernard M. Shanley, of Newark; John D. Crimmins, of New York; Chandler W. Riker, of Newark, and Col. E. W. Hine, of Orange.

DOVER, N. J.—The proposed electrical equipment of their High Bridge branch from Rockaway to Port Oram, is viewed with favor by the officials of the Jersey Central Railroad. The matter was brought to the attention of the company by the Dover Electric Light Company, which has power to spare to operate twenty or more cars.

### New York.

BUFFALO, N. Y.—A repair shop may be built by the Buffalo Railway on a site just purchased.

LASALLE, N. Y.—George P. Smith is getting additional consents for his electric railway project.

LONG ISLAND, CITY, N. Y.—The Steinyard Railroad is considering an extension of its trolley line to Whitestone.

MECHANICSVILLE, N. Y.—J. A. Powers is at the head of an electric railway enterprise. Lansingburgh is one terminus.

BUFFALO, N. Y.—The Buffalo, Gardenville & Ebenezer Street Railway Company proposes to extend its line on Seneca street and Union road.

PORT CHESTER, N. Y.—A bond for \$10,000 has been given the village trustees by the Port Chester Electric Railway Company to guarantee the construction and operation of the road as provided in the franchise recently granted.

WOODHULL, N. Y.—It is stated that the bonus subscription of \$10,000 has been raised and the work on the electric road from this town to Branchport will be commenced.

BUFFALO, N. Y.—The Crosstown Street Railway Company applied for a franchise in new streets, and its application will be heard on the 19th of this month by the committee on streets.

BUFFALO, N. Y.—Depew and Blasdell, two suburbs, are to be connected by electric railway. Messrs. Vanderbilt, Depew and Webb, large holders of real estate, will build the line.

SENECA FALLS, N. Y.—N. H. Becker and W. C. Gray, of Seneca Falls, are interested in the proposed electric road to Auburn. An iron bridge will be built across Cayuga Lake.

BUFFALO, N. Y.—The Niagara Falls, Clifton & Drummondville Street Railway, which runs from Clifton to Lundy's Lane in Canada, has changed hands and will be electrically equipped with an anticipated extension to Fort Erie.

ADDISON, N. Y.—Postmaster John Hinman, of Addison, and J. S. Sargent, E. Chatfield and Dr. F. H. Van Orsdale, of Jasper, are interested in the proposed electric railway to connect Addison, Jasper and Woodhull, a distance of 12 miles.

BUFFALO, N. Y.—The Buffalo Traction Company is now ready to begin building 15 miles of track on the east side of the city. The Erie Construction Company will do the work and have opened offices on the seventh floor of Ellicott Square.

BROOKLYN, N. Y.—Permission has been granted by Justice Dickey of the Supreme Court, to the Kings County Electric Railroad and the Long Island Electric Railroad, to connect and extend the two systems. The incline will be built in Liberty avenue at the city line, and the works will cost about \$35,000.

ADDISON, N. Y.—An electric road is to be built between Addison, Tuscarora, Woodhull and Jasper. Among those interested are G. H. Brewster, John Hinman, W. O. Feenaughty, D. M. Darrin, H. D. Baldwin, R. P. Brown, E. M. Welles, F. H. Wheaton, B. G. Winton, O. B. Stratton and C. O. Shockey.

FALLSBURG, N. Y.—The incorporators of the Fallsburg & Monticello Railroad, already noted in DAILY BULLETIN, are B. Van Steenberg, J. H. Devoe, C. B. Harris, and William Dean, of 53 Broadway, New York city; John A. Cartledge, J. H. Van Steenberg, W. A. Lester Rock, of New York. The company's principal office will be in New York city.

CATSKILL, N. Y.—The Catskill Electric Railway Company has been incorporated to operate an electric street surface line, two miles long, from Catskill to Jefferson, Greene county, with a capital of \$30,000. The directors are Charles S. Williamson, M. D., William S. Roberts, Louis E. Roberts, Michael W. Conway, W. C. Courtney, W. C. Wood, Howard A. Mock, Daniel W. Sharpe, and Schuyler W. Mattison.

NEW PALTZ, N. Y.—The New Paltz & Walkill Valley Railroad Company has been incorporated to construct 0 miles of electric railway from Highland to New Paltz. Capital stock, \$150,000; directors, Hugh H. Douglass, G. H. Harmon, Paul Shiffer, Charles G. M. Thomas, James F. Reed, Joseph H. Devoe, George E. Woods, Henry M. Brundage and William G. Hoyt. The backer is Ferdinand McKeige, of New York.

AUBURN, N. Y.—The Auburn & Western Railway Company has been incorporated to build eleven miles of electric road between Auburn and Seneca Falls. Capital stock, \$300,000; directors, Robert Wetherill, of Chester, Pa.; William C. Gray, Jr., and Norman H. Becker, of Seneca Falls; George B. Longstreet, of Auburn; George B. Leonard, William P. Goodelle, W. A. Holden, Hiram W. Plumb, and C. D. Beebe, of Syracuse.

### North Carolina.

RALEIGH, N. C.—Charles C. Johnson, secretary, writes that the Raleigh Electric Company will rebuild its burned plant at an early date. A first-class building will be erected and equipped with the latest machinery, the type of which has not as yet been decided upon.

### Ohio.

MARIETTA, O.—The Marietta Electric Company made its initial trip February 3.

SANDUSKY, O.—Clark Rude has been appointed receiver of the Sandusky Electric Railway on application of stockholders.

SANDUSKY, O.—Rumor has it that the abandoned grade of the Sandusky, Ashland & Coshocton Railroad will be used by a new electric line.

STEUBENVILLE, O.—The Steubenville Traction Company is negotiating a lease of the Steubenville branch of the Wheeling & Lake Erie Railroad.

FOSTORIA, O.—C. C. Conroy, an oil man, and C. T. Geddes, are at the head of a project to build an electric railway between Fostoria and Waterville.

FRANKLIN, O.—The council has granted to the Cincinnati & Miami Valley Traction Company, permission to build and operate an electric car line in this village.

CINCINNATI, O.—The Cincinnati & Miami Valley Traction Company has given a mortgage of \$650,000 to the Finance Company of Pennsylvania for construction purposes.

CANTON, O.—William A. Lynch, president of the Canton & Massillon Electric Railway, says that the Akron-Canton Street Railway Company will begin work as soon as the weather permits.

CLEVELAND, O.—The Cleveland & Eastern Electric Railway Company has been incorporated to build a line terminating at Orwell. The incorporators are D. H. Tilden, R. M. Lee, C. E. Fish, G. H. Hopper and C. H. Taylor.

EAST LIVERPOOL, O.—The East Liverpool and Wellsville Electric Street Railway Company will be sold in one month at sheriff's sale. The Union Trust Company of Cleveland, O., foreclosed the mortgage securing \$300,000 of bonds.

MIDDLETOWN, O.—An ordinance has been passed granting the Cincinnati & Miami Valley Traction Company the right to construct and operate a street railway through Middletown which shall be commenced within six months and completed in a year.

MANSFIELD, O.—The town council of Shelby granted to Reid Carpenter a franchise for an electric road between Mansfield and Shelby. Application is also made to the board of county commissioners by the same party for right of way along country roads and nothing will be done until the decision is given.

DAYTON, O.—The Dayton, Johnsville & Eaton Traction Company has been incorporated to build an electric road from Dayton to Eaton by way of New Lebanon, Johnsville and West Alexandria. Capital stock, \$50,000; incorporators, Henry B. Pruden, Alfred G. Feight, J. Elliot Beirce, Joseph Weil, and Barry P. Murphy.

TOLEDO, O.—Contracts for the construction of the line between Toledo and Monroe Piers, 22 miles in length, have been let to J. N. Bick, of Toledo. Wm. C. and Wm. M. Johnson and P. N. Jacobson, Detroit parties, are backing the enterprise. The cost of construction and equipment will be about \$300,000, and the road to be complete by August 1.

TROY, O.—The T., T., D. & E. Electric Railway project is booming. The officers are: President, Judge Theodore Sullivan; vice-president, George W. Scott; secretary, Dr. W. H. Thompson; assistant secretary, F. J. Gates; treasurer, John T. Knoop; superintendent, F. M. Sterritt; assistant superintendent, Frank T. Worman; superintendent of construction, Colonel Jeff Miller; attorney, George T. Long.

CINCINNATI, O.—A bond for \$10,000 has been filed by President C. T. McCrea, of the Cincinnati & Hamilton Electric Street Railway guaranteeing that construction will be under way by May 1. From the terminus of the Cincinnati Consolidated at College Hill, the line will run over the Hamilton pike to the county seat of Butler County, passing through Mt. Healthy, Pleasant Run and Symmes Corner. The line will be 12 miles long.

## Pennsylvania.

NANTICOKE, PA.—The Nanticoke & Newport Railroad Company which was formed to build a street railway, has been dissolved.

NEW HOPE, PA.—The East Pennsylvania Traction Company has applied for a franchise. The road will cross the Delaware between New Hope and Lambertville, N. J.

QUAKERTOWN, PA.—It is proposed to extend the Quakertown & Springtown Electric Railway, now in course of construction, to Argus, Trumbauersville, Tylersport, Schlichtersville, Sellersville and Perkasie.

NEW CASTLE, PA.—The New Castle Traction Company has been incorporated. Capital stock, \$500,000; incorporators, H. W. Mitchell, M. L. Merwin, Pittsburg; C. F. Patterson, E. L. Allen, and William Beal, of Alleghany.

WEST NEWTON, PA.—A charter was granted to the West Newton Northern Street Railway Company to connect West Newton with Herminie. The directors are James E. Bell, cashier of the First National Bank of West Newton, and T. F. Vankirk and F. M. Null.

HARRISBURG, PA.—The Sewickley Valley Electric Passenger Railroad, capital \$15,000, was chartered to build 2½ miles of road between Osborn and the Beaver pond. James D. Callery, Pittsburg, is president; directors, J. D. Callery, W. H. Keech, J. C. Reilly, Geo. C. Wilson, Pittsburg; J. M. Tate, Jr., Sewickley.

PITTSBURG, PA.—The Citizens' Monongahela Electric Railroad Company has been incorporated to build four miles of road on Mt. Washington, for which franchises are asked. Capital stock, \$24,000; president is James M. Bailey; directors, John Paul, Joseph G. Walter, William Halpin, William H. Minnick, of Pittsburg.

ALLENSTOWN, PA.—A. S. Cadwallader of Philadelphia, is president of the East Penn Traction Company, just incorporated to build through Lehigh county, beginning at the Bucks county line, on the road leading to South Bethlehem, thence to Coopersburg, Centre Valley, Friedensville and Colesville to the Northampton county line.

TITUSVILLE, PA.—The Titusville Electric Traction Company has been incorporated to build 15 miles of road beginning at Pleasantville and running through Crawford, Venango and Warren to the Titusville city limits. Capital stock, \$100,000; president, M. B. Dunham, of Warren; directors, George H. Dunham, R. D. Stoilzing, Pleasantville; T. F. Lemassena, Newark, N. J.; A. J. Hazeltine, Warren.

PITTSBURG, PA.—Stockholders of the Mt. Troy & Reserve Township Traction Company have decided to commence the construction in the spring of their line running for three miles in Allegheny city and Reserve township. Jacob Beckert is president; C. Beckert, vice-president; August Beckert, secretary and treasurer; Florence Wohleber, John Habermehl, Chas. Beckert, John F. Havekotte, William Eberhardt, G. H. Beckert and John P. Ober are directors.

## Rhode Island.

PROVIDENCE, R. I.—The United Traction Company will extend its Pawtuxet Valley line to Natick.

## South Carolina.

AIKEN, S. C.—The Aiken & Augusta Railroad Company has been incorporated to build an electric railroad 18 miles in length. Philadelphia capital is interested.

CHARLESTON, S. C.—The Charleston Street Railway Company has purchased the controlling interest in the enterprise Railroad, owned by Cuyler, Morgan & Co., of New York, and is negotiating for the outstanding interest. Both lines will be electrically equipped and operated as one system.

## South Dakota.

EDGEMONT, S. D.—An electric road to connect its mines may be built by the Edgemont & Union Hill Smelting Company.

## Tennessee.

CHATTANOOGA, TENN.—The Chattanooga Rapid Transit Company will be incorporated to build Samuel W. Divine's proposed electric road between Rossville and Chicamauga, Ga. Capital stock, \$150,000; incorporators, Samuel W. Divine, W. B. Royster, Charles T. Divine, John W. Wyatt, J. P. Pemberton, James R. Reid and James R. McFarland.

## Texas.

DALLAS, TEX.—The Dallas City Street Railway Company began work this week putting down new track and this, it is thought, is the first step in the proposition to put the lines on an electric basis.

SAN ANTONIO, TEX.—A mule car line is to be built to Von Ormy, 12 miles distant, by the Von Ormy-Medina Railway Company, of which F. Villereal is president; J. B. Bywaters, vice-president, and Edward Krause, manager.

DALLAS, TEX.—The Dallas & Fort Worth Company has been formed to build 30 miles of steam or electric road between the two cities. Capital stock, \$500,000. Back of the project is the Dallas Terminal Railway & Union Depot Company.

## Vermont.

STOWE, VT.—A bonus is offered any one who will build an electric road to Waterbury. Address J. F. McMahon.

BURLINGTON, VT.—Subscriptions are being received for the stock of the Grand Isle Railway Company, which plans to build an electric road from Burlington through Colchester, Milton South Hero and Grand Isle.



## Washington.

TACOMA, WASH.—Additional franchises have been petitioned for by the Tacoma Railway & Motor Company.

SEATTLE, WASH.—The Seattle Traction Company has been incorporated. Capital stock, \$1,000,000; incorporators, Jacob Furth, George B. Blanchard, Manson F. Backus, William A. Walthew, John W. Catbcat, John R. Walthew, Maurice C. Cheal.

## West Virginia.

PARKERSBURG, W. VA.—S. Darrow, C. W. Daly and William Caskey have petitioned for right to construct a double track electric road between Parkersburg and Williamstown.

MORGANTOWN, W. VA.—Theodore L. Swan, C. L. Brown and T. H. Wilson, of New York, have been granted the privilege of constructing and operating an electric railway from Grafton to Pruntytown.

WHEELING, W. VA.—Arrangements have been made to extend the Wheeling & Suburban Railway from Tridelpia to West Alexander. Pa. Capitalists of Washington, Pa., wish the line extended to their town also.

## Wisconsin.

KENOSHA, WIS.—The Milwaukee, Racine & Kenosha Electric Railway Company, it is said, will renew its application for a franchise in Kenosha.

OSHKOSH, WIS.—The Council granted F. H. Josslyn, representing the Citizens' Traction Company, permission to build a track on River street. It is expected that the road will be in operation in 60 days.

DELANAV, WIS.—A 20 year franchise has been asked and will be granted to the Delavan Light & Fuel Company to build 12 to 15 miles of electric road from this city to the several parks around the lake in this vicinity. Local capitalists only are interested.

GREEN BAY, WIS.—Sealed proposals for furnishing and placing an electric motor and other apparatus for swinging the Main street bridge will be received up to January 22. Specifications and plans may be obtained by addressing E. L. Shaw, Marinette, Wis.

OSHKOSH, WIS.—Although the Winnebago Construction Company contemplates putting in an electric railway from Oshkosh to Kaukauna, it is doing nothing on the line at present, but is confining its attention to the electric street railway of Oshkosh, which it is hoped to have in operation by June 1.

RACINE, WIS.—Although Hiram J. Smith has been made receiver of the Belle City Street Railway, Jackson I. Case, the former manager, will continue as superintendent. The liabilities, outside of the bonded indebtedness of \$300,000, will not amount to \$12,000. The bonds are distributed as follows: Charles B. Hathaway, of Cleveland, \$50,000; Case estate, \$50,000; Mr. McNair, of St. Louis, \$50,000; Jackson I. Case, \$60,000. No other changes have been made, and it is expected the affairs of the company will soon be straightened out.

## Canada

FORT ERIE, ONT.—The Fort Erie Ferry Company contemplates building an electric line to Chippewa, 15 miles distant.

BRANTFORD, ONT.—Mayor Elliott states that his company proposes to build an electric road from Brantford to Port Dover.

BERLIN, ONT.—The owners of the Berlin Electric Railway are negotiating for the purchase of the St. Thomas Street Railway, with a view to equipping for electricity.

WINNIPEG, MANITOBA.—The Fort Frances & Pacific Railway will be chartered to build an electric railway in the Rainy Lake gold country, connecting with the Canadian Pacific Railway at Wabigoon.

ROSSLAND, B. C.—Mr. Heinze, owner of the Columbia & Western Railway, is estimating the cost of changing its motive power from steam to electricity.

## REPORT OF THE TORONTO STREET RAILWAY.

The report which was submitted to the shareholders of the Toronto Street Railway Company on January 20, made an exceedingly satisfactory showing when the severe depression in business during the past year is taken into consideration. After paying fixed charges and a dividend of  $3\frac{1}{2}$  per cent on \$6,000,000 capital stock there was a surplus of \$12,026. The operating expenses increased over those of 1895, but the increase is explained to be due to the repairs of motors. During the spring the city permitted large quantities of water to accumulate in the streets and many cars were damaged in consequence, on some days as many as 35 or 40.

The following statement exhibits the totals for the last two years:

	1896	1895
Gross earnings.....	\$997,273.28	\$992,800.80
Operating expenses.....	597,760.31	489,814.76
Net earnings.....	489,512.97	502,886.04
Passengers carried.....	23,537,911	23,355,228
Transfers.....	7,354,895	7,257,572
Percentage of operating expenses to earnings in 1896, 59.9; in 1895, 49.3.		

There are a number of questions between the city and the company that have been in dispute and arrangements have been made to settle them by an amicable suit, the result of which will be final. Negotiations for a Sunday car service are progressing favorably and the company is confident of bringing them to a satisfactory conclusion.

No changes were made in the officers of the company, but F. L. Wanklyn was appointed manager, an office newly established. Mr. Wanklyn has had an extensive experience, having been for several years works manager for the Grand Trunk Railway.

## SAVANNAH COMPANY AGAIN ON ITS FEET.

On January 17 the receivers of the Electric Railway Co. turned over the property to the new company known as the Savannah Traction, and after the election of directors, Herman Myers was chosen president; J. H. Fall, vice president; J. G. Reid, secretary and treasurer; and J. S. Collins, managing director. No stock has been issued as yet, but the amount will probably be \$500,000. After the late experience of the company, the stockholders are of the opinion that the bonded indebtedness should be kept as small as possible. A new power house is soon to be built and the road will be put in first class shape.

## JOINT USE OF TRACK IN CALIFORNIA.

A bill was railroaded through the California legislature several years ago, at the instance of an electric line in Los Angeles, which wanted to get into valuable territory already occupied by cable tracks. The bill provided that under certain conditions of rental one company could run its cars over not more than five consecutive blocks of another company. A bill is now pending to amend the law by changing the word five to ten, and omitting "consecutive."

W. G. Seevers has succeeded his brother, Paul, as manager of the Muscatine (Ia.) Electric Railway.

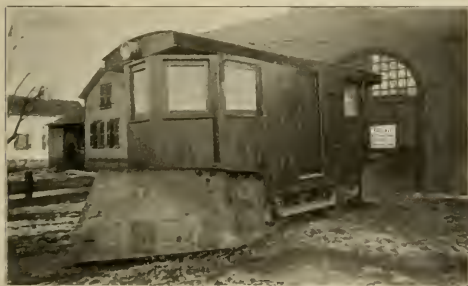
## BREAKING THE SNOWBANK.

BY GEORGE E. STEPHENS.

"Of the falling of snow there is no end."

More than one street railway in this country has had reason to declare the truth of this statement during the past few seasons. In fact on some occasions the truth has been enforced by a snow bank piled mountain high on each side of the street car track and many a poor superintendent, compelled to drag himself out of a good warm bed to take his place on the elevated seat of a road scraper, with the wind blowing forty knots an hour and the mercury hugging the zero notch, can testify to the need of a well designed snow plow. The winter so far in Galesburg has not been a hard one but the management believes in making hay while the sun shines.

As the result of the plans laid by E. P. Baum, chief engineer and electrician of the Galesburg Electric Motor & Power Company, the snow plow which is shown in the accompanying cut was built and on its first run was proven a success. The work has been accomplished within a few weeks from the start and now the officials of the company are ready for the fray. A description of the car as completed will give one a good idea of its size and the work it is expected to do. The car is 16 feet long and 6 feet, 13 $\frac{1}{2}$  inches wide and rises 7 feet from the rail to the top of the roof. The frame work is of heavy oak timber and the heavy stresses of the plows come on sills 5 by 8 inches in



SNOW PLOW, GALESBURG, ILL.

size. The body of the car is finished in pine and made light as possible, there being enough weight in the frame, truck and plows. The plow is mounted on a McGuire Columbian truck and equipped with Westinghouse No. 3 motors with type D controllers. The converters and connecting wires are all placed inside the car leaving only the motor connections beneath.

The main features of the machine, of course, are the plows, one in front and one at the rear, and the whole car is constructed with a view to the best workings of these. They are made of quarter-inch steel; are 1 feet high and run 8 feet and 1 inches from the point of the nose to the heel. They are raised and lowered in guides by a ratchet lever and screw inside the car. The plows are so constructed that they run back to a point close to the truck, doing away with the up and down motion common to cars using single trucks. On either side of the plow at the rear and hedging, close onto the truck, is a very convenient part, consisting of

a 16-inch wing worked by levers inside the car. The principal use of the wings is in bucking large drifts. When the nose is poked into a big heap and the car sticks fast the wings are brought into the side and the car may be easily backed.

By means of the levers in the car the plows may be raised and lowered at will, from a distance of a half inch to 8 inches. This lift is needed because Galesburg is well provided with brick pavements and the operator who should be so unfortunate as to plow up some feet of bricks would likely be brought before the common council. Inside the car are two sand boxes with a rotating sand valve which allows of three different sized flows. Each box is independent of the other and can be worked from either end of the car. A draw bar is arranged through the plow so that passenger cars may be attached. The car has two headlights and is lighted inside by three lamps. On the right side of the car is placed a door, 2 feet, 3 inches wide and 6 and one-half feet high. There are 5 windows in each end giving a full view of the street. The steel plows were made at the shops of the Frost Manufacturing Company.

## SECOND AVENUE RAILROAD, N. Y., SOLD.

A majority of the stock of the Second Avenue Railroad, N. Y., has been purchased by William C. Whitney. While Mr. Whitney bought the stock as an individual it is his intention to have the road incorporated with the Metropolitan system and operated by electricity or compressed air. The Second avenue company owns 13.5 miles of double track and operates 3.38 miles under leases, using animal traction. There is \$1,862,000 of capital stock, on which a dividend of 5 per cent was paid last year, and \$1,900,000 of bonds bearing 5 per cent interest. After meeting fixed charges and paying the dividends the surplus in 1896 was \$21. With mechanical traction substituted this road can not fail to make a paying addition to the Metropolitan system.

## PRESIDENT BILLINGS DEAD.

A. M. Billings, of this city, and president and owner of the street railway system of Memphis, Tenn., died suddenly of heart disease on February 7. He was one of Chicago's old settlers, and worth from \$10,000,000 to \$20,000,000. He became interested in the Memphis road about 6 years ago and later was practically its only stockholder. He spent about \$12,000,000 there, transforming to electricity and extending lines, etc. His interests in Chicago gas are well known, and he was also president of two banks. Although 83 years of age at the time of his death he was actively engaged in the management of large affairs, and one of the best known and respected men in the city.

## WAUKEGAN-CHICAGO LINE.

The Bluff City Electric Street Railway Company expects to sell through tickets from Waukegan to Chicago for 30 cents which is 75 cents less than is charged by the Northwestern railroad. There are about fifteen growing towns and villages between these two cities which will furnish much local travel. There will be 29 miles of track built to connect the Waukegan line with Chicago at Evanston. The cost of the road will be about \$500,000.

"EVERY INCH A KING."

I read with great interest the very able and courteous article in the January number of the Street Railway Review, over Mr. Henry R. King's signature and feel that I have not lived in vain, since to me is due the discovery of the Kipling of Conductivity, the Genius of Joints.

My joy is increased by the fact that throughout my small circle of electrical and railway acquaintance, I can find no previous trace or hint of the scientist and poet whom I have unwittingly unveiled to an admiring world. Though none can tell what happy clime has hitherto shielded him from universal homage, it is evident from his inspired words that he proudly retains an ancient prerogative of his royal name for things that were not so, promptly become so because he states that they must be so. At his command, cast scrap iron assumes the tensile strength of rolled steel and acquires the conductivity of hammered silver; iron oxide loses its insulating properties, while the expansion co-efficient of steel rails shrinks modestly to zero!

I once thought that the hundreds of copper-bonded "cast-weld" joints which I had personally measured in Newark and elsewhere had three to five times the resistance of the same length of rail between joints; the rails are still in the streets where any one can test them to my confusion. But this is needless; the King has spoken. Selah!

The resistance of the joint is less than the rail as per advertisement; let it be so! I must bow before the royal mandate and believe, or tremble lest his veiled threats materialize into a thunderbolt and blast my reputation. The King speaks of a St. Louis road; does he not know that the officials of the Missouri Railroad Company actually dare to think heavy copper bonding necessary to help out their "cast-weld" joints? Why not blast them just a little for their infidelity? Then they probably have the same two unused joints from the "cast-weld" exhibit which were tested in their power house and found wanting; why not repeat my tests and consign me to a dungeon for inaccuracy? The King quotes from Mr. Bowen, of the Chicago City Railway in merited praise of the mechanical stability of the joint.

Surely he must have heard that Mr. Bowen's road uses on its "cast-weld" joints even heavier copper bonds than most angle-plated roads put in. And furthermore, Mr. G. W. Knox, Electrical Engineer of the same road, has had the audacity to recommend the use of the Edison Plastic Alloy on the terminals of the big copper bonds he uses to help out the "perfect conductivity" of the "cast-weld" joints!

Evidently I shall have plenty of good company when the royal blasting apparatus gets under headway. But when the King tackles mathematics, I fear he gets outside his jurisdiction. He tells of a marvellous "cast-weld" joint whose dimensions he does not give. This joint has never been used, but he says it has been *exposed to the weather for three years!* Of course such exposure is more trying to the joint than actual service! He says this joint has a drop of .0107 volts with 760 amperes and that in "the rail alone the drop was .0117 volts;" (length and section of rail not stated.)

While, with Brown's plug, (depth, diameter and method of application not given,) the drop with 700 amperes is said to be .012 volts.

Here occurs a dramatic pause in which the blasting of Brown is supposed to commence. But figures are queer

things for Kings to fumble with. For purposes of comparison, I will assume that the rail weighed 90 lbs. to the yard; that the "cast-weld" joint had eight times its section; that the voltmeter terminals were properly attached to the rails at the same points in each case, and that the "plug" was  $\frac{7}{8}$  of an inch in diameter and  $\frac{3}{4}$  of an inch deep, applied so that half was in each rail. All the sample "cast-weld" joints I have seen exhibited have had the rail ends closely pressed together. There are therefore two paths for the testing current, connected in parallel with each other; one directly through the rail ends, and the other from the sides and bottom of the rails through the metal of joint; the latter is of cast iron having one-half the conductivity of steel per square inch, but with 8 times its section. It thus has 4 times the actual conductivity per lineal inch. Therefore if there should be *contacts of no resistance* through the rail ends and between the rails and the iron the iron would carry 4.5 of the current and the rails 1.5. The actual section of the joint at junction is 81 square inches, 9 of which are steel and 72 are iron. The latter are equal to 36 square inches of steel and the joint to .41 of steel. The figures quoted by his majesty now give us common mortals a means of getting the resistance of each of the two paths. The hole would affect only the path through the rail ends; if it were drilled with oil and the Plastic Alloy inserted *without* removing the same and *without* properly amalgamating the steel surfaces, the plug might just as well be made of insulating material, *for it could carry no current.* For convenience in calculation, I will assume that the voltmeter wires were attached in line with the outer edges of hole. Now this hole has taken from the contact area of the rail ends a piece of metal about  $\frac{7}{8}$  inches by  $\frac{3}{4}$  inches, or 0.65625 of a square inch. As the cross section of the joint equals 41 square inches of steel, the hole has robbed it of  $\frac{1}{4}$  per cent (.016) of its section. This loss should of course increase the drop just  $\frac{1}{4}$  per cent (.006). Instead of that, it is said to increase the drop from .0107 volts to .0120 volts, which is an increase of  $\frac{12}{100}$  per cent (.1214), which is  $7\frac{1}{2}$  times what it should be. In other words, according to this report, *the rusty rail ends* transmitted about 617 amperes of the current while the contacts on the iron were so poor that only 83 amperes could get through the "cast-weld." It surprises me to find that my tests should give the "cast-weld" joint a far better conductivity than its own advocate. Evidently someone has blundered badly. To settle which of us is guilty, I respectfully suggest that the King direct the Chancellor of his Exchequer to deposit with the Editor of this paper sufficient coin of the realm to cover all expenses, as a guarantee that he is not "articulating through his royal crown." Let the Editor then be requested to select without measurement a "cast-weld" joint that has been in actual daily service with heavy current for two years, or for even one year, in the track of some large road outside of Milwaukee or its suburbs. Let this joint be sent to the electrical testing department of some prominent university and its resistance tested up to the full carrying capacity of the rail. I will then insert a plug of plastic alloy and if with similar tests, this material does not give results similar to those obtained by me at St. Louis, I will pay all expense of tests and humbly crave his royal mercy. But if he proves to be mistaken, then his deposit is to be used to cover all expenses incurred. I cannot close without expressing my admiration for the King's eyesight which can detect in a printed reproduction of a photograph, evidences of a "weld" which do not exist

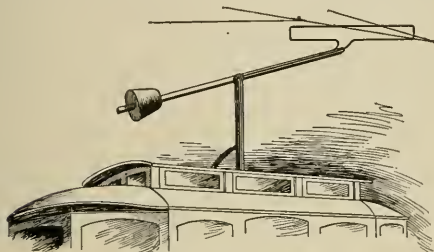


in the original article itself. So far as has been reliably recorded, no one has succeeded in welding together without a flux, a molten metal and a dissimilar solid metal which is at a different temperature. You may easily inclose one in the other; you may at points burn the surface of the solid and get a degree of adherence, but this does not secure a metallic union and is not a weld.

HAROLD P. BROWN.

### A TROLLEY SWITCHING CAR.

The West Chicago Street Railroad has recently put a dinky motor car at the O'Neil street barns to do the switching for the South Halstead street cable line. The car takes the place of 13 horses and two men and does the work in shorter time and in a very satisfactory manner. It requires but one man to operate the motor. Perhaps the trolley arrangement is the most interesting feature of the car. An ordinary trolley would require another man and be entirely unsuited to the wiring which is without switches. A home-



made contrivance was designed which has solved the problem. At the end of a 2-inch vertical pipe a beam is pivoted. On one end is a 1/2-inch steel wire bent so that it is about 6 feet across and this forms the contact to the trolley wire. On the other end of the beam is a weight which insures a constant pressure of the wire against the line. This makes allowance for the slack in the line, does not break contact when switching from one track to another and makes it possible to use the crude system of overhead wiring now in place. The accompanying illustration represents trolley arrangement.

### SALT WAR IN WASHINGTON, D. C.

The snow storms of last month afforded an opportunity for a legal quarrel between the Eckington & Soldiers' Home and the Metropolitan Railroad Companies of Washington. On January 20 six employees of the former company were arrested for sprinkling salt upon the tracks of the Metropolitan. The case against them was dismissed by Judge Miller, but that did not end the difficulty. The Metropolitan Company has begun suit in the District Supreme Court and prays an injunction against a repetition of the offense. The bill alleges that the company's plant was seriously damaged by reason of the salt water finding its way into the conduits and destroying the insulation, causing short circuits. It is alleged that in three days 51 cars were disabled because of the salt having been used.

The works of the Kepp Gear Wheel & Foundry Company, Allegheny, were destroyed by fire February 7. Loss, \$30,000; insurance, \$7,000.

### PRESIDENT VREELAND ON CONDUIT CONSTRUCTION IN NEW YORK.

President H. H. Vreeland, of the Metropolitan Street Railway Company, says that contracts have been let for the engines and electrical equipment to operate the lines on 6th, 8th and Amsterdam avenues and the 4th street and Madison avenue and the 59th street crosstown lines. The same plans for construction will be used as on the Lenox avenue conduit electric railway. The minor defects of this system have been remedied from time to time until it is now satisfactory in its operations both to the railway company and its patrons. This experimental line has been so successful during the past 18 months that the company feels justified in spending the enormous sums, necessary to transform these lines to the conduit system. The machinery is now building and the work of track construction will be pushed with vigor. In all probability cars will be running on the lines by next fall.

### WAGES REDUCED AT TOLEDO.

On February 1 a general reduction was made in wages and salaries, including every employe of the Toledo Traction Company, from the president down to the water boy. The cut is 10 per cent and will be continued until the business improves. It is hoped that when the summer riding begins the old rate can be restored. Train crews have been receiving 18 cents an hour for a 10 hour day.

### OBITUARY.

Chris. Murtaugh, superintendent of the Rockport (Ill.) Traction Company, died on January 19 of erysipelas.

Charles Parrish, who was for several years past the president of the Hazard Manufacturing Company, Wilkesbarre, Pa., died very suddenly at his home on Christmas day.

Charles Swan, who from 1846 until 1881, was general superintendent of John A. Roebling's Sons' Company's wire rope mill, died at his home in Trenton, N. J. Mr. Swan was born in Breslau, Germany, but came to this country at an early age.

Harvey Hart Woods, who has been secretary of the Second Avenue Railroad Company, New York, for many years, died suddenly of apoplexy. Mr. Woods was interested in politics, being a member of the Progress Republican Club and had been twice chosen as school inspector of the tenth ward.

Col. W. A. Sinclair, whose sudden death at Rochester, N. Y., we chronicled last month, was buried at Galveston, Tex., where he had been so prominently connected for 30 years. The funeral was conducted jointly by the Masonic and G. A. R. societies, and was one of the largest ever held in that city. The floral offerings were many, including pieces from the employes of the Galveston City Railway, who attended in a body and the Texas Street Railway Association, of which he was president.

The White-Crosby Company, of New York, has taken the contract to build 16 miles of electric road in Charleston, S. C., and will let sub-contracts for all material, except rails, but including cars and trucks.

## PERSONAL.

Wm. H. Traner has been appointed receiver of the Lincoln (Ill.) Electric Street Railway Company.

J. A. Ferguson, of Morris, Ill., is the successor of Louis Senseny as manager of the Lincoln (Ill.) Street Railway Company.

Paul B. Secvers, superintendent of the Muscatine (Ia.) Electric Street Railway, has tendered his resignation, to take effect February 1.

J. Frank Pratt has resigned as superintendent of the Southington & Plantsville (Conn.) Tramway Company and is succeeded by R. T. Ives.

John Balch, receiver of the Dubuque (Ia.) Light & Traction Company, has resigned and returned to Boston, his successor probably being H. G. Tarbert.

J. I. Nelson, formerly of Detroit, is the superintendent of the new Milwaukee, Racine & Kenosha Electric Railway which was opened for traffic on January 1.

H. P. Myton, superintendent of the Elkhart, Ind., lines, leaves the operating department to take charge of the construction work on the new line to Goshen.

W. E. Richards, electrical engineer of the Toledo Traction Co., was badly burned in both hands from touching a live wire at the switchboard in the power station.

L. O. Williams, chief engineer and electrician of the Springfield (O.) Railway Company, has been appointed superintendent of the line, vice E. F. Tindolph, resigned.

W. T. Lane, superintendent of the Pontiac & Sylvan Lake Railway Company, Pontiac, Mich., has sent in his resignation to take effect February 15, to accept a position with a Detroit road.

Superintendent McLain, of the Newton & Boston and Commonwealth Avenue Street Railway Companies was on Christmas the recipient of a gold watch and chain from his employees.

Phillips Begley, superintendent of the Nashua Street Railway, has been transferred to the Lowell (Mass.) & Suburban system, vice Leslie Wentworth, who resigns on account of ill health.

Warren C. Griffith, of Philadelphia, was elected president of the Lafayette (Ind.) Street Railway. Mr. Griffith has promised to make repairs and improvements on the system and equipment.

G. H. Campbell, general manager of the Winnipeg Electric Street Railway Company, has resigned that position to devote his entire time to mining interests. The vacancy has not been filled as yet.

Louis A. Wright, general manager of the Carbondale (Pa.) Traction Company, resigned in January and will take a similar position with the Schuylkill Electric Railway Company at Pottsville.

The Lackawanna Valley Company (Pa.) will have the following officers for the ensuing year: President, Lemuel Amerman; vice president, L. A. Waters; secretary and treasurer, Robert C. Adams.

Wm. B. Kilpatrick, private secretary of the general manager of the Staten Island Rapid Transit Company, accepted a similar position at Washington, D. C., under Frank S. Gannon, general manager of the Southern Railway.

C. P. Wilson was on January 1 appointed superintendent of the Sioux City Traction Company. Mr. Wilson's home is in Philadelphia but he comes more recently from Indianapolis where he has been connected with the street railway.

James Young has resigned the presidency of the Baltimore, Middle River & Sparrow's Point Railroad and the office of the company has been removed to the corner of Baltimore and Eden streets. Mr. Young was succeeded by Daniel Crook.

H. F. J. Porter, western representative of the Bethlehem Iron Company, gave a very entertaining and instructive stereopticon lecture on the "Modern Methods of Making Miscellaneous Steel Forgings, Guns and Armor Plate" at the Chicago Academy of Sciences.

William A. Flett, assistant superintendent of the Sioux City Traction Company, who has been connected with that company for a number of years, has resigned to accept a position with I. B. Walker, the former superintendent of the line, but who is now located in Chicago.

John M. Roach will undertake to make a saving of about \$365,000 in the operation of the West Chicago Street Railroad Company this year. This will be about 2.7 per cent of the capital stock. Mr. Roach is a very capable man but this undertaking will likely tax even his capacity.

W. L. Conyngham has been elected president of the Hazard Manufacturing Company, Wilkesbarre, Pa. Mr. Conyngham is very well known in the anthracite coal trade, being the principal partner of Stickney, Conyngham & Co., of New York, Philadelphia, Baltimore and Harrisburg.

J. N. Beckley, director of the Union Street Railroad Company, New Bedford, Mass., resigned, and Thomas B. Tipp was elected to fill the vacancy. Charles F. Shaw, treasurer of the road, severed his connections with it, and the president, Henry H. Crapo will act in both capacities, with A. C. Gardner to assist him in the treasury department.

There have been several changes at the Denver Consolidated Tramway, by which John Curtis, master mechanic, goes to the Gulf Railway Company, and C. F. Musgrove becomes purchasing agent in place of C. C. Keever who resigned. Fred Simmons who has been road master for a long time has also resigned to accept a similar position with the Milwaukee Street Railway Company.

A. H. Ford has been chosen secretary and treasurer of the New Orleans Traction Company in place of Henry Seligman, of New York. Mr. Ford has been connected with this company since its organization and has been a

faithful worker in its upbuilding. Formerly he was auditor of the Louisville Southern Railroad Company and later of the Kentucky & Indiana Bridge Company.

C. A. Denman, general manager of the Toledo & Maumee Valley, was on December 31 appointed general manager of the Toledo, Bowling Green & Fremont Railway Company, to succeed C. T. Geddes. As the two roads are closely connected it was decided to consolidate the management, and Mr. Denman retains his old position. Mr. Denman was for 10 years superintendent of the Consolidated Street Railway Company of Toledo, and accepted his position with the Toledo & Maumee Valley Company in 1896. He started at the foot of the ladder in the old horse car days and by close attention to business worked up to his present position. The REVIEW wishes him continued success.

M. K. Bowen, until January, superintendent of the Chicago City Railway, was at the last meeting of the directors elected general manager of the company. Mr. Bowen was born in Jefferson Barracks, Mo., in 1856. After a technical course at Washington University, St. Louis, he in 1877 entered the service of the United States as assistant engineer on a survey of the Mississippi river. After several years work on topographical surveying for railroads he entered street railway work as engineer and superintendent of construction of the Kansas City Street Railway and later as general superintendent of the road. Mr. Bowen left Kansas City to go to New York as representative of the Short Electric Railway, leaving there a year later to come to Chicago. For several years he has been superintendent of the Chicago City Railway, in which position his executive ability has been demonstrated, and his promotion is a deserved one.

## THE PARIS EXPOSITION OF 1900.

Advance sheets of the consular reports in regard to the Paris Exposition, have been received from the Bureau of Statistics, Department of State, Washington. The report states that work has commenced and will be vigorously prosecuted from this time forward. The details of management and regulation have been worked out. The United States will have a commissioner with absolute power in all questions concerning the distribution of space, erection of buildings and installation of American exhibits. Notice will be given of special tariffs made to exhibitors by railroad, steamboat and transportation companies. No charge will be made for space, water, gas, steam or other motive power in the exposition. All exhibits must be made in the name of the person, firm or company signing the application, and exhibitors are invited to mark the price of their exhibits upon them. Goods should be accompanied by a bulletin, attached to the bill of lading indicating their nature, class, weight and place of origin, and this will exempt them from statistical dues and inspection on the frontier. As much as possible all the products of a single country will be brought into juxtaposition, but where this is not practicable the grouping will follow the nature and utility of the objects rather than the country of production. In the classification, railroad and tramway construction will be under group No. 6, civil engineering and transportation.

The exposition will offer rare opportunities for American manufacturers of street railway supplies, for Europe and

France especially, is now and will be in the immediate future a field of great activity in street railway affairs. Appreciating the value of American experience, the French naturally look to the American builders for the best and most economical forms of railway apparatus.

## OUR FOREIGN EDITION.

The STREET RAILWAY REVIEW enjoys the distinction of having inaugurated the first and only Foreign Edition of a street railway publication, in the world. This was not a few extra copies of some month's home edition with the word "foreign" printed on the front cover, but was made up, printed and bound as a separate and distinct publication. It contains a large amount of matter which would not specially interest American readers, but is adapted to the wants and needs of managing directors abroad. A copy of this FOREIGN EDITION has been sent to every tramway in the world outside of the United States and Canada, and hundreds of copies to officers, directors, engineers, and heavily interested stockholders.

The tramway world abroad naturally looks to this country as the fountain-head of information and experience in electric and cable traction, and is now ready to enter upon that same progressive and wide spread transformation from animal to electric power, which prevailed here a few years ago. The opportunity for American manufacturers of street railway supplies to enter and possess this field is most inviting and promising, and the firms which organize to secure and care for this new business will be richly rewarded. In order to assist in this work, we shall for the first year, at least, print free of cost to our advertisers, all the advertisements which appear in our home edition of the month in which our FOREIGN EDITION comes out. We are making no extra charge for this, and do so as a compliment to our customers.

As the FOREIGN EDITION is the same size and printed with the same care as our monthly, our readers who have ever examined foreign technical and trade journals will readily understand what an impression the FOREIGN REVIEW is sure to make, by comparison with the poorly printed, and as a rule miserably illustrated, foreign journals. We have entered upon this work with a thorough organization, and ample facilities to make it absolutely cover the entire field, and with our advertisers can now truthfully say, "The world is ours."

## NEW MANAGER AT ROCHESTER.

At the last meeting of the directors of the Rochester (N. Y.) Railway Company, T. J. Nicholl was appointed general manager. Mr. Nicholl has had a wide experience on steam roads as well as street railways. During the past few years he has held the position of general manager on two of the railways in Chattanooga, Tenn., and was president of the Chattanooga Terminal Ry. Co. Mr. Nicholl has been division engineer on the Illinois Central and was for four years superintendent of construction on the Chicago & Northwestern.

The North Hudson County Railroad Company, operating trolley lines in Hoboken and North Hudson, is conducting experiments with two new car heaters; one a hot water and the other an electric heater.



### CONSOLIDATION IN NEW JERSEY.

During the month of January the condition of the Consolidated Traction Company of Jersey City, has shown much improvement. The receipts for the month were \$15,000 in excess of those of January 1896, and the operating expenses were reduced \$10,000, making a gain in the net earnings for the month, of \$25,000. In a recent interview D. M. Shauley, one of the directors of the company, stated that the company had just purchased the Passaic & Newark Line, which extends from Bellville to Paterson and connects with the Paterson Street Railway. A traffic agreement has been negotiated with this latter company and as soon as a connection with the Consolidated Traction can be built, the company will have a through line from the Market street station of the Pennsylvania railroad in Newark to the city of Paterson. This line will parallel the Erie Railroad from Newark to Paterson, passing under the latter's tracks at most of the passenger stations.

A syndicate has also been formed to build a road from Westfield to Elizabeth, a distance of five miles, which shall bring the Plainfield Traction Company in direct connection with the Consolidated and the city of Elizabeth. This line will make a valuable feeder for the Consolidated.

### NEW PUBLICATIONS.

We are in receipt of the first number of the National Engineer, a monthly, and the official organ of the National Association of Stationary Engineers.

The Siemens-Halske Electric Company has just issued a big pamphlet containing a partial list of plants installed and a large number of testimonial letters speaking in high terms of the Siemens-Halske machinery.

One of our exchanges which we welcome most gladly is City Government, a New York and Chicago monthly, published by the City Government Publishing Company, of which Clarence E. Stump is president and treasurer. The title is indicative of its contents; it differs from many things municipal in being good.

The Clonbrock Steam Boiler Company, Brooklyn, N. Y., has recently issued a catalog of 128 pages, illustrating the Morrin "Climax" water tube boiler. The book is profusely illustrated with views of the company's works, showing the boiler in process of construction and with views of some large plants where it is used. The last 30 pages contain tables, data, etc., useful to steam users and designers.

The McGuire Manufacturing Company, of Chicago, has just issued an illustrated pamphlet filled with handsome illustrations of various types of trucks both under cars and separate, together with testimonial letters from a large number of street railways which are using the McGuire equipment. A list is also appended of street railways in the United States and elsewhere, which have purchased McGuire trucks.

Electric Tramways and Railways, is the title of a little treatise by H. Scholey, assistant editor of the London Electrical Review. Technical terms are avoided and the subject is treated in a popular style, as the purpose of the book is

that "It may help to dissipate some erroneous notions concerning the overhead wire system and may prove of some service in establishing the great claims of electricity as an economical agent for working tramsways, branch and light railways." It gives a brief history of electrical traction, and then goes on to explain the various systems in use, chiefly those in Europe. The booklet is fully illustrated. Price 2 shillings.

Power Distribution for Electric Railroads, by Dr. Louis Bell; Street Railway Publishing Company, New York, price \$2.50. This is undoubtedly the most complete book ever published on electric railway power distribution, and the ability of Dr. Bell to handle the subject no one will question. It is for the most part a reprint of the series of articles that Dr. Bell recently wrote for the Street Railway Journal. The author recognizes the fact that electric railway power distribution is something about which it is impossible to lay down any fixed rules except as to methods of calculation, and wisely limits himself to outlining possibilities and taking up a few concrete examples.

### THE ATTORNEY OVER DID IT.

The only argument which appeals to a Chicago damage case lawyer is to lose his suit. The appellate court has set aside a judgment obtained in the lower courts, whereby Jessie Krueger was awarded \$50,000 damages against the West Chicago Street Railroad. Jessie was five years old at the time of the accident, which was being struck by a cable car while running across the street, and which resulted in the amputation of one leg.

The award was for the largest amount ever secured in such cases, and the appellate court reverses on account of the inflammatory language plaintiff's attorney used in making his closing argument to the jury. He referred to street car lines as "modern Juggernauts," and said that they operated "machinery of death," and announced that the gripman did not exercise any mercy toward the child when his train struck her.

Justice Waterman wrote the opinion. In closing, he said: "Our experience leads us irresistibly to the conclusion that the very large and most unusual verdict in this case was the result in some measure of the inflammatory and improper address of counsel. So believing, we feel compelled to set aside the judgment rendered."

### HALF RATES TO WASHINGTON VIA B. & O.

#### Inauguration President-Elect McKinley.

Excursion tickets to Washington, D. C., will be sold via B. & O. on March 1, 2 and 3 at rate of \$17.50 for the round trip. The B. & O. is the short line to Washington, and passengers may have the choice of routes either via Pittsburg or via Grafton, or they may go via one route and return via the other, at their option.

Inauguration excursion tickets will be accepted on vestibuled limited trains without extra charge. Dining car service on all through trains. Special trains will be run on March 1, 2 and 3.

Sleeping car reservations may now be made. Further information may be obtained at city ticket office, 193 Clark street, or at depot ticket office, Grand Central Passenger Station, Harrison street and Fifth avenue.



The West End road, Boston, has ordered 75 open cars and 175 trucks of the J. G. Brill Company, Philadelphia.

On February 1, the Ball & Wood Company, removed its New York offices to the Beard building, 120 Liberty street.

The West End Street Railway Company has made a contract with the Westinghouse Electric Company for 450 12 A, 30-horse-power motors.

The Falk Manufacturing Company of Milwaukee, has lately received orders from the Los Angeles Railway Company for welding a large number of joints.

The Newburyport Car Company has received orders from the West End Street Railway Company, Boston, for 35 large open cars, work upon them to begin immediately.

We have received a decidedly unique wall calendar "made in Japan," from Bagnall & Hills, electrical engineers, importers and dealers in all kinds of electrical supplies; Yokahama and Singapore.

Edward P. Sharp, of Buffalo, N. Y., dealer in overhead material, second hand electrical apparatus and electric railway supplies, has removed from the Agency Building to 909 D. S. Morgan Building.

Ford & Bacon, mechanical engineers of New York, Philadelphia and New Orleans, on February 1, admitted George H. Davis to the firm, which will hereafter be known as Ford, Bacon & Davis.

The Hunter Illuminated Car Sign Company of Cincinnati, is meeting with success in interesting street railways in its box signs. Since the St. Louis convention 37 signs have been shipped on trial orders.

W. McLain has been appointed the Pittsburg agent of the Cambria Iron Company and has opened an office in room 318 Park building, where he is ready to negotiate for the sale of all kinds of rails.

A. O. Schoonmaker, 158 William street, New York, importer of India and Amber mica, has issued an 1897 catalog and price list of his large stock of block and cut mica, stamped segments and washers, etc.

We are in receipt of a very handsome calendar from the Peckham Motor Truck & Wheel Co. Each sheet is devoted to one of the Peckham trucks and has two illustrations, one of the truck and one a car mounted on the same.

The Westinghouse Company, from time to time, issues catalogues describing improvements and new forms of apparatus. These catalogues make a useful collection, and for convenience in keeping them, the company kindly provides a cloth cover.

The Westinghouse Company has received orders for five 5,000-h-p. generators from the Cataract Construction Company of Niagara Falls. These are to be of the same type as those already installed and the consideration will be in the neighborhood of \$500,000.

George W. Conover and David E. Goe of Chicago, have combined to act as western agents for a number of electrical manufacturing concerns. The extensive experience and wide acquaintanceship of these gentlemen in the electrical field assure their success in this new enterprise.

Four of the thirty cars recently ordered by the Rapid Transit Railway Company of Syracuse, N. Y., from the Barney & Smith Car Company, Dayton, O., have been put in service. The cars are double enders with seats along the sides and are equipped with double fare registers.

The Central Electric Company, Chicago, furnished a large part of the wire, switches and transformers used in keeping the 25,000 incandescent lamps going in the Coliseum during the Cycle Show recently closed in this city. The promptness and satisfaction with which it furnished all supplies was a source of comment.

Ahearn & Soper, Ottawa, Canada, have received the contract for the complete rolling stock equipment of the Quebec Electric Railway, which it is intended shall be as nearly as possible a duplicate of the Ottawa road. The contract includes the motors, which will be of the Westinghouse make and especially adapted for the severe grades at Quebec.

The Milwaukee, Racine & Kenosha Electric Street Railway Company recently purchased a snow plow from the Taunton Locomotive Manufacturing Company of Taunton, Mass. Two 50-h-p. motors are used to furnish motive power. During the severe storms of January the railway company experienced no difficulty in keeping its tracks clean.

The Wheeler Rail Joint Company has been fortunate in securing the services of Geo. W. McNulty for president. His wide experience in street railway affairs will be of much service to his company. Jay Willard Clark was elected secretary and treasurer. The new officers expect to do a good business this coming year and will soon open a New York office.

The Pennsylvania Steel Company, Steelton, Pa., has been awarded the contract for the steel work of the new Southern Union Station train house to be erected by the Boston Terminal Company. This contract is for 14,000,000 pounds of steel, one of the largest of its kind ever placed. The same company also furnished the steel for the Northern Union Station of the Boston & Maine Railroad and for three sections of the subway.

The largest order ever placed for manufactured tapering yellow pine poles, being for 8,000, ranging in length from 25 to 55 feet, has just been awarded to S. C. Strock of 50 Broadway, New York, by the American Telephone & Telegraph Company, for use on its lines. Mr. Strock is a man well known to the electrical profession on account of his former connection with the Thomson-Houston and General Electric Companies.

A very complete electric power and lighting plant is now being placed in position in the extensive works of the Shoemaker Steel Company, Pittsburg. The power plant consists of one 400-h-p. vertical cross compound engine, direct connected to 225-k-w. generator, and one 175-h-p. vertical compound engine direct connected to 125-k-w. generator. The engines were furnished by the Ball Engine Company, Erie, Pa., and the generators by the Siemens-Halske Electric Company, Chicago.

The Apollo Iron & Steel Company, Vandergrift, Pa., has ordered a direct-connected set for electric lighting. The engine, which is a 150-h-p. vertical compound, built by the Ball Engine Company, Erie, Pa., is direct connected to a 90-k-w. General Electric alternating machine. This company already has an electric light and power plant, consisting of three 400-h-p. tandem compound engines made by the Ball Company, which are direct connected to Westinghouse generators of 225-k-w. each.

The Standard Air-Brake Company, in addition to sales already reported, closed contracts during the first week in February for one lot of twenty outfits for one road, and another lot of fifty outfits for a road near by. The company is building some heavy types of air-brakes for equipping electrified steam roads, and is about to close a contract for furnishing its motor-compressor type to be applied to some extra heavy locomotives to haul passenger trains of four cars, as well as freight.

In view of the criticism which has been occasioned through the failure of the Dornier & Dutton Manufacturing Company of Cleveland, it is but fair to Mr. Dutton to state that he severed his connections with the firm about two years ago, and has since that time been connected with it only as a sales agent and was in no way responsible for the failure. His friends will be glad to learn that he has taken charge of the railway department of the Van Dorn Iron Works in Cleveland, where he will be glad to meet them or hear from them.

The Partridge Carbon Company, Sandusky, O., reports that the prospects are very flattering for a largely increased business during the coming year, and has been increasing the stock carried so that orders may be promptly filled. The company makes three grades of brushes, hard, medium and soft, so that any of the requirements of service can be met. The brushes are truly "self lubricating" as they are treated after they are copper coated, and are recommended to consumers who wish to save commutators, give better service and do away with squeaking.

The Central Electric Company is now the exclusive general western agent for the Billings and Spencer Company, and carries in stock a complete line of all overhead materials, generator and motor patent drop forged commutator segments, also a complete stock of mica and micanite specialties, including commutator rings, segments, cut and uncut mica, both Amber and India. The new Billings & Spencer hangers are a radical departure from other forms and incorporate new and very meritorious features. The Central Electric Company is complimented upon its quick shipments and close attention to the needs of patrons. The line of specialties is unexcelled and a point is made to furnish to the customer whatever may be desired, as it is in a position,

through its agencies, to manufacture all forms of overhead and other materials and it controls many of the best specialties on the market.

The E. P. Allis Company of Milwaukee, is completing two vertical compound beam blowing engines, with steam cylinders 40 and 78 by 60 inches and two air cylinders 76 by 60 inches for the Krainische Industrie Gesellschaft, of Trieste, Austria. These are duplicates of the 12 engines in the Carnegie steel plant at Duquesne, Pa. Negotiations are pending for the machinery of a 1,200-barrel flour mill, to be built at Braila, Roumania. The company has been advised of the completion of a gold and silver concentrating plant for which it built the machinery. A feature of this last plant is that because of the difficulty of transporting it, no piece of material could be made heavier than 150 pounds.

The Cleveland & Chagrin Falls Electric Railway, now building between the above named cities, a distance of about 16 miles, placed an order with the Peckham Motor Truck & Wheel Company, for entire equipment of No. 14 double trucks. The car bodies to be supplied by the Kuhlman Car Company of Cleveland, are 39 feet over all, being vestibuled on the front end only; the two motors, 50-h-p. Walker, will be placed on the rear truck; the cars are to run at a speed of from 35 to 40 miles an hour and to be extremely handsome and comfortable. The Peckham double trucks differ from all other makes of double trucks in that they carry the car bodies as low as the ordinary four wheel street car, which is an important feature in cars which run at high speed through comparatively short curves. The Peckham Motor Truck & Wheel Company, also has an order from the Cleveland Electric Railway, for extra long trucks to be used under 24-foot car bodies, 32 feet over all. This we believe to be the longest closed car ever placed on four wheel truck with 7 ft., 6 in. wheel base.

The manager of a large and well-known road writes the New Process Raw Hide Company of Syracuse, N. Y., the following letter: "Your inquiries in reference to my experience with your raw hide pinions used on electric car motors received. I have used these pinions on three different roads. The mileage obtained from them has been very satisfactory. The greatest point to be observed, however, in the use of your raw hide pinions instead of steel, is the fact that the raw hide pinion does not perceptibly wear the gear. The gears of electric motors represent the greatest cost of repairs on motors of any mechanical part. It is true that the raw hide pinion usually costs about three times as much as the steel pinion. Steel pinions will wear out a gear within eighteen to twenty-four months. When raw hide pinions are used, it will be found that the gear will last for many years. There are other advantages to be taken into consideration by the application of raw hide pinions. These are, that they reduce the noise made by the motor very materially: that they are a factor of safety at times when the motorman, or driver puts his power on too quickly; by their use the gear case is not necessary; a saving will be made on the lubricants which are now used in gear cases. Another advantage is that the absence of grease from the gear cases stops the possibility of any grease dropping on the pavements, which in some towns is a source of great annoyance to the people. Raw hide pinions will be found to work better with new gears. It is not fair to the pinion to place it in service with a partly worn out gear."



The Omaha Street Railway has ordered 7 Dutton trucks of the Van Dorn Iron Works, Cleveland, the contract being taken by W. A. Dutton, manager of the railway department.

The Vilter Manufacturing Company, builders of refrigerating and ice making machinery, corliss engines, etc., Milwaukee, Wis., has recently closed a contract with the Reymann Brewing Company, Wheeling, W. Va., for a 100-ton refrigerating machine; with A. Gettleman Brewing Company, Milwaukee, Wis., for a 75-ton machine; with the Milwaukee Cold Storage Company, for two 40-ton machines; with Ruemmell & Siebert Refrigerating Machine Company, St. Louis, for three 75-ton refrigerating machines; with L. Gerlinger Company, Portland, Ore., for one 25-ton machine; with the Portsmouth Brewing & Ice Company, Portsmouth, O., for one 75-ton refrigerating machine with 15-ton ice tank; with the British American Brewing Company, Windsor, Ont., one 35-ton refrigerating machine; with Born & Company, Brewers, Columbus, O., two 50-ton ammonia condensers; with Fred Miller Brewing Company, Milwaukee, Wis., direct expansion cellar piping; with J. C. Miller Brewing Company, Philadelphia, Pa., direct expansion cellar piping; with Joseph Schlitz Brewing Company, for its Pittsburg branch, direct expansion cellar piping and an ammonia condenser. With each of the above name refrigerating machines an improved "Vilter" corliss engine is included.

The Syracuse (N. Y.) and Oneida Lake Electric Railway will be started as soon as the frost is out of the ground. The franchise for this road was granted about two years ago. At the recent annual meeting of the stockholders the following officers were elected: President, W. B. Kirk; vice-president, T. W. Meachem; secretary, W. S. Wallis; treasurer, J. B. Morgan.

The annual report of the Baltimore Traction Company proves it to be in a very prosperous condition. The income during the past fiscal year amounted to \$1,269,514, an increase of \$90,323 over the previous year. The operating expenses were \$646,127 and the fixed charges, \$445,511, leaving a balance of \$177,875. The board of directors was not altered for the coming year. The board will soon meet for the election of officers, but no change is anticipated.

People, often as soon as they get injudicious railway legislation, begin to find fault with it. Perhaps this is on account of the perverse streak in most men and they look assiduously for something to kick about. A new ordinance in Brooklyn prohibits the opening of the front doors of trolley cars, and now some are dissatisfied with this restriction, for it is thought that there is more danger in getting off the rear end than from the front platform. Such regulations should be left to the companies and the public weal would be better served.

## A QUEER DECISION.

Prior to the building of its road, a suburban belt line, 21 miles long, the Toledo & Maumee Valley Railway Company entered into a contract with the Toledo Traction Company under which the cars of the former company were to be run on the tracks of the latter within the city limits. This contract was fully carried out by both parties.

A few months ago the Toledo & Maumee Valley Company granted to a second suburban company, whose lines connected with its own at Maumee, the right to run cars over the entire loop including the lines of the Toledo Traction Company.

The Toledo Traction Company attempting to prevent this unauthorized use of its tracks, was beaten in the lower court last month but has appealed the case to a higher court.

## STREET RAILWAYS IN MASSACHUSETTS.

The report of the Railroad Commissioners shows that the 83 street railway companies in Massachusetts have 1,368 miles of road at a total average cost of \$46,041 per mile. Of this \$23,396 was spent for the road bed, \$9,804 for equipment and \$12,840 for lands, buildings and other permanent property. The gross assets of the companies were \$62,187,775 and liabilities \$61,117,713. The total income for the past year was \$14,900,941 and the expenditures \$14,423,012. Dividends of \$1,802,846 were paid, an increase of \$196,652. One company paid as high as 10½ per cent.

Sleepy Hollow, N. Y., made famous by the writings of Washington Irving will soon have its echoes awakened by the swift running trolley car. The modern Ichabod Crane can go a courting on electric cars with no fear of headless goblins.

The Halifax Town Council passed resolutions, which were ratified afterwards at a mass meeting of the citizens, to petition Parliament for a bill to empower the corporation to build tramways and operate the same. The mayor gave as his opinion that electricity was the only motive power worthy of consideration.

## AN ENGLISH CONDUIT.

The accompanying drawings show the conduit ducts and methods of jointing used in some underground work at Leyton, England. It is known as the Doulton conduit and is made in two, four or six ducts 2½ inches square. It is supplied in lengths of two feet, and jointed on stoneware cradles with Portland cement, as shown in Figures 1 and 2. While making the joint, plugs of wood were inserted into the ducts to insure their alignment, and to exclude cement from the interior.

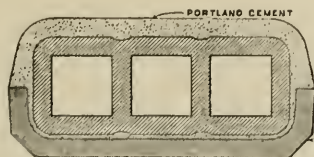


Fig. 1.

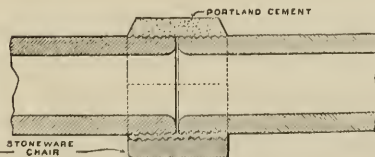


Fig. 2.



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

A car barn, 76 by 185 feet, is being built for the Cincinnati & Miami Valley Traction Company at Trenton, O.

The Union Traction Company of Philadelphia is the largest street railway company in the world, being capitalized for \$110,395,910.

Owensboro Electric Railway suffered the loss of car sheds and supply house, together with eight street cars and a number of motors. Loss, \$8,000.

Icy rails caused a Buffalo & Niagara Falls car to jump the track near the Tonawanda Driving Park. It ran into a board fence but suffered little damage.

C. M. Burlingame, the defaulting bookkeeper of the Buffalo & Niagara Falls Electric Railroad, was apprehended and returned to Niagara Falls for trial.

The annual report of the Beaver Valley (Pa.) Traction Company shows a very gratifying condition of the road's finances and good prospects for the future.

By throwing a piece of telegraph wire over the Never-sink trolley wire near Reading, Pa., and grounding it, a thief burned off and stole 200 pounds of copper wire.

It is said that surveys will shortly be made for an electric road between Clinton and Westboro, (Mass.) which is to connect with the proposed line between the latter town and Worcester.

Justice Richardson began the month by assessing the first \$5 fine for violation of the recent order of the health commissioner of Chicago against expectorating in public places.

The new charter for New York city provides for the sale of street railway franchises at auction, with the right reserved for the city to take possession of the road at the end of 25 years.

Two miles of electric road will be built connecting Catskill, N. Y., and Jefferson. W. S. Roberts, I. E. Roberts, W. Conway and Charles S. Williamson have organized the company with a capital of \$30,000.

The Denver Consolidated Tramway Company received during the year 1896, \$724,511, an increase of \$8,472 over the preceding year. The net earnings amounted to \$281,771, which was better by \$7,014 than 1895.

On January 18 a suit was brought in the District Court of Des Moines county, Iowa, by the American Trust Company of New York, to foreclose a mortgage given by the Burlington Electric Railway Company. Ostensibly the suit is brought because the company has defaulted on interest, but the object is to enable capitalists controlling the company to

buy the rest of the stock at a low price and then consolidate with the lighting and power companies of Burlington.

Annie M. Kerrison has sued the Market Street Railway Company, of San Francisco, for \$15,000 damages for alleged personal injuries received through the sudden stopping of a car on which she was a passenger.

The Post Office Department has entered into an agreement with the Consolidated Traction Company of Newark, N. J., to carry mails from the depots to the post office stations. The contract goes into effect February 15.

From January 1 to November 30, 1896, the gross earnings of the Cleveland (Ohio) Electric Railway Company were \$1,499,266, being an increase of \$131,509, and the net earnings were \$510,960, compared with \$480,015 for 1895.

Work is progressing on the Oshkosh Street Railway and it is expected by the management that operations will begin about June 1. A line from Oshkosh to Kaukauna is contemplated by this company, although nothing has as yet been done.

The financial statement of the Metropolitan Street Railway Company of Kansas City makes a very good showing. From January 1 to November 30, 1896, the total receipts were \$1,631,923 and the net earnings \$687,905, an increase of \$42,937 over the same period in 1895.

On the Union Elevated Railroad of Brooklyn, an engine jumped the track while going at full speed and collided with a train going in the opposite direction. The engine and smoking car were pushed off into the street, the engineer was killed and several passengers injured.

The employes of the Camden, Gloucester & Woodbury (N. J.) Railway have formed a relief association and elected officers: President, Benj. E. Poole; secretary, Hugh Brown; financial secretary, William Zinc; treasurer, Edward Foster; directors, Thomas Davidson, Joseph McVey and Joseph Ackroyd.

Charles C. Johnson, secretary of the Raleigh (N. C.) Electric Company, writes that a temporary plant has been installed to supply power to the street railway in place of the one recently destroyed by fire. The power house will be rebuilt and equipped with the latest electrical machinery in the near future.

A serious fire at the car sheds of the Brooklyn & Newtown line was prevented by the presence of mind of the motorman, who, on arriving at the sheds and finding a car on fire, ran in, coupled on to it and hauled it out into the street. The one car was destroyed. Loss, \$1,500, but the barn was saved.

At Mt. Clemens, Mich., there has been considerable trouble between the Rapid Railway and the Lakeside Traction Companies. A city ordinance was passed allowing the Rapid Railway to pass over the tracks of the Traction company, but there was some delay in accepting it. Recently when the Rapid company availed itself of this privilege, the other company chained a car to its track and cut the trolley wires. This almost precipitated a riot, but the mayor interfered. It is expected that the council will straighten out matters.

The Taylor Electric Truck Company, Troy, N. Y., has supplied 25 trucks for use on the Quebec Electric Railway.

The American Electric Heating Company of Boston, has made changes and improvements in its apparatus during the year. A revised price-list has been sent out to the trade.

The Westinghouse Electric & Manufacturing Company has furnished electrical equipment and 12A, 30 H-P motors for 25 cars to be used on the Quebec Electric Railway.

The contract for new track rail for the West End Road, Boston, has been placed with the Johnson Company, and the special work was divided between the Johnson Company, Wharton of Philadelphia and the Pennsylvania Steel Company.

Under an order of court the assignees and receivers of the J. H. McEwen Manufacturing Company, Ridgeway, Pa., will on February 22, sell the plant of the company together with all assets, including patents, shoprights and contracts.

It is stated that F. B. Torrey is fitting up an extensive plant at Bath, Me., for the manufacture of trolley wheels, brass goods, electric car fittings, etc., and it is expected that the works will be opened in March. The plant will be operated by electricity.

The Consolidated Car Fender Company of Providence has sent out a pamphlet bearing testimony of the excellence of the Providence street car fender. Records have been kept of accidents and the figures show that of the number of persons struck by cars equipped with them, 97 per cent escaped.

The Siemens & Halske Electric Company of America, announces that the statements of competitors claiming to absolutely own and control patents covering all underrunning trolleys do not refer to the Siemens trolley or contact bar. This is a well known device that has been often described. And further, that all United States patents covering the main features of the "Buda-Pesth conduit system" are owned and controlled by the Siemens-Halske Company, notwithstanding that other companies claim to install this system.

The F. L. Gaylord Company, of Ansonia, Conn., manufacturer of brass, bronze and composition castings, has added to its manufacture a full line of electric railway supplies. Among the patented articles made by this company are its well known brake handle, its trolley head with detachable springs and swivel ring for trolley rope and the "old reliable" sand box which has been considerably improved. The company makes trolley wheels of a special mixture guaranteed to run 12,000 miles. It is one of the few concerns that make pure copper castings guaranteed solid.

The stockholders of the Standard Underground Cable Company held their annual meeting in Pittsburg, on January 26, and re-elected the old board of directors. The report of the directors showed assets aggregating \$1,112,016 and liabilities exclusive of capital stock of \$106,928; the surplus over and above all liabilities (including capital stock) was \$308,107. The company's plants were reported as in good

condition with very flattering prospects for 1897, as there are contracts aggregating \$250,000 already booked. On January 30, the directors met and re-elected the officers of the company to their respective positions.

Communication comes to us from the Cahall sales department saying that their boilers are the only ones having "flowed" steel headers, etc. Some of their competitors have offered for sale Babcock & Wilcox type of boilers with "flowed" steel manifolds and cross boxes. "Flowed" steel is a special mixture of open hearth steel manufactured under a secret formula which belongs exclusively to the Cahall company. The Penn Steel Casting & Machine Company of Chester, Pa., prepares this steel and wrote the following letter in reply to the question whether any "flowed" steel headers had been furnished to any party other than the Cahall company.

"Referring to your inquiry, we beg to state that we consider the special mixture for 'flowed' steel we are making for you, your property, of which you have the sole right, and that we never have nor never will furnish 'flowed' steel to anyone but yourselves unless authorized by you. Neither will we give to anyone any information as to the formula under which this special mixture is made."

## HOW THE CASUALTY COMPANY WON.

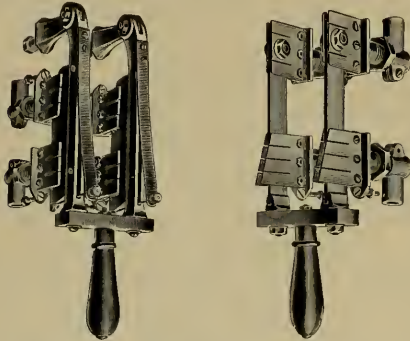
The Electric Mutual Casualty Association, through its attorneys, Taylor, Upton & Smiley, of Niles, Ohio, has just secured a verdict for one of its members in the Common Pleas Court of Trumbull County, Ohio, in the case of Cora Barb vs. Mineral Ridge & Niles Railway Company, and in the case of Aaron Barb vs. same road, dismissed by plaintiff.

On June 30th, 1896, the plaintiff, Aaron Barb and wife were in a covered wagon driving along the tracks of the Mineral Ridge & Niles Street Railway, and when at a point midway between street crossings, they suddenly attempted to cross said tracks without taking proper precaution, consequently their wagon was struck by one of the defendant's cars and demolished and they, themselves, claimed receiving personal injuries to the amount of \$1,500.00 and \$2,500.00 respectively, for which amounts they brought suit. The evidence of negligence on the part of the driver, Barb, was strong, but under the Ohio statutes, such negligence could not be imputed to his wife. However, by the skillful introduction of evidence and cross examination on the part of ex-Congressman Taylor, of the attorneys for the defendant, it was shown that Mrs. Barb usually "wore the pants" and "she would not have allowed her husband to drive across there if she thought there was any danger and he had spoken of crossing the tracks at that point and she had consented to it." The court charged the jury especially as to the significance of the woman's admission and it took but a few minutes for that body to render a verdict for the defendant. Another feature of the trial was the introduction of evidence given by a female detective employed by the association; she had obtained employment in Mrs. Barb's millinery shop and testified that Mrs. Barb, subsequent to the accident, did all kinds of hard work, such as lifting counters, boxes, etc., and boasted that she never was sick. The trial of the wife's case revealed to the husband that a detective engaged by the association, had also been in his employment, to whom he had boasted since the accident occurred of his physical powers and athletic abilities, hence his loss of heart and subsequent dismissal of the case.



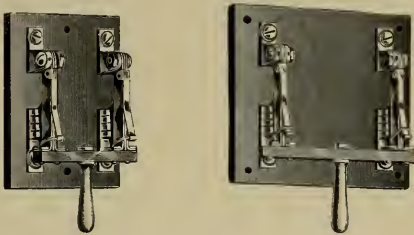
**THE WESTERN ELECTRIC KNIFE SWITCH.**

The demand for high grade knife switches has brought upon the market designs of various makers. The most recent are the type "E" and type "Q" manufactured by the Western Electric Company, Chicago. The contacts of these switches are all rolled tempered copper and great care in construction and design has been observed in order that the switches may carry their rated capacity in amperes without heating. In placing and fastening the jaws in position they are not soldered but bolted to the metal plates or lugs as can be seen from the illustrations. By this method the temper of the jaws is in no way injured and they will always grasp



the blade of the switch firmly and the contact will not deteriorate with time. The hinge contact is made in the same way and the bolt which passes through the hinge is provided with a lock nut, preventing any liability of loosening at this point. The blades are of drawn copper, hand finished.

The base is extended for connections on back of board and is secured in place by a lock nut. Swivel connections



are provided which will admit of the circuit wires being brought into the switch from any direction. The switches are all made to gage and any repair part can be obtained and a damaged part replaced in a few moments.

The type "E" is for station and switchboard work, being of the regular jaw pattern. The type "Q" is essentially the same as type "E" with the addition of a quick break spring and is especially approved by the underwriters for an entrance or service switch for motor work, constant potential arc, or incandescent lighting.

Two cuts of quick break switches mounted on slate bases are shown, one for a pressure up to 110 volts the other for a pressure up to 500 volts.

**WHAT BECOMES OF OLD COPPER WIRE.**

Few people outside of a certain line of business know what becomes of copper wire after it has served its purpose and been discarded. There is one firm in Chicago that makes a specialty of buying copper wire and burnt out incandescent lamp bases from electric railways and lighting companies, and handles a million pounds of this scrap annually. This is the Swartz Metal Refining Company, 120-122 West Lake street. The company has men who carefully inspect the old wire, and such as has any life remaining in it is sorted, re-rolled and sold for use again. Old lamp bases are of value only for the platinum they contain. From some of the other scrap the company makes a high grade of anti-friction babbitt metal for high speed dynamos. During the last year when business was dull at home, large quantities of the rejuvenated copper wire were exported.

**We Purchase Total Issues of Street Railway Bonds.**

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**N. W. HARRIS & CO.**

BANKERS,

Marquette Building, - - - - - CHICAGO.  
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**WARDWELL BROTHERS,**

**ELECTRIC ▽ RAILWAY ▽ BUILDERS ▽ AND ▽ MANAGERS,**  
**DANBURY, CONN.**

Will make Proposals for the Construction of all Classes of Street Railway Tracks, Power Houses, Etc.

**WANTED.**

**SCRAP COPPER WIRE, SCRAP BRASS and PLATINUM.**

We buy any quantity of Scrap Metals at Highest Market Values for Cash or in Exchange for our High Grade Babbit, Cotton Waste, etc. Correspondence solicited. Write for Illustrated Catalogue.

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ESTABLISHED 1885.

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MANUFACTURERS OF  
**INDESTRUCTIBLE STEEL GONGS,**  
**STEEL OILERS AND**  
**ENGINEERS' SETS.**



**EDWARD P. SHARP**  
**BUFFALO, N. Y.**  
**WILL BUY OR SELL**  
**"ANY OLD THING"**  
**IN ELECTRIC RAILWAY**  
**APPARATUS OR SUPPLIES.**



WINDSOR & KENFIELD PUBLISHING COMPANY,  
**OLD COLONY BUILDING, - - CHICAGO.**

TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

Address all Communications and Remittances to Windsor & Kenfield Publish  
 ing Company, Old Colony Building, Chicago.

**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.

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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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. MARCH 15, 1897. NO. 3

A UNIQUE method of discipline, which keeps a man steadily at work instead of granting a sometimes welcome vacation when suspended, has been adopted on a Massachusetts road. Violation of rules not warranting dismissal is punished by being assigned to night car runs. The scheme is not at all a bad one, and we can easily imagine the thoughtful, expectant look on the faces of the owl car crew as they scan the bulletin each night to see if some other unfortunate has slipped up and will let them back on the day run.

WATER power for street railway use is receiving much attention, and from this time on will receive more study than ever. Already Buffalo, Salt Lake City, Niagara Falls, and Portland, Ore., lines, all good sized systems, are using water power in whole or part, and Minneapolis and St. Paul lines will turn on current from water power in a few weeks. Denver is also looking to this kind of power, and others are taking the subject up. The improvement in apparatus during the past two years has made the governing of water quite as uniform as that of steam.

THE FOREIGN EDITION of the STREET RAILWAY REVIEW has elicited scores of complimentary letters from street railway men abroad. The American con-

suls especially commend the enterprise as what was greatly needed to acquaint foreign buyers with our American products, which in street railway supplies and apparatus are without question the best in the world. Our FOREIGN EDITION is the same size as the home edition, though prepared, printed and bound as an entirely distinct publication. The FOREIGN EDITION is issued quarterly, and is sent to every foreign street railway in the world. The next issue will be out May 1.

INTEREST in electric traction in foreign countries is steadily increasing, and each new installation will materially help to decide others to make a similar change. In Germany, particularly, is the work being prosecuted with great vigor. It is estimated that as many miles of electric railway were constructed in Germany alone in 1896 as were in operation with animal power eighteen months previous. The capital invested in electric railways in Germany is now over \$23,000,000. Construction is planned in other countries to a large extent. Our home manufacturers, however, to secure and hold a large share of this trade must be alert and pushing, for already German manufacturers are getting in shape to handle this new work.

THE American Street Railway Association probably never had a better executive committee than the one in office this year. This was made very evident by the thorough and business like methods which characterized its recent meeting at Niagara Falls, at which time arrangements were completed for the convention there next October. There has been a fear expressed by many that the accommodations there so late in the season would not be adequate to the requirements of the association, and that exhibits would suffer for want of proper shelter. The committee insisted on quarters both large enough and warm enough to make the display in comfort and with success. All this the local committee pledged itself to do, and also that the hotels should be warm and equipped with good service. The Niagara people are evidently very much in earnest, and will do their utmost to accommodate and please the visitors in every way. Unless the weather should happen to prove very unseasonable the natural and electrical features of interest will be unusually attractive.

THERE had been some doubt expressed as to the ability of Niagara Falls to take care of so large a guest as the American Street Railway Association. Never before has the meeting been held in any but a big city. Hence President McCulloch was very frank and plain spoken in his address to the local people at the Chamber of Commerce meeting, and the needs of the association even to the matter of small details were set forth. The Niagara people, however, were equal to all demands, and will undoubtedly exert themselves to the utmost to comply with every possible requirement, and promise that the association will be glad it selected that city. The plans, as now arranged for exhibits and meeting hall,

are all that could be asked. The hotels, which are chiefly summer hotels, will be kept open until after the convention, and while not modern, have large rooms, parlors and corridors and name rates to which no objection is made. For those to whom the Falls is an old story, the new power plants will be interesting, while the electric lines along the top of the cliff on the Canadian side, and at the bottom of the gorge on the American side open up new sights no less interesting than the Falls. Altogether the prospect for the '97 meeting is highly gratifying. At no previous meeting have so many details been settled so early in the year.

The phenomenally low price of steel rails has been taken advantage of, not only by steam roads, but by many street railways. Every one appreciates the fact that prices cannot long remain at the figures at which orders have been booked, for as soon as the mills are well loaded on future delivery orders, quick deliveries are going to command a premium. While the price of girder sections has not touched that of the T's, there has been a corresponding reduction, and many roads which were fortunate enough to be in financial condition to place orders have effected the saving of many thousands of dollars. The proposed interurbans, which, of course, lay T sections, have been greatly encouraged by the low prices, and not a few of them were able to place orders at the \$17 price. One such line alone which had its order for this spring delivery placed at \$28 per ton, with proviso of any lower rate which might maintain between date of placing order and delivery of the steel, was able to save \$22,000 on the drop. Another road which did not have the saving clause will have to pay \$28 per ton. In this connection it is encouraging to contemplate the widespread effect of activity in the iron trade. It is estimated that sufficient orders for rail have been placed to keep the mills running steadily for the next eight and some say, twelve months. If this be true, it means the putting in circulation, chiefly through the medium of labor, of anywhere from \$30,000,000 to \$50,000,000. It means activity in coal and coke industries, transportation lines, and scores of smaller industries whose existence depends on the activity in the steel trade. Let us hope that this may prove to be the needed impetus to start that general revival of business which has been dormant so long.

It is against the ethics of the profession for a doctor to pay for an advertisement in the ad columns, but he is free to work the editorial department for as many columns as it is willing to give him. Such a case appears to be that of a Newark physician who boarded a through car and refused to pay more than five cents for a ride within the city limits, when the fare on that car was ten cents. Notwithstanding the fact that in the cross examination he stated he had been sent for in a great hurry, he allowed himself to be ejected from the car rather than hand over the additional five cents. The ejection seems to have been only too readily accepted, for upon

the conductor laying his hand gently on the doctor's shoulder and telling him to leave the car, he lost no time in doing so. Then he rushes into court and lays claims to \$10,000 damages to his tender sensibilities which were so grossly outraged. The fact that five cents, whether justly or unjustly demanded, would have saved this outrage, never seems to have entered into the doctor's diagnosis of the case. Nor the other fact that the company would certainly have refunded the amount in question if it was in the wrong, and had it been demanded by correspondence or in person, does not appear to have been found in the doctor's *materia medica*. What he wanted was not ounces but pounds of corporate flesh. The jury, however, being composed of plain business men, fixed their eagle X-rays on Dr. Mulcahey, and prescribed a return of the doctor's nickle and an additional one cent as damages for the company's malpractice. The expenses to plaintiff, defendant and the county in trying the case amounted to several hundred dollars, and common sense would dictate that such nonsensical suits should not be given a place on the calendar. But then, this is a free country, you know.

THE adaptation of electricity to other than street cars proper, is making steady advance. The first notable exception was upon the elevated road in Liverpool, which was opened for traffic in February 1893. In this country the elevated road at the World's Fair was put in operation the same year, and it was an easy step to apply it to the Metropolitan and Lake street L roads here. Much has been written, and more expected, of the adoption of electricity by steam roads. But it has not been the experienced electricians who have at one bound looked for all the locomotives in the country to dash into the scrap heap. They realize that the change must come first through the suburban departments of steam roads, and that as yet unsolved problems must be worked out in long distance transmission before long stretches of steam lines can be changed to a partial or entire use of current. The work of the switching locomotives in the Baltimore tunnel and elsewhere has been successful, and the electrifying of the Nantasket branch of the N. Y., N. H. & H. was a big advance. At the present time 13 miles of steam suburban road running out of Chicago are being converted to electricity and will go into operation about May 1. It is in this connection the address of President Clark of Boston, before the railroad committee of the Connecticut legislature, appeals with special force and interest. He represents the great consolidation of New England steam roads, and while he has been known for a long time as favorably inclined toward electric power, is the first prominent railroad man to come out as strongly as he has done, in its favor. His experiences as related elsewhere in this issue, as an electrician solving problems of insulation and transmission "according to Clark," instead of by the rule, is decidedly amusing; but the cars are in successful operation as the world knows, and results are what count, not theories. He is not the only one who in the



past two years, being forced by the exigencies of a case, has found it possible to do in practice what was stoutly denied in theory. Mr. Clark utters several statements which are specially noteworthy. He says: "Our locomotives may go into the scrap heap, as the old stage coaches had to go. We must keep up with the times or else we shall be left in the rear." And again: "Gentlemen, you may tell everybody who is engaged in investing his own or any one else's money in lines competitive with steam lines, that they cannot long prosper when the day comes to lay down third rails in this country." We cannot allow this matter to pass without reference to the fact that it was threatened competition by a parallel trolley line, which has decided this railroad company to adopt electricity between Hartford and New Britain. Under the system of steam propulsion it is impossible to give the frequent service that the proposed trolley line would have done, and Mr. Clark publicly recognizes the prediction made by the REVIEW long ago, that on passenger business of the character in question, the steam roads have but one choice. It is to adopt electricity with its frequent service, or go out of the business just as the steam roads between St. Paul and Minneapolis have practically done. And he is the wise steam railroader, who anticipating trolley competition, forstalls it by himself installing the coming universal power. In the above we are commenting of course on passenger service, but while the day may be somewhat remote when the trunk freight lines will operate electrically, there can be little doubt as to the outcome for the transportation of passengers, mail and express.

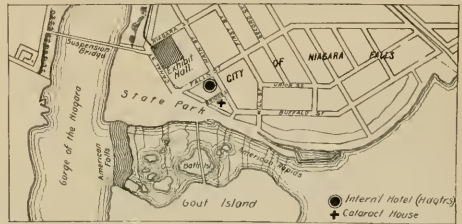
#### EXECUTIVE COMMITTEE A. S. R. A., MEETING.

The executive committee of the American Street Railway Association met in Niagara Falls on Monday, February 15. There were president Capt. Robert McCulloch; T. C. Penington, secretary; and C. S. Sergeant, Boston; Col. D. B. Dyer, Atlanta; Geo. B. Hippee, Des Moines; H. P. Brantford, Cincinnati and C. F. Holmes, Kansas City. The committee met the local representatives in the Chamber of Commerce, where the requirements of the association were fully stated by President McCulloch. After the arrangement of minor details and securing hotel rates which were satisfactory to both sides, the entire party inspected the site of the proposed convention building. The location chosen was approved and is very desirably situated. It is directly opposite the American entrance to the foot and carriage suspension bridge and faces the state park. Steam railroad tracks are already within 300 feet of the site and will be extended into the building, a condition which exhibitors will highly appreciate. Exhibits in less than car loads can be transferred at the depot and reloaded in a car and switched in, or hauled by teams.

The building which will be erected especially for convention uses by the citizens, will be 120 x 150 ft., and being on a corner and backed by an alley will be nicely lighted by day. It will be amply lighted by night and heated by electricity from one of the water power companies. Plenty of light,

power and heat is promised, for, as President Ely puts it they "have power to burn." The meetings will be held in the second story of the exhibit hall. The building is within five minutes walk of post-office, the Falls and headquarters hotels. The hotel people promise good service and reduced rates.

There is much of interest to visitors in both natural and electrical attractions. The plans for entertainment comprise a trip over the Buffalo & Niagara Falls Electric road; another over the Gorge road, a ride of thrilling interest; a trip over the Lewiston & Youngstown route to Ft. Niagara; one over the Niagara Falls, Park & River Railway, and from Chippewa to Queenstown; the inspection of the power plants of the Niagara Falls Power Company, and the Hydraulic Power & Manufacturing Company. It is also proposed to have a grand ball at the International hotel one evening, in addition to the regular banquet. All



this, with visits to the Rapids, Falls, etc., will combine to fill every moment. It is urged that delegates bring their families, and accommodations for all are guaranteed.

Applications for space may now be made and should be addressed to H. W. Beardsley, secretary Chamber of Commerce, Niagara Falls, N. Y.

After completing its business the executive committee, with several street railway people who were in the city, and officers of the local roads, took a trip down the Gorge road in a special car, and visited the water power stations.

Tuesday morning the party took a special car on the electric line to Buffalo, where they became the guests of H. H. Littell, general manager of the Buffalo Street Railway. They were shown about the city in an elegant special car and royally entertained in Mr. Littell's own hospitable style, dinner being served at the club.

#### PETROLEUM FOR THE TEXAS STREET RAILWAYS.

Woodford Brooks, treasurer of the Glenwood & Polytechnic College Street Railway Company of Fort Worth, Tex., says that the street railways will soon take advantage of the new oil fields in Texas. About three months ago petroleum was discovered at Corsicana and 5 wells bored. Upon investigation the oil was found to be of the finest quality and promises are good for a practically inexhaustible supply. The present cost of oil is 50 cents per barrel of 12 gallons, which makes it more economical for steam purposes than coal. The street railway company, controlling the lines in Fort Worth and Hillsboro, is endeavoring to get the railroads to give favorable rates for the transportation of oil, and arrangements are being made in the power houses for its use.

NEW TRACK CONSTRUCTION AT KANSAS CITY.

The heaviest rail as yet used by street railways is that to be laid in Wyandotte street, Kansas City, Mo., by the Metropolitan Street Railway Company. This line will extend from 2nd street to Southwest boulevard, and serve as a down town connection for the Southwest boulevard line to Rosedale. The new construction comprises 7,600 ft. of

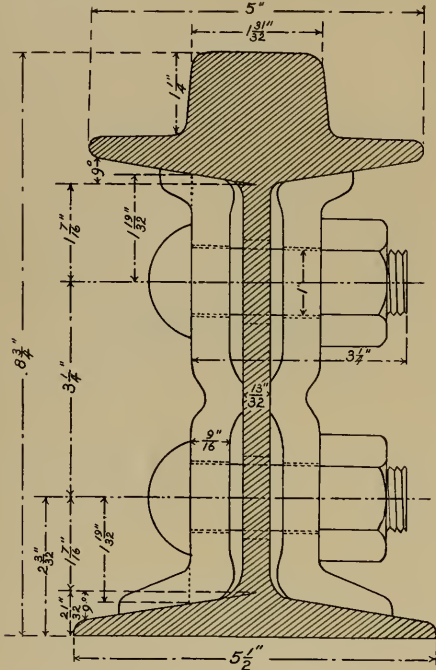


FIG. 1—103-LB. RAIL—HALF SIZE.

double track, in a street where at present no tracks are laid and which for the most part is already well paved with asphalt.

In order not to destroy any more of the pavement than is absolutely necessary the trench construction was adopted in that portion of the street. The contract has been let to the American Railway Construction Company of Chicago, and work will be commenced about April 1.

Fig. 1 shows a section of the rail, one-half size. It is a center bearing girder rail 9 in. high and 60 ft. long, weighing 103 lb., per yard, and is rolled by the Johnson Company.

A cross section through one track is shown in Fig. 2, which illustrates the construction. Oak ties 6 x 8 x 16 in. are laid at intervals of 10 ft. in the trenches 15 in. deep and 20 in. wide, that are dug in the pavement. On these blocks the rails are laid and spiked and the track surfaced. Wrought iron tie-rods are also put in every 10 ft., being placed midway between the blocks. The trenches are then filled up with concrete and the granite tooting blocks set, care being taken to have the spaces between the granite and the rail web properly filled. As only narrow trenches are dug it is impracticable to use temporary ties when surfacing the track, as was done in laying T-rails on concrete beams in Minneapolis.

The concrete is composed of 1 part cement (1/2 Portland and 1/2 Louisville), 2 parts sand and 5 parts of broken stone. After the cement has hardened asphalt is run into the spaces yet remaining between the granite tooting blocks and the old asphalt. The city ordinances require that the company shall maintain the paving between the rails and for 12 in. each side of the outer rails. It will be seen that the 12 in. includes practically the granite headers only.

As the joints are cast-welded it is probable that this construction approaches very closely to the absolutely permanent way of which railway men dream.

ELECTRIC RAILWAYS IN EUROPE.

In a report to the State Department, Thomas Ewing Moore, commercial agent at Weimar, Germany, calls attention to the fact that locomotion by electricity is gaining ground in Europe. After giving the data as to the number, mileage and mode of operation of the street railways of Europe which has already been given in the February REVIEW, the report continues:

"A large number of electric railways which were building during 1895 have been finished in 1896. It is estimated that the new lines of the present year will exceed in number and mileage those constructed in 1895, and it would appear from the activity shown in planning and laying out new routes that next year will show a like increase.

"The capital invested in Germany alone in electric lines is estimated at 100,000,000 marks (\$23,800,000). German industry and German capital are responsible for the advance shown in this new departure in the Empire. It is due in a great measure to the Rhenish-Westphalian iron industries having been for years trained in the production of street railway material, both for the home and foreign market.

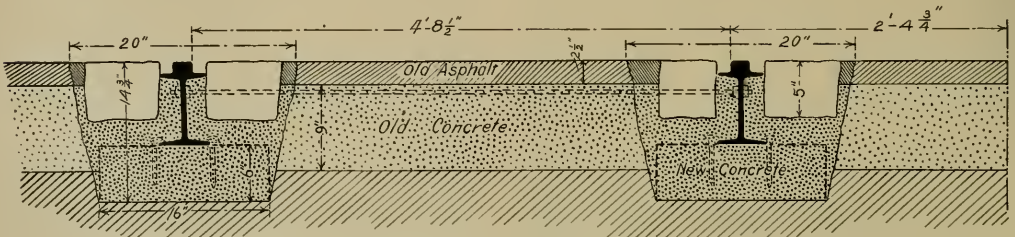


FIG. 2—SECTION OF TRACK AT KANSAS CITY.

“German electrical companies and supply manufactories have greatly increased in number and capital during the past few years and are constructing electric lines with steam engines down to the smallest isolator, thus giving an impetus to the boiler and car manufactories.

“Among the larger cities, Berlin is just about to introduce general electric locomotion in its streets. At present it is almost entirely dependent on the old horse tramway and omnibus service. Hamburg and Leipsic have their electric street railways nearly completed.

“The overhead surface system, owing to its being cheaper than the two remaining systems, will continue to be preferred for the lines contemplated or in course of construction.”

**HOME MADE SNOW PLOW FOR THE CALUMET.**

Much of the 75 miles of line of the Calumet Electric Railway Company lies in the sparsely settled districts south

lowered close to the track and any rigid obstruction will not damage the plow. At each end of the plow is a heavy fixed share extending seven feet in front of the car body and about 5 in. above the track. On either side of the car frame, but not shown in the illustration, is a spring suspended wing which can be adjusted to throw the snow as much as 6 feet on either side of the track. In front of the wheels are flanges suspended from a rod on each truck and held in place by springs. These bear on the rails and scrape them clear of snow, sleet and dirt. The brakes are also fastened to the truck and operated by a lever at the side of the controller. If the car should leave the track the chain guide on the truck can be shortened by pulling up the chain and dropping a link on the hook on the car body, a jack put under the car frame and the whole end of the car hoisted back on the track.

Although this snow plow has been built at small expense it is a powerful machine, equal to the most exacting service, and its construction has been such that it can perform its duty with efficiency.



HOME MADE SNOW PLOW—CALUMET ELECTRIC RAILWAY.

of Chicago. In many places the tracks are not protected from drifts by buildings, and this together with the infrequent service on some lines makes a snow storm of serious consequence. The road has been equipped with two sweepers and a snow plow, but the difficulty has been to remove heavy drifts. General Manager Sloan and Electrician Harding put their heads together and decided to build a plow specially suited to their needs. Much of the necessary machinery was on hand and the repair shop had every facility for construction. McGuire axles were used and two four-wheeled trucks were constructed, fitted with 1 W. P. 50-T.-H. motors. These trucks were separated far enough to permit a large adjustable share to go between them. The body of the car is very strongly built and quite large, being 29 feet in length. The car is entirely closed, affording protection to the men operating it.

There are two steel multiple-series controllers. The motors are arranged in two units of two in parallel and can quickly be thrown in multiple so that a burnt out armature does not disable the plow. In the middle of the car is a windlass for raising or lowering the central plow. This plow share is in three sections and on a spring suspension so that it can be

**CITY RECEIPTS FROM RAILWAYS.**

The receipts of the city of Chicago from the street railways during 1896 were as follows:

City Railway.....	\$133,703
West Chicago.....	69,726
North Chicago Street Railroad, North Chicago Electric, North Chicago North Shore, Chicago Electric Transit Company..	71,904
Calumet Electric.....	3,302
Chicago & South Side Rapid Transit Company.....	5,000
Metropolitan Elevated.....	5,750
Chicago & Jefferson Urban.....	1,147
South Chicago Company.....	425
Cicero & Proviso.....	168
Lake Street Elevated.....	6,000
Northwestern Elevated.....	20,000
Total.....	\$317,068

Of this \$69,000 was for car licenses; \$71,000 was paid to the public works department, and \$150,000 to the street lamp fund.

The street railway in Milwaukee paid \$20,485 in taxes last year.



## FLOOD INTERFERES WITH STREET RAILWAYS IN CINCINNATI.

About once in every 5 or 6 years, the Ohio river runs over its banks and goes on a rampage, causing loss and inconvenience to those living along its course. After a long experience with floods, property owners in the districts subject to overflow have erected their buildings above high water mark, putting in substantial foundations, built levees, and made other provision for high water, but all the pranks of the unruly stream can not be anticipated. Heavy rains throughout the watershed of the Ohio caused it to reach the danger point, 45 ft., at Cincinnati. Vast districts on both the Ohio and the Kentucky sides were deluged, making travel in the lower parts of Cincinnati, Newport, Bellevue and Dayton uncertain and dangerous.

The first illustration shows a view on Eastern avenue near the Torrence road. The car in the foreground was abandoned on account of the street being impassable as the water stood from 3 to 6 ft. deep. The Cincinnati, Bellevue & Dayton road can operate only a portion of its line on the



EASTERN AVENUE—CINCINNATI.

Kentucky side of the river. One of our pictures shows a broad expanse of water where is usually high, dry land. The latest mode of transportation is very primitive, consisting of a barge ferry with man power for tractive effort. A cable is anchored on the street car track on either side of the inundated districts and the passengers transferred in the barge. A car may be seen in the distance waiting to take the water bound inhabitants of Dayton to their places of business in Cincinnati and Newport.

Perhaps the most serious damage caused by the flood was the collapse of the 8th street viaduct, in Cincinnati, which is used for the Warsaw avenue, Elberon avenue and Sedansville car lines. A disaster was narrowly averted by the presence of mind of a motorman on the Elberon avenue line. The car, containing 31 passengers, was on the viaduct when the floor began to sink. The motorman turned his controller on to the last notch and as the car sped over the approach the structure went crashing into the Mill creek bottoms. The flood had softened the earth beneath the south retaining wall and it gave way causing the wreck of the viaduct. An idea of the extent of the damage may be had from our illustrations. The car lines are operating on

either side of the structure and the passengers are transferred after crossing on the north side-walk which still remains. It is reported that the Liberty street viaduct over Mill creek is also in danger and is being carefully inspected.

## ADVANTAGE OF ELECTRIC OVER STEAM LOCOMOTIVES IN STARTING.

Perhaps in no other way is the superiority of electric locomotion better shown than in the controlling mechanism for starting and stopping. The controller and reversing handles are very easily and quickly manipulated, when compared with the corresponding appliances on a steam locomotive. The motors respond almost instantly, and give such an even acceleration to the train that there are no great strains in the cars and draw bars. The quick acting air brake which is attached to the electric locomotives permits of higher rates of speed than the steam brake on many steam switch engines. In steam engines there is always a noticeable delay between the time when the throttle valve is opened and the pistons begin to move. This is often the cause of serious delays, for while each stop and start causes only a small loss of time, yet the aggregate amounts to a great deal. Another point worthy of mention is that when idle an electric locomotive absorbs no power, while a steam engine consumes as much coal just keeping steam up as it would to run at a constant speed of six miles an hour.

In switching yards either for making up trains or moving cars in manufacturing districts, the advantages of electric locomotives are so apparent that their use will not be long disregarded. But as E. H. Mullin points out in *Cassier's Magazine*, some alterations are needed in the present designs. The cab should be a circular conning tower, from which the operator could see in all directions, and in this should be placed the handles of the controller, reversing lever and air brake valve. The contact to the trolley wire should be designed to run equally well in either direction without the necessity of its being pulled around by hand. With these improvements electric locomotives should find application in many localities, making a saving in time and cost of handling freight.

## FIVE DOLLARS EXCESSIVE CHANGE.

An interesting change case was decided in Pittsburg recently, action being brought by Thomas Muldowney and wife against the Pittsburg & Birmingham Traction Company, in which \$500 were claimed. On trial it was found that Mrs. Muldowney boarded a car, and on fare being demanded found with the exception of three pennies the smallest money she had was a \$5 bill. This bill was tendered and refused two or three times, and the passenger finally ejected. The case was tried before Judge McClung, who, in the progress of the case, ruled that the tender of a \$5 bill was an unreasonable tender, and that if there was nothing more in the case than the refusal to accept the \$5 note in payment of the fare, which was 5 cents, the conductor would have been justified in ejecting the plaintiff from the car. The judge added that in ejecting the passenger regard must be had for the manner of doing it. While the conductor would have been in the exercise of a legal right, yet he was bound to do it in an orderly and proper manner. The jury concluded there was about \$90 worth of impropriety in the manner aforesaid and awarded the plaintiff that amount.



TRANSFERRING PASSENGERS IN CINCINNATI.



EIGHTH STREET VIADUCT—CINCINNATI.



EIGHTH STREET VIADUCT—CINCINNATI.



BETWEEN NEWPORT AND BELLEVUE.

## ELECTRICITY ON STEAM ROADS

President Clark of the Consolidated as an Electrician—Surprised Himself and Others—  
Success of Experiments to Date—Big Promise for the Future.

Charles P. Clark of Boston, one of the best known and most successful steam railroad men in the country, and president of the big consolidate railroad interests in New England, recently made an address before the railroad committee of Connecticut. The occasion was the fight between a proposed trolley line between Hartford and New Britain which threatened to parallel Mr. Clark's present system of steam locomotives. His utterances are so full of prophecy, based on his experimental electric lines, they are notable as indicative of what other steam roads may expect to come to in the near future. After a few introductory remarks Mr. Clark gets down to what interests us—the application of electricity to his steam road. He said:

About three years ago, east of Boston, there was a cry for the double tracking of a short piece of road, about seven miles in length, upon which the business was extremely variable. On some days the number of passengers carried, being those resident on Nantasket Beach, would not outnumber a thousand or fifteen hundred. Perhaps the next day, a pleasant holiday, the number of passengers would be 25,000. On busy days the handling of the traffic was attended with delay and risk. The use of electricity as a method, not of creating power, but of conducting power, had been very largely discussed, and it seemed proper that an experiment should be made with the advantages of a high, dry, well-graded rail, so that we might learn as to its economy, both under a great volume of business and under a small volume, and it was determined to erect a very substantial trolley line, which up to that time had been the only practicable method of using the fluid. A large line of solid center posts was set up, and the double track was laid at a sufficient distance from these posts to prevent accidents to passengers, who often injure themselves if they have an opportunity. The power house was located at one end of the line.

A trolley wire was strung, the section of which was in the shape of a figure eight, so that a mechanical grip might be had upon it, instead of depending upon the old method. Everything worked as we had hoped it would, and better than those who had been in the business of trolley construction had prophesied. The continual application made to us as managers of the road was to make our rolling stock as light as possible, to assimilate to the practice of the street roads in every respect. All these overtures were resisted, and the equipment put upon that road consisted entirely of open cars, the business being a summer business. The cars themselves weighed between thirty and thirty-two tons. They were fitted with standard Westinghouse brakes and were so fashioned as to comply with the laws in force as to whistles and bells, compressed air being used for the whistles, and large gongs of the requisite weight answering for bells. After the service which had been demanded for the summer had closed we obtained figures which showed us that with business in volume electricity proved a much cheaper source of conveying power generated in a stationary plant than to generate the same force and power at the head of the train. And we found also that notwithstanding the

entire absence of insulation, either on the feeder or trolley wires, saving only the wooden posts upon which they were carried, without an ounce of glass or porcelain, the waste was very much less than had been experienced by any street road with whose figures we had become familiar. At the close of that summer's work, two years ago, it was determined to make further experiments as to the power which can be obtained from these motors and from this power house. As we were engaged in some heavy construction work, which required the use of between fifty and one hundred cars of granite every day, a sufficient number of these were weighed and sent to the power house for the purpose of testing by no spring or no patent contrivance, but by the actual article, the power which was generated and used with the apparatus. We found that we could haul in both directions, lest there might be any slight grade in either more than the other, over one thousand tons of dead weight. And it was determined, first, that electricity with a given volume of business was a cheaper way of applying power generated in a single station than by generating it at the head of a train in a locomotive, and, second, that it was no longer a plaything, but would answer for serious work. That was the lesson of the first summer.

In the fall I directed that the engineers should make an estimate of the cost of extending this trolley, which was entirely satisfactory in every way, toward Boston. The conditions were different. We had to deal with a road already double tracked, and the question of supporting the trolley wires over the center of the tracks was a very different one from the erection of posts alongside of a single track, and the laying of the second track far enough away from the posts to prevent accidents. It was necessary to put either a truss across the two tracks, with a margin of safety from the possible heads of passengers, or in some way to support these trolley wires. There were many bridges which carried the railroad and many bridges that carried the highways over the railroad. There was not room between the tracks for this center line of posts, and to spread the tracks for the purpose of using them involved the reconstruction of the road. The tracks carrying the bridge must be changed and the bridges spread. The tracks carrying the highways over the railroad must have their abutments removed and set farther away from the track. The expense of suspending these trolley wires by a truss or by spanning wires was very much complicated by the grading of a steam road, already constructed, when passing from cut to fill. The expense of either construction forbade any further experiment in that direction.

We then took up the question of a center rail on each track, midway between the running rails, for the purpose of conveying the current and dispensing with the trolley wire entirely. Well, of course, the trouble began. The electricians all told us that the current would be lost, and that we might put as much current as we pleased at one end and at the first five miles it would be dissipated. I asked them if they could suggest any remedy for that, and they handed me



an involved set of figures, such as I have never seen since I left school, which told me how many copper feeder wires must be laid and so on. I asked whether the current passed along the outside, or through the body of a conductor, and of every eleven men, entirely conversant with their business, five said through the inside, five said on the outside, and the eleventh man said he did not know. I took the judgment of the eleventh man, and not knowing myself, determined that we would make this rail in such a section that if this mysterious current for it is mysterious to anybody, street railroad or standard railroad men should take a notion to travel through the body of the rail it should have body large enough to conduct it. And the rail laid was of one hundred pounds weight, having the advantage in making that weight of providing also a very large surface. The electric rail is substantially like a letter "A," the top resembling ordinary surface rails with sloping sides, which gives it an appearance entirely distinguishable from the outside ones. The question came up of insulating the rail to avoid loss of current. The current costs money. We went to work on that and one of the largest electrical companies cast some sections identical to what we proposed to lay down and made some tests, proposing a number of elaborate schemes for insulating this rail. We agreed with them as we agreed with the eleventh man. I said to them that no doubt their scheme would be nicer, but we would try to do it with simple blocks of wood.

We felt our way in that direction and finally laid down five miles of double track with these A-shaped rails bonded therein, and bonded the outside rails in the usual manner, and I give you my word that ever since that day the electrical talent of this country have been trying to invent some excuse for the current keeping on those rails and doing its work and not diffusing itself and wasting. Their tests showing practically no loss of the force amazed them, and they confessed that they could not understand it. But they said trouble would come when we got ice, snow and rain. The kind Providence sent us a cloudburst at that place and all three rails were under water for hours and the cars went on just the same. They said these are the facts and we cannot tell why exactly, but that probably this thing could not be done to any greater distance. A couple of street railroads running up into the interior of the country wanted to get their passengers down to the beach line, and we told them they might lay their tracks on the back side of our station platform. When we put the third rail in operation and began to carry their passengers it developed such a business on those street railroads that their power house broke down. They were in trouble. They came to us and asked us to supply them with current, and the head of the electrical department directed the connection of their entire system at our junction station, made with this same third rail, which had been guaranteed not to be successful without a lot of knitting work. And we ran their whole electric system with better results at our own power house than we did with our own rails alone.

You all know why electricity can be made to propel a car faster than steam. On a locomotive a ton of dead weight comes to a stop twice at every turn of the wheel and reverses its motion; whereas this is a continuous revolving mechanism, and we can run seventy miles an hour, or as fast as it is possible to keep on the rails if the copper wires of the electric motors are so wound.

Having determined that we had the speed; having deter-

mined that electricity is capable of doing serious work, as we did by the granite experiment; having found that it is economical; and having found that its application by a third rail was at about one-fifth of the cost of a trolley line, then another field of duty was opened.

As the custodians of these great railroad properties, if we could serve the public better by four tracks we have invested our money in four tracks. If better served by two tracks where there is only one, we have put down two tracks, and the Consolidated railroad has spent millions and millions of dollars for the purpose of doing business more satisfactorily and at cheaper rates, and everybody seems satisfied with one or two exceptions, both with the method of administration and with the charge for it.

Now, this electric problem is not simply one between New Britain and Hartford, but a living one all through this country. We have more women stockholders in the New Haven road than men. Nearly one-third is held by people who have less than twenty shares each, and if ever an officer or a director of a great corporation was more especially a trustee than a manager, every one of the nineteen men who control the New Haven interests are trustees, and we could not stop here with the development of the electric problem. Because having found that electricity affords the force, and the economy, and that it is practicable to run cars with two-minute headway as well as under two hours with trains, and that accommodation could in many places be afforded, we concluded that the time had arrived when we ought to operate on a larger scale, and we preferred to do it where everybody could see it. We found a place where the roads cross as I cross my hands, and that is Berlin. If it goes on as we have tried it, there is no more question as to what will soon be done on the steam roads than there is of another day. You shall see it before you adjourn. We were held back a few weeks and are so much behind our calculations. We had hoped that cars might be run in this month of February. The experiment is pertinent to Hartford and New Britain and I present it here. The New Haven road has no quarrel with electricity; on the contrary, electricity has harnessed itself in its service and is more highly appreciated by the New Haven road today than by the managers of any other steam railroad in the country. There is no malice about our experiment. Our locomotives may go into the scrap heap, as the old stage coaches had to go. We must keep up with the times or else we shall be left in the rear.

Gentlemen, you may tell everybody who is engaged in investing his own or anybody else's money in lines competitive with steam lines that they cannot long prosper when the day comes to lay down third rails in this country. There is neither malice in this statement nor a desire to injure anybody. The New Haven road is owned alike by rich and by poor in Connecticut and out of it, seven thousand stockholders, who trust Judge Hall, Henry C. Robinson, Mr. Brainard and the rest of us to take care of their affairs. There is no mistake about this use of electricity as far as we can see. If there develops something that we do not know, the exhibition will be made here in the course of a few weeks and you will be able to judge for yourselves. Now, a word about the New England road and about this particular business. If New Britain and Hartford were all that were involved in this question there would have been no building at Berlin. Hartford has 70,000 people. New Britain has say 25,000, but the business between New Britain and Hartford we know is 350,000 people a year.

That is hardly enough to maintain a power plant and all that it involves. It is the first in this part of the state, although it is number three. It is an experiment in the line of the duty and obligation of steam railroads to serve the public better by frequent communication by car service than by train service. The power house is located where the third rail can go to Middletown, to Meriden, run the entire street railroad of Meriden, go up to New Britain, west to Plainville, we know not how far. The transmission of power by the third rail has gone farther than the electricians thought. How far it will answer without commercial loss nobody yet can tell. But the investment is not a large one. A power house costs the same whether put up by a street railroad or a steam railroad. The charges that have been paid by the steam railroad for lighting its different stations, when the lighting is done as an incident from this same power, will pay the interest upon it. Two motor cars, of which there are eight times as many idle all the winter, owned by our road, will give a fifteen-minute service between New Britain and Hartford. If the petitioners wish to go on and construct their road, I want them to understand exactly what they are experimenting with, but the greatest of all questions is whether this house to house business done by lines through the streets or frequent traffic is most desired by the public.

I am president of the New England as of the New Haven road. But I do not appear because we simply do not want these charters granted. The gentlemen should understand what they are to meet. It will go down in the future, if I do not fail in my prediction, that at Hartford in the state of Connecticut was constructed the first practical demonstration of the subordination of electricity to the standard steam road. Instead of having six, eight or ten trains a day, all the New England road could afford to run, we may develop a service and a traffic of ten times that. The business may not want to come by us; it may want to go by the other line, but we shall learn whether it is any use anywhere to proceed farther with these investments and make these constructions, which are infinitely cheaper than building a new railroad, and which, where there is a sufficient volume of business, is undoubtedly practicable and profitable for steam railroads. It is in that spirit that we proceed to lay this third rail. It is with the same interest and with the same views that the managers of these properties have endeavored to serve the public by an expense of millions of dollars in creating additional facilities within the last ten years.

We do not like this parallel scheme, we do not want it, but if it is carried forward it will remain for the public to determine by their use whether it is worth while for steam roads to make further developments. All the machinery from Berlin can be transferred to a location where the road now does a business of four and a half millions instead of three hundred and fifty thousand passengers a year, and all the possibility of loss to the New Haven road will be the transference of these generators to that point.

## EXHIBITION AT MUNICH, 1898.

On the occasion of its fiftieth jubilee, the General Industrial Association of Munich, with the co-operation of the Polytechnic Association of Munich, will hold an exhibition of such machines and auxiliaries as tend to improve industry and the arts. The management of the exhibition, which is under the patronage of the prince-regent of Bavaria, is in the hands of a board of directors of which Max Nagle is the president.

This exhibition is known as the Second Exhibition of Motors and Machine-Tools, the first one having been held in 1888. The exhibit will be divided into five groups as follows:

Group I. Motors, gas, petroleum, benzine, steam and hot-air engines, machinery driven by water and wind power, and electro-motors up to ten horse-power.

Group II. Machine-tools, hand-tools and implements.

Group III. Auxiliary machines, as pumps, ventilators, presses, cranes, clocks, parts of machines, electrical arrangements, safety appliances, apparatus, auxiliary materials.

Group IV. Manufacturing processes in operation, and machinery in motion.

Group V. Special technical literature.

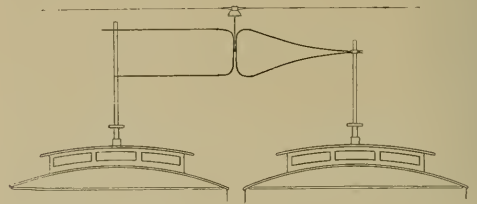
The exhibition will open June 11, 1898 and close October 10. Final applications for space should be made by October 1, 1897, at the latest. The charge for floorspace is 20 marks (\$5) per square meter; for wall space 15 marks per square meter. As a rule machines of more than 10 h. p. will be accepted only in the form of models. The exhibits will be received any time after April 15, 1898.

This exhibition will offer an excellent opportunity to American manufacturers of street railway apparatus and they will no doubt be well represented at it.

Full information in regard to the rules and regulations for exhibitors may be had by addressing the Office of the Exhibition, Munich, or any of the German consuls in the United States.

## SIDE CONTACT TROLLEY.

The daily papers are illustrating a new form of side contact trolley which is promised to do great things. If the original is anything like the pictures, we can readily imagine



that "great things" can be expected of the tower wagon crew.

The inventor is said to be a Denver man, but our correspondent there has been unable to find any trace of any such invention there. By using this form of collector but one trolley wire is required, according to the story. Such an installation would provide one continuous Fourth of July for the small boy.

On February 15 Horace G. Torbert succeeded John Balch as receiver of the Dubuque (Ia.) Light & Traction Company. The final report covered the last fifteen months of the receivership, and shows the receipts since December 1, 1895, to have been \$60,746, which was \$2,246 in excess of the disbursements. All claims against the company have been paid except some special taxes for street improvements.

### MAMMOTH PLANT OF THE MARKET STREET RAILWAY, SAN FRANCISCO.

The illustration shows one of the new engines recently installed in the Bryant street power house of the Market Street Railway Company at San Francisco. This is one of four 1,200-h.p. vertical triple expansion engines built for the company by the Union Iron Works, three of which are now in place. Each engine is direct connected to two 400-k.w. Siemens-Halske generators.

When the company adopted electricity as the motive power for its Mission street line it installed two 600-h.p. and two 300-h.p. vertical compound engines, belted to 200-k.w. generators but soon found them inadequate to supply the demand, as mile after mile of horse car track was rebuilt and converted to electricity. The four engines built by the Union Iron Works bring the capacity of the station up to 6,600 h.p. which is ample for the demands of the near future,

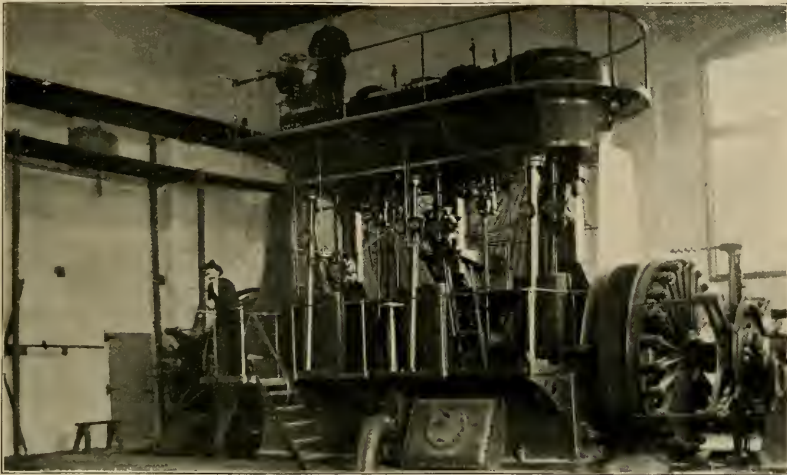
driven by 110-h.p. motors, one being sufficient for the duty and the other held in reserve.

The boilers for supplying steam are of the elephant type arranged in sets of three, and are fitted with the "Howden" system of forced draught. A double line of steam piping has been put in so that a stoppage resulting from a burst pipe cannot take place. The switchboard, of white California marble, 58 ft. long, presents a very handsome appearance and is equipped with all the latest appliances.

We are indebted to H. H. Lynch, superintendent of construction for the illustration.

### NOISELESS ROLLING STOCK.

The REVIEW has several times called attention to the desirability of making cars as noiseless as possible, maintaining that by looking after this matter the comfort of passengers is as surely increased as in any other way, and that money spent in making cars noiseless is just as wisely spent



1,200-HORSE-POWER ENGINE—MARKET STREET RAILWAY, SAN FRANCISCO, CAL.

and leaves something in reserve. The power house, however, was designed for nearly double its present capacity, and will ultimately have 12,000 h.p.

The cylinders of the engine shown are 20, 30 and 44 in. in diameter, all having a stroke of 30 in.; the speed is 150 r. p. m., and the steam pressure 160 lbs. The high pressure cylinder valve is of the piston type with a separate cut-off controlled by a shaft governor; the intermediate and low pressure cylinders have plain slide valves. The bed plate is extra heavy, the condenser forming a part of it, with the tubes at right angles to the line of the crank shaft, and is set on a very heavy concrete foundation bedded in solid rock.

Each engine is fitted with a direct connected vertical air pump. The condensing water is taken from San Francisco bay at a point about a mile from the power house and is pumped through a line of cast iron pipe. The pump house is situated near the inlet and contains two centrifugal pumps

as that employed in making them attractive to the eye. To many persons a rattling car, be it ever so roomy and attractive other ways, can never be a comfortable means of transportation. Modern car building practice uses nearly every possible device to make the car body and windows noiseless. The same can hardly be said of some trucks. Is it reasonable to take great pains to make the car bodies noiseless and let the trucks go on with their rattle? At least one large company has begun to take steps to make its trucks more noiseless, recognizing that while some modern all steel trucks are economical as to repairs, they are not as comfortable for passengers or as economical as they would be were many of the metallic joints cushioned. Our steam road brothers set a very good example in the way of noiseless rolling stock, and it is also fair to presume that because of it they gather in some cash that would otherwise go to electric roads where they are in competition. When buying new equipment give some serious thought to noise prevention.



### UNION TRACTION, PHILADELPHIA, POWER HOUSE BURNED.

On March 3 the power house of the Union Traction Company at Ridge avenue and 13th street Philadelphia was destroyed by fire. Fire was discovered a few minutes after 6 p. m., just after the night force had come on duty, and



POWER HOUSE AFTER THE FIRE.

before it could be located and any attempt made to check it, the employes were all driven from the building by smoke. Aside from some oil stored in the basement, there was but little inflammable material about the building except the floor and the roof, and the fire burned itself out within two hours. Soon after the fire got under headway the roof fell in, breaking the steam mains, and the deafening roar made by the escaping steam is responsible for the only fatalities

that occurred. The horses of one of the fire engines became frightened and ran away, killing two people and injuring from ten to twenty others.

This plant was built in 1893-4 for the central distributing station and was the most important of the company's nine power houses. The building was 200 x 175 ft., the engine and boiler rooms being under separate roofs and divided by a party wall. The equipment comprised 19 boilers, 9 Wetherill engines and 9 Westinghouse dynamos, four of them 1,500-k. w. machines. In addition to the wrecking of the machinery, the cables and feed-wires in the basement and the switchboard were badly damaged. Though the Traction Company carries its own insurance to a considerable extent, this power house was insured for \$275,000, which will probably cover the loss. The cause of the fire is not definitely known as yet, though it is said to have been caused from a chain from the overhead crane falling upon the commutator of one of the large dynamos and short-circuiting it, the sparks igniting oil about the machine.

This station supplied power for about 20 of most heavily traveled lines east of the Schuylkill river, and the accident caused a tie-up that has been unequalled in extent since the strike, but it was temporary only. No sooner was the accident known than all the available men were put at work making the necessary connections for supplying the dead lines with current from the other power houses, and by 10 p. m. all of the cars were able to move. The following morning cars were running on all lines, though on slightly greater headway than usual. President Welsh and his assistants made every effort to save patrons from inconvenience and was eminently successful in rapidly getting the lines into working order.

The work of cleaning up the rubbish was begun as soon as the fire was extinguished. The switches and instruments on the upper part of the switchboard were ruined but the frame work was for the most part uninjured, and the follow



INTERIOR OF ENGINE ROOM—UNION TRACTION COMPANY, PHILADELPHIA.

ing day men were busy installing new instruments mounted on temporary supports so that the station might be used for distributing the power generated at the other stations. The walls are not badly damaged and it will not be necessary to rebuild them in the event that the company restores the station. Whether it will do so has not yet been decided.

Our illustrations show interior and exterior views of the power house as it appeared the morning after the fire.

## TRAMWAYS IN THE UNITED KINGDOM.

A report has been made to the House of Commons giving some interesting information and statistics in regard to tramways and their prospects of future development. At the present time England has 792 miles, Scotland 96, and Ireland 121, making a total of 1,009 miles of tramways in the United Kingdom. Of these lines 116 belong to private companies and 37 to city corporations. There are 4,663 cars operated by 35,621 horses and 568 locomotives. Last year 759,466,047 passengers were carried, making the receipts \$20,760,000, of which \$5,230,000 was net. Electric traction is yet in an embryonic stage. There are but 19 lines operated by electricity, with 110 miles of track. Although few in number these roads represent a great diversity of practice in every detail of equipment. The varied types may be represented by the Liverpool elevated road, the South London underground, the seashore line of the Brighton & Rottingdean Electric Railway, the Dublin-Dalkey line with alternating currents and rotary converters, the storage battery road at Birmingham and, in fact, hardly a line could be noted that has not some peculiar features more or less experimental. The street railway practice is far from crystalization. Although many American methods have been accepted, yet the many municipal restrictions, local prejudices and conditions make these deviations necessary. It could not be questioned, however, that if the Britons would not allow their ultra conservatism to obscure their better judgment, the services of experienced American engineers and the use of superior American street railway equipment would be highly advantageous.

## THE STREET RAILWAY ACCOUNTANTS MEETING.

**Attendance will be Large—Fine Program Prepared—Work to be Laid Out for Coming Months—Will Meet in Cleveland, O., March 23-24.**

The Street Railway Accountants, including auditors, secretaries, treasurers, or by whatever title the accountants of various roads may be called, will gather in the first meeting of the kind ever held, at Cleveland, O., on March 23 and 24. Headquarters will be made at the Hollenden hotel, where suitable and commodious rooms for the sessions have been secured.

While it is contemplated to effect an organization of this department of street railway work, and appoint strong committees to prepare reports and recommendations at the first succeeding meeting, it was not deemed necessary to wait several months before getting down to business. Hence a fine program has been prepared, in which the names of many of the best street railway accountants in the country appear. The subjects are practical and timely and no one who attends can fail of being many times repaid for the

trouble and time spent in going. Among the papers to be read the following appear in

### THE PROGRAM.

- "From Horse to Electric Accounts"..... H. L. Wilson.  
Auditor West End Street Railroad, Boston.
- "Useful and Useless Classifications"..... E. D. Hibbs.  
Auditor Consolidated Traction Company, Jersey City.
- "Suggestions for a Standard System of Accounts; Classification of Operating Expense Accounts, and Form of Report that will Admit of Comparison and Diffuse Information between Companies"..... C. N. Duffy.  
Secretary and Treasurer Citizens Railway, St. Louis.
- "Earnings: Handling and Accounting"..... John Hourigan.  
Auditor Albany Railway Company, Albany, N. Y.
- "Monthly Closing of Accounts"..... Dana Stevens.  
Accountant for Receiver, Belt Railway, Washington, D. C.
- "Transfer Tickets"..... Frank R. Greene.  
Secretary Chicago City Railway.
- "The Relation of Accountants to Managers and Employees"..... P. V. Burington.  
Secretary and Auditor Columbus Street Railway, Columbus, O.
- "A Simple System of Interurban Accounts"..... W. B. Brockway.  
Auditor Toledo, Bowling Green & Fremont Railway, Toledo, O.
- "Naming and Standardizing Apparatus"..... J. P. E. Clark.  
General Manager Binghamton Railroad Company, Binghamton, N. Y.
- "Depreciation"..... H. C. McJilton.  
Auditor Baltimore Traction Company.

Several other subjects have been called for, which will be announced for general discussion.

During the stay of the accountants in Cleveland, they will be tendered a trolley ride by the local street railway men and shown points of interest about the city.

Every road which can possibly do so, should send a delegate to this meeting. It means dollars to the company. No such opportunity to meet and exchange ideas among the heads of this department has ever before been offered, and now the occasion has come the most possible should be made of it.

Delegates are also specially reminded to bring with them sets of blank forms in use, for comparison with others. In this way much benefit can be derived in securing the most perfect forms as yet in use.

Cleveland, March 23-24.

## CLEVELAND & CHAGRIN FALLS LINE PROGRESSES.

The Cleveland & Chagrin Falls Electric Railroad Company is pushing the work on its 14.2 miles of line which it is expected will be in operation by May 1. The track is being laid with 60-pound rail and the overhead work includes the figure 8 trolley wire. Generators and motors will be supplied by the Walker Company, of Cleveland, engines by Russell & Co., cars by the G. C. Kuhlman Company, of Cleveland, and trucks by the Peckham Motor Truck & Wheel Company, of New York. Vincent A. Taylor, who has been the prime mover in the enterprise, is now president of the company, with offices at Cleveland, O. The overhead work will be furnished by the Ohio Brass Company.

## IN THE HALLS OF LEGISLATION.

Not in the history of the oldest street railway man has there ever been at "one consecutive time" so much or so great a variety of legislation pending directly affecting street railway interests as now. The street railway bill fever seems to be epidemic, and while much of it is absolutely iniquitous, and cannot possibly hope to go through, some of the bills are good. Others are only mildly harmful, but with few exceptions the grist has the appearance of a large and healthy sand bag. A glance at some of the bills introduced is interesting:

**COLORADO.**—Vestibule bill pending with petition signed by 2,000 in its favor. As open cars are run throughout the year in Denver, at which the bill is especially aimed, it would seem not to be greatly needed.

**CONNECTICUT.**—To provide vestibules; for street railway tax to be paid the state instead of the cities; for transfers in New Haven; to authorize mayors and city councils to grant extensions of lines; the parallel road bill.

**DELAWARE.**—House passed a bill extending the time in which the Chester & Wilmington road might build, to January, 1898.

**IOWA.**—A vestibule bill covering the time from November 1 to April 1.

**INDIANA.**—To heat cars; 3-cent fare; to terminate charter of Citizens road, Indianapolis, in 1901; to allow companies to take advantage of the Barret law for paving between tracks. The 3-cent fare bill is now a law.

**ILLINOIS.**—Forbidding laying of tracks without valid ordinance; 3-cent fare bill; vestibule bill; to establish a railroad commission; to sell franchise to highest bidder; to extend franchises 40 years on payment of \$2,000 per mile of single track; tax of 3 per cent on earnings; to vestibule.

**KANSAS.**—A vestibule bill.

**MICHIGAN.**—Bill authorizing consolidation; requiring the sounding of gongs at railroad crossings; bill to get consent of railroad commissioners prior to increasing stock or bonds; to give a car service every five minutes in cities over 150,000; to pay employes in cash only; to permit the carrying of freight; to limit franchises to 30 years.

**MISSOURI.**—The Ward bill is for a different method of assessment of street railways, with a view to make a more uniform taxation of street and steam railways in cities over 100,000. The Dunn bill for 3-cent fares in St. Louis and Kansas City was killed. The vestibule bill providing for vestibule protection from November to March inclusive, was passed. Bill introduced allowing street railways to sell power and do a general lighting business under a railway charter. Also one for half-fare for standing passengers.

**NEW HAMPSHIRE.**—Unimportant; being 10 bills to incorporate new roads.

**MASSACHUSETTS.**—Bill to allow roads on which gross earnings do not exceed \$500,000 per annum to combine for accident insurance; a franchise tax of 3 per cent, and in addition a sum equal to the amount paid in excess of 5 per cent dividends; bill for elevated road in Boston; bill to make minimum amount of paid in capital \$5,000 per mile of track instead of \$10,000; also for board of arbitration in Boston.

**MINNESOTA.**—Bill to require the Twin City road to pay 5 per cent interest on deposits required of employes.

**MARYLAND.**—Bill requiring certain roads to issue transfers and to regulate the wages of trainmen.

**NEW JERSEY.**—For the creation of a board of three railroad commissioners to serve for five years at a salary of \$2,500 per year each; to regulate flagmen at steam crossings and to provide other safety appliances at such places; a bill increasing taxation of corporations with a view to prevent stock watering; a bill relating to time schedules and one for vestibules.

**NEW YORK.** Half-fare for standing passengers; to place two motormen on front platform of all cars; to sprinkle tracks twice daily; a penalty of \$500 for violation of local ordinances regarding speed and snow cleaning; to adopt fenders; to adopt vestibules; to permit lines in third-class cities to charge 10 cents fare where 450 feet of elevation are overcome within 1½ miles; to provide transfer stations.

**NEBRASKA.**—Vestibule bill. Several Omaha motormen testified before the committee that they did not consider vestibules necessary.

**PENNSYLVANIA.** Vestibule bill.

**UTAH.**—A bill to compel companies to vestibule, in the absence of which one legislator declared of the men that "the manhood was being ground out of them."

**WISCONSIN.**—To put wires underground (aimed at trolley wires); requiring consent of majority in each mile; 4-cent fares; to tax both capital and property of roads; to tax tracks for improvement or repair of streets occupied; new lines crossing old lines must pay for and keep in repair crossings; to carry free police and firemen in uniform.

**DISTRICT OF COLUMBIA.**—Most of the bills are purely local, relating to desired extensions, removal of dead tracks and the placing of flagmen at steam road crossings.

Few of these bills have yet become laws, and while some of them, particularly the vestibule bills, may pass, there is little likelihood of the rest getting through.

## BICYCLE HOLDERS ON STREET CARS.

As noted in the REVIEW for January the Market Street Railway Company, of San Francisco, has for some time been experimenting with bicycle holders on its cars. The device which we illustrate was adopted on the San Francisco street line on February 7, and its use is rapidly increasing,

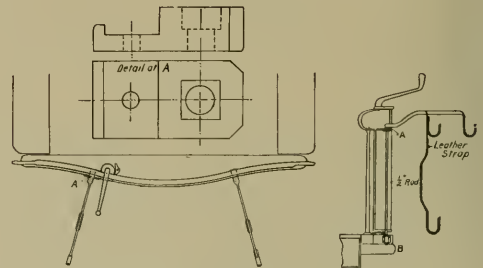


FIGURE 1.

and the present indications are that its success will justify the company in equipping several other of its 30 lines with them. On February 28, the number of bicycles carried was 82. The regulations governing bicycle traffic are given in the circular which we reproduce.

The holders adopted carry two bicycles and are shown in Figs. 1 and 2. The two arms from which the machines are



**MARKET ST. RAILWAY CO.**  
**NOTICE.**

Commencing Sunday, February 7th, 1897, the cars of

**The Sacramento Street Line**  
WILL BE EQUIPPED WITH  
**BICYCLE HOLDERS.**

Bicycles that can be safely carried thereon, not exceeding two to any car, will be taken at owner's risk, for a five-cent fare.

Transfers to other lines cannot be given for bicycles.

Tandems, and other bicycles for which the holders are not suitable, cannot be carried.

hung are welded to 1/2-in. rods supported in brackets fastened to the dash at A and B. The arms are swung back against the dash when not in use. At A a square socket in the bracket receives a shoulder on the rod and locks the arm in its closed or its extended position. From

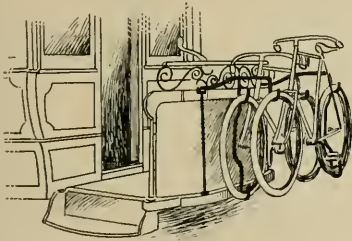


FIGURE 2.

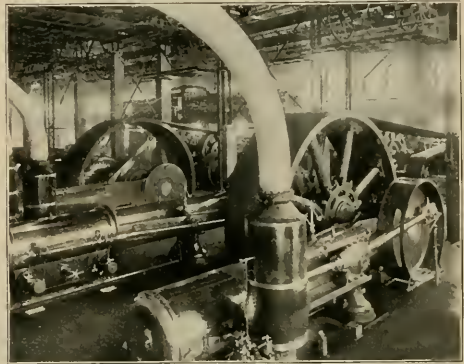
each arm depend three leather lined hooks; two of these are short ones, over which the bicycle wheels are hung, while the third extends down and receives the lower part of one wheel of the bicycle and serves to steady it. As shown in Fig. 2, there is only one of the long hooks to each machine. Application for a patent on the device has been made.

**PROGRESS ON THE POWER HOUSE OF THE CHICAGO CITY RAILWAY.**

The illustrations show the engines and dynamos as installed in the new power house of the Chicago City Railway on 49th street and Oakley avenue. A full description with plans for the machinery appeared in the December issue of the REVIEW.

At present, two units of engines and dynamos are practically finished and work is commenced on the third. Each unit consists of two 36 x 60-in. simple Wheelock engines coupled together and driving two 880-k. w. Walker 500-550-volt generators. When the power house is completed six of these units will be in operation, but it is intended to install but three of them for use in the immediate future.

As shown, the carriage of the tightener for the rope drive runs on a frame work above the engines and the weights hang down the boiler room side of the partition wall. This method of driving the dynamos works in a satisfactory man-



ENGINES—CHICAGO CITY RAILWAY.

ner and in the opinion of the chief engineer, R. J. Hill, is superior to any other for this kind of work.

The load on the old station has become so great that each morning and evening one of the new dynamos is run to supply a part of the feeder system. For this purpose a temporary switch board has been erected. The new switch board is nearing completion and one can now get an idea of its handsome appearance when finished. It is of black enameled slate with nickel plated trimmings and is 104 ft. in length. Each machine is to have a 2,000-ampere Weston wattmeter and with these an accurate record of the working of the station can be kept. Perhaps the most interesting instrument on the board is the large ammeter which indicates the total current of all the dynamos. It was made especially for this station by the Weston company, and is said to be the largest ammeter in the world on a 500-volt circuit. It registers to



GENERATORS CHICAGO CITY RAILWAY.

20,000 amperes, each division recording 200 amperes. The dial is illuminated by two incandescent lamps. The instrument measures 27 in. across and 20 in. in height. The

shunt consists of 14 strips of copper, 4 ft. long and  $\frac{1}{4}$  x 10 in., and the ammeter actually shows the fall of potential in



20,000-AMPERE AMMETER.

this shunt. There is much work yet to be done and it will probably be June 1 before a complete test can be made on the entire station.

### A SUGGESTION FOR THE ACCOUNTANTS ASSOCIATION.

EDITOR STREET RAILWAY REVIEW:—

In looking over the programme for the meeting of the Street Railway Accountants at Cleveland it has seemed to the writer that there is one very important point that has been overlooked—at least it has not been mentioned—and that is the point of "State Reports."

Several states now have Boards of Railway Commissioners who, among other things—require the making out of reports and data on the forms furnished and in the manner prescribed by them, and the prospects are that the number of states that do this will be very materially increased in the near future. The forms used differ greatly in the different states, and, as a rule, are ill adapted to be easily and accurately filled in from a properly kept set of street railway account and record books. This condition is probably due to:

1. The officials who devise the public forms are very often not accountants, or at any rate have not a knowledge of railroad accounting and especially of street railway accounting, its needs, its methods and its aims.

2. These forms are very often intended to be used interchangeably by both steam and street railways; an incompatible combination at present.

3. These forms are generally made up with a view to obtain amounts and statistics for the use of the state, and in consequence everything is sacrificed to that point.

In view of the above facts, would it not have been well for the Accountants to have invited to the Convention—from all the states—the officials having charge of these reports? As this has not been done and as the time is now too short to admit of this mistake being rectified at this convention, would it not be as well for the members to "go slowly" at this meeting in regard to finally determining on any forms or methods which may conflict in any way with the forms and methods as now required by the several states. As a matter of fact these state officials are the final arbiters in the matter; if they prescribe a form or even a method of keep-

ing the books and accounts we are compelled to follow it whether we desire to do so or not. It is policy, therefore, as well as courtesy, for the accountants to call into their councils the above officials, and to endeavor to have the states as well as the companies, use a uniform and co-relative set of forms.

It is only within a year or two that the Railroad Commissioners of this state invited the accountants of the steam and street railways to a sort of convention in order to determine on better forms and methods than were then in use. From this "pow-wow" was evolved a set of compromise forms which are not fully satisfactory from either an investing, an operating or a statistical point of view. We had, however, to change all our books and methods to conform to it—no very acceptable job and one we do not care to repeat unless there is immediate and lasting good to be obtained from it. At that time the street railways were not as important factors as they are now, neither were their forms and methods in anything like a fixed or proper shape. The case is now different, we are beginning to know and feel our value in the community and our rights; we know better our needs and aims in our accounts and departments; we have, by hard experience and conscientious stealing of ideas from our elder brothers the steam railroads, brought our forms and methods into a shape adapted to our needs from an operating point of view; now let us also get them into shape for our directors and probable investors and also for our state and government use.

To do the latter means that we must have the willing and hearty co-operation of the state and government officials who make and prescribe the forms we must use. The only way to do this is to make them "accomplices in the act;" let them be invited—nay urged—to attend the next convention; let them get fully acquainted with our needs, our aims and our present and prospective methods in accounting; get them to agree on a common form or forms of general or special state report, one which will give them the information they desire or may desire and that will still leave us a system of books, accounts and forms that we can use to advantage in our operating and one that we can show to our directors and to possible investors. Let them do this and we will once again (cheerfully instead of tearfully this time) and finally change our books, forms and methods where necessary.

H. S. COOPER,

Supt. Schenectady (N. Y.) Railway Company.

### BRUSSELS EXPOSITION, 1897.

The international exposition to be held at Brussels during the summer of 1897, opening on April 24, was briefly mentioned in the January REVIEW. The seventh section comprises two groups, electricity and traction. Under electricity, group XXIX, are included generators, batteries, accumulators, all forms of meters, systems for the transportation and distribution of power (including poles, insulators, safety appliances and tools), telegraphy, telephony and sundry other applications of electricity. Under traction, group XXX, are machines for locomotion and appliances for cable traction, electric motors, safety appliances, locomotives and self-propelling carriages of all descriptions, and steam and street railway rolling stock.

Further information may be had by addressing Louis Moreau, 725, 218 La Salle street, Chicago.

## A PNEUMATIC SNOW PLOW.

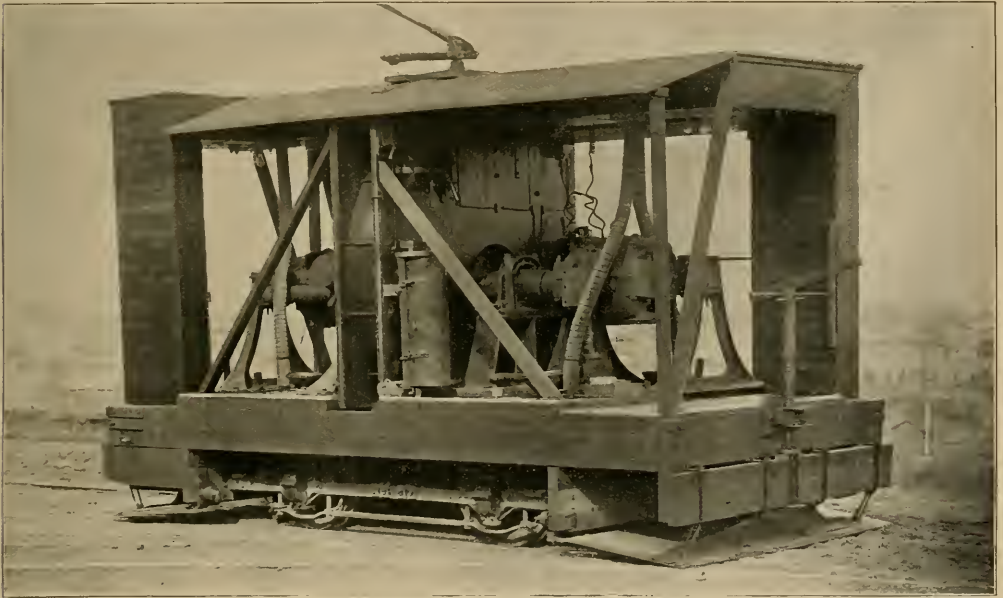
Our illustration shows a decidedly novel snow plow designed by Thomas Elliott, master mechanic of the Atlanta Consolidated Street Railway, which is of interest for the ideas embodied as well as because of those left out. We have illustrated many kinds of snow plows but never before one in which the active agent was air.

The cut, from a photograph, shows the construction. A 5-ft. fan is mounted on a heavy frame over a Brill No. 21 truck, and delivers air through the overhead wooden box to the opposite ends of the plow. The two "shears" are of  $\frac{3}{8}$ -in. steel 36 in. wide and 8 ft. long, and are placed squarely across the track, one at each end. Each shear may be raised

The steel plows serve to scrape the snow from the roadway and it is then blown out of the way by the current of air supplied by the fan. The air pressure required to blow the snow any given distance is very easily regulated by the wind gate which is operated by the small wooden lever shown. The two ends of the plow are duplicates and each blows the snow to the right as the line is double track.

Where the pavement is above the rail the snow remaining on the rails is taken care of by adjustable steel scrapers that fit the rail, and blown to one side by air delivered through the hose shown. It will be noted that neither the snow removed nor that remaining is packed. Back of the rail scrapers and close to the wheels are the sand pipes.

So long as the fan keeps the track and rails clear the



PNEUMATIC SNOW PLOW, ATLANTA, GA.

and lowered by means of a vertical screw at the end of the platform. In addition it is suspended on links so that it will swing backward and upward in case it strikes an obstruction, such as a guard rail or the pavement. The backward movement is resisted by springs which ordinarily hold the sheet to its normal position, and at the same time serve to cushion the blow when an obstacle is struck at high speed.

The fan is a steel disk with the wings securely rivetted in place and is mounted on a shaft 5-in. in diameter. The fan case is built of three thicknesses of matched flooring with a strip of sheet iron around the outside to keep it in shape. The fan is driven by two 30-h. p. Westinghouse motors which may be connected in series or in parallel as required. Two internal gears are shrunk onto the fan shaft and gear with the motor pinions so that no change whatever need be made in the motors, and the latter may be changed in a few minutes.

plow is easily propelled, it being easy to secure tractive effort with clean rails. This saves the time usually lost from slipping and backing up for a new start when a nose plow stalls.

The truck is equipped with two motors and with a powerful lever brake. The brake shoes are of wood and placed between the wheels and high up so as to be well out of the way. With the exception of the four motors, which are taken from open cars not in use, and the lumber, this plow was built out of the abandoned belted equipment of the old power house, and aside from this material and the truck, the plow cost but \$240. It was built at the company's shops.

When passing teams on the road the wind gate may be closed for an instant and the snow permitted to accumulate in front of the plow until the air is turned on again. At full speed the fan requires 50 h. p. and the breeze can give points to a young cyclone.



THE COLUMBIA & MARYLAND RAILWAY.

BY S. W. HUFF, ELECTRICAL AND MECHANICAL ENGINEER.

It has been thought that a sketch of some of the plans considered and problems encountered in the construction of the Columbia & Maryland Railway might be of interest, particularly to those who are contending with problems similar to those presented by this undertaking. This road seems to have been the first of its type to be constructed. The officers of the company, while on an inspection tour of similar roads throughout the country, found nothing that presented the severe conditions characterizing their road. Roads were found upon which high speeds were made, others upon which long runs were made, and still others upon which high speeds were made over light grades and with heavy cars. But no road was found that presented the combination of long runs, high speeds, heavy trains and severe grades which characterizes the Columbia & Maryland. The road extends from the center of the city of Baltimore to the center of the city of Washington, a distance of about 40 miles, and it is intended to make such speed and to carry such a class of coaches as to make the line a formidable competitor of the two existing steam lines operating between these two cities, the service of which steam lines is first-class in every respect.

This high rate of speed with heavy coaches is to be maintained despite grades which, in comparison with those of steam road construction, are very heavy. The ruling grade between the cities is 2 per cent, while the grades in the cities conforming to street grades are much heavier, in one place the grade being as great as 7 per cent, and in another place there is over a mile of 5 and 4.5 per cent grades.

The roadway is of the best type of steam railroad construction. The double tracks are laid with 85-lb. T-rails 60 ft. long, and ballasted with stone. The president of the construction company being a distinguished civil engineer of wide experience, the details of roadway construction have been worked out with great thoroughness, and much of the exactness and care of details characterizing the older profession were infused into other engineering departments of the company. It was decided to provide for a schedule under which an express train would leave each terminal city for the other every 30 minutes, with through local trains leaving each terminal with the same frequency. Both classes of these trains are to make a speed of 60 miles per hour on a level and down grades, and such speed ascending grades as would be possible with motors of proper power and design. Both the express trains and the local trains are to consist of a motor car and one trailer. The express coaches are 45 ft. long, and the train loaded weighs 50 tons, while the local train loaded weighs 30 tons.

No reliable data could be obtained as to the average or maximum power required at the power station, for trains of this description operated under these conditions, and to determine this as accurately as possible considerable detail work was undertaken. Taking the most reliable data obtainable as to the resistance due to wind and track, with this class of track and cars, and from the characteristic curves of standard motors of the proper power, the power was determined that would be required to force trains of each class up to 60 miles per hour on a level and on all down grades, and on up grades to the speed characteristic of the motor. This

power was determined for each grade upon the road with the time required to run the grade—the power and the time being calculated going both up and down the grades and going both ways on a level. Thus, having the power required, and the time for which it would be required, on all the grades on the road, it was only necessary to multiply each amount of power by the time for which it would be required, sum up the result and divide this sum by the summation of time to determine the average power required for the cars while running. Afterward a schedule was laid out upon the profile of the road, and the position of the trains were taken at intervals of 5 minutes during an hour, and the power they required calculated. The average of the power required at each of the twelve positions of

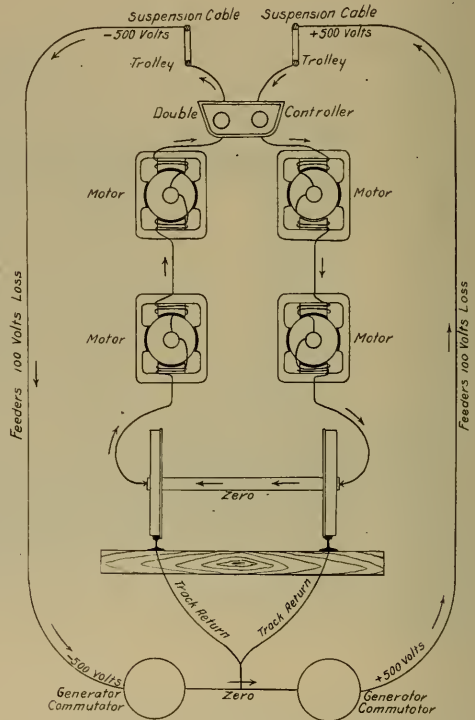


FIG. 1—DIAGRAM OF THREE WIRE SYSTEM.

the trains checked very closely with the result obtained by the method just described. The former being a power average for all positions of the trains, while the latter was a power average for twelve positions taken within an hour, and at 5 minutes intervals. From the data of the power and time required to run up and down the various grades, at the suggestion of the president, tables and afterwards curves were prepared for a guide in establishing the grades of the road. Three sets of curves were prepared. The first to show the relative effects of different grades upon the total power required at the power station. For example what length of 3 per cent grade would be equivalent in drain upon the power station to a 5 per cent grade 1,000 ft. long. The second to show the effect upon schedule time, regardless of power required, of the different grades. For exam-

ple, schedule time alone being considered, what length of 3 per cent grade could be employed in curving around a hill, and the same schedule time result as by going over the hill with 1,000 ft. of 5 per cent grade. The third to show the heating effect upon the motors of different grades. For example, supposing that it had been determined that the motors would stand, without injurious effects from heating, a 5 per cent grade 1,000 ft. long, what length of 3 per cent grade could be run without injurious effects. There being so many variable quantities entering into these values, the tables or curves can be only an approximation, but they are nevertheless interesting and suggestive.

SYSTEMS OF DISTRIBUTION.

The road is so located that coal and water for condensing purposes can be had conveniently about midway of the line, and midway of the halves, or in track parlance, at the center and half-centers. The distance and the power required both being great, it was readily seen that distribution by the standard method, and at standard pressures, was practically out of the question. At that time the alternating current motor was too much of an unknown quantity to admit of an attempt to use it. The rotatory transformer system in operation at Lowell, Mass., was inspected and the cost of installation and operation under this system was worked out. But the choice finally lay between the various forms of direct current distributing, and with a power station located at each

of the two half-centers of the line. The fact that, for traction and power, the motor cars would each require four motors, led naturally to an effort to double up the voltage in distribution over the line, and to divide it out among the motors, they being run in permanent series pairs. It was suggested that the motors thus connected in series pairs be supplied with 1,000 volts in the high speed section, and 500 volts in the slow speed sections, there being 1,000 volts between the trolley wire and track. In addition to other objections to this plan there seemed great probability of one of the motors of a series pair slipping its wheels, while its mate of the series pair stood still, and thus by taking the greater part of the 1,000 volts to itself cause serious trouble.

THE THREE WIRE SYSTEM.

A special form of the Three Wire System was proposed, which possesses features of special interest. It was proposed that the four motors on each car be divided into series pairs, and each pair have its own controller, fuse, trolley and ground connection, the two controllers, however, being under the same cover, and operated by the same handle. Above each track were to be suspended two trolley wires, one being + 500 volts and the other - 500 volts. One pair of motors with its controller, trolley pole, etc., was to operate from the + trolley wire, while the other pair was to operate from the - trolley wire, the current crossing over through the ground connection, and the track rail forming the third wire. The

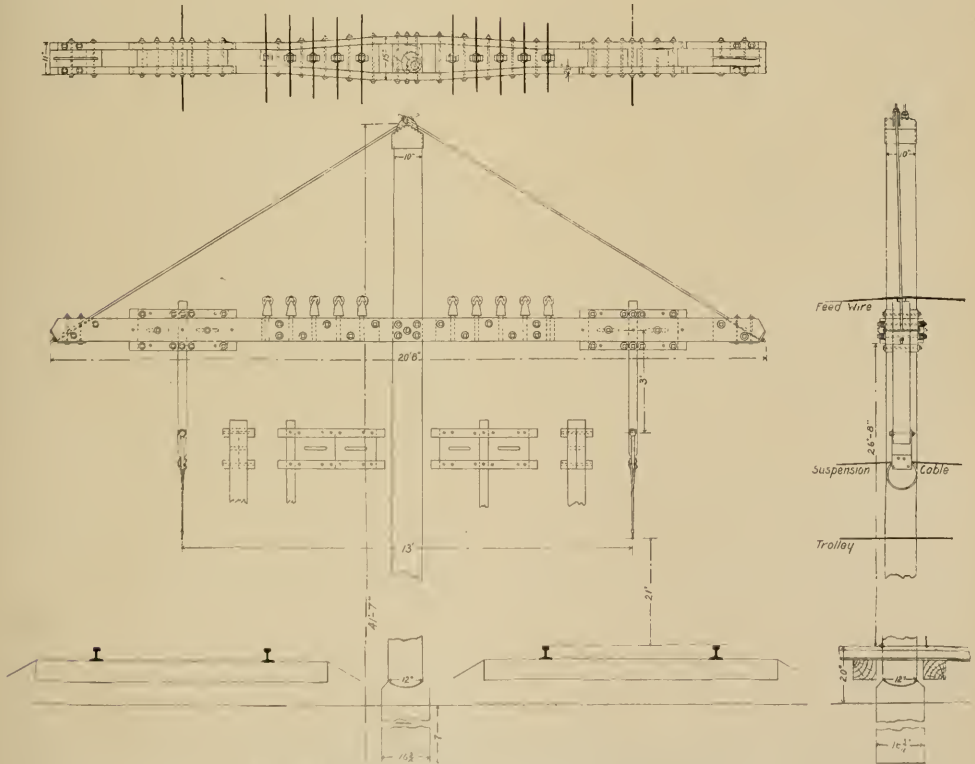


FIG. 2—GENERAL ARRANGEMENT FOR SINGLE TROLLEY SECTIONS.

accompanying sketch, Fig. 1, indicates this arrangement of circuits as proposed for the high speed section of the line. With this arrangement the equipment would consist of standard motors and controllers working on standard voltage, while the voltage of distribution would be double that of standard practice. There would be a plus and minus generator to each engine, while the plus and the minus switchboards and their feeders would be entirely separate, each being a standard switchboard.

Any derangement at the power house, or on the line, causing the loss of current on one side, would not affect the operation of the motors on the other side. The motor connection of the inoperative side could be switched over onto the operative side, while the trolley pole and lamp circuit could be left connected to the inoperative side, to indicate the return of current. In the slow speed sections it was proposed to pull down one trolley, and breaking the ground connection switch this trolley connection on to the ground, thus throwing the two sides into series relation on 500 volts and reducing the speed. It was proposed to divide the

trolley wire suspended at frequent intervals as shown in Fig. 3, a trolley is secured that is very elastic and without serious dips in the wire. The suspension cable also serves as a feed-in wire, there being no insulation between the trolley wire and the suspension cable.

One drawback to this form of three wire system was the non-use of the efficient track return afforded by the heavy rails and bonds under contract. This did much to detract from its otherwise high efficiency. Another drawback was the liability to unbalance on the slow speed sectioned portions of the line, rendering the system less desirable for the slow speed section of the cities than for high speed service.

It was suggested that the trolley in the slow speed section be all of the same sign, and be connected to the generators of this sign through feeders that upon full load would have a fall of potential of 500 volts. This 500 volts drop through the feeders to be compensated for by a series booster, the booster being driven by a motor receiving its current supply from the generators of opposite sign. By this arrangement the drain upon generators of opposite sign would be about equalized and a reliable voltage maintained upon the line. It was also suggested to divide the trolley into sections of opposite sign as first proposed, and connect the track return or neutral wire to the generators through a series booster located in the power house. The booster thus connected would raise or lower the potential of the track according as the excess of load was on the minus or plus side. By this arrangement the booster would boost only when there was an unbalancing of the line, and then only to the extent of the unbalancing, making this application of the booster very economical.

(To be continued.)

## NEW KIND OF TROUBLE.

A new species of legal trouble of the genus spit has appeared to vex the already distracted claim agent. The crusade against expectorating in cars is being vigorously waged all over the country, and already the results are highly encouraging for the abatement of this old time nuisance. All the surface, elevated and steam suburban cars running within the city limits carry a big sign from the board of health forbidding spitting in cars under penalty of a fine. Recently a passenger on a West Chicago car was arrested and charged with violation of the law. The case failed of convicting evidence, and now the man sues for \$50,000 damages because he didn't spit when the conductor said he did. He should have failed to spit twice and made his case an even \$100,000, while he was about it.

It is understood that the west park commissioners of Chicago have consented to the extension of Division street through Humboldt park on the west side, and it is very probable that the Division street electric line will be extended through it as soon as the street is opened.

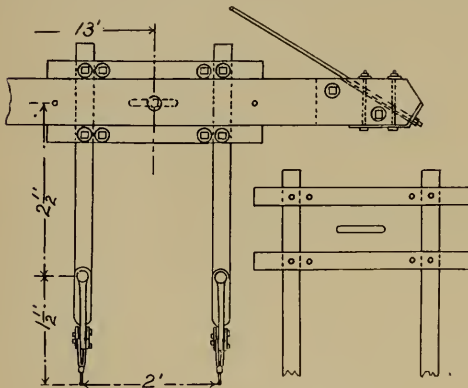


FIG. 2 A—DETAIL FOR DOUBLE TROLLEY.

trolley wire in the slow speed sections into plus and minus sections, as is done with the usual three wire system.

The two trolley wires of opposite sign in the high speed section were to be two feet apart and to secure proper insulation between them it was proposed to suspend them from suspension cables attached to the ends of vertical wooden arms, projecting downward from wooden cross arms as shown in Fig. 2 a. Fig. 2 shows the arrangement for the use of a single trolley. These vertical arms being long enough to prevent the trolley pole from striking the cross arm in the event of its leaving the wire, and being of treated timber, there would be interposed between the trolley wires of different sign the insulation due to several feet of treated wood. The suspension cable running in the same direction with the trolley wire and being directly over it with the

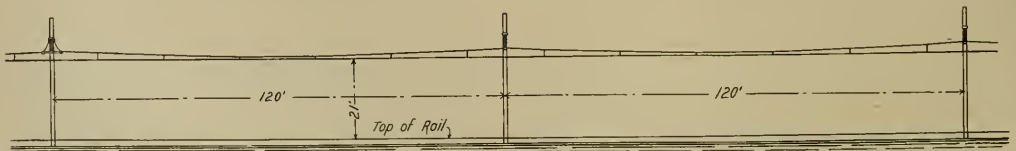


FIG. 3—SIDE ELEVATION OF LINE.



### THAT AMPHIBIOUS CAR.

The daily papers have been giving considerable space to the free advertising with text and illustrations of a wonderful car which hails from Boston. Under the front platform is a pair of revolving brushes, each 4 feet long, guaranteed to keep the rail as clean as a parlor floor, while the rear platform brings up with a sprinkler from which oozes a gentle spray to allay the sufferings of the aroused dust. The picturesque condition of a waiting passenger who happened to get within range of those brushes on a rainy day can easily be imagined; and the available space for seats in a tank car carrying sufficient water to be of any account would certainly command a premium. An additional and equally practical innovation would be a compartment for the convenience of an armature winder or two, and an arrangement for grinding the wheels before they are worn flat.

### CLEAN TRACKS AND COAL BILLS.

There is perhaps no place where there is now a better opportunity to work a decided economy in the daily operation of city roads as usually operated, than in the matter of keeping the rails as clean as possible, even if such cleaning costs something. The power required to move a given number of cars from day to day, as the condition of the rail varies, is an interesting study, and reveals many chances for reducing coal bills by cleaning the rails at certain times. It is usually thought that if track brushes and scrapers are used during snow storms and when there is much dust that everything desirable in the way of track cleaning has been accomplished, and it is only in these extreme cases that any attempts are made to clean the rail. That this limited use of track cleaning appliances is a mistake we think will be discovered by any one who takes the trouble to investigate the subject systematically. We have before us a series of very careful tests made on a cross-town line operating in a large city, which show there is a great difference in the power required per car on a perfectly clean rail and one which would ordinarily be called a moderately clean rail. These tests were all made on days when the track was in good condition—that is, there were no snow storms, no very cold days and no days on which the track was covered with stiff mud or much dry dust. The temperature varied between 10 degrees above freezing and 10 degrees below freezing—a very small range—the cars were operating on the same schedule in all the tests and the passenger traffic was uniform. Leaving out variations due to variations in passenger traffic at different hours of the day, and comparing only similar hours of different days, there is still a difference between tests of about 20 per cent that can only be accounted for by variations in the condition of the rail head. The best showing is, of course, made when the rails are wet and clean or dry and clean. A dry clean rail is usually obtained in northern cities in winter by a freeze immediately following the conditions that bring a wet clean rail, and at such a time these tests show the power consumption to be very low. After such a freeze, however, the clean rail does not continue long if the weather continues steadily below the freezing point, for dry frozen mud soon gets pulverized on the rails and the power consumption goes steadily up until there is a thaw. It is safe to assume that the same thing occurs after a rain in summer. The power consumption is low

when first the rails are washed off, but dust soon accumulates and the coal pile pays for it. Stiff mud is, of course, a power consumer.

Now, in view of the fact that nearly all roads have track brush equipments for use against snow or very bad dust, it is certainly a good plan for them to consider whether it is not a paying investment to renew more track brushes and buy less coal; to keep the track brushes on a few cars in operation more of the time rather than furnish power to force cars over the millions of minute obstructions that a dirty track offers? In other words, is it not good policy to pay more attention to cleaning tracks in what is usually considered good weather, and not confine such efforts wholly to the abnormal conditions occurring but a few times a year.

A twenty-car road operating 20 miles of single track and having a coal bill of \$25 a day can certainly afford to keep track brushes operating on two or three cars or more for the sake of \$2 to \$5 a day saving. As the road gets larger, with more cars per mile of track, conditions are approached which make it advisable to run a sweeper over the line once a day in addition to the use of track brushes on the cars.

### DETROIT HOSPITALITY.

A pleasant party of street railway men found themselves in Detroit on February 14, and were met at the Cadillac by a delegation of the local street railway officials. The party embarked in the palace car of the Citizens' line and spent three hours in viewing the city, and bringing up at the Detroit Club. Here a famous dinner was spread in the banquet room and the afternoon delightfully spent. At 6 o'clock an invitation came from Swarts Bros., proprietors of the Cadillac hotel, to come over and visit them, and the meeting adjourned in a body to reassemble in the banquet room of that hotel with the genial landlords as hosts. Another elaborate dinner was spread and enjoyed, after which speeches and the orchestra filled every minute until 11 p. m., at which time the visitors departed for Niagara. The entertainment throughout the day was simply royal and long to be remembered.

In the party were: T. C. Penington, Chicago, secretary; C. F. Holmes, Kansas City; Geo. B. Hippee, Des Moines, members of the executive committee A. S. R. A. Also A. S. Littlefield, Louis Myers, D. B. Dean and H. H. Windsor, of Chicago, and Chas. Castle, New York. Among the Detroit gentlemen were Strathearn Hendrie, A. B. Dupont, J. Grant, Judge Riley, C. N. Goodwin, and Michael Carmichael of the Detroit Journal.

### GASOLINE MOTOR OBJECTIONABLE.

The operation of a gasoline motor car on the tracks of the Brightwood Railway Company, Washington, on 14th and Kenyon streets, has become very obnoxious to the people in that locality. There is no legal provision to prevent the running of the car by the company. At the request of the citizens the commissioners called the attention of the street railway officials to the nuisance and requested them to take the car off the road.

A freight line will be established between Columbus (O.) and Westville by the Columbus Central Street Railway. The company is building a freight car for this service.



# IN THE POWER HOUSE

This department 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.

Setting generator brushes on large generators is not by any means as easy a job in practice as it would seem to be in theory. It is well understood by those engaged in erecting generators for the large manufacturing companies, but a few words here for the benefit of those having had little experience with setting brushes on large machines, will not be out of place. Theoretically the way to set the brushes on such machines is to place all brushes exactly the same distance apart, start up the machine and then rock the entire circle of brushes until they are all sparkless. This is beautifully simple but unfortunately the method outlined would give but poor results on the average large direct connected generator. In practice it is necessary to adjust each set of brushes independently at the point which gives the best results. Slight variations in the strength of the different poles of the field magnets or wear in the bearings so as to bring the armature out of center all have their influence on the neutral and sparkless position of the brushes, and the neutral position of each individual set should be determined and the brushes should be set at that point without reference to the others.

\* \* \*

It is nothing uncommon to go into an electric railway power station of small or moderate size and see on a table near the switchboard a blank on which the switchboard attendant is expected to note once every hour, half hour, or fifteen minutes, as the case may be, the amperage and voltage. These figures are averaged at the end of the day and the result is put down as the average station load for the day. From this average, perhaps, the station efficiency for the day is calculated, and perhaps, too, when said efficiency is so calculated the manager or engineer wonders why his boilers, generators and engines do not make a better showing. Or perhaps on the other hand the showing is a remarkably good one—better even than was ever heard of before for that type of machinery. On the other side of the switchboard he may wonder how it is that the cars pull so hard on one day and so easy on another, when the condition of temperature, track and traffic are practically the same. It seems as if a few minutes study of the ammeter and the way the station attendants usually take readings would convince any thinking man that the chance of getting correct average readings by looking at the ammeter but once in fifteen, thirty or sixty minutes would be about equal to a chance in a lottery where forty or fifty tickets were out. The attendant may happen to look at the ammeter at a time when its pointer is somewhere near the average current flowing for the period the reading is supposed to cover, but the chances decidedly against it in a small station with the usual violent fluctuations in output. To take a concrete example, on a road where the actual average is 200 amperes the ammeter will be found on the move the greater part of the time between 50 and 500 amperes. The chance that any one

reading will be an average in this case is about 1 in 90 if the ammeter is calibrated to read to 5 amperes. It may be said in defense of the common practice we are discussing that there is a chance for a low reading at one time to be corrected by a high reading the next time and that the average will come correct at the end of the day. But it will be evident on a little thought that with such chances for error in each individual reading and so few readings in the course of the day there is a very slim chance for the day average coming right. It is not necessary to rely entirely on theory to arrive at these conclusions, for a little testing, by taking ten second readings for a few hours will prove their correctness. Not a few electric railway men have reasoned this matter out for themselves and put little reliance in infrequent switchboard readings, but there are still so many that do place reliance in them that there is room for much more reform. The recording wattmeter is, of course, one way out of the difficulty and a very good way it is too. It is out of the question in any station, be it large or small, to hire two men to take 10 second readings from one end of the day to the other and it would take several clerks full time to average said readings after they were taken, but if a road does not feel as if it could afford a recording wattmeter it would be at least an improvement to take several readings at each time set for taking readings, and make the intervals as short as practicable. For example it would be well to have 15 minute readings and at each reading, instead of taking a single reading take four or five at 10 or 15 second intervals. These could then be averaged by the attendant immediately or at the end of the day, and it is needless to say the day average would be much nearer what it should be than with single readings every half hour.

\* \* \*

The report of the Liverpool Overhead Railway for the half-year ending December 31, 1896, shows an excellent record for the power house. The average power was 4.29 board of trade units or 5.75 electrical horse-power-hours per train mile, a train consisting of three cars. The cost of operation chargeable to the power house was 7.29 cents per train mile or 1.269 cents per horse-power-hour, of which .181 cent was for fuel. When these figures are compared with the reports of power house performance published in the REVIEW from time to time, it is seen that the most remarkable feature is the low percentage of fuel cost to total cost of power. The cost for fuel to the Citizens Traction Company of Pittsburg is .118 cent per electrical horse-power-hour, but the total cost of power is only .335 cent. On a Massachusetts road reported page 139 of the REVIEW for 1896, the total cost is given as 1.201 cents, about the same as on the Liverpool road, but the fuel cost is much higher, being .382 cent, or one-third the total as for the Pittsburg road. The generating plant of the Liverpool

road consists of four horizontal compound-condensing engines with six Lancashire boilers.

### \* \* \* Heating Value of Low Grade Fuels.

In a paper before the Engineer's Club, of St. Louis William H. Bryan gave some interesting data on the heat-

Association of Engineering Societies. Mr. Bryan is a warm advocate of expressing boiler "efficiencies" as the ratio of the heat taken up by the water to the total heat in the coal, and believes that the concordant results obtained with coal calorimeters show them to be reliable instruments for determining the total heat in the coal.

### \* \* \* The Fischer System of Filtration.

The problem of filtration is an important one in many parts of this country where the water supply is drawn from rivers that are very turbid for several months in the year, and in large cities its importance is increased because, as a rule, the river is further fouled by sewage. In a recent report to the state department, Frank H. Mason, consul general at Frankfort, describes the system in use at Worms and numerous other places in Germany. It is the invention of Director Fischer, who has been for many years past the

#### SUMMARY OF ANALYSES AND CALORIFIC DETERMINATIONS OF WESTERN FUELS.

##### PRINCIPALLY SOUTHERN ILLINOIS BITUMINOUS.

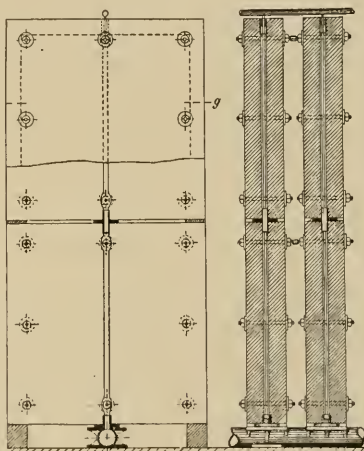
KIND OF COAL.	SIZE.	B. T. U. per pound.	Theo. Cap <sup>y</sup>	PROXIMATE ANALYSES.				
				Moisture	Volatiles	Water.	Fixed Carbon.	Sulphur.
Big Muddy	Lump	12,190	12.62	7.18	28.83	55.58	1.30	7.92
Murphyboro	"	12,126	12.53					
"	"	11,766	12.18					
Hurricane	"	11,511	11.92					
Mount Olive	"	11,455	11.86	6.84	27.57	53.07	1.72	10.80
"	"	11,481	11.88					
"	"	11,352	11.75					
"	"	11,281	11.68					
"	"	11,278	11.67	10.84	31.63	42.37	5.08	10.06
"	"	11,100	11.49	12.32	29.55	41.63	3.28	10.10
"	"	11,085	11.47	11.36	33.13	41.08	4.18	10.23
"	"	11,024	11.41					
"	"	10,980	11.37					
"	"	10,963	11.35	9.27	30.87	42.66	5.32	11.88
"	Run of Mine	10,830	11.31					
"	"	11,233	11.63	11.26	30.39	45.91	3.88	8.56
"	"	11,130	11.52	11.98	28.01	45.83	4.28	9.90
"	"	10,836	11.22					
"	"	10,771	11.15	3.58	29.37	41.55	5.32	15.18
"	"	10,669	11.05	11.70	28.35	40.85	5.68	13.52
"	Nut	11,217	11.61	10.35	30.45	47.29	3.62	8.29
"	"	10,512	10.88					
"	Slack and Nut	10,573	10.95	12.23	30.26	39.50	4.66	14.29
Glen Carbon	Lump	11,481	11.86	10.68	32.74	41.99	4.26	10.35
"	"	11,350	11.75	9.66	31.96	41.82	4.16	12.40
"	"	11,000	11.39	10.78	33.32	41.55	4.25	10.10
"	"	10,836	11.22	10.48	31.64	39.08	4.32	14.48
"	"	10,707	11.09					
"	"	10,512	10.88					
"	"	10,320	10.68	10.52	31.80	39.77	4.21	13.70
"	Run of Mine	11,674	12.09	9.78	32.73	44.75	3.47	9.27
"	"	11,666	12.08					
"	"	11,610	12.02					
"	"	11,041	11.43	10.25	31.14	43.03	3.84	11.74
"	"	10,686	11.07					
"	"	10,707	11.09	10.52	30.96	41.22	4.20	13.10
Collinsville	Lump	11,153	11.55					
"	"	11,020	11.39	9.46	31.09	40.35	5.82	13.28
"	"	10,707	11.08	7.95	31.27	39.20	5.50	16.08
"	Nut	10,232	10.59	9.88	30.56	39.20	2.40	18.02
"	"	9,721	10.06	9.78	26.62	44.61	1.53	17.14
Bryden Royal	Lump	10,232	10.59	8.73	32.71	48.56	1.73	10.30
"	Run of Mine	10,679	11.05	7.46	32.55	43.55	4.60	11.75
"	"	9,848	10.19	7.06	30.90	48.20		13.84
Heints Bluff	Lump	11,126	11.52	9.26	29.29	43.68	4.42	13.35
"	"	11,029	11.42	6.62	31.36	40.60	6.12	15.30
"	"	10,515	11.26	9.70	32.88	39.86	4.96	12.60
Superior	Nut	9,848	10.19	6.64	29.74	44.02	3.90	15.80
"	"	9,440	9.77	3.92	29.54	41.76	2.50	16.28
"	"	9,336	9.66	3.80	28.12	42.92	2.60	16.50
Gillespie	Lump	9,722	10.07	8.60	29.60	50.30	1.36	10.23
Southern Ill.	"	9,905	11.29	7.41	30.81	43.78	4.13	13.87
"	"	10,900	11.28					
Belleville	"	11,230	11.62	10.35	29.27	45.65	3.18	11.55
"	"	11,047	11.44					
"	"	11,021	11.41					
"	Mixed Lump and Slack	10,320	10.69	8.42	30.24	41.16	3.54	16.64
Rentschler	Run of Mine	10,961	11.35	9.87	28.16	45.53	3.98	12.47
St. Clair	Nut	10,575	10.95	10.69	28.18	41.96	4.40	15.46
Wilderman	"	10,360	10.66	10.65	28.30	40.66	4.76	17.63

#### MISCELLANEOUS.

Cherokee, I. T.	Lump and Slack	12,662	13.11	2—	31.40	50.40	4.50	11.70
"	"	11,997	12.40		21.32	41.49	3.88	12.20
"	Slack	11,575	12.07		20.52	40.58	3.60	14.73
"	"	11,353	11.74		23.58	35.47	3.68	15.08
"	"	10,671	11.03	4.07	27.67	42.12	6.94	20.20
"	"	10,662	11.02	3.81	27.51	42.42	5.30	20.96
"	"	10,513	10.87	4.28	26.57	42.17	6.62	21.36
Hocking Valley	Run of Mine	11,757	12.17	7.72	28.63	53.72	6.07	7.33
Poschonia	Lump	13,029	13.49	1.20	17.29	75.92	.60	6.60
Kansas & Iowa	Mixed Slack	10,900	11.27	4.83	26.28	45.49	6.48	17.92

#### COKE.

Connellville		12,850	13.30	.34	36.87	50.00	7.21	10.78
"		12,550	13.30	.28	37.88	52.00	8.01	10.23
Gas House		12,300	12.73	.60	39.82	74.00	1.08	14.60



THE FISCHER FILTER.

water works engineer of the city of Worms, where the water supply is drawn from the Rhine and must be filtered before use.

The fundamental idea on which this system is based is the fact that clean, sharp sand, when mixed with a proper proportion of pulverized glass, forms a porous mass which, by baking at a high temperature, may be hardened in any desired form. In the Fischer filters this mixture of sand and glass is molded into hollow plates or plaques about 40 in. square and 8 in. thick; the sides are 3 inches thick, leaving a 2-in. hollow space in the center of each plate.

These plates are set upright and ranged in tanks built of masonry laid in hydraulic cement. Usually two tiers of plates are set, one above the other, in order to save space. The accompanying drawing shows a front and a sectional view of two pairs of plates thus mounted. The tanks are filled with unfiltered water to a depth of 3 or 4 feet above the plaques, and under this head the water is forced through the porous walls into the interior of the plaques and is drawn off through the pipes as shown. The discharge pipes are rigged with cocks, so that each plate and group of

ing value of low grade fuels. The summary of calorimetric tests made by him is reproduced from the Journal of the





We can scarcely agree with the statements made by "Engineer," in his communication. Of course it costs less to run steam pumps when the exhaust from them can be used for heating the boiler feed, but even then the steam pump leaves much to be desired. An engine which uses from 60 to 200 pounds of water per i. h. p. per hour, can scarcely be called an economical one, and yet that is the "economy" of the small steam pumps and many of the large ones also. The point in regard to the disadvantages of belts is well taken, but is not of the first magnitude, and we feel confident that when the decreased steam consumption is taken into account, the high priced, modern, slow speed motor geared to the pump will be found the cheaper. It is also doubtful whether the supply men will admit the adjective "high-priced" to be well applied. Further we do not think "Engineer" will maintain that a first-class tandem compound single cylinder pump leaves nothing to be desired for economy, if he will take a few indicator diagrams from one. If the superior economy of the crank and fly wheel pump is more imaginary than real, then there are thousands of water works pumps running today that ought never to have been put in.

**STREET RAILWAY NOTES FROM GREAT BRITAIN.**

(From Our Own Correspondent.)

The work of constructing the Leeds Corporation electrical tramways is being rapidly carried forward.

The Newport town authorities are unanimous in favor of adopting an electric tramway scheme for the town of Newport.

The local tramway company at Cardiff is prepared to use electricity on the present horse lines if the Corporation can supply the necessary energy from the lighting station.

The Crewe Town Council has decided not to oppose the application of the British Electric Traction Company to construct a light railway or tramway in the borough of Crewe.

The Sheffield Corporation, after a most exhaustive enquiry into the subject of electric traction, has decided to equip a portion of the town lines for electrical working on the overhead system.

The Waterloo & City Railway which will be the second underground electrical railway in this country, will be completed by March of next year. The line necessitates a double tunnel under the Thames.

The Bury, Rochdale & Oldham Tramway Company is seeking powers to convert its present steam lines to electrical working and the Rochdale Town Council having sent a deputation to inspect the electrical lines at Coventry, Bristol and Walsall, is not likely to oppose the company.

The proposed electric tramways at Hastings, a popular seaside resort on the south coast, is meeting with a good deal of opposition but the fact that the scheme is receiving the support of prominent members of the Town Council is almost sufficient guarantee of the system being eventually adopted.

The Belfast Street Tramways Company which has just paid a dividend of six per cent is anxious to equip the whole of its extensive horse lines for electrical working and though Parliamentary sanction would not be difficult to secure, it is necessary first of all to obtain the permission of the Belfast Corporation. The corporation, however, has declined to sanction the use of electricity except upon terms that are absolutely prohibitory, consequently the question of electric traction as far as Belfast is concerned is shelved for some-time to come.

The Bristol Tramways Company is extending electrical working onto further sections of its lines and recently an extension to Eastville, a point some distance outside the town, was opened to the public. Electrical working on the Bristol lines has proved to be an overwhelming success; the plant at the power house is being quadrupled, the much debated American engine forming the chief part of it, and the fact that the total working costs do not exceed 5½ pence per-car mile will have a very material influence on the spread of electric traction. Extensions are also the order of the day at Coventry, where the recently declared dividend of 8 per cent by the Electric Tramway Company has done much to convince people that electrical working can be made profitable, where steam and horses have proved to be unmitigated failures. A small accumulator line is proposed for the district of Waterloo which is a suburb of Liverpool.

**RAILWAYS HAVE RIGHTS.**

Justice Dickey of the supreme court of New York granted an injunction restraining the commissioners of the Shore road from interfering with the construction of the Coney Island, Fort Hamilton & Brooklyn Railroad. The company had obtained permission from the old town of Utrecht and also consents from abutting property owners and had begun work. In the meantime certain land through which the road was to run was made a park by legislative act, and on this ground the shore road commissioners stopped the work of construction.

The court held, however, that the company had acquired property rights which could only be extinguished by purchase or condemnation proceedings and not by legislative act. It was also held that, under the present law governing railway construction, the failure of a company to build the road within the time agreed upon does not forfeit the franchise, but the city may sue for such forfeiture.

**WAGES REDUCED AT LOS ANGELES.**

The wages of train crews which have been in force several years have now been cut. Gripman are reduced from \$2.50 to \$2.25; conductors, from \$2.25 to \$2. This is for day runs of 10 and 12 hours. The night crews average 8 hours and were receiving \$2 for gripman and \$1.75 for conductors. Night men now receive 20 cents an hour, \$1.60 per night.

There has recently been raised in Allegheny, Pa., a question as to the power of the directors of a railway to change the route as defined in the charter of the company without the consent of the stockholders. The suit was brought to compel one of the stockholders to pay for stock subscribed, his defense being as outlined.

## MAIL SERVICE ON STREET RAILWAYS.

The carrying of the mails is not a source of great financial gain to street railways and the efforts which street railway managers have made to extend this service are due to a desire to accommodate the people in the district served by their lines.

The mail service on street cars is of two kinds; the street railway post-office, and the closed pouch service. The former is a branch of the railway mail service and while yet largely in the experimental stage has made extensive progress in the last year. It suffers like so many other departments of the government service from too small an appropriation. The railways have appreciated the embarrassment of the postal authorities and have met the latter half-way, with the result that street railway post-office system is rapidly extending.

This branch is of course of most importance in large cities, and will be first developed there. As fast as funds permit post-office cars are put in service, replacing, as the case is in Baltimore, the closed pouch service.

Under date of October 26, 1896, the general superintendent of the railway mail service in his report to the second assistant postmaster-general for the fiscal year ending June 30, 1896, says:

"In my last annual report in referring to the railway post office service on electric and cable car lines, I predicted that it would be a success—a valuable and important adjunct of the general mail service and capable of great developments.

"The past year's experience demonstrated that this view was not a mistaken one. The larger experiments made during that period have convinced this office that the best service possible must be a combination of what has long been known as the railway post-office service and the electric and cable railway postoffice service, for by a combination of the two working in perfect harmony and under one direction it is possible to forward the mails deposited in the general office and branch offices of one city to the general offices and branch offices in another city much more expeditiously than is possible in any other way.

"In Boston, Brooklyn, St. Louis and Philadelphia, where a beginning was made with this service previous to June 30, 1895, it has been developed and improved by the establishment of new routes, the adoption of new schedules and the closer joining of the delivery and collection service there-within the contiguous territory.

"This service has been newly established in Washington, D. C., Cincinnati, Chicago, San Francisco and Rochester, N. Y., during the past year.

"The development of this class of service could have proceeded much faster but for lack of sufficient appropriation for car mileage and clerk hire. In the former item the estimates were reduced 25 per cent below what the department considered it prudent to provide.

"A new feature of this service, which is destined to become of great importance wherever possible to adopt it, is the location of special street letter boxes at important street intersections, several squares apart, painted white, to correspond with the color adopted for street railway postal-cars, from which collections are made by the clerks on each trip. It St. Louis the number of such boxes visited during the day amounts to 288, and in Rochester, N. Y., to 120."

The statistics for this service for the fiscal year, ending June 30, 1896, are shown in the following table:

Number of routes.....	21
Miles of routes.....	198.58
Number of cars.....	45
Number of round trips with clerks per day.....	195½
Average number of miles run daily with crews.....	279.45
Annual miles with clerks.....	907,863
Estimated pieces of mail handled daily.....	505,481
Average number of closed pouches handled daily.....	398
Number of crews.....	60
Number of clerks appointed to lines.....	75

For the previous year the statistics showed 12 cars and 17 clerks; the annual mileage for the time in operation was 76,336 and the pieces of mail handled daily but 78,932.

The routes at present in operation on cable or electric railways are given below:

Date of order.	Description.	Length.	Daily average.
		Miles.	Miles.
1893.			
Feb. 3	St. Louis and Florissant, Mo., R. P. O.....	18.10	80.98
1895.			
May 1	Boston and Brighton, Mass., R. P. O.....	8.25	69.90
1	Boston and North Cambridge, Mass., R. P. O.....	6.59	80.89
14	Boston and Dorchester, Mass., R. P. O.....	4.49	63.65
14	Dorchester and Back Bay, Mass., R. P. O.....	4.60	56.87
14	Boston and Roxbury, Mass., R. P. O.....	2.79	54.59
14	Boston and Somerville, Mass., R. P. O.....	3.24	53.87
June 1	H and P, Philadelphia, Pa., R. P. O.....	11.98	161.41
8	Boston, Mass., Circuit R. P. O.....		42.06
July 5	Williamsburg and Northampton, Mass., R. P. O.....	6.63	52.20
Sept. 27	Third avenue, New York, R. P. O.....	12.15	713.52
Oct. 24	Philadelphia and Manayunk, Pa., R. P. O.....	7.98	134.23
Nov. 11	Chicago, Ill., Milwaukee avenue R. P. O.....	3.79	70.13
11	Chicago, Ill., North Clark street R. P. O.....	3.78	66.77
11	Chicago, Ill., Madison street R. P. O.....	4.97	96.29
11	Chicago, Ill., Cottage Grove avenue R. P. O.....	7.73	149.77
11	Cincinnati, Ohio, Walnut Hills and Brighton, R. P. O.....	7.62	38.29
Dec. 16	Brooklyn and Long Island City, N. Y., R. P. O.....	5.19	51.39
19	Washington, D. C., Pennsylvania avenue R. P. O.....	4.86	101.48
1896.			
Mar. 13	Brooklyn, N. Y., Circuit R. P. O.....	12.04	365.42
May 16	St. Louis, Mo., Grand avenue circuit R. P. O.....	13.66	127.61
Sept. 14	San Francisco, Cal., Mission street R. P. O.....	4.93	60.67
14	San Francisco, Cal., Market street R. P. O.....	3.77	65.82
14	San Francisco, Cal., Sacramento street R. P. O.....	4.91	57.67
Oct. 5	Rochester, N. Y., east and west side R. P. O.....	15.31	134.44

### SUMMARY.

Total length.....	Miles.
Total daily average.....	181.16
	2,954.83

Arrangements have been completed which will result in the postal-car service being extended to Baltimore, where the mail is at present carried on the street cars in closed pouches. Two routes with railway postal-cars are contemplated.

Of the various cities where postal-cars have been introduced, Boston has the best arrangement of street railways; the long loop through the suburbs requiring two and one-half hours for the trip, gives more time for distribution and fewer men are required in the car.

In Chicago there are street railway post-offices on four lines; the routes are all short, requiring but 40 minutes for the longest, and hence, rapid work is required of the men. The schedules are so arranged that the cars connect with each other when on the down town loops, and all mail deposited in the cars by carriers or by individuals, that is intended for the territory of a sub-station is transferred to another line, and thus reaches its destination much quicker than formerly, when all the distributing was done in the general office. Also, so far as the completeness of the addresses permits, the mail is sorted for the carriers and a further saving of time effected. This service has resulted in a saving of from 2 to 3 hours in the transmission of letters from



one division of the city to another. On two of the routes, four postal clerks are required for each car, when on the down town portion of the line. It is found that the better service afforded is greatly appreciated by merchants in the outlying districts who are now able to order goods from down town by mail and have them delivered the same day, often after a few hours only.

Within the last month special boxes have been placed at intervals of four blocks on the Cottage Grove avenue route, into which carries dump the collections from the contiguous territory, and collections are made by the railway post-office crews each trip. On this route the mail trains are specials, and as there is about four minutes headway between the preceding and the following regular trains, ample time is afforded for making the collections from boxes. A few of the special boxes have also been placed on the other routes.

So soon as some arrangement is made, which will obviate the blockades which at present occur so frequently on the South Clark street and Wentworth avenue lines by reason of the steam road crossings on 16th street, postal cars will also be placed upon those lines.

The closed pouch service was adopted about 1890, that is, but little later than electric traction on street railways, and has grown very rapidly. This branch of the mail service pays the street railways better than the other, because, while the receipts are small, everything received is clear profit. No special cars and no extra men are required to handle it.

The following data in regard to this service are taken from the last report of the general superintendent of railway mail service. The figures are for those roads and parts of roads over which no railway post-offices run, in operation during the fiscal year 1895-96:

### CLOSED POUCH SERVICE.

Number of companies.....	91
Number of routes.....	126
Mileage of routes.....	726.84
Annual mileage.....	1,986,838
Pouches handled per day.....	1,929

This service is, of course, small when compared with the total mileage on steam roads, but it is one that will become more important with the extension of suburban and the building of new interurban lines.

## AMERICAN GOODS IN SPAIN.

The success which American manufacturers of street railway supplies have had in finding a market in England, France and Germany has led many firms to prosecute inquiries in Spain, with a view of developing that field also. At present there are street railways in but six Spanish cities, Madrid, Barcelona, Seville, Santander, Bilbas and Malaga, and under ordinary circumstances the field could be considered a very promising one.

But there are many obstacles to American imports, and in a report to the state department, Charles L. Adams, United States consul at Carliz, discusses them as follows:

First. There is a high and discriminating tariff imposed on American goods, to which must be added the octroi taxes levied by cities and towns; freight-rates are excessive in Spain; all the carrying trade is by way of Liverpool.

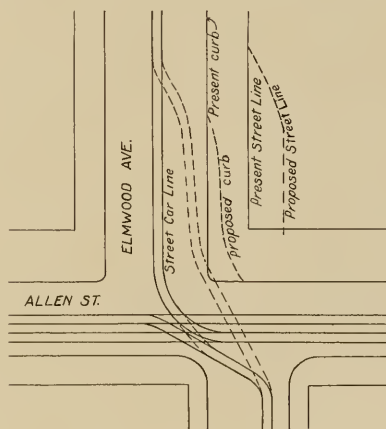
Second. England, France and Germany have reciprocal trade conventions with Spain, placing the United States at a serious disadvantage except with respect to the Cuban trade.

Third. The only direct importations into Spain from this country consist of cotton, petroleum and lumber, all other importations coming through the hands of French or English merchants.

Fourth. The present feeling in Spain is far from friendly to American business interests, because of the active sympathy for the Cuban insurgents which is manifested in the United States.

## A BAD CORNER IN BUFFALO.

The Buffalo Railway Company is endeavoring to make a change in its track layout at a particularly bad crossing. The cut shows the present and the proposed layout. The single track line on Elmwood avenue crosses the double track line on Allen street, and it is necessary for cars going north on Elmwood avenue to wait on the south side of the crossing until the south bound car can turn into Allen street. Tedious delays are caused on both lines and the situation is



aggravated by the jog in Elmwood avenue at this point making a system of signals necessary. The company has purchased a lot 35 by 75 feet on the northeast corner and proposes to widen Elmwood avenue for a distance of 75 feet and put in the track shown by dotted lines. This arrangement would make the angle of crossing better, do away with many of the vexatious delays experienced at present, and altogether greatly improve the service to the public on both lines. Some objection is made to this change by property owners in the vicinity, who would prefer that the street be widened for the entire block at the expense of the street railway company.

The elevated structure for the Union Loop, Chicago, has been completed and everything is in readiness for the electrical equipment. The Metropolitan Elevated has yet to be connected to the Loop, but the iron work for this has been received and will soon be in place. Provision is made for the expansion and contraction of the iron work by slip joints. These are at every third span. No rivets are used in these joints, but the girders just slip into and are held in place by shoes. It is expected that trains will be running on the loop by May 1.

SOME RECENT DEVELOPMENTS IN COPPER MANUFACTURE.

BY HAROLD P. BROWN.

In these days of keen business competition, makers of electrical apparatus and machinery are quick to seize upon each advance in the arts which will reduce the cost of material or increase the daily output of their shops. And the alert engineers in our large electric power houses are always ready to adopt improvements which will effect a saving of power. Both of these classes will, therefore, be glad to learn of a discovery in metal handling which will reduce cost and save time and power. It has been considered impossible to obtain solid castings of copper without mixing with it some other metal.

And it is well known that even one-half of one per cent of alloy is enough to reduce the electrical conductivity of the casting to one quarter that of pure copper. Many processes of mixing or tempering this metal have been invented but their product has not up to this time been able to show the physical properties of rolled or drop-forged copper.

Some months ago in a new type of rail bond I used strips of rolled copper with cast copper terminals. These castings were made for me by a firm which claimed extraordinary things for their product. I, therefore, expected very little from the metal, and in making tests was greatly surprised to find that a piece of this metal with but  $\frac{3}{8}$  of a square inch section, could transmit 1,500 amperes for twenty minutes without excessive heating. A calculation based on this performance indicated a conductivity of at least 90 per cent that of the best rolled copper. As I had never before found cast copper with more than 40 per cent conductivity, I decided to make a thorough and complete series of tests so as to ascertain the facts concerning this metal which is called MB copper. A chemical test, suggested by Mr. Edison showed that these castings had less impurity than was contained in some sheet or rolled metal sold as pure electric copper. To exactly determine the relative conductivity, I ordered a pattern made from which I obtained castings of the best commercial copper and of the MB metal.

These castings were carefully finished so as to present for testing a cylinder 25 in. long and 0.8 in. in diameter; a terminal was left at each end, about  $2\frac{1}{4} \times 2\frac{1}{4} \times 1$  in.

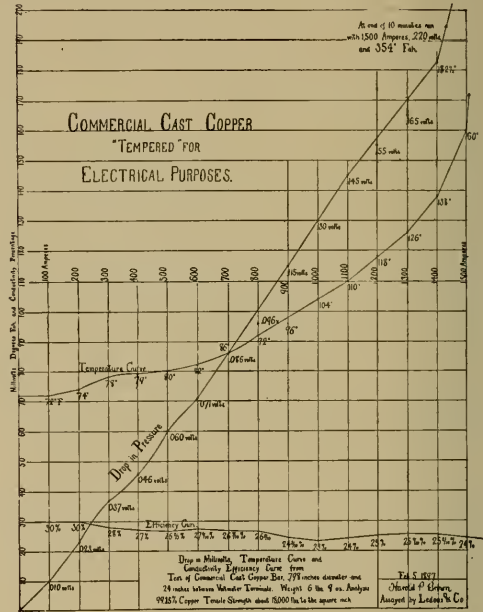
As a basis for comparison I had an exactly similar bar turned up from the best rolled Lake Superior copper. The completed bars were magnificent pieces of metal, without an apparent flaw. The difference in shrinkage of the two castings and a slight variation in the size of the terminals made it impossible to exactly obtain the comparative weight. The terminals of the rolled bar measured  $2 \times 2 \frac{7}{8} \times 1$  in., and its weight was 7 pounds, 6 ounces.

The commercial cast bar was a popular process "tempered" copper with terminals  $2 \frac{1}{8} \times 2 \frac{1}{8} \times 1$  in.; its weight was 6 pounds, 9 ounces.

The MB bar's terminals measured  $2 \times 2 \frac{3}{8} \times 1$  in., and its weight was 7 pounds, 1 ounce. Each of the cast bars gave a clear musical tone when suspended and struck; the MB bar, though the heavier, gave the higher tone. Of course the rolled bar was without resonance. The commercial cast bar had accidentally been turned 0.002 of an inch too small but the other two measured exactly 0.8 of an inch, thus having a section of practically one-half a square inch.

I decided to test the electrical drop in two feet of each bar and its temperature at from 100 to 1,500 amperes, the latter being three times the proper current for that section of copper. In order to prevent any rise of temperature from the contacts at terminals, each terminal was amalgamated by the Edison process and coated with the Edison flexible solder; there was, therefore, no appreciable drop at these contacts. In amalgamating the commercial copper bar by the Edison process, fumes were given off with an odor of zinc, and a black precipitate was formed. This was washed off and the process repeated several times until the surface remained bright. Both of the other bars yielded instantly to the process without fumes or precipitate.

Mr. Edison states that this is a keen test of the purity of copper and so it proved, for analyses subsequently made for



me by Ledoux & Co. showed the commercial casting to have 99.15 per cent of copper; the rolled bar 99.83 per cent and the MB 99.85 per cent.

In spite of the different characteristics of these bars, the variation in composition is less than seven-tenths of one per cent.

From tests of similar samples, the tensile strength of the commercial cast copper was 19,000 pounds to the square inch while the MB was 30,000 pounds, which is practically the same as rolled copper.

The cables used for connection were 500,000 c. m. with triple braided insulation. When heavy currents were used the bare ends of the cables near the bar connections were cooled with wet waste.

The observed temperature of the bars was, therefore, not due to any outside cause. The instruments used were all made by Weston and comprised a shunt ammeter reading to 1,500 amperes; a millivoltmeter reading 0.0002 per degree up to 0.01 volt, another reading 0.002 per degree up to

0.1 volt and a third reading 0.01 per degree up to 1.5 volts. In each case the same voltmeter terminals were used; these were clamped upon amalgamated spots on the bars just 2 1/4 inches apart.

A special dynamo driven by Edison motors was used; its field was excited from the Edison mains; by using a rheostat and a bank of lamps, the amount of current generated could be accurately adjusted.

The first readings were taken at 100 amperes after about one minute's run; the current was then increased 100 amperes and a second reading taken, and so on until 1,500 amperes was reached. This amount of current was continued for ten minutes and increase of the temperature and drop noted. The bars were then disconnected and laid upon a wooden floor and their rates of cooling noted. Since the copper resistance tables are either calculated for a constant temperature or were compiled years ago from data based on impure copper, I decided to use as a base of comparison, the drop of the rolled copper bar at each 100 amperes. Since the performance of the MB copper came so close to this standard, I repeated the tests on each and found the readings accurately recorded.

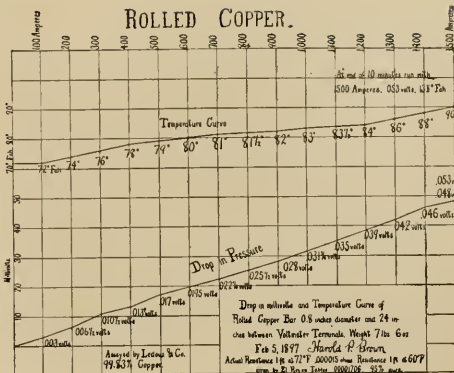
The tabulated results are as follows:

Amp's.	Rolled Copper.		MB Copper.		Commercial "Tempered" Cast Copper.			
	Deg. F.	Mil.V.	Deg. Fah.	Mil. V.	Deg. Fah.	Mil. V.		
100	72	.003	72	.0032	94	72	.010	30
200	74	.0065	72	.007	93	74	.023	30
300	76	.0105	72	.011	95	78	.037	28
400	78	.0134	72	.014	96	79	.046	27
500	79	.017	72	.017	97	80	.060	26.6
600	80	.0195	72	.020	97.5	82	.071	27.4
700	81	.02225	72.5	.023	96.7	86	.086	26.7
800	81.5	.025	73	.027	94.4	92	.096	26.5
900	82	.028	73.25	.0295	95	96	.115	24.3
1,000	83	.03175	73.5	.034	93.4	104	.130	23
1,100	83.5	.035	74	.036	97	110	.145	24
1,200	84	.039	76	.040	97.5	118	.155	25
1,300	86	.042	78	.044	95	126	.165	25.4
1,400	88	.046	80	.048	96	138	.1825	25.2
1,500	90	.048	81	.052	92.3	150	.195	24.6
1,500	138	.053	136	.057	93	354	.220	24

The last set of readings was taken after a ten minutes' run with 1,500 amperes.

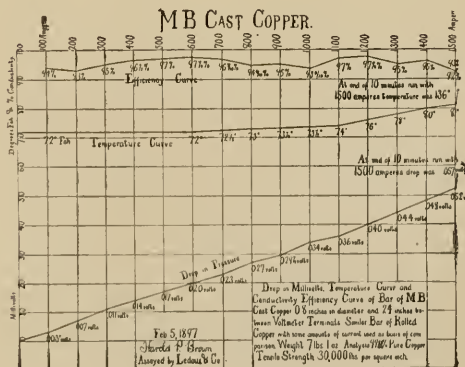
The accompanying curves will show the behavior of the three metals under exactly the same set of conditions. The commercial cast copper averaged less than 28 per cent conductivity, and before the end of the run scorched the wood on which it rested and the cotton covering the thermometer bulb, as it reached 354 degrees Fah. and 0.22 of a volt drop. Before the test the color of this piece was fine and closely resembled that of the other bars; after the test the bar was a mass of red and silver colored spots and had lost nearly all its resonance. At the end of the run it had expanded from increase of temperature 1/8 of an inch in 2 1/4 inches and 0.002 of an inch in diameter.

Allowance should be made for its difference in size. It required two hours and twenty minutes to cool to the temperature of the room. The rolled copper showed a conductivity far greater than called for by the tables ordinarily used. Its actual resistance per foot at 72 degrees Fah. was 0.000015 ohms. In the table published by the London Electrical Review, the resistance of a piece of copper, 95 per cent pure, one foot long, with a section of one-half a square inch, is said to be 0.00001706 at 60 degrees Fah. Without reducing to the same temperature, the latter resistance is



13.7 per cent greater than the resistance observed. The tables based on the Matthiessen Standard Conductivity also show greater resistance; it is therefore wise to use an actual measurement of modern rolled copper as a standard of resistance for cast copper. The rolled copper bar at the end of the ten minutes run with 1,500 amperes, reached 138 degrees Fah. and 0.053 volts. It had then increased 1/8 of an inch in 2 1/4 inches as did the other, but the diameter increased but 0.0005 instead of 0.002 of an inch. It required one hour twenty-three minutes to cool. The performance of the MB copper was a surprise and remains a puzzle. In the test it kept 8 to 10 degrees cooler than the rolled bar up to a load of 1,400 amperes. At the end of the ten minutes run with 1,500 amperes it reached 136 degrees Fah. and 0.056 volts. Its increase in size was the same as that of the rolled bar.

It required one hour and thirty-nine minutes to cool. The varying temperature of the two bars evidently accounts for the up and down movement of the efficiency curve, between 94 per cent and 97 1/2 per cent. If in the test the temperature of the bars should be kept at 72 degrees by allowing time for cooling after each reading, it is my opinion that this curve would be practically a straight line at 95 or 96 per cent. I need not say that this conductivity is marvellous and opens an entirely new field for dynamo and motor construction and for switch board work, where a large saving can be effected by using it in place of rolled or drop-forged copper, both of which will warp or twist when heated,





while the finished cast metal retains its shape. I know of large multipolar dynamos upon which castings of low conductivity have been used for field coil connectors, etc.; on account of the unsuspectedly high resistance of these contacts, the calculations concerning compounding have been upset and the dynamos have been failures. Another surprising quality of these MB castings lies in their elasticity. I have fastened in a vise one end of a casting  $1$  inch wide and  $\frac{3}{8}$  of an inch thick; the other end, 12 inches distant from the point of support, was bent one inch out of its position but sprung back when released. I have driven through a  $\frac{7}{8}$ -inch hole in a hardened steel plate, a plug of MB metal  $\frac{5}{8}$  of an inch in diameter. This required as many hammer blows on the fifth trial as it did the first.

In another experiment I drove into an opening  $1\frac{9}{8}$  inches wide between heavy steel rails, a plug of MB copper cut in two pieces lengthwise, the sum of whose widths was  $1\frac{1}{2}$  inches, thus compressing the metal  $\frac{1}{2}$  of an inch. A current of 1,500 amperes was then passed through the junction whose section was  $\frac{3}{8}$  of a square inch, and a drop of 0.018 volt was indicated from rail to rail through the two copper pieces in series. The rails were then separated  $\frac{1}{2}$  of an inch more, but the drop remained the same, showing that the copper had resumed its previous width. An analysis of another sample of this MB copper gave the following results:

Copper . . . . .	99.870 per cent.	Bismuth . . . . .	None.
Silver . . . . .	.034 per cent.	Lead . . . . .	None.
Iron . . . . .	.011 per cent.	Cobalt . . . . .	Trace.
Arsenic . . . . .	.002 per cent.	Sulphur . . . . .	None.
Zinc . . . . .	.013 per cent.	Oxygen . . . . .	(by difference)
Tin . . . . .	None.		.068 per cent.

This analysis is verified by others made by such experts as Ledoux & Co., Booth, Garrett & Blair, Prof. Frank X. Moerk and others, and shows exactly the same results as the best Lake Superior copper. It is evident that no alloy has been used. And yet the process has increased the electrical conductivity and the tensile strength; has given a certain amount of elasticity and decided resonance; has increased the density and changed the structure of the metal.

On presenting this matter to Mr. Edison he accounted for the evident change in the structure of the metal by the theory that the shape of the crystals has been altered so that their lines are parallel, and that the molecules are thus brought closer together and into more intimate contact with each other.

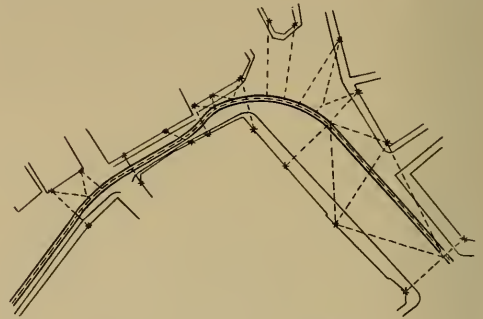
The fact that MB copper can also be rolled or forged adds new interest to its development. As its tensile strength exceeds that of ordinary copper wire, it is certainly worth while to make wire from it in order to determine its strength and conductivity. If it is possible by this process to make as large an increase in the conductivity of wire as it has made in conductivity of cast copper, it will revolutionize dynamo and motor building, and every electric light and railway company will save money by using it to replace its present line wire. And if the tensile strength of the wire is increased by the process poles can be set farther apart and the wire will be less likely to decrease its diameter during winter. This metal is well worth the attention of all electrical engineers who appreciate the value of high conductivity.

It is understood that Mr. Edison is interested in the development of the process and that the MB copper will be manufactured under his supervision at the celebrated Menlo Park works.

## TROLLEY SUSPENSION WITHOUT POLES.

In Elberfeld and Barmen, Germany, two adjoining manufacturing towns with a combined population of 260,000, the street railways have to contend with great difficulties in the way of steep and narrow streets and sharp curves at awkward points. In two instances the streets are 14 ft., 9 in., and 16 ft. wide, respectively. The steepest grades are 1 in 16 and 1 in 20 and the sharpest curves have a 52-ft. radius. There are two lines, one running through the two towns, of 4 ft. 8½ in. gage, double track, and a cross line in Elberfeld, of 3 ft., 3 in. gage and single track. Where the streets are too narrow for both tracks different routes are taken for the "up" and "down" lines.

The roads are operated on the overhead trolley system. The overhead wires are suspended chiefly from "rosettes"



TROLLEY SUSPENSION FROM ROSETTES.

affixed to the buildings. The distance between rosettes varies from 18 to 20 ft. on curves to 120 ft. on straight track. There is no power to compel property owners to permit the rosettes to be affixed to their buildings, but pressure is brought to bear, and if consent is not obtained poles are used. The illustration, for which we are indebted to the Surveyor of London, shows the method of suspending the trolley wires and also the close quarters at curves. The heavy dotted line indicates the trolley wire and the light dotted lines the guy wires fastened to the rosettes.

## HORSE CAUGHT IN A FENDER.

A peculiar accident occurred recently on the trolley line between Wethersfield and Hartford, Conn. A team of horses being left without a driver for a few moments walked onto the track and were struck by a slowly moving car. One of the horses put his foot through the car fender, and was only released after two hours by filing through one of the iron bars of the fender. When released it was found that the horse had injured his spine in floundering about and it was necessary to kill him. The accident occurred at midnight, it being the last car, and consequently no delay of traffic was caused.

The litigation of the Baltimore & Ohio and the Baltimore & Potomac Railroad Companies involving the right of the Commissioners of the District of Columbia to make the railroads stop their trains at the crossings of street railways, resulted in a decision of the Court of Appeals February 9, in which the power of the Commissioners was upheld.



An electric road is talked of in Glanclan, Germany, so the American consul at Chemnitz reports.

The Cracow (Austria) Tramways Company has completed plans to build five new lines in the city and suburbs.

Ponce, Porto Rico, granted a franchise for an electric railway two years ago, but construction has not yet begun.

There is a valuable concession at Tampico, Vera Cruz, which is held by Louis Goodman, of Neuvo Laredo, Mexico.

The Privy Council of Kingston, Jamaica, invites application for a license to establish rapid transit lines in that city and suburbs.

Perry Barsholow, U. S. Consul at Mayence, Germany, informs us that the street railway of that city is to be changed to electric system.

An extension of 6 miles of double track is being made to the Brussels tramway lines. It is stated that conduit instead of trolley system will be used.

At Freiberg, Germany, a committee has been appointed to study the different systems of street car propulsion. The electric system will probably be adopted.

Claude M. Thomas, United States consul at Marseilles, France, says that the Marseilles Street Railway Company has decided to change its system to electricity.

Consul-General J. B. Richman of St. Gall, Switzerland, informs us that the Gas, Wasser & Electricitatzwerke Company has just built an electric road in that city.

Augsburg, Bavaria, is a city of 60,000; its street railway, the Schuckert Actien Gesellschaft is now operated by horses but electricity will be substituted the present year.

Stephen H. Angell, U. S. Consul at Roubaix, France, writes us that the tramway company at Lille, which is now a horse road will be changed to electric this summer.

Progress is being made on the electric railroad between Buenos Ayres and Floresta, Argentine Republic, and it is expected that the road will be in operation about April 1.

Up to January 1, the number of applications to build light railways presented to the English Light Railway Commissioners was 26, 15 in England, 3 in Wales and 8 in Scotland.

St. Petersburg, capital and largest city in Russia, has only two street railways, operated by horses, using single tracks with turnouts. Cars run from 8 a. m. to 12 p. m., and the service is of a very primitive nature.

Ciseros & Co., owners of the street railway at Barranquilla, Colombia, propose to extend their line to Solidad, a

distance of 6 miles, and very possibly to equip with electricity. The manager of the railway is E. Mejia.

J. C. Monaghan, U. S. Consul, at Chemnitz, Saxony, Germany, writes: "Almost every little town of 20,000 souls and upwards, has or desires to have a street railway, and many of them must soon move in this direction."

The estimates for an electric street railway in Willesden, England, have been completed by the engineers. The road will be 4.5 miles long, costing about \$1,480,000, of which one-third will be for right of way and station buildings.

The Dublin, Wicklow & Wexford Railway Company will apply to Parliament for a permit to extend its lines and equip them with electricity. Provision will be made for freight as well as passenger traffic between Dublin and Bray.

O. H. H. Boyesen, American consul at Gothenburg, Sweden, writes that the Gothenburg Street Railway Company has asked for a concession to start a line of electric cars. The company is known as Goteborgs Sparvags Aktiebolag.

The earnings of the Bristol Tramways & Carriage Company amounted to \$245,225 last year, of which \$61,890 was profit. The Eastville trolley line will be extended to Staple Hill, permission having been granted for this as the new line is outside of the city limits.

The report of the Liverpool Overhead Railway shows a satisfactory condition of its finances. During the past six months 3,919,134 passengers were carried, with total receipts of \$163,910. On a balance of \$60,885 a dividend of 5 per cent was declared on preferred and 3 per cent on ordinary stock.

G. W. W. Gade, consul at Christiania, says that German capitalists are building an electric street railway in Bergen, Norway, and it will be completed this year. The German Electric Company has purchased a controlling interest in the horse car line in Christiania with the view of transforming it into an electric system.

It is reported that the Jungfrau mountain electric railway plans have been completed. The road will be about 7.5 miles long, ascending to within 250 feet of the top of the mountain. An elevator will carry the passengers the rest of the distance. The ascent will be about 6,500 feet, with a grade in places of 25 per cent. It will require 1,100 h. p. to operate the road.

"Up to the present, Bucarest is the only city in Roumania which owns street railways," writes H. G. Boxshall, United States Vice Consul. "Here we have two, one of which was established in the 70's by an English company, whilst the other was established in this decade, about four years ago, by a Belgian company, which then turned the business into a joint stock company. The name of the first is the Bucarest Tramways Company, and that of the second is the Societe Anonyme des Nouveaux Tramways. This latter company has also an electric line. Several other towns in this country are now studying the question of tramways, and are working out projects for this purpose. Those which have so far come under my notice are Galatz, Braila, Jassy, Craiova and Ploesci."

## POWER FOR THE SALT LAKE CITY RAILROAD COMPANY.

The development of the water power in the Big Cottonwood canyon has proven a great boon to the Salt Lake City Railroad Company. It is now using that power to operate its whole street car system. The canyon is located some 13 miles southeast of the city in the Wahsatch mountains. The stream passing through the canyon is fed by eight lakes situated 11,000 feet above sea level, but the natural conditions are such that only a 440-ft. fall is available for power purposes.

About two years ago local capitalists organized the Utah Power Company, of which Francis Armstrong is president, A. W. McCune, vice-president, and J. E. Dooly, secretary and treasurer. Careful surveys were made, plans drawn and an estimate of \$250,000 made on the cost of the work. The sources of revenue were the street car company, lighting the city and furnishing power for manufacturing concerns. The large contracts already on hand demonstrate the financial wisdom of the plan.

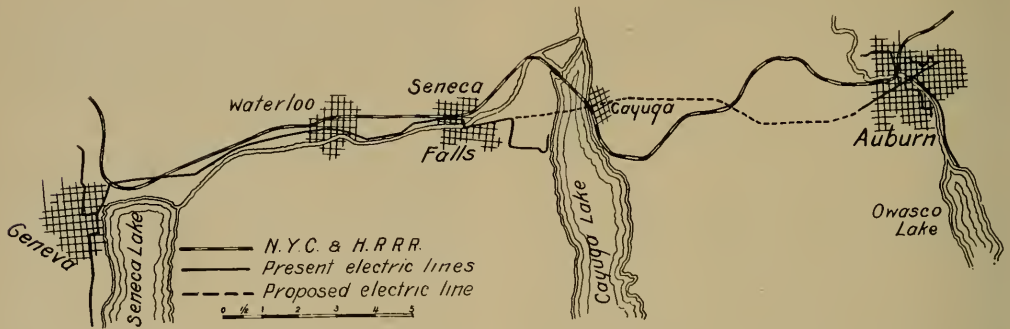
Work on the hydraulic part of the enterprise began nearly two years ago. Water was conveyed from the Cottonwood

500. The street car system is operated by direct current, so two rotary converters transform the alternating current of 500 volts to a direct current of the same voltage. The current then passes into the trolley and feeder lines of the Salt Lake City Railroad Company. On the 42 miles of track, 27 motor cars are operated. The power from the Big Cottonwood has only been in use since February 25th, but the system is so simple and complete that no difficulty is anticipated.

Two more dynamos are yet to be installed and another transmission line put up to the city. With this abundant and cheap source of electrical energy the people of Salt Lake City expect greater industrial activity in their prosperous community.

## INTERURBAN EXTENSION IN NEW YORK.

The Auburn & Western Railway Company has been incorporated to build an electric line between Seneca Falls and Auburn, N. Y. This railway will be about 10 miles long and connect the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company with the Auburn City



creek by a wooden flume to a 48-in. steel pipe 1,300 ft. long, which carried it to the power house. This gives a working pressure of about 190 pounds. A Pelton water wheel, about 60 in. in diameter, develops from this head of water about 1,000 h. p. at 350 r. p. m.

The supply of water is such that the minimum flow will give 2,500 h. p. with a possible development of 4,000 h. p. during 9 months in the year. A reservoir was built which holds water sufficient to run the wheels for 24 hours.

The electrical installation was the next problem and this was given to P. H. Knight to solve. Westinghouse apparatus was selected throughout. C. F. Lacombe, western agent of that company at Denver, conducting the negotiations for the sale, and superintending the setting up of the machinery. The dynamo, furnishing power for the street railway company has a capacity of 1,000 h. p. The dynamo was connected direct to the Pelton Water wheel and an alternating current of 1,500 amperes at 500 volts is generated. This is conducted to the transformer house which is close to the power station and the voltage is raised to 15,000 in the two stationary transformers. From here the current passes over the transmission line which is 13 miles in length and consists of 3 No. 2 copper wires. The loss in this line amounts to about 16 per cent. In the power-house in Salt Lake City step-down transformers reduce the voltage to

Railway Company, and make a through line from Geneva, through Waterloo, Seneca Falls and Cayuga to Auburn, a distance of about 20 miles. Application has been made to the state board of railway commissioners for permission to build the line.

It is intended as a passenger road and, through mail and express may be carried, no freight business is contemplated.

The map shows the system as projected. The solid lines indicate the existing electric lines, and the dotted line the proposed extension. The New York Central Railroad, which will be parallel from Geneva to Auburn, will be crossed twice by the proposed line.

The Indianapolis city council has adopted an ordinance providing that the street car company shall heat its cars from December to March inclusive when the temperature is below 20° F.

The election of directors and officers of the Second Avenue Street Railroad Company, New York, was held February 9. William C. Whitney, who recently purchased a controlling interest, was elected to the board. John D. Crimmins was elected president, succeeding George S. Hart, and Thomas F. Ryan was chosen a director to represent new stockholders.



## CAILLETET SINGLE-RAIL RAILWAY.

We are indebted to London Engineering for the following illustrations and description of the very ingenious mono-rail system for light railways, designed by Mr. Cailletet, a French engineer. It is not adapted for mechanical traction, and consequently will not prove a dangerous rival to other light railways, which are most economical when so operated.



FIG. 1.

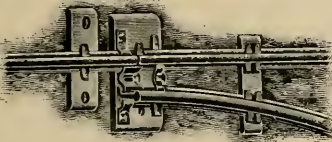


FIG. 2.

The low cost and wide adaptability, however, make it eminently suited for agricultural districts where the roads are often so bad as to be impassable for loaded wagons, and it has found an extensive and useful application in France and the French colonies; also in Egypt it has received the strong endorsement of the British Engineer officers.

The track may be either permanent or portable, but the latter type has been more extensively used. The rails are of light section, the weight used depending on the nature of the service; up to the present they have weighed 3, 4.7, 6.4 and 8 pounds per foot. For the portable lines the permanent way is usually laid in sections 16.4 feet long, the section of this length together with six bedplates and fishplates,

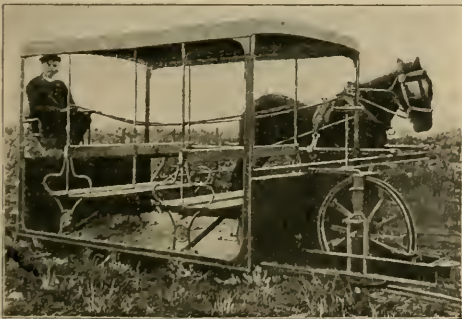


FIG. 3.—CAILLETET PASSENGER CAR.

weighing 61, 89, 94, 123, 137 or 165 pounds, according to the traffic for which the line will be used.

Figs. 1 and 2 illustrate the rail, bedplate and fishplate, all of which are of steel. The rails are not weakened by drilling, the fish-plates being more or less elastic clamps fitting over the lower flanges of the rail. The bedplates are rectangular, with stiffening flanges on the four sides, being from 8 to 12 inches long and from 1 to 8 inches wide. As

shown in Fig. 2, there are two clamps riveted to the bedplates in such manner that the foot of the rail may be slipped in and then fixed by pulling back so that the clamps lock upon it. For convenience in laying, the rails are in lengths of only 4 to 8 feet. Where the ground is soft it is of course, necessary to properly support the bedplates. The sharpest curves which are used are of 13 feet radius, but this is recognized as too sharp and a 26-foot radius is recommended as the standard minimum. At switches the T-rail is replaced by a channel broad enough to receive the wheel flanges between its own.

The cars for these mono-rail lines are mounted on two grooved wheels, which are of course, placed in the same plane. A very common type is a hand car in which loads up to 700 pounds may be readily transported. For animal traction, cars are in use which have a capacity of 2 tons. The car body is in all cases disposed symmetrically with respect to the line of support and the load is also distributed in the



FIG. 4.—THE CAILLETET MONO-RAIL RAILWAY.

same manner. Fig. 3 shows a passenger car, and Fig. 4 a car for transporting earth, etc. The latter shows the manner of supporting the car body on two light girder frames in which the wheels are mounted. For cars of this size the wheels are from 20 to 30 in. in diameter. The wheels are controlled by brakes as on other railways.

A light frame projects from one side of the car and to this the horses are harnessed. The load being properly placed, practically the only effort exerted by the team is for traction. There is no occasion for turning the cars, as the team may be harnessed to pull in either direction. Other types of cars are in use for handling various classes of material and a quite interesting adaptation is that of an ambulance car, which has been used in Africa.

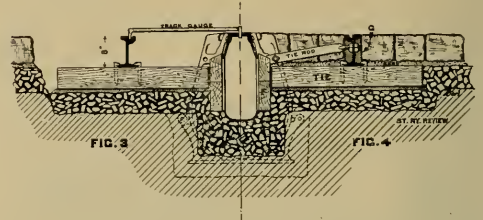
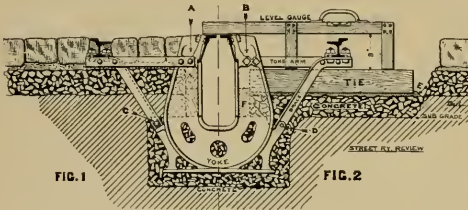
## OWL CAR WORK AS DISCIPLINE.

The Globe Street Railway Company of Fall River, Mass., has adopted a new method of disciplining its employes, and hereafter men will be put on night duty instead of suspended for violation of rules. This system has many points in its favor. While not so severe upon the man disciplined as is a suspension, the longer hours, unpleasant work and the long walk home when the last car is turned in, all serve to remind him that he has been in fault, and show him the advantage of good conduct. Also the men will not in future feel that the easiest way to get a vacation is not to violate a rule and be laid off for a few days. Suspensions now are for serious offenses only.

## RECONSTRUCTION OF CABLE TRACK IN CINCINNATI.

By Bert L. Baldwin, M. E., Cincinnati.

When the cable roads were first built in Cincinnati, the question of the kind of rail to be used received very careful consideration, and the heaviest rails in use at that time were selected for the purpose; these being the well known 52-lb. Johnson girder rail, for straight track, and an 82-lb. girder rail for curve work. These rails had been put in service on one of the "horse car lines," and after a test of about one year, were found to be so satisfactory in that kind of service, and were so far superior to the old stringer rails, that they were selected for use on the cable construction. The cable yokes, in both straight and curve work, were designed to suit the rails, and for the first two or three years' service the rail answered very well, but it was found that cable road service was very trying upon the rolling stock, the shocks, jars and sudden strains being so severe that cars built upon the same line as "horse cars," were soon racked to pieces, so that it was necessary to have them more heavily famed; again, with the addition of radial couplings, special brakes, sand boxes, bumpers, vestibules, etc., the weight of the cars increased at an alarming rate, so that the rail joints began to let down. To add to the misery, electric cars weighing two and even three times as much as the cable cars, were operated over certain sections of the cable construction, some of these cars weighing as high as 10 tons empty, or nearly a 4-ton load upon each wheel when loaded. This made the joint question rather serious, as it required such a large force of men to keep the track work in proper repair. Almost every type of joint was tried, but there was not sufficient room between the head and base of the rail to obtain the proper



amount of strength. Where the joint was too rigidly supported below, the webs would crush, and if a very solid joint were made to prevent this, the rail would often snap off just beyond the joint; so it was finally decided to make a complete change and substitute the 95-lb. full grooved rail, which was being used upon all new electric roads in Cincinnati. To remove the old rails and lay the new one without interfering with the regular operation of either the cable or electric cars was a point which required careful study before deciding upon a new system. The original design of the cable construction was such that a plan finally decided upon worked without a hitch and for the benefit of those interested, the following description may prove instructive, in event that they may be driven into undertaking a similar reconstruction.

Fig. 1 shows the Walnut Hills and Vine street cable road construction, when in perfect order, with the old 52-lb. rails supported upon wrought iron yoke arms secured to the cast

iron yokes. These yokes were spaced four feet apart and thoroughly imbedded in concrete, so that they formed a very good support for the tracks and slot rails, and although the tracks settled badly out of line, the slot rails have maintained their alignment and grade very nicely throughout the entire system, except in one or two places where a landslide caused the entire street to move and where it was necessary to realign the slot rails, but with the exception of a few hundred feet of track, it has not been necessary to disturb the concrete in tunnel bottom or under the yokes.

Single track was handled in the following manner:

The granite paving was removed to a width of 10 ft., or 5 ft. on each side of the slot rail, and for a length of from 400 to 600 feet, according to the location of the intersecting streets, curves, etc. The concrete foundation below the granite paving, together with all earth, stone or other material was removed for a width of 9 ft., or 4 ft. 6 in. on each side of the slot rail, to a new sub-grade, 21 in. below top of slot rails; this sub-grade was thoroughly rammed solid with hand rammers so as to secure a good foundation; at each yoke a small pocket was made to give access to the bottom bolt in yoke arm (marked C in Fig. 1); following the excavators were other men who removed the bolts C, leaving the yoke arm braces supported and held in position by a lug on the yokes, as shown at D Fig. 2; these men also removed the rivets A, by means of ratchet drills and punches, replacing the same with bolts B, so that the rails would still be supported by the yoke arms; for additional security the rails were blocked up at various points directly from the ground as well as braced from the sides of trench. New sections of lower tunnel siding, made of creosoted yellow pine were fitted in position at F, after which the concrete gang filled in the trench to a level 16 in. below top of slot rail, using a level gage for the purpose, similar to what is

shown in Fig. 2, only with longer "legs." Upon the concrete was spread a bed of stiff cement mortar and short oak ties bedded directly in this mortar, using the "level gage" shown so as to insure their being properly leveled, the mortar being put in place in a heavy layer and the ties rammed until the gage showed it to be at the proper level when tried at both edges. The tops of ties are then still further tested for level by using a steel straight edge 10 or 12 ft. long, slid along the tops of ties and clear under the yoke arms; this located all high or low ties which are corrected for level at once. Two of these ties, size 6 in. x 7 in. x 3 ft. 6 in. were placed between each yoke on each side of slot rail, and at rail joints a 6 in. x 12 in. x 3 ft. 6 in. tie is used, the location of each joint being carefully measured off and marked upon the side of slot rails for this purpose.

All of the foregoing work is done during the day time, while both electric and cable cars are operating over the old rails and, of course, it requires close watching to prevent

tools, blocks, ties and other articles from getting into the tunnel and catching a grip; and it requires a lively gang of men to keep out of the way of the cars, especially at such times of the day as they are passing at the rate of three or four per minute, and still be able to progress with the work.

After the ties are in position for a stretch of say 400 ft., and the cement set sufficiently hard, the new rails are hauled along side of the trench and everything prepared for changing the rails after the last regular cars have passed over the lines, usually about 1 a. m.

Headlights are used for illuminating the work if it is at a point where there are no electric lights.

The rails used are 60 ft. long, and in many cases two or three of these are spliced together before being lifted into position.

After the last regular cars have passed over the line, the track gangs start at work, first removing the yoke arm bolts throughout the entire length of the work, removing the splice plates only where they connect at each end of the work to be changed, then with bars and wooden levers the rails with their splice plates and yoke arms attached, are wrenched from their old position and deposited against the curb stones, care being taken so as not to disturb the new ties. After removing all blocking and rubbish that may have collected upon the ties, the new rails are lifted into position, spliced together and spiked in place, using one hook head spike on outside and two on inside flange of rail base. As it is too dark to sight along the rails and obtain proper alignment, a special track gage is used in laying the first line of rail which gages from the cable slot, as shown in Fig. 3. The opposite rail being aligned by using the usual type of track gage. This, together with the tightening up of all splice bolts puts the road in a condition so that the cars can start again; 600 ft. of single track have been changed in this manner in less than two hours; of course there is other work to be done, holes to be drilled through the webs of rails opposite the yokes, to receive the tie rods, as shown in Fig. 4, and in some cases, spikes have to be drawn so as to straighten out some slight "kink," copied from the slot, while using the slot to gage by, but this work can be performed while the cars are running over the new rails.

Next the two new pieces of upper tunnel siding are fitted in place and the concrete filled in around and leveled with the tops of the ties, the same being well tamped under the rails and in place as well as finished off with thin cement grout, which fills all cracks and voids.

The webs of rails are filled with a stiff cement, as shown at G, after which the granite paving is relaid in the usual manner, on a bed of sand with the joints properly graveled and tarred.

After the paving is in place all old track material and rubbish is then removed and the work of reconstruction may be said to be complete.

In very narrow streets only one side is reconstructed at a time, so as to leave at least one side of the street open for wagon travel, and in double track work the two rails and space between the two sets of slot rails are reconstructed first, and then the outside portions of the work follow, one side at a time. In asphalt paving the work is performed in the same manner as with granite, excepting that the concrete is carried up and over the tops of the ties to a level  $3\frac{1}{2}$  in. below the top of slot rails to allow for the asphalt surface.

It seems rather odd to replace iron yoke arms with oak ties, but where a water proof paving covers these ties and they are bedded almost completely in cement concrete, there is very little danger of the wood decaying. In certain places in Cincinnati ties have been removed after having being bedded in this manner for over eight years, and with the exception of a little white mould, less than  $\frac{1}{8}$  in. deep on the surface, the ties were as sound as could be wished.

In the case of these cable roads, even should the ties rot away the rails have base flanges  $5\frac{1}{2}$  in. wide which rest directly upon the concrete, so that they could not "get away," and they will probably stay where they are until they wear out.

All portions of the forenamed cable line, which have both cable and electric cars operating over the rails, have been reconstructed. This amounts to about 50 per cent of their length, and as the weather permits, the balance of the line will be reconstructed this year.

### EXEUNT HORSES IN PHILADELPHIA.

On January 14 the last horse car in Philadelphia made its last trip, running over the Callohill street line to the new trolley barn at 24th street and Fairmount avenue, where it now awaits its end. Whether that end is to be under the auctioneer's hammer or just a removal to the scrap heap is not yet determined. Business was good up to the last, 35 fares being collected on the final trip. This marks the closing of an interesting epoch in transportation in Philadelphia. The first real horse car in that city was run on Germantown road January 21, 1858, so that horse traction extended over a period just 7 days less than 39 years. Unlike many of the institutions incident to the "good old times," this one has no friends and no one wishes to see the era of the horse car return. While, as stated above, the first horse cars were put in service in 1858, horses were used for drawing cars on the Germantown Railroad for a few months in 1832, before the steam locomotives were put in service, and also for a few trips on the Northern Liberties & Penn Township Railroad in 1834.

### PRIZES AT GRAND RAPIDS.

The Consolidated Street Railway Company of Grand Rapids, Mich., on February 12, awarded the prizes for good conduct during the last six months. Twelve men received awards ranging from \$40 and one week's vacation with full pay to four days' vacation with full pay. At the same time the management thanked the men for the excellent records made, and regretted that all those whose conduct had been good could not also receive an award. During the past year the number of accidents has been greatly reduced.

Buenos Ayres is the largest city in the Western Hemisphere outside of the United States, and the most progressive in the South American republics. Its street car service is operated by animal power but it is quite extensive. There are 10 companies in the city running 191 cars on 231.5 miles of track. The employes number 3,729 and 7,885 horses are used. During the month of December these companies carried 7,137,080 passengers.





On the Construction of a Factory Chimney of the Capacity to Suit a Plant of 2,000 Horse Power, by Robert Kunstman.

In the construction of every factory chimney it is necessary, owing to a concentration of so great a weight on a comparatively small area and on account of its lofty nature as a structure, that a careful examination of the ground by means of proper sounding rods be made; it is of considerable importance to ascertain whether any layers of quicksand intersected with a watercourse may not be concealed in a lower stratum, which would necessitate special consideration and a more careful and elaborate operation in order to secure a good and permanent foundation. It is of no rare occurrence that an apparently solid bed of clay may be of a limited thickness only, overlaying quicksand, or a bed of a different nature of clay that will not sustain the great weight which will have to rest upon it. In hilly country it may occur that layers of clay of different density intersected with a watercourse, begin to slide upon each other, even at a considerable depth below the surface, when great pressure on the surface is brought to bear.

In Fig. I and Fig. II we represent sectional and full elevations of a round brick chimney, 193 feet high from base line to top of cap. The connecting flues from the boilers here reach the chimney at a height of 14 feet from the base line, leaving, for the stack proper, an effective draft height of 179 feet. The inside diameter at the flue inlet is 8 feet while the inside diameter of the discharge opening at the top of cap is 7 feet.

#### FOUNDATION.

The nature of the ground upon which this chimney is erected requires a good and uniform distribution of weight and for this reason the concrete foundation is considerably strengthened by means of completely imbedded steel beams in the lower three layers. A solid concrete bed 18 inches thick and 37 feet square is first placed upon the excavated ground; on this three layers of steel beams 35 feet long, 10 inches deep are laid across each other and everywhere surrounded with concrete; the beams weigh 25 pounds per running foot and are spaced 9 inches from center to center.

The component parts of the concrete must not be too coarse and the latter requires to be thoroughly well rammed between the beams so that the interior shall be homogeneous and free from flaws.

Four concentric circular layers of concrete are then placed on the top of the completed courses of square layers, each circular block raking back along a line of slope making an angle of 60 degrees with the horizon. The whole exterior of foundation is rendered fairly smooth with cement mortar of best Portland cement and left for a week or two to harden and consolidate before the surrounding ground is filled in and the brickwork proceeded with.

We shall now give the quantities of materials used for foundation:

2,053 cubic feet of concrete in the bottom block.  
3,250 cubic feet of concrete round and within steel beams.  
3,445 cubic feet of concrete in the circular blocks.

Total 8,748 cubic feet, at 137 pounds per cubic foot will weigh 535 tons and with 37 tons of steel beams we have a total weight of about 572 tons in the foundation.

#### SHAFT OF CHIMNEY.

The shaft of the chimney is composed of an inner flue reaching within, from base line, 193 feet to the top and an outer surrounding wall, or shell, 178 feet 3 inches long, together with a cap of 14 feet 9 inches terminating the shaft.

Both these flues are erected independent of each other, and only approach within about  $\frac{3}{4}$  of an inch through ribs (as shown in the different sections AB, CD, EF and IK), bonded into the outer walls and projecting inward.

The batter for the outside walls is found thus: The difference in diameter at the base and at the neck of the cap is 17 ft. minus 10 ft. 6 in. or  $6\frac{1}{2}$  ft., and the height from base to neck is 178 ft. Hence the batter is  $\frac{7}{8} \div 178$  or .219 inches to the foot.

For the inside flue it is  $\frac{1}{2} \div 193$  or .031 inches to the foot.

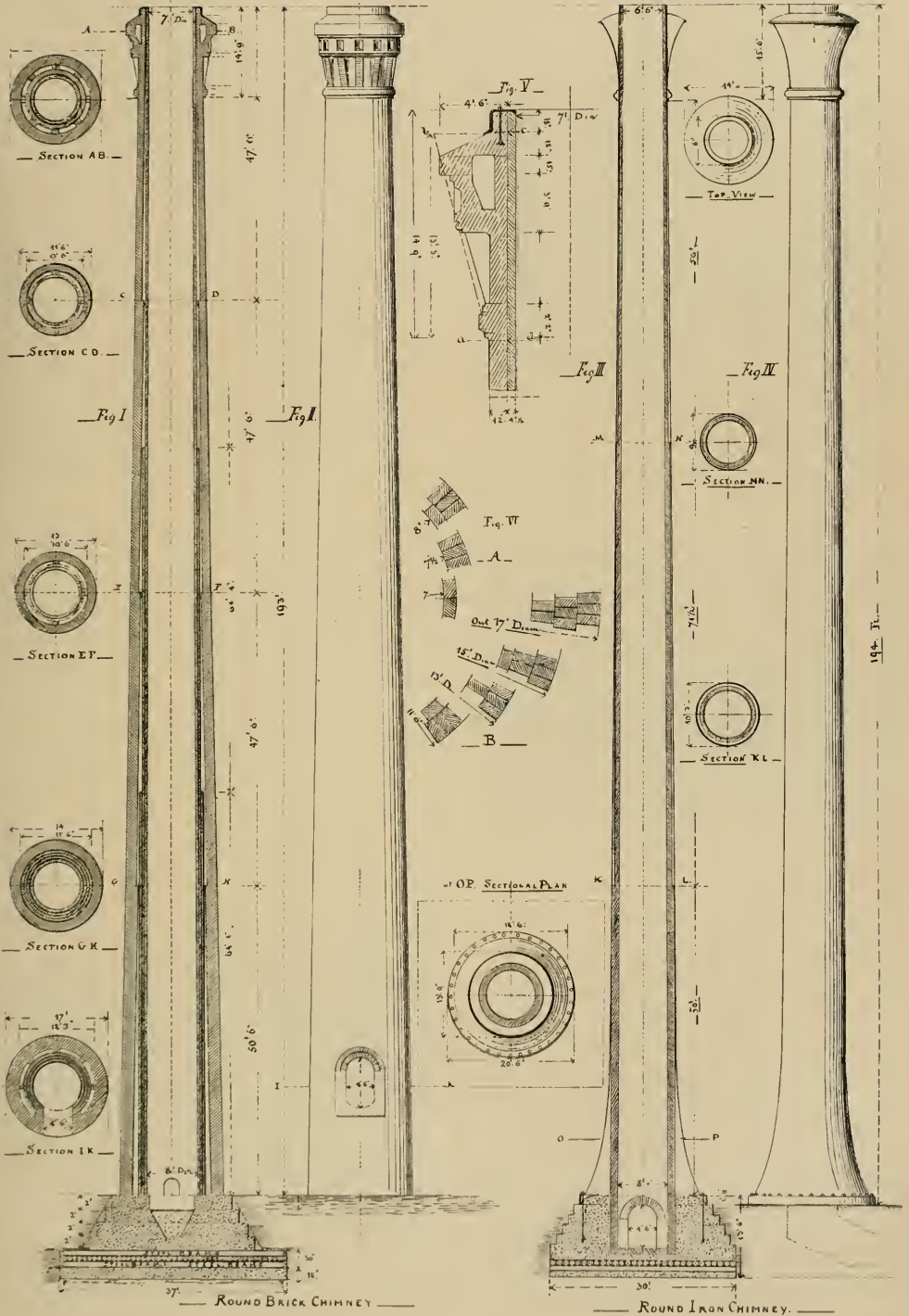
The outside flue is divided in four sections as shown in Fig. I, while the inside flue is divided in three sections, the respective thicknesses are, for the former (taken from the neck of cap downwards)  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$  and 3 brick, and for the inner flue (from base upwards)  $1\frac{1}{2}$ , 1 and  $\frac{1}{2}$ , width of brick, respectively.

The vacant space left between the two flues is an effective non-conductor of heat to the outside, or against the chilling influence of lower temperature toward the inside.

For the round chimney, which we represent in Figs. I and II, considerable advantages are obtained and a superior and better class of work achieved if the brick are made to specially shaped templates for the different sections; greater strength through better bond and a more economical use of materials, both brick and cement mortar, are gained, with a greater saving of labor in cutting brick.

There will be no necessity of using fire brick for the inside flue as it is not to be expected that the temperature or gases within the chimney will go beyond  $500^{\circ}$  to  $600^{\circ}$  F., which is a temperature not injurious to a good, sound and well burnt brick of ordinary clay. For inside, as well as for outside work, the brick should be laid in cement mortar. The use of lime mortar is objectionable for the inside on account of lime being readily attacked and crumbled away through the constant exposure to sulphurous vapors from the fuel. There is no fear that the cement will be injured at so low a temperature as that prevailing in the chimney.

We show in Fig. VI, diagrams which will illustrate that



the form of the brick, whether it be key form or circle brick, may be so determined that not very many different shapes are necessary. If too many forms were chosen there would probably be confusion in their use. At A we give the two sizes of key form and of circle brick that will be required for the inner flue, while at B the wider circles are shown for the outside walls. From the respective circles it may be inferred that two different shapes of key form and one for circle brick will be sufficient to meet the requirements of obtaining good bonds.

In order to obtain the quantity of brick required for the erection of the chimney, we have to calculate the contents of the flues, together with those of the cap. We treat, for the sake of convenience and of more quickly getting a result, which will suffice for our purpose, the different sections, not as truncated cones, but as so many cylinders, and calculating the sectional area of each division, multiply the same by the height of division, which will give us the cubic contents of the respective flue. For easier calculations we express all dimensions in decimal parts of a foot. For the outer flue, therefore, we have:

Division 1, out. diam., 17'	—12.25'	area 109.1x50.5	= 5,509.5 cu. ft.
Division 2, out. diam., 14'	—11.5'	area 50.1x47.5	= 2,379.7 cu. ft.
Division 3, out. diam., 13'	—10.5'	area 46.1x47.5	= 2,189.7 cu. ft.
Division 4, out. diam., 11.5'	— 9.5'	area 33.0x32.7	= 1,079.1 cu. ft.

Total for outside wall, 11,158 cu. ft.

In Fig. 5, we show the cap in enlarged scale, and how the same is constructed with projections and recesses. It should not be unnecessarily heavy, but of such proportions as are appropriate to its character, namely, such as to give the chimney a finish pleasing to the eye, and worthy of its destination. A cast-iron ring plate is put on the top and secured with anchor bolts, as shown in plan. For obtaining the cubic contents of this part of the chimney, we will treat the cap as a truncated cone, deciding upon an outline that will embrace projections and allow for recesses, deducting from this solid cone the inner cylinder, we shall get the desired approximate result.

Let a, c, d, b, in Fig. 5, indicate the area of solid contents of the truncated cone, we have:

Diameter at top,	= 17 ft. 9 in.;	(17.75 ft.) <sup>2</sup>	= 315.0
Diameter at bottom,	= 10 ft. 7 in.;	(10.50 ft.) <sup>2</sup>	= 111.0
10.58x17.75			= 187.7
			614.6

614.6 x 0.785 x 13.25..... = 2,128.8

3

Inner cylinder ..... = 699.7

Total cubic contents of cap..... = 1,429.1      1,429.1 cubic feet.

For the contents of inner flues we have:

1 division 38.00 square feet x 64.3....	= 2,443.4
2 " 25.52 " " x 64.3....	= 1,640.9
3 " 14.50 " " x 64.3....	= 932.3

Total cubic contents..... = 5,016.6 cubic feet.

For outer flue, cap and inner flue... = 17,603.7 " "

We now have to add the contents of ribs, with an average projection of 8 inches and 12 inches wide and for these we can allow..... 500 cubic feet.

Total for shaft..... 18,103.7 " "

From the foregoing result we can at once obtain the quantity of brick required to erect the chimney. In a cubic foot of brickwork with a 1/8 inch joint and using a brick 8 x 3 5/8 x 2 1/4 inches there are 21 1/2 brick, so that we shall require 389,229.5 for the whole chimney. Both kinds, the key form and circle brick can be brought to a size that will

contain in volume an equivalent of the size of brick on which our calculation for the quantity is based, but as we have previously stated, the specially shaped brick is preferable, as waste of material is obviated and labor for cutting is saved and a stronger and superior class of work obtained. It will also be found that in building the chimney entirely from the inside without the use of outside scaffold, greater accuracy of the work is secured, as the plumb rules or straight edges when specially regulated for the batter of the walls are easier handled with better results on the face of the walls.

Provision is made at the base of the chimney by means of a small man hole to enter the chimney and free it from accumulating ashes and soot; iron spikes are also fixed into the inner face of the flue, at convenient distances to reach the top if it may be found necessary when the chimney is completed.

Having obtained the cubic contents and quantity of brick, we have no difficulty in arriving at the total weight of the chimney and the pressure which the structure exerts on the concrete foundation and, with the latter, upon the ground.

Let one cubic foot of brick work set in cement mortar weigh 126 pounds; we have a total weight of shaft and inside flues of 1,016 tons. To sum up the foregoing remarks on the constructive details and quantities, we will append a table of dimensions, etc., as follows:

Working capacity of chimney.....	2,000 H-P
Depth of foundation.....	12 ft.
Height of chimney inclusive of foundation.....	205 "
Height of chimney from base line to top of cap.....	193 "
Height of cap from neck of shaft to top.....	14 ft. 9 in.
Effective height from inlet of boiler-flues.....	178 ft. 3 in.
Batter per foot on side walls 2 1/8 inches outside, and 1 1/8 inside.	
External diameter of chimney at base line.....	17 ft.
Internal diameter of flue at base line.....	8 "
External diameter at neck under cap.....	10 ft. 6 in.
Interior diameter at extreme top.....	7 ft.
Thickness of outer wall under the cap, 1 1/2 brick.....	12 in.
" " " " at section C D, 2 ".....	16 "
" " " " " E F, 2 1/2 ".....	20 1/2 "
" " " " " G H, 3 ".....	24 1/2 "

Size of inlet flue from boilers 9 feet by 4 feet 6 inches, with an area of 32 square feet.

Area of outlet on top of chimney.....	38.5 square feet
Total weight of chimney, including foundation.....	1,588.5 tons
Total weight of brickwork, from base line upwards.....	1,016.5 tons
Load on concrete foundation 2.9 tons, or nearly 3 tons per square foot.	

The load on the ground and distributed over an area of 1,370 square feet is therefore 0.86 tons per square foot.

It should not be difficult to arrive at the cost of this chimney at any locality if, according to local conditions, prices of materials and labor are estimated from the quantities we have given.

#### AN IRON CHIMNEY OF SIMILAR DIMENSIONS.

We also give in Figure III and IV, for comparison, an iron chimney of nearly equal dimensions as regards height and inner dimensions, namely, total height 194 feet from base to top of cap, with an interior diameter of 8 feet at the inlet of boiler flues and 6 feet, 6 inches at the top. In view of these dimensions the outer flue, which is constructed of steel plates, reaches to the foundation and is bolted down to an iron bed plate, with which the foundation is covered, by strong anchor bolts.

This chimney is lined inside with brick from base line to top of cap. The foundation is constructed in a similar man-



ner to that of the previously described round chimney; here are also two layers of steel beams imbedded in the concrete, and a square block of 30 feet is formed; on this concentric circular blocks of concrete are placed until the base line is reached. The long anchor bolts are imbedded in the concrete while it is rammed in, extending down three-quarters of the depth of concrete; the bolts are spaced 18 to 20 inches from center to center in a circular line, that is, corresponding with the cast iron top plate.

Provision is here made for bringing the inlet flue from the boiler plant through the foundation underneath the foundation plate into the inner flue, as shown in the section.

The inner flue is divided into three sections, of the lengths shown, with three thicknesses, or  $1\frac{1}{2}$  brick from base upwards, two thicknesses, or 1 brick for the second division, and 1 thickness, or  $\frac{1}{2}$  brick for the upper section; the inner face of the flue is carried up flush and true to the batter as in the previous case, ribs are formed where room will permit for it, and the space between steel flue and brickwork is filled up with fine dry ashes.

The outer flue, as shown in sectional plan, is made of steel plates of the following thicknesses,  $\frac{1}{8}$  inch for the first,  $\frac{1}{2}$  inch for the second and  $\frac{3}{8}$  inch for the third division, a cap is formed of steel plates as indicated in Figure III and Figure IV. The erection of an iron chimney of the foregoing dimensions requires, no doubt, a safe scaffold and good tackle, with the skill and experience of good boiler makers to insure a satisfactory result.

The chimney as represented here may not exceed in weight 55 to 60 tons, while the inside brick flue, containing about 5,000 cubic feet, would increase this weight by about 225 tons, giving a total of only 285 tons, being somewhat more than one-third of the weight of the round brick chimney of similar dimensions.

### SOME VIEWS IN LYONS.

Lyons, the second city in France, has a population of 450,000 and is located at the junction of two navigable rivers, the Rhone and the Saone, by which it is divided into three parts. The Rhone here follows a nearly straight course from northeast to southwest, while the Saone approaching from the north, is turned by the surrounding

flow nearly parallel to the junction. The old town is on the narrow tongue and now also includes the quarter of La Croix-Rousse lying on the bluffs to the north, just above



REPAIR CAR—OULLINS LINE.

the bend in the Saone. To the east on the left bank of the Rhone are the divisions of La Guillotiere and Les Botteaux occupying the slopes of the hills which are crowned by



SNOW-PLOW—OULLINS LINE.

fortifications. On the right bank of the Saone the bluffs are much sharper and the quarters of Fourviere and Vaise are on plateaus overlooking the rest of the city.

When compared with other European cities, Lyons has an extensive system of tramways, there being ten lines of street railways which connect the several parts of the town and the numerous suburbs surrounding it. The most progressive of these lines are operated by electricity, as described in the REVIEW for February, and all of them will probably be so transformed in the near future. The first line equipped with electricity runs from the Place de la Charite, near the center of the old town, along the right bank of the Rhone, through the Perrach quarter (so called from the name of a citizen who in the latter part of the last century enlarged the town by moving the junction of the rivers farther south) to Oullins, a town of 9,000 inhabitants, 3 miles below the junction. One of our illustrations shows a construction car used for overhead work on this line, and another a snow "plow." The snow question is not a serious one for the railways of Lyons, and no special cars are



PLACE CARNOT—LYONS.

bluffs and makes a broad curve to the left and then to the right, forming a sharp shoulder in the tongue of land between the two rivers. Below this shoulder the two rivers

needed for cleaning the tracks. Snow falls but seldom and is never so deep as to block traffic. For clearing the tracks however, the triangular plow shown is drawn behind a car in regular service.

The Place Carnot, a handsome square in the central



"FICELLE" TO CROIX-ROUSSE.

part of the city ornamented with a statue of the Republic, is the terminus of several of the tramway lines. Our illustration shows the old style double-decked horse cars.

In addition to the horse and electric lines in Lyons there are four cable lines, called "Ficelles," which are employed for reaching the plateaus to the north and west of the city. These are double track lines on the "balanced" system. The two cars, one ascending and one descending, are attached to the ends of a steel cable which passes about a drum at the head of the incline, to which the motive power



"FICELLE" TO ST. JUST.

is applied. The cable is supported on pulleys placed at short intervals along the center of each track. The Ficelle to the Croix-Rousse ascends 100 feet in less than half a mile, making trips at intervals of five minutes and very considerably shortens the time required for reaching this quarter of the town.

The Ficelle to St. Just affords ready access to the railroad station, Gare de St. Just, which is a few minutes walk from the cathedral of Notre Dame de Fourviere.

In the report of the Scranton Traction Company for the six months ending December 31, 1896, the gross earnings were given as \$191,625, an increase of \$23,095 over the previous six months, while the operating expenses amounted to \$102,390 and the fixed charges of \$67,476 left a surplus of \$21,758.

EXHIBITION IN NEW SOUTH WALES.

On June 26 an important exhibition will be opened at Sydney, New South Wales. The exhibition is solely for the advancement of engineering science and will embrace all the branches of engineering. No charge is to be made for space but the executive committee reserves the right to limit the space of each exhibitor.

Group VI comprises railway, tramway and vehicular appliances and embraces rails, switches, signalling apparatus, locomotives, goods wagons, carriages, tram cars, brakes, bicycles, tricycles and auto-cars.

Group IX covers electricity and is an important one, embracing generators, conductors, testing and measuring apparatus, telegraph, telephone and electric lighting apparatus, transmission, distribution and utilization of power, etc.

The exhibition will remain open throughout July and August and it is expected that it will be an even greater success than those held in 1883 and 1886. The executive committee has appointed Edward Noyes, of Sydney, as its representative in Europe and America. All communications on the part of intending exhibitors may be addressed to him care of the Standard Air-Brake Company, 100 Broadway, New York, and they will receive prompt attention.

A MODEL RECORD.

The Calumet Electric Street Railway, Chicago, of which H. M. Sloan is the progressive manager, has made up a statement of operating expense, from May 1 to December 31, 1896, and the result appears in the following table:

Expense item.	Average operating expense per car-mile.
General .....	.00502
Taxes, insurance and legal .....	.00559
Power .....	.01061
Transportation .....	.04246
Line .....	.00152
Track .....	.00075
Motors and appliances .....	.00212
Generators and appliances .....	.00017
Trucks .....	.00070
Bodies .....	.00052
Buildings .....	.00013
Steam plant .....	.00020
Tools and machinery .....	.00004
Sundries .....	.00020
Total .....	.07003

STREET RAILWAYS FOR CHEYENNE.

The old horse car system of the Cheyenne Street Railway Company has been abandoned for the past four years. The city now has a population of 20,000 and is able to support a good system of street railways. Recently a franchise for 99 years was granted to the Cheyenne Electric Railroad Company, incorporated by M. S. Weller, A. N. Butler, J. N. Freeman, of Denver, Col., and C. T. Metz and M. McGill, of Cheyenne. Three lines will radiate from the Union Pacific station, making the length of track about 9 miles. The organization of this new company has aroused the old one to life and action. It now proposes to relay its old tracks and introduce electric traction. Between the two companies the prospects for street car service are very good.

## STREET RAILWAY LAW.

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

*Riding on the Front Platform of a Street Car.*

It is not negligence per se to ride on the front platform of a street car, even though there are seats inside; the question of negligence is one of fact for the jury taking into view all the circumstances of the case.

The Court, by Patterson, J., in its opinion said, this action was brought to recover damages for personal injuries sustained by the plaintiff while a passenger upon a car belonging to the defendant, a street railway company, which injuries, it is alleged in the complaint, were caused by the negligence of the defendant's servant, the driver of the car. The plaintiff, at the time the accident occurred was riding on the front platform of the car, which circumstance induced the trial judge to dismiss the complaint, on the ground that the evidence showed that the plaintiff failed to place himself in as safe a position in the car as he was able to obtain. That was attributed to the plaintiff as negligence on his part to defeat his right to a recovery. From the judgment entered upon the dismissal of the complaint and from an order denying a motion for a new trial the plaintiff appeals.

It appears that the plaintiff entered the car on the rear platform and was smoking, and, according to his story, he was told by the conductor that if he wished to smoke he must go to the front platform. There were not many passengers in the car and he could have found a seat in it. Acting upon the assumed invitation of the conductor, he went to the front platform. The car was going along West street, and when it reached the curve at West Eleventh street, the condition of the pavement between the tracks was such that the horse drawing the car was compelled to stop. There appears to have been quite a network of tracks at or near this point. According to the plaintiff's version, the driver gave the horse a blow with a whip, the horse made a plunge and the car went off the track. The next thing the plaintiff knew was that he was picked up by two laborers and carried across the tracks to a woodshed in the neighborhood. He was seriously injured by falling or being thrown from the car. The plaintiffs' account of the occurrence with respect to the act of the driver, and the cause of his falling off the car is contradicted by the defendant's witnesses. The plaintiff further testified that the street and the tracks generally were in very bad condition; repairs were being made to the pavement on the street, but those repairs had not been completed at the place at which the car went off the track. It was apparently a perilous place, in consequence of the condition of the street. The plaintiff says that, noticing that fact, he had grasped the handrail, but had released his grasp upon being called on by the conductor to pay his fare.

The motion for a non-suit was made upon two grounds: First, that negligence on the part of the defendant's servant, the driver, was not shown, and secondly alleged contributory negligence of the plaintiff. There was evidence (coming from the plaintiff himself) to show the negligence of the driver. Counsel for the plaintiff insists that negligence is to be imputed to the defendant, from the mere fact that the car left the track, upon the authority of *Edgerton* against *N. Y. & H. R. Co.* (39 N. Y. 237), and subsequent cases to the same effect. But the rule applied in that case refers altogether to steam railways and to cases where not only the vehicles, but the tracks, are within the entire control of

the defendant. It would be grossly unjust to extend that rule to street railway companies, which have no exclusive control over the track or roadway, but whose tracks are daily used by thousands of other vehicles, and are placed in public streets under the control of the city authorities, and in which work is constantly being done on or under the roadways and tracks. But there was in the testimony of the plaintiff, if it is to be believed, very positive evidence of negligence on the part of the driver, and it is only upon the theory that the statement is true that the question of negligence could properly have been left to the jury.

The condition of the street and of the track according to that testimony was such as called for more than ordinary care on the part of the driver. The difficulty of making progress was so great, according to the plaintiff's account, that the horse stopped and it was (if the plaintiff's story be true) the sudden blow with the whip that started the horse, whose plunging forward cause the car to leave the track. There was, therefore, some evidence of negligent conduct on the part of the defendant's servant inducing the accident.

The learned judge held that it was contributory negligence on the part of the plaintiff to ride on the front platform, that not being the safest place for him. We assume that the learned judge meant the safest place under all the circumstances of the case. It is not negligence per se for a passenger to ride on the front platform of a street railway car. *Spooner v. B. C. R. R.*, 54 N. Y. 230; *Sheridan v. B. C. N. R. R.*, 36 N. Y. 39; *Clark v. 8th Ave. R. R.*, 36 N. Y. 135; *Nolan v. B. C. & N. R. R.*, 87 N. Y. 63; *Graham v. Man. R'y*, 149 N. Y. 336. It is suggested that in the cases in which the rule referred to has been applied, it appeared that the passenger on the platform was riding on a crowded car and could not find a seat in the interior; but that is not so, and the rule is not confined to such conditions only.

In *Nolan v. B. C. & N. R. R. Co.*, supra, the facts closely resembled those in the case before us. There, the plaintiff got upon a car of the defendant in which there were many vacant seats inside; he went to and was smoking upon the front platform, the conductor took his fare, the driver struck one of the horses with his whip, the horse plunged, gave the car a jolt which threw the plaintiff off and the plaintiff was run over and injured; and it was held that contributory negligence as a matter of law could not be imputed to the plaintiff from the fact of his riding upon the front platform, but that that question was one for the jury. In the opinion in that case the authorities are collated and criticised and it is stated that the rule is settled (independently of a statute not applicable to this case); that even with relation to cars on steam railways, it is not negligence per se for a passenger to stand on the front platform while the car is moving, and it is said that the question is one of fact for the jury, taking into view all the circumstances of the case.

(Supreme Court of New York, *Hastings vs. Central Crosstown Railroad Company*. 29 Chicago Legal News 26.)

*Change of Motive Power, — Acquiescence. — Paramount Right of Street Railway Company to use of Street.*

Where the consent of a borough is necessary to empower a street railway company to change its motive power, the acquiescence of the borough in the change for five years will



be presumed to give such consent, and will estop the claim of an individual, in an action against the company for personal injuries, that the maintenance of the new system of active power is negligence per se.

Although the right of an electric street railway, even to that part of the street occupied by its rails, is only in common with that of other travelers, yet it has the paramount right to the use of the street for a reasonable time, and to place there usual and ordinary appliances for the repair of its wires.

Supreme Court of Pennsylvania. *Potter vs. Scranton Traction Co.* 4 *American & English Railroad cases.* (N. S.) 307.

### THE METROPOLITAN STREET RAILWAY ASSOCIATION.

The benevolent association recently organized among the employes of the Metropolitan Street Railway Company, of

of death his representatives receive \$150. These dues secure medical services for members without further expense to them.

In keeping accounts, each month is made to stand by itself and any surplus is invested for the benefit of the association. A wise and responsible financial management is secured by the constitution, which provides that the general manager and the treasurer of the Metropolitan Company shall be ex-officio president and treasurer, respectively, of the association. In accordance with this provision, H. M. Littell is president, and H. S. Beattie treasurer, and to their efforts the present flattering condition of the association is due.

### A STREET RAILWAY IN HAYTI.

Through the courtesy of Alexander Battiste, United States deputy consul at Port au Prince, Hayti, we are enabled to present illustrations of the street railway in that



STREET RAILWAY IN PORT AU PRINCE, HAYTI.

New York, started business on February 1, with 1,120 members and its success is assured. In addition to the benevolent and insurance features, the Metropolitan Street Railway Association, as it is called, offers social advantages which, as the present membership indicates, are keenly appreciated by all classes of the company's employes.

The company has very generously provided a large club room at 50th street and 7th avenue, and furnished it with chairs, tables, bookcases and piano. This room will be supplied with about forty weekly and monthly papers, and also with models of tracks, curves, grips, signal boxes, trolley plows, motors, etc., so that the men can always find amusement and instruction here when off duty. Concerts, lectures and smokers will be given frequently as special entertainments.

Membership in the association is purely voluntary, but is limited to employes of the company, and ceases when this connection is severed. The dues are 50 cents per month with an initiation fee of one dollar. When disabled, a member is entitled to one dollar per day sick benefit, and in case

city. The line when completed will comprise 18 miles of track, there being 6 miles already built. The original intention was to procure the equipment in France, but on the death of H. Laforesterie, to whom the franchise was originally granted, and the reorganization of the company under its present title of the *Societe des Tramways de Port au Prince*, it was decided to have the rolling stock built in America.

The track is narrow gage and laid with 35-lb. T-rails rolled in Pittsburgh. As shown in the illustration, steam is the motive power, but a change to electricity is already a mooted question. The cars were furnished by the Jackson & Sharp Company, Wilmington, Del., and are of the ordinary open type used in this country, but shorter and smaller in every way for the proper adaptation to the narrow gage. The engines are small tram engines, built by H. K. Porter & Co. of Pittsburgh.

The capital for the enterprise was furnished by German and Haytian capitalists, and the management is under the direction of F. Hermann & Co., a German firm. The chief

engineer, H. Tomasset, and the manager, Charles Thomas-set, are Frenchmen, with extensive experience in street railway work.

The second illustration shows the principal street of the capital on the occasion of the celebration of the national independence. The present progressive spirit in Hayti is in marked contrast to that of a few years ago, when it could be truthfully said: "There is not a railroad nor a common road worthy of the name in the country; no public improvements and no public weal. Her motto might well be, 'millions for dissension and not one centime for improvement.'" The investment of capital in such enterprises as this means that there is more confidence in the stability of the government, and the "black republic" is to be congratulated.

### LITERALLY SNOWED UNDER.

General Manager Sergeant, of the West End road, Boston, relates an amusing incident which occurred on his road during the last big snow storm. In order to get quick

of arrest the old man sadly drove off with his load of snow, the boys from Italy tossing a few farewell shovels which filled the front of the box up to the driver's knees. When last seen, the old man was headed down Washington street with a load of snow as big as a small house, looking for a place to unload.

### TROLLEY CAMPAIGN IN NEW HAMPSHIRE.

The friends of the trolley in New Hampshire have formed a permanent organization for the purpose of conducting a "campaign of education" during the next two years and electing a legislature that will grant charters to electric railway companies in all parts of the state where a demand for them exists. The organization was effected at a meeting held in Concord on February 10, which was attended by about 35 prominent men from New Hampshire and Massachusetts. It is not intended that the association shall exert its influence in behalf of the roads which have charters now pending, but is to look to the legislature of 1899.



SCENE IN PORT AU PRINCE, HAYTI.

action every available team in the city was hired, some among the lot being very antiquated. At the same time hundreds of shovelers were employed, including one large gang of Italians who could not speak a word of English.

It chanced an honest old farmer with a big lumber wagon wandered into the down town district, and unfortunately for him stopped a moment in the midst of these Italians. In an instant several big shovels full of snow were in the air and descended into his wagon. The old man heard the noise and looking around called out to them to stop. This was accepted as encouragement to work faster, and the snow came in more rapidly than before. Then the driver began to wax wrath, and the more he waved his arms the faster the boys let it come. His language, quite un-Bostonian was taken as an admonition to "shake-em-up," and that wagon was filled with a ton of snow in less time than it takes to tell the story. About this time an officer came along, and seeing the wagon loaded and blocking the street, ordered it to move on. Explanations were in vain, and under penalty

### POSSIBLE FIELD FOR INTERURBAN LINE

Our attention is called to what promises some day to be a profitable interurban enterprise in Colorado. The distance from Denver to Cheyenne is 107 miles, with good towns along the line. Greeley has 4,500 people; Brighton, 1,200; Ft. Lupton, 1,000; Evans, 2,000, and Athol 3,500. There are numerous smaller places and a rich farming district. Good freight business can be secured, as the local rates on the Union Pacific are very high, with no competition. Several good water powers are available for power.

Rapid progress is being made on the Elm avenue line, Philadelphia, which skirts West Fairmount and East parks. The grading had been done for the road bed and the loops finished, six miles of steel cable is being used for fence work along the way. The 60 cars, now stored in the barns, will soon be carrying passengers.

**ORGANIZATION OF THE CHICAGO CITY RAILWAY.**

At the annual meeting of the Chicago City Railway some slight changes were made in the scheme of administration; the office of general manager, hitherto filled by the president, was annexed to that of superintendent. The diagram which we publish shows in a graphical manner the organization, the lines indicating the channels through which the reports of officers and heads of departments reach the president. The following extracts from an order taking effect February 15, will explain further the duties which devolve upon the different officers and heads of departments, whose duties are not made clear by the title of the office:

The general officers of the company, vice-president, secretary, treasurer, general manager and superintendent, general counsel, and auditor, report to the president direct. The vice-president in the absence of the president receives the reports otherwise going direct to the latter. The claim department and the right of way department are under the supervision of the general counsel. The auditor keeps all accounts, checks bills, makes out vouchers and attends to rents, collections and statistics.

The general manager and superintendent has charge of all questions of operation, discipline of train service employes, and purchasing department.

The chief engineer reports direct to the manager, sending daily written report of amount of pay roll for each power station and for floating gangs, as compared with last year.

The storekeeper buys articles needed when ordered on requisitions approved by manager, and submits reports on

station); also all heat, light and insurance questions; makes daily report as to number of men employed and pay roll as compared with last year. The inspector of heat, light, signals and insurance reports to the electrical engineer upon the economics of these subjects and also upon cleanliness, fire service, fire drill of employes, and keeps signals, etc., in order.

The superintendent of time tables attends to the fitting of cars and trains to the demands of traffic, and has charge of and gives orders to all officers of the operating department as to the movement of trains and time tables. In this connection an effort is made to have the system pliable so that trains may be arranged to suit conditions on short notice. The superintendent of time tables also has charge of transfer tickets and points of transfer.

The receivers report to the manager and also send in daily duplicate reports to the treasurer.

The chief inspector has charge of special agents, of examination of applicants for train service, and of examination of men turned in. Uniforms, trainmen's lists, trip sheets, registers, pay rolls, lost articles, complaints, and miscellaneous office duties not otherwise assigned are also included in the inspector's department.

The chief supervisor has charge of all outside work in connection with train service; hires and discharges, subject to the approval of the general manager, all watchmen, switchmen and signalmen. He has immediate charge of barn foremen and two regular assistant supervisors, and will employ others when needed. The supervisor, his assistants and barn foremen will, at their discretion, suspend employes in the transportation department, to report to general manager for discipline, and will send in written report of such action on the same day. The supervisors are also the custodians and inspectors of buildings, waiting rooms, cars and repairs of the same (except the general office building).

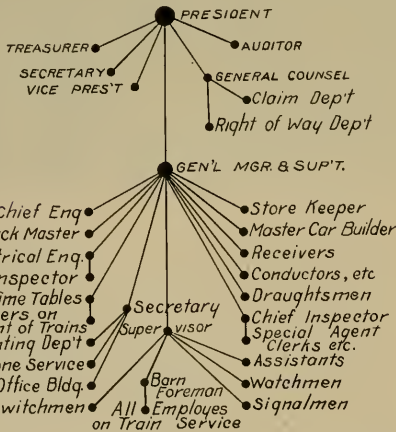
The barn foremen, subject to the directions of the supervisor and the superintendent of time tables, have charge of barns, cars, property and men and train service each in his own division.

The general manager's secretary has charge of the printing department, employes' passes, telephone service and the general office building.

The general orders conclude as follows:

"Reports from all chiefs of departments to the manager will be made daily, and will be made out by them personally, as their personal familiarity with their expenditures is important.

"Officers and foremen will not employ relatives of any employe already on the road; will not board or room men under them; solicit business or subscriptions, or in any other way make use of their positions for personal profit to the possible detriment of the company's interests. No two members of the same family will in future be employed in the operating department."



receipts and expenditures of material and stock in store room.

The master car builder has charge of shop employes, fixes standards, and employs shop men. He makes daily report to manager as to number of men, cars turned out, and amount of wages as compared with last year.

The track master makes similar report in regard to his department.

The electrical engineer has charge of construction and operation of all 500-volt circuits (except inside of power

**OPEN CARS IN WINTER.**

Many of our readers will be surprised to learn that open cars are kept in operation a good portion of the winter, each year, in Denver. The past season has been unusually favorable with much mild weather, and opens have been the rule and closed cars the exception. One day about the middle of February there were only 22 closed cars in operation on all the lines, the balance being summer cars.



### SHOPS OF THE CINCINNATI STREET RAILWAY COMPANY.

The new shops of the Cincinnati Street Railway Company are located at what was the once famous "Chester Park Race Track". Chester Park comprised about 26 acres of almost level land lying northwest of Cincinnati, just outside of the corporation line. When the company acquired possession of the park a portion was set aside as a pleasure resort and the company has built a club house, amphitheatre, bicycle track, cinder sprinting track, etc., so that it remains a popular resort, and retains the old name. The eastern portion of the grounds is occupied by the shop.

The company had a large number of small shops, acquired through consolidation with other systems, but wished to concentrate the work at one point. Accordingly after a careful

The buildings lie on either side of Mitchell avenue and are separated by cross streets giving good light and fire protection as well. The Spring Grove avenue fronts of the paint shop and car house are shown in one of the illustrations. Being the ones most seen by the public they have castellated towers at the corners and imposing arched doorways at the car tracks.

Beginning at the south end the first of the buildings on west side of Mitchell avenue is the paint shop, a building 205 ft. wide and 325 ft. long on the longest side. The building has 12 tracks. The floor is of cement except where the rail heads show themselves. On the south side are the oil room where the paints are mixed and a room for the heating apparatus. The office building joins the paint shop on the southwest corner.

North of the paint shop is a large building 378 x 205 ft.



FIGURE 1—SHOPS OF THE CINCINNATI STREET RAILWAY COMPANY.

examination of several car works the present plant was built. It has a capacity for overhauling and repairing 500 or 600 cars in the four months that open cars are in service and of course an equal number of closed cars are cared for during the winter months. In addition the company will build its own cars. Work was begun at the shops on February 15.

Work on the plans was begun in the fall of 1895, and as the Chester Park athletic grounds were to be opened in May, 1896, the generating station was the first to be completed. The generating station is located at the north end of the plant on the tracks of the Cincinnati, Hamilton & Dayton Railroad, so that coal is delivered to the boiler room in cars. The building is of brick with stone trimmings and is the only brick building on the grounds.

The boiler plant comprises five 72-in. x 18-ft. tubular boilers, equipped with Murphy furnaces. The engines are of the Hamilton-coriiss type by the Hooven, Owens & Rentschler Company, Hamilton, O. They are belted to a line shaft which drives three 62-D generators supplying current at 500 volts, used for motor purposes, and three Card 75-k-w machines for the incandescent lamp circuits. It is of interest to know that the engines, boilers and generators in this plant formed part of the first electric railway equipment used by the company in its original Brighton plant.

The other buildings are all built of broken ashler lime stone, quarry face, with Indiana stone water tables, sills and copings. The roofs are supported on trusses and all the buildings are provided with ventilating windows or skylights which serve to light them no matter how the floors may be crowded with cars.

which contains the erecting shop 175 ft. long, the cabinet shop and the mill shop. In these shops the line shafts are driven by a 62-D generator working as a stationary motor.

The company transferred the wood working tools from the old Pendleton shop to Chester Park, but has also made extensive additions of new machinery, which was furnished by the J. A. Fay & Egan Company. Some of these new machines are shown in the illustrations. Fig. 3 is the No. 3½" surface planer. It takes material up to 26 inches in width and 10 inches in thickness, is provided with divided feeding-in roll and pressure bars, permitting the planing of two pieces of different thickness at the same time, and altogether is well adapted to the needs of a car shop. The tenoning machine, Fig. 4, is a recently designed tool for medium work and is adapted for door work as well as for tenoning



FIGURE 2—INTERIOR OF CAR HOUSE.

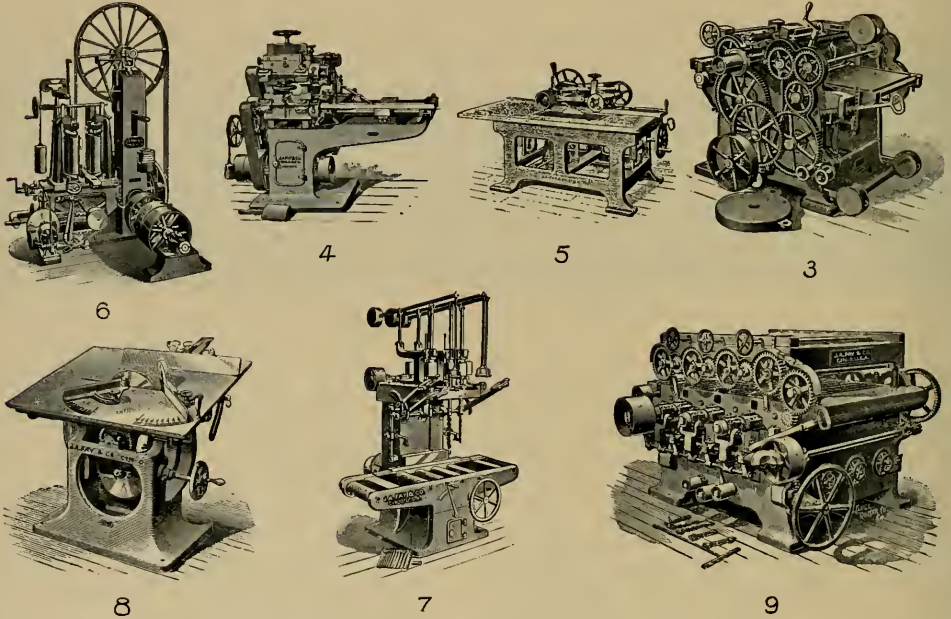
framing timbers. The self-feeding ripping saw is shown in Fig. 5. This tool will take all classes of work, from the most delicate to the heaviest. It is largely used for reducing rough lumber to the proper width for framing timbers. For reducing material for panels and other thin work the band resawing machine, Fig. 6, is well adapted. It will receive material up to 30 inches wide and 12 inches thick, and will saw through the center of stock 10 inches thick and resplit from the side of an 8-inch timber. The tool has a variable feed, ranging up to 100 feet per minute, and is provided with outside bearings for the wheels, and with a sensitive weight device for regulating the tension of the saw blade, which latter is so essential to a band resaw. The vertical boring machine, Fig. 7, is provided with three spindles that have lateral motion, across the table, instantly

drums, so that in case of accident the latter may be easily repaired.

The wood working department is excellent in its general appointments and reflects credit on the company and on the tool makers.

The dry kiln is just west of the generating station and is reached by a side track from the C., H. & D., so that lumber may be unloaded directly into it.

On the east side of Mitchell avenue are the car house and warehouse, the armature shop, the machine shop and the blacksmith shop. This last is 90 x 107 ft. and is equipped with 12 heavy cast iron forges by the Buffalo Forge Company, arranged with the draft and exhaust pipes underground. In this shop is also a 1,250-pound steam hammer. The punch, shears and drill press are operated by a 20 H-P



WOOD WORKING MACHINERY AT CINCINNATI STREET RAILWAY SHOPS.

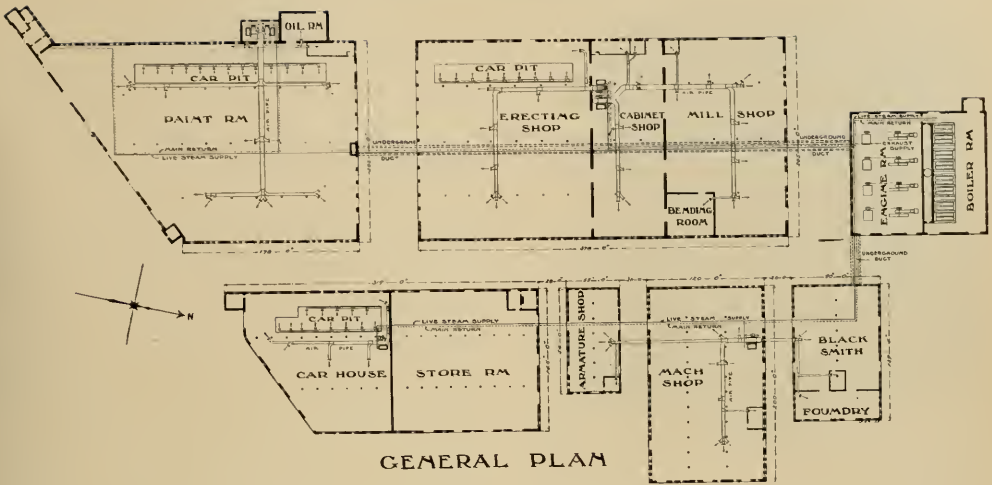
controlled by levers and with vertical adjustment by means of hand levers for controlling the depth of boring. The table has power driven rolls and heavy material is easily handled. Fig. 8 shows the double circular saw used for pattern shop purposes where there is a rapid change from one class of work to another. The many adjustments of this tool make it admirable for the purpose. Perhaps the most important tool in the wood shop is the triple drum sander, Fig. 9, used for polishing. This is a heavily built and very efficient machine. The finest veneers may be sanded without cutting through them. The feeding rolls, pressure bars, plates in the table and the drums themselves all admit of the finest adjustment from both ends independently, and the machine is provided with oscillating devices on the drums for automatically varying the position of the rolls for various thicknesses of stock, and the whole of the upper works may be instantly raised above the line of the

electric motor which also drives the blowers for the forge blast and exhaust.

The machine shop is 120 x 200 ft. and well lighted. The machines, which are for the most part by the Niles Tool Works, Hamilton, O., are located in the south division of the room, the other portions being reserved for erecting motors, trucks, etc. A 5-ton hand power crane is used for handling heavy work. The shop is driven by a D-62 generator working as a motor.

The armature shop is 55 x 109 ft. and has a steam heated bake oven for drying out armatures and field spools. The work is easily handled and moved about by means of chain blocks suspended from trolleys running on a system of I-beams suspended from the roof. The shop is equipped with various binding and winding machines, and presses for forcing armature pinions on and off.

The supply warehouse is 145 x 152 ft. with overhead wir-



ing for three tracks, so that an "express" car can be run into the building for loading and unloading. In one corner of this room is the timekeeper's office. The warehouse is connected with the erecting shops by an iron foot bridge over Mitchell avenue so that the men do not need to pass the gates to get from one department to another.

The car house which joins the warehouse has a capacity for 40 cars and is used for the temporary storage of cars sent to the shops for repairs or of cars bunched at the park to meet unusual conditions. All of the buildings are connected by a very complete system of tracks so that material can be readily transferred.

One of the features of these shops is the heating and ventilating apparatus installed by the American Blower Company of Detroit. In the plant are a total of 5,386,000 cubic feet of space and this is heated by means of six separate steam coils which altogether contain 45,000 lineal feet of 1-inch pipe. Six fans are used for forcing the air over the steam coils, where it is heated, and thence through galvanized iron pipes into the various buildings. These fans deliver 301,000 cubic feet of air per minute. The heating system is subdivided into five plants: No. 1 being used for the paint shop, No. 2 for the erecting shop, No. 3 for cabinet and mill shops and bending room, No. 4 for the armature, machine and blacksmith shops, and No. 5 for the car house. The heaters are of the A. B. C. sectional base pattern having the supply and drip headers on the same side. The fans discharge vertically at the top and the air piping throughout the plant is carried up to the roof trusses. The engine for each fan is direct connected to it but supported on a separate foundation. The location of the different heating plants and layout of the piping is shown in the general plan.

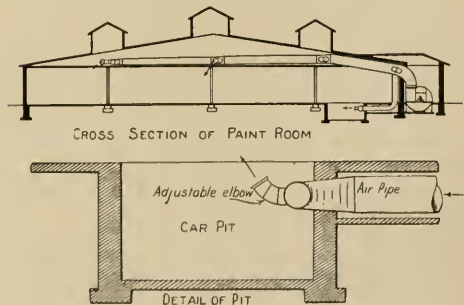
Plant No. 1 which heats the paint shop is the largest and heats about 1,200,000 cu. ft. of space. It comprises two heaters with 8,000 feet of pipe in each. The fans are 160-inches in diameter and are driven by 12 x 10-in. engines. Plant No. 2 heats about the same space as No. 1 but comprises only one 8,600-ft. heater coil, one 160-in. fan and one 12 x 10-in. engine. No. 3 heats the same extent of space and contains one 9,500-ft. coil, one 180-in. fan and one 12 x

10-in. engine. No. 4 heats 970,000 cu. ft. and has one 7,600-ft. coil, one 160-in. fan and one 8 x 10-in. engine. No. 5 heats 440,000 cu. ft. and has one 3,200-ft. coil, one 120-in. fan and a 6 x 6-in. double engine.

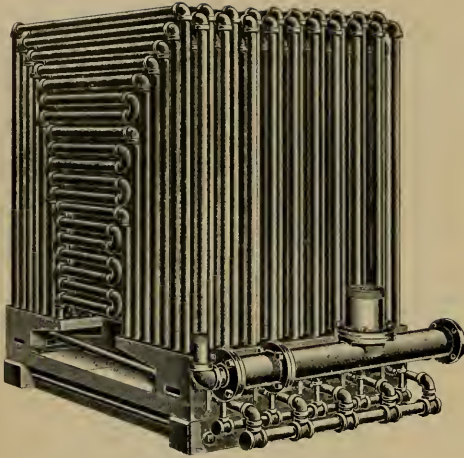
The coils of plants 1 to 4, inclusive, are made up of six sections; No. 5 of three sections, each containing four rows of pipes. The first two sections of heaters in plants 1, 2 and 3 are set aside for the exhaust steam from the blower engines; plants 4 and 5 have only one section for the exhaust.

A 10-in. exhaust main is led from the engines in the power house and supplies heating plants 2 and 3, a 7-in. branch being used for each. An 8-in. high pressure main is taken from the steam heater in the boiler house leads to plants 1, 2 and 3 through a 7-in. branch and to 4 and 5 by a 5-in. branch. By this arrangement a live steam supply is provided for all the coils in the event that exhaust steam should not be available. The steam and return mains for plants 1, 2 and 3 are carried underground as far as the paint shop and thence along the ceiling of the shop. For plants 4 and 5 the steam main is everywhere overhead. The water of condensation is discharged into tanks at each heater and carried to the boiler room through a single main where it is returned to the boilers.

In the buildings containing car pits (the paint shop and







IMPROVED A. B. C. HEATING COIL.

the car house) hot air pipes are carried down from the overhead duct and run along the sides of the car pits. These pipes have outlets about 10 feet apart provided with adjustable nozzles so that the current of hot air may be turned in any direction desired. The object in thus supplying heat to the car pits is to render it easy to thaw out cars that are frozen up and to dry out "grounded" cars in wet weather.

By this system the questions of proper heating and ventilation are solved in a satisfactory manner. In summer no steam is admitted to the heating coils and the plant is a ventilating one only. The fans supply a complete change of air for the paint shop every 15 minutes and for the other buildings every 20 minutes, but they are of sufficient capacity to increase one-third the air delivered.

When the Cincinnati Street Railway determined upon the general arrangement of the plant, the work was intrusted to the company's mechanical engineer, Bert. L. Baldwin, who prepared a complete set of detail drawings for each building. The contracts were let separately for each building, and as each class of work had its set of detail drawings and specifications the bidding was very close. This together with the "hard times" secured good buildings at low cost. The engineering department superintended the inspection and erection.

### NEW COMPANY IN CHARLESTON.

On February 12 the directors of the City Railway of Charleston, S. C., held their last meeting and closed up the affairs of the company preparatory to turning the property over to the Charleston Street Railway Company, which took charge on the next day. The last important business of the old board was to dispose of a surplus of about \$20,000. The stockholders received a dividend of \$7 per share in addition to the purchase money from the new company.

At Palermo, Italy, electric railways have been talked of, but as yet nothing has been done. The only line in the city is operated with horses and owned by the "Societa Sicula Tramways-Omnibus."

### SNOW PLOW AT MAUCH CHUNK.

The snow plow shown in our illustration was constructed last summer by J. A. Bonnell, the general superintendent and electrician of the Carbon County Electric Railway of Mauch Chunk, Pa. The body is short and mounted on a single four-wheel truck of 6-ft. wheel base, equipped, with two 30-h.-p. Westinghouse motors. The platform is surrounded by a bulwark about 3 feet high, so that the view of the operator is always unobstructed, and yet he is in a great measure protected from the wind. The trolley base is supported on a 3-in. gas pipe in the center and braced by rods running from the four corners of the car. Under the canopy below the trolley base are 5 incandescent lamps for use in night work.

At each end of the car is a steel shear, which may be raised or lowered by means of the ratchet lever seen in front. Following the shear is a set of small steel scrapers which remove any ice or snow that may have remained on the rails.

During the winter this plow has been used when occasion offered, and has given perfect satisfaction. The Carbon County road is short, only  $4\frac{1}{2}$  miles in length, but is nearly all grades and curves. There are 26 curves on the line and there is no piece of level track longer than 25 feet.

Mr. Bonnell began his street railway career in Philadelphia in 1859. In 1864 he was on the Atlantic avenue line



SNOW PLOW AT MAUCH CHUNK, PA.

in Brooklyn, and the next year became assistant superintendent of the Dry Dock & East Broadway line in New York city. In 1888 he entered the employ of the National Improvement Company of New York, and constructed a line in Norfolk and Portsmouth, Va., and in 1889 reconstructed the railway at Allentown, Pa., for the same company. Mr. Bonnell remained at Allentown until he accepted his present position with the Carbon County road in 1893.

The report of the Wheeling (W. Va.) Street Railway Company shows the financial condition of the road to have been so much improved during the past year that a 5 per cent dividend will be declared, payable quarterly. The completion of the Benwood and Moundsville line has added greatly to the traffic of the road.



Chas. P. Steinmetz, of the General Electric Company, has gone to Milan, Italy.

Albert Vickers has been made general manager of the Buffalo, North Main Street & Tonawanda Electric Railroad.

F. S. Stewart has been appointed superintendent of the Pontiac & Sylvan Lake Electric Railway Company, Pontiac, Mich.

It has been reported that ex-Secretary of War Lamont was offered the presidency of the Metropolitan Traction Company, New York.

Charles S. Howell, claim agent of the Consolidated Traction Company of Pittsburg, has been chosen superintendent of the West Penn Hospital.

E. W. Ashe has been placed in charge of the Lakeside Railway lines, Mahanoy City, Pa., recently leased by the Schuylkill Traction Company.

John M. Ward, the famous ex-short stop of the New York base ball team, has been engaged by the Nassau Electric Railroad to take charge of the claim department.

Frank De Ronde, of the Standard Paint Company, New York, participated in the inaugural parade at Washington, being captain of the 2d regiment of the National Guards of New Jersey.

On the evening of March 10, H. F. J. Porter, the western representative of the Bethlehem Iron Company, delivered a very interesting address to the students of Lewis Institute on "Steel Forgings."

Edwin R. Gilbert, who has been connected with the Hartford Street Railway Company, recently was appointed general manager of the Holmesburg, Tacony & Frankford Electric Railway, Philadelphia.

Mark H. Hubbell, general manager of the Schuylkill Electric Railway Company, Pottsville, Pa., has resigned. In the two years he has been in charge the system has been greatly improved and extended.

S. B. Stillwell, who has been associated with the Westinghouse Company in its work at Niagara Falls, has severed this connection and accepted the position of electrical director for the Cataract Construction Company.

B. F. Jones has resigned his position as superintendent of the South Chicago City Railway Company, and will engage in the manufacture of electrical specialties with J. M. Atkinson & Co., who are now making Mr. Jones' horse-shoe rail bond.

D. A. Brooks, superintendent of the Weymouth & Braintree Street Railway, Weymouth, Mass., has resigned his position to accept a similar one with a new company organized to build from East Weymouth, through Randolph and

Stoughton to Canton. Mr. Brooks left the Weymouth Company February 1.

Julian S. Yale has resigned his position as general sales agent of the Illinois Steel Company, and with Townsend V. Church has opened offices in the Rookery, Chicago, in the interests of a general iron and steel business. A. M. Crane, who has been Mr. Yale's assistant, now takes his place with the Illinois Steel Company.

John Balch, who has been for the last two years the receiver of the Dubuque (Ia.) Light & Traction Company, was on February 16 married to Miss Katherine Torbert of Dubuque. Mr. and Mrs. Balch left at once for New York and on the 20th sailed for Italy. Upon his return from abroad Mr. Balch will make his home in Boston.

F. H. Fowler, representing the Bemis Car Box Company, Springfield, Mass., spent several days in Chicago during his western trip this month. Mr. Fowler's long experience in engineering and steam railroad work, and three years as master mechanic of the Springfield road, peculiarly fit him for the excellent work he is doing with the Bemis trucks and street railway specialties.

T. M. Burt on March 1, severed his connection with the Berlin & Waterloo (Ont.) Street Railway, a road with which he has been identified ever since it was built. Mr. Burt went to Berlin from New York in 1888 and purchased the charter of the railway company; the road was built the following spring, and continued in successful operation as a horse line until 1895, when the motive power was changed to electricity. Until January 1896, Mr. Burt held the position of president and treasurer; at that time the line was sold to Berlin capitalists, but Mr. Burt remained as general manager. He is also president of the Preston & Berlin Street Railway and director in other companies. T. E. McLellan is the new manager of the Berlin & Waterloo Company.

C. F. Uebelacher has entered the employ of the Peckham Motor Truck & Wheel Company. He is a valuable acquisition to the company, for his practical experience has made him conversant with steel railway usages. He took charge of the works at Kingston, N. Y., on March 1 in the capacity of superintendent. Mr. Uebelacher is thoroughly familiar with both shop and railway practice, having been for two years with the Short Electric Company of Cleveland, O., as chief engineer. During the past four years he has filled the position of master mechanic of the Consolidated Traction Company of Jersey City, N. J., where he has had supervision of from 150 to 250 men in the various departments of car building, repairing and operating. We wish Mr. Uebelacher success in his new position.

The committee on railroads of the New Hampshire legislature has heard applications for four charters for electric railways in Nashua, Manchester and Concord. The representatives of the street railways in these cities testified that as soon as there was a demand for such roads that they would build them under their existing charters. It seemed that the proposed lines were for speculative purposes only, so an adverse report was given by the committee.

## J. A. RUTHERFORD.

J. A. Rutherford, who has for the last ten years been with the Westinghouse Electric & Manufacturing Company, has tendered his resignation, to take effect February 20, and accepted a position with the Johnson Company, Johnstown, Pa., as salesman in the street railway department. Mr. Rutherford is an ex-Canadian, having been born in Hamilton, Ontario. He commenced his business career with the steam railroads, but left that service to start with the Edison



J. A. RUTHERFORD.

Company, at Hamilton, when that company was organized in 1883 to manufacture under Edison patents for Canada.

In 1886 he was transferred to the main office of the company in New York, but left there that year to accept flattering overtures to return to his first love, steam railroad-ing. Having tasted of electricity, the old work did not prove congenial, and Mr. Rutherford in 1888 accepted a position in the office of the general superintendent of the

Westinghouse Electric & Manufacturing Company.

When this company commenced the manufacture of street railway apparatus he was the first to be transferred and was made assistant to H. McL. Harding, the manager. Under Mr. Harding's tuition he began his experience as salesman, and since 1892 has acted altogether in that capacity.

Mr. Rutherford has made a host of friends who will be glad to know that he will remain in the street railway world.

## LAUGH AND GROW FAT.

I was extremely pleased at Mr. H. P. Brown's article in the REVIEW of February, entitled, "Every Inch a King." He does me honor to take the time and attention he must have taken with his article.

It is true I do not know Mr. Brown, personally, and I am sorry I do not, for I would then have been more careful in my language and not brought him to the pitch of anger that seems to have possessed him.

Calling names is no argument, nor a support of one, and your mathematics, Mr. Brown, is far less convincing.

"Figures are queer things for kings to fumble with."

The definition of "fumble" in the sense as used is "to seek awkwardly."

Now, the only figures I made were from an experiment by Mr. Ran, as compared to one made by Mr. Brown, and he assumes they were both made fairly, of which assumption I grant the truth.

I did not even intimate that "cast scrap iron assumes the tensile strength of rolled steel," nor that "the expansion co-efficient of steel rail shrinks modestly to zero," and the cool reader will quickly see that I "assumed" nothing.

All of this is an exhibition of anger and should not enter into an argument of mathematics. Mr. Brown says, "Certainly some one has blundered badly." Let the reader, coolly, with paper and pencil, see who:

I accept Mr. Brown's basis of figuring; that is, the rail

is 90 pounds to the yard, the hole  $\frac{7}{8}$  in. by  $\frac{3}{4}$  in., and that the cast-weld joint has 8 times the sectional area of the rail, but with  $\frac{1}{2}$  the conductivity of the rail and that the voltmeter terminals were placed in both cases alike.

Mr. Brown says, "The actual section of the joint at junction is 81 square inches, 9 of which are steel and 72 iron. The latter is equal to 36 square inches of steel and the joint to 41 of steel." Evidently some one did blunder; 9 and 36 are 45, not 41 Mr. Brown.

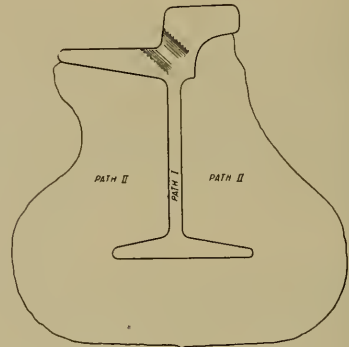
This, however, is a small affair and as every one is liable to make errors, I will admit it is an error. Of course this throws the whole of his mathematical calculation out, as the 41 was his basis. If, however, he had used the 45, his deduction would be still greater in his favor, providing his method of figuring was at all proper.

He says, "There are, therefore, two paths for the testing current, connected in parallel with each other; one directly through the rail ends, and the other from the sides and bottom of the rails through the metal of the joint."

The figure quoted by his majesty (me) now give us common mortals (him) a means of getting the resistance of each of these two paths.

"Now, this hole has taken from the contact area of the rail ends a piece of metal about  $\frac{7}{8}$  inches by  $\frac{3}{4}$  inches, or 0.65625 of a square inch. The hole would affect only the path through the rail ends."

Now, if there are two separate and distinct parallel paths



and Mr. Brown disturbs one, he should leave the other alone, as he says they are two distinct paths, and if he takes 0.65625 of a square inch from the rail ends, he has added to their resistance just as much as that amount relates in percentage to the whole area of the rail ends. He assumes that with the rail ends intact, the drop is .0107 volts and with the hole, the drop is .012 volts, a difference of .0013 volts. This latter figure, then, represents the resistance of the hole in this separate and distinct path.

Now, much to my surprise, he declares that paths 1 and 2 are one path and that the hole in path 1 is 1.6 (1.46) per cent of the two separate and distinct paths and then reasons on in this illogical way.

To illustrate the peculiar system of mathematics, as presented by Mr. Brown, I will ask the reader to draw an imaginary line around the joint, of sufficient diameter to make the sectional area of the joint and rail forty-five square feet instead of forty-five square inches.



We now have the area of the hole the same .65625 of a square inch, the drop is .0013 of a volt, just the same, as the paths are separate and distinct, but how different the relations - we find that .65625 instead of being 1.6 (1.46) per cent is reduced to .0001 of one per cent and is represented by the .0013 of a volt just the same.

Now, what a wonderful transformation: The rail ends, if insulated, would increase the drop .01857 volts, if the joint was 45 square inches; but, if it was 45 square feet, it would increase the drop 13. volts and as this represents the carrying capacity of the rails, you can go on ad infinitum increasing the joint, only at the junction of the rail ends, until the rails carry a current far greater than the ammeter shows, issuing from the station.

Mr. Brown evidently forgot that path 2 is based upon contact area and not sectional area at the rail ends. I trust that all of Mr. Brown's figures are not as faulty as these are.

Regarding the challenge, I will say I have no authority to accept a challenge for the Falk Manufacturing Company, but I have no doubt but that it would gladly accept one, if it is offered on fair terms, and would suggest that as Mr. Brown has seen fit to criticise its joint with no aim in view other than to advertise the plastic-alloy plug, if he does challenge them, he should also agree that if the joint has at least the carrying capacity of the rail, he will publish a testimonial over his signature that the Falk cast-welded joint is not only mechanically but also electrically perfect, and by so doing restore himself to his former professional standing.

Again, Mr. Brown, evidently in the absence of good reason, calls attention to the title cast-welded as a misnomer, in this he may be right, but I do not believe it is of interest sufficient to take space to explain to him why the name is better than cast-fluxed or cast-amalgamated.

In concluding this controversy, I desire to thank Mr. Brown for his kindness in offering an opportunity of resenting a very unjust and unprofessional attack on the Falk Cast-Welded Joint.

HENRY R. KING.

## COLUMBUS STREET CARS RESUME OPERATION.

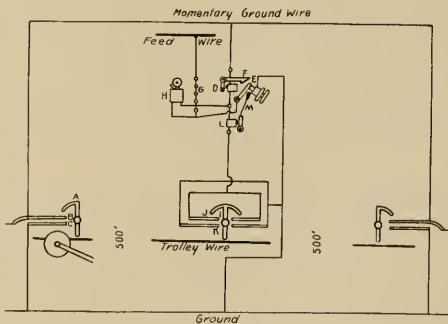
In the February issue of the REVIEW mention was made of the fact that the street railway of Columbus, Ind., had ceased operation on account of the advance in insurance rates.

Electric traction was inaugurated on the horse car line in the spring of 1893, but the traffic was light. Electric lights were furnished to parties wishing a day-time service, which could not be obtained from the local lighting company. Current for both the lights and street cars was taken from the same generator, but the lamps were supplied with current from a separate circuit. This arrangement gave satisfaction and not an accident of any kind occurred during the four years it has been installed. Some two years ago the board of underwriters required the payment of an additional 1 per cent premium where the electric lighting service was in use. The case was argued before the Indiana State Board, the Local Board Commission No. 1, at Cincinnati, and the Underwriter's Electrical Bureau at Chicago, and the ruling was set aside. After several vacillating decisions the underwriters decided to enforce the rule on January 6th. The essential objection on which the rule was based was that the light and power line was grounded through the generator. As this was the more profitable part of the plant

the street car service was abandoned. However, Mr. Crump succeeded in securing a sufficient number of light subscribers to justify the purchase of a low potential dynamo. This was installed, removing the ground for objection by the underwriters, and after two weeks of idleness the street car service was continued.

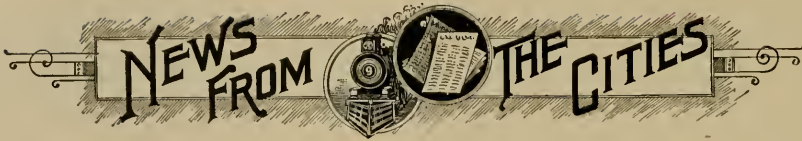
## A NEW CROSSING SIGNAL.

Homer A. Parrish, of Jackson, Mich., a few months ago received a patent on a crossing signal, applicable to steam or trolley roads. It has been in operation on the street car system in Jackson for two years and has given entire satisfaction. For railroad work perhaps the greatest objection is that it is an "open circuit" alarm and does not indicate when it is out of order, yet this is not a serious objection here for the lighting of the lamps will assure the trainmen of its being in good repair. The accompanying diagram shows the arrangement of the connections. At a safe distance from the crossing, say 500 feet, a box is supported by the span wire above the trolley. When the trolley wheel strikes the trip A, it presses the springs B and C together, thus forming a circuit from the feed wire through the 5 incandescent lamps G, the bell H, and to the ground. These magnesium bronze springs, B C, immediately separate, but not before the bell has sounded and the electro-magnet D, lifted the trigger F, which drops the tongue E on a set screw,



connected to the ground. The five lights G, are now burning in a box of red glass which is located at some convenient place on the crossing.

When the car passes the crossing the trolley wheel strikes the trip A, which presses the springs B and C together, forming a circuit for an instant through the electro-magnet L. This actuates the arm M, which presses the tongue E into its former position and breaks the circuit through the lamps. Thus the gong is rung when the car is some distance from the crossing and the incandescent lamps remain lighted until the car is past the danger point. Very little power is absorbed by the signal, the incandescent lamps only taking about 2.5 amperes for a few seconds. Such a current necessitates but small wires in all the connections. If need be, ordinary iron wire can be used. The parts are so designed that there is little wear and the cost of repairs is very small. This device would assure greater safety at the points of intersection of trolley lines with each other or with steam roads as well as at street crossings.



### Alabama.

MOBILE, ALA.—A franchise for the use of Water street was granted the Mobile Street Railway Company.

MOBILE, ALA.—The Mobile Light & Railway Company has commenced work on altering and extending the system. Car sheds, 75x200 feet will soon be erected at Monroe Park. Mr. Wilson of this company says that these improvements will be in readiness for the spring traffic.

### California.

LOS ANGELES, CAL.—Wealthy men are said to be considering a proposition to construct an electric railway from Los Angeles to Redlands, to be operated with power derived from the Santa Ana and San Gabriel rivers.

SAN BERNARDINO, CAL.—C. R. Lloyd of the San Bernardino Electric Company proposes to build a street railway with a loop line to Harlem Springs. Mr. Lloyd asks a bonus of \$5,000 and the franchise held by the company now operating the car line.

LOS ANGELES, CAL.—The Los Angeles & Pasadena Railway Company is now building a large bridge over the river and this, with the new line proposed, will obviate the necessity of running its cars over the tracks of the Los Angeles Railway Company. For the new line 40 car loads of 60-pound rails have been received and these will be welded.

SAN FRANCISCO, CAL.—The Santa Rosa & Sonoma County Railroad Company, of which Col. Geo. Stone, of the Union League Club, is president, is receiving bids on 21,000 tons of rails and 75,000 cross ties. The \$700,000 worth of bonds have been contracted for by New York York parties and will be advanced about February 25. The gage of the road is to be 3 feet 6 inches; electric freight cars will be used as well as passenger.

SAN BERNARDINO, CAL.—The Southern California Power Company has been formed to develop the power of the Santa Ana River for transmission to Los Angeles, 75 miles distant, for railway and lighting purposes. Capital stock, \$1,000,000, and principal stockholders Henry Fisher, of Pittsburg, Pa., and H. S. Sinclair, manager of the Redlands Electric Light & Power Company. The company will make its headquarters at Redlands, Cal.

### Chicago.

CHICAGO.—G. Herbert Condit, receiver of the Englewood & Chicago Electric Street Railroad, has petitioned the federal court for permission to issue \$313,000 of receiver's certificates to pay off liens and complete the road.

CHICAGO.—The reorganization committee of the Englewood & Chicago Electric Street Railway suggests an immediate sale of the road. Judge Showalter orders that all claims against the road be filed with Henry W. Bishop, master-in-chancery.

CHICAGO.—The \$60,000 of receiver's certificates, issued for the Englewood & Chicago Electric Railway, have been purchased by the Hanover National Bank. The certificates bear 7 per cent interest and were purchased by the bank at par, less 2 per cent commission.

### Connecticut.

HARTFORD, CONN.—The railroad committee has reported favorably on the bill granting a charter to the Central Railway & Electric Company of New Britain for an extension to Hartford.

DANBURY, CONN.—Senator Woodruff, of Sherman, has introduced in the Legislature a bill to incorporate a company to build a trolley line from Danbury north to Sherman, to furnish transportation for farm produce.

BRIDGEPORT, CONN.—Henry Setzer, Jr., a member of the board of directors of the Traction Company informed the Board of Appointment that the company would begin and complete as soon as possible the double track on Park avenue, south of State street.

SUFFIELD, CONN.—Jesse Starr of New York, is the chief promoter of the Southwestern Electric Railroad Company, which will connect Springfield, Mass., with this city. Others interested are Arthur Sikes and A. R. Pierce of this place, Frank Grange of East Granby, and Frank C. Root of West Suffield.

### Delaware.

WILMINGTON, DEL.—It is reported that J. Edward Addicks, W. B. Rockefeller and George Gould of New York, will be the incorporators of the Peninsular Electric Railway Company, which will connect every town in Delaware by trolley. Capital, \$1,000,000.

DOVER, DEL.—Notice was given of a bill to incorporate the Chester, Claymont & Wilmington Electric Railway Company with a capital stock of \$50,000. Those interested are I. N. Carswell, Dr. Jacob Derickson, I. S. Elliott, E. T. Cooper, F. A. Hanby and Clifford Perkins.

### District of Columbia.

WASHINGTON, D. C.—A. E. Randle, president of the Capital Railway, has applied for a permit to erect trolley poles through Anacostia.

WASHINGTON, D. C.—R. L. B. Clark, of East Washington, has secured the sanction of the commissioners to a bill before Congress, giving the East Washington Heights Traction Railway a right of way in the district. Col. Archibald H. Bliss, James G. Berret, Hamilton Disston, George S. Bantwell and others are interested.

WASHINGTON, D. C.—The Washington, Westminster & Gettysburg Railroad Company has been incorporated to build through Montgomery, Howard, Frederick and Carroll counties, with a lateral branch from Sandy Spring or Laytonsville to Frederick. The capital stock is \$100,000, and the incorporators are William B. Thomas, James A. C. Bond, T. Reifsnider, T. Herbert Shriver, John A. Shoob, Stilson Hutchins, George Colton Smith, James B. Colegrove, H. A. Cacey, E. M. Hoffer, John R. Cunningham, David Cowan, H. Stewart Roberts, John L. Reifsnider, Milton Schaeffer and Edward T. Lawyer.

### Florida.

ORLANDO, FLA.—J. M. Cheney of Orlando, Fla., on March 1 purchased the Orlando Street Railway at sheriff's sale. The property, which was sold for taxes, has been neglected for two years, and will require extensive repairs.

### Illinois.

OTTAWA, ILL.—The Ottawa Electric Railway Company has purchased 18 acres to be improved as a pleasure resort.

DIXON, ILL.—There is talk of an electric line from this town to Rockford, traversing the Rock river valley. Jason C. Ayers is one of the promoters.

WAUKEGAN, ILL.—The county board of supervisors in a special session granted a 20 year franchise to the Bluff City Street Railway. This makes the right of way secure as far south as the Cook County line. Chas. E. Loss, Pullman Building, Chicago, is president of the company.

### Indiana.

MADISON, IND.—Charles R. Johnson has been appointed receiver of the Madison Light & Railway Company by the federal court on application of John Dona, of Chicago.

MARION, IND.—Supt. W. C. McWhinney of the Marion City Railway Company, has gone to New York City to place orders for machinery for the new power house and material for the Fairmount extension.

## Maine.

EASTPORT, ME.—The Eastport Street Railway Company will be incorporated.

BANGOR, ME.—Right of way for a line through Newburg, Dixmont, Monroe and Searsport is wanted by the Hampden & Winterport Railway & Light Company.

KITTERY, ME.—Stockholders of the Portsmouth & York Beach Electric Railroad Company met March 1 at Kittery and voted to increase the capital stock from \$50,000 to \$200,000.

WATERVILLE, ME.—A. O. Lombard has purchased the interests of I. C. Libby in the Waterville & Fairfield Electric Railroad, Light & Power Company, and has been made general manager. A new power station with steam plant will be commenced in the spring.

BANGOR, ME.—All the property of the Pen Argyl, Bangor & Water Gap Electric Railroad, was sold at auction to John C. Merrill, of Easton. Mr. Merrill bought the property at a judicial sale recently, but this was a foreclosure sale to divest a mortgage of \$500,000 and give him a complete title. The road will likely be built this summer.

## Massachusetts.

NEWTON, MASS.—Watertown has granted a franchise to the Newton Street Railway Company.

WESTFIELD, MASS.—The Woronoco Street Railway Company has accepted its franchise for a line to Springfield.

TAUNTON, MASS.—The Taunton & Brockton Street Railway Company has filed a petition for a franchise in Taunton.

BROCKTON, MASS.—Right to extend its tracks on certain streets has been granted the Brockton Street Railway Company.

NEW BEDFORD, MASS.—The Union Street Railway Company has been authorized to issue \$100,000 additional capital stock.

BROCKTON, MASS.—I. N. Nutler and J. S. Allen, of East Bridgewater, are interested in a proposed electric road to Brockton.

BOSTON, MASS.—A petition has been filed to incorporate the Bay State Elevated Railroad with a capital of \$10,000,000. Wm. B. Mack and F. W. Longstreet are named as incorporators.

NEEDHAM, MASS.—A franchise has been granted the Newton & Boston Street Railway for a road from the Newton boundary to the Newton Upper Falls, the line to be built in the spring.

BOSTON, MASS.—John Graham is at the head of a company recently organized to build an electric railway from Forest Hills to Neponset, in connection with the Quincy & Boston Street Railway. The capital stock is \$100,000.

ANDOVER, MASS.—The selectmen have granted a franchise to the Lawrence & Reading Street Railway Company for tracks in Mam street from Andover to North Reading. A portion of the work must be completed by September.

WESTFIELD, MASS.—The Woronoco Street Railway Company has placed an order for 6 miles of rails for the contemplated extensions. The stockholders have voted to petition the railroad commissioners for the privilege of increasing the capital stock from \$50,000 to \$100,000.

BRIDGEWATER, MASS.—The selectmen have granted the franchise asked by the Bridgewater, Whitman & Rockland Street Railway Company for a line in Broad street. The proposed line is part of a system which is to provide a direct route from Taunton to Nantasket.

AMESBURY, MASS.—The Haverhill & Amesbury Street Railroad Company has petitioned the Salisbury selectmen for permission to erect poles and equip a road from the Square to the New Hampshire line. If this is granted it is expected that the road will be built at once, so as to be ready for the summer's traffic.

ROCKLAND, MASS.—The Bridgewater, Whitman & Rockland Street Railway Company has applied for a franchise to extend to miles of trolley road. Charles H. Wilson of Boston is treasurer, and the directors are, Geo. J. Morse of Hyde Park; Fred C. Hinds of Newton; Chas. L. Stevens of Rockland; Chas. H. Wilson of Boston; J. T. King of Abington; Chas. F. Allen of Whitman, and Richard W. Nutter of East Bridgewater. Capital stock is \$25,000.

## Michigan.

CARO, MICH.—F. S. Wheat has been granted a 30-year franchise for a street railway at Caro.

PONTIAC, MICH.—The Plank Road Company has finally given a right of way from Birmingham to this city for the construction of the electric railway.

GRAND RAPIDS, MICH.—The pavilion of the Consolidated Street Railway at Reed's Lake was burned February 22, causing heavy loss. Well insured.

PONTIAC, MICH.—The Oakland Electric Railroad will be extended to this place and the management intends to apply to the Plank Road Company for a right of way between here and Birmingham.

NEW BALTIMORE, MICH.—John B. Dyar filed a certified check for \$2,000 with the treasurer. This is the last check necessary by terms of the franchises for the road between Detroit and Port Huron.

ERIE, MICH.—Mr. Riopelle, of the firm of Johnson, Jacobson & Riopelle, Detroit, offered the township a bonus of \$3,000 for a right of way to build an electric road. It was referred to the township board which will report next week.

SAGINAW, MICH.—John E. Nolan, of this city, who is interested in the Flint & Fenton Transportation Company, says that the company will be ready to begin operations about April 1. The cost of the line, which will be 21 miles long, is to be \$250,000.

SAGINAW, MICH.—The court has denied the application of bondholders for a receiver for the Consolidated Street Railway on the ground that by the terms of the mortgage six months must elapse between default and the appointment of a receiver.

MT. CLEMENS, MICH.—James G. Tucker, receiver of the French road, was granted a franchise for an electric line between the city limits and Chesterfield township. A bond of \$3,000 must be filed in 20 days, guaranteeing the road to be built by November 1.

BENTON HARBOR, MICH.—The Benton Harbor Electric Railway & Transit Company has let contracts for a tunnel 2,300 feet long, under the residence portion of the city. The disused Courtright factory will be converted into car house and power station.

DETROIT, MICH.—John B. Dyar was given a franchise, March 2, for a line on Crocker avenue, Front and East streets, Mt. Clemens. At the same time James G. Tucker, receiver of the French line, was given a franchise on North Gratiot avenue. Each gave \$2,000 bonds to carry out the contract.

BAY CITY, MICH.—There seems to be every prospect of two electric roads being built this summer. The one to Port Huron is backed by Charles Montague, of Caro, and he is considering a plan to dam the Cass river for power. The other road will connect this city and Unionville, F. S. Wands and L. L. Culver being the chief promoters.

MONROE, MICH.—Messrs. Jacobson & Johnson, of Detroit, have asked the council for a franchise through this town, promising to build the line next month. Right of way has been secured from Trenton to LaSalle. Those interested in the Detroit & Toledo line are W. C. Sterling, Strathearn Hendrie, Truman Newberry, Geo. Hendrie, G. F. Smith, Cameron Currie, Frank T. Lodge and James S. Carleton.



## Missouri.

KANSAS CITY, MO.—The Metropolitan Street Railway Company has finished its big electric power station at Riverview.

ST. LOUIS, MO.—The Shaw Avenue Electric Railway Company has been incorporated to construct a line. Capital stock, \$40,000; incorporators, J. D. Peckington, Chris Von der Ahe and Charles E. Wehner.

ST. CHARLES, MO.—The St. Charles & St. Louis Bridge Company will endeavor to secure the operation of an electric line to St. Louis. Contracts for a bridge over the Missouri river have been let, contingent only on the construction of the electric railway.

ST. LOUIS, MO.—Charles Green on March 6 was appointed receiver of the People's Railway Company, which defaulted its interest on bonds January 1.

ST. LOUIS, MO.—Application has been made for the appointment of a receiver for the Fourth Street & Arsenal Railroad, which failed to meet the semi-annual interest on its bonds March 1.

ST. LOUIS, MO.—James D. Houseman, of the Highlands Scenic Railroad Company, made application to the county court at Clayton, for a franchise to build an electric road connecting the De Hodiamont and the St. Louis & Kirkwood electric lines.

KANSAS CITY, MO.—Frank Dixon, who bought the old Union cable road at special master's sale for \$1,250, says that the line will not be torn up, but will be put in condition for running with the expectation of using electricity as power.

## New Hampshire.

CONCORD, N. H.—The 6 bills introduced in the Legislature, to incorporate 6 companies to construct a chain of electric railways from Massachusetts to Canada, have been killed.

KEENE, N. H.—Surveys of the Keene Electric Railway have been made between Keene, Swanzey and Marlboro. E. F. Lane, of Keene, is president; and Samuel Wadsworth, of Keene, chief engineer.

## New Jersey.

TRENTON, N. J.—Chancellor McGill has ordered the South Jersey Traction Company's lines to be sold at master's sale.

PLAINFIELD, N. J.—The Brunswick Traction Company and the New York & Philadelphia Traction Company are rival applicants for a franchise in Piscataway township.

NEWARK, N. J.—The petition of Union Traction Company has been granted to lay a double track on Elm street from the New York & Greenwood Lake Railroad north to the township line.

EAST ORANGE, N. J.—The Consolidated Traction Company was granted permission by the township committee to build a line on Central avenue. David Young is president of the company.

JERSEY CITY, N. J.—The Consolidated Traction Company contemplates a general extension of its lines. An important line is mapped out between the Jersey Central Railroad Ferry in Jersey City and the Oranges.

CAMDEN, N. J.—Articles of incorporation were filed by the North Jersey Traction Company, its object being to build a trolley line in Amboy; capital stock, \$100,000. Theodore T. Hansen, Geo. D. Armstrong and Richard H. Turner of Atlantic City, are the incorporators.

ROCKAWAY, N. J.—The Rockaway Electric Railway Company has been incorporated to build a double track street railway in Rockaway. Capital stock, \$250,000; incorporators, Remington Vernam, of Averte, L. I.; Joseph McClean, George F. Keller, Cornelius Connolly, Theo. Bernard, James Crowley, Henry C. Davidson, and Fred. Gibbs, of Brooklyn, and Michael Crowley, of New York.

## New York.

BUFFALO, N. Y.—George P. Smith is negotiating a sale of the Tonawanda & Wheatfield Electric Railway.

BUFFALO, N. Y.—The Crosstown Street Railway Company has filed plans for its car house, which is to cost \$15,000.

ELMIRA, N. Y.—The Elmira & Horseheads Railway Company are considering the adoption of electric heaters in all the street cars.

WATERTOWN, N. Y.—The Watertown & Brownsville Street Railway will be sold under foreclosure of four mortgages aggregating \$160,000.

YONKERS, N. Y.—An extension of the Yonkers trolley line down New Main street and South Broadway to the New York city line is to be built very soon.

PENN YAN, N. Y.—The recently incorporated Penn Yan, Keuka Park & Branchport Electric Railroad Company has applied to the village trustees for right of way.

WHITE PLAINS, N. Y.—The White Plains & Elmsford Electric Railway Company has been granted a franchise to construct a line down Lexington avenue and Post road.

CORTLAND, N. Y.—The Cortland & Homer Traction Company proposes to equip its plant with new machinery, provide new lamps and rearrange its entire circuit to do the city lighting.

NEW YORK, N. Y.—The Third Avenue Railroad Company and the Metropolitan Street Railway Company have discontinued their fight against the granting of additional franchises to one another.

NEW YORK, N. Y.—It is said that the Metropolitan Street Railway Company has closed contracts with the General Electric Company to supply insulators, generators, motors and all electrical equipment for the new conduit systems.

BUFFALO, N. Y.—The Niagara Falls & Lewiston Electric Railway has been mortgaged for \$1,000,000 to the Knickerbocker Trust Company of New York. This sum will be used in paying indebtedness and making improvements.

SYRACUSE, N. Y.—President Palmer, of the Suburban Railroad Company said that the cars would likely be running on the road by June. McCartney, McElroy & Co., of New York, are preparing the plans. No contracts have been made as yet.

BUFFALO, N. Y.—President Herbert P. Bissell, of the Traction Company, has practically closed a deal with Bankers Tallman & Co., of New York, securing money to build the 66 miles of road projected by the company. Charles W. Ricker, electrical engineer, has the specifications ready. Estimated cost of extensions is \$1,980,000.

SYRACUSE, N. Y.—The Syracuse Rapid Transit Company has spent large sums for relaying the tracks, equipping the road with new cars and building a power house. About \$25,000 more will be spent on the power house machinery and \$60,000 on the new car barns which will include a modern machine shop with all conveniences for handling the motors.

BUFFALO, N. Y.—The Buffalo, Gardenville & Ebenezer Electric Railway Company has been given a franchise by the highway commissioner of West Seneca to put down tracks on Clinton street, Aurora Plank road and on the Union road. These extensions are to be from 5 to 6 miles in length and will be built this spring. Chas. F. Schoepflin is president and Wm. P. Smith, secretary.

PENN YAN, N. Y.—The Penn Yan, Keuka Park & Branchport Railway Company has been incorporated to build the long talked of electric railway between Penn Yan and Branchport. Capital stock, \$100,000; incorporators, William S. Reed of Leominster, Mass.; W. H. Tylee, O. W. Rugg and A. White of Worcester, Mass.; C. L. B. Tylee, Frank Viele and George Tylee of Corning; H. S. Sill of Bluff Point, and John H. Lawer of Penn Yan.

**COXSACKIE, N. Y.**—The Greene County Traction Company has been incorporated to operate a street surface electric railroad five miles long, from the village of Coxsackie to a point three miles beyond the village line. Capital, \$50,000; directors, Edward J. Duggan, Albany; Henry E. Stern, William E. Drisland, E. J. B. Murray, Michael F. Cantwell, and Edward J. McCaffrey, of Albany; Matthew J. Duggan, of Greenbush; William G. Raines, of New York City, and George C. Spencer, of Chicago.

**CATSKILL, N. Y.**—Application to incorporate the Catskill Electric Railway Company has been made by Charles S. Williamson, M. D., 25 Third Place, Brooklyn, N. Y.; William S. Robert, 200 Halsey street, Brooklyn, N. Y.; Daniel W. Sharpe, Catskill, N. Y.; Louis F. Robert, 200 Halsey street, Brooklyn, N. Y.; Michael W. Conway, 187 Monroe street, Brooklyn, N. Y.; William C. Courtney, 406 Vanderbilt avenue, Brooklyn, N. Y.; William C. Wood, 229 Quincey street, Brooklyn, N. Y.; Howard A. Mock, 106 Monroe street, Brooklyn, N. Y.; Schuyler W. Mattison, 67 Lincoln avenue, Newark, N. J. Two miles of road will be built; capital stock, \$30,000.

## Ohio.

**XENIA, O.**—Jno. P. Martin has asked the council for a franchise to build a street railway.

**WARREN, O.**—The Trumbull Electric Road of Warren expects to extend its line to Leavittsburg.

**WARREN, O.**—Daniel Moynahan has sold for \$90,000 his electric railway to the Mineral Ridge & Niles Street Railway Company.

**LIMA, O.**—The Lima Street Railway has applied to the council for a franchise to extend its lines to Hover's Park and the Solar Refinery.

**DAYTON, O.**—Surveyors are in the field for the new electric road from Dayton to Wilmington via. Beavertown, Bellbrook, Spring Valley and New Burlington.

**YOUNGSTOWN, O.**—The Youngstown Park & Falls Street Railway Company has been granted right to extend its line over Warren avenue and South Market street.

**TOLEDO, O.**—A franchise will soon be asked for 12 miles of electric street railway. C. T. Geddes, formerly superintendent of the Bowling Green road, is attending to the affairs of the new company,

**AKRON, O.**—It is stated by Geo. C. Mozer, one of those interested in the Canton-Akron Electric Railroad Company that the line would be built this year. Wm. A. Lynch, of Canton, and president of the Canton-Massillon Electric Railroad Company, is backing the new road.

**CINCINNATI, O.**—Right of way has been given the Dayton Traction Company through Bond Hill for 23 years. The company agrees to have the road in operation by the close of the year. Senator Foraker, Andrew Hickenlooper and Senator Chas. Fleischmann are interested in the company.

**MANSFIELD, O.**—W. E. Haycox writes that the franchises for the construction of the electric railway from Bucyrus to Galion have all been secured, except in Galion, where the ordinance has passed its second reading. Mr. Haycox expects to be ready to start the construction by April 1.

**DAYTON, O.**—The Dayton & Western Traction Company was incorporated at Columbus with a capital stock of \$400,000. The line will be from this city through New Lebanon, West Alexandria and Eaton to Richmond, Ind. County Commissioner John B. Hunter, Dr. J. E. Lowes, Col. R. M. Nevin, C. L. Kurtz of Columbus, Oscar Sheppard and J. E. Feight are the incorporators.

## Pennsylvania.

**CHARLEROI, PA.**—The Charleroi, Bellevernon & Fayette City Street Railway Company has been incorporated. Capital stock, \$20,000; president, William M. Bell, Pittsburg.

**PHILADELPHIA, PA.**—The Philadelphia & Merion Railway Company has been incorporated to build an electric railway. Capital stock, \$25,000; president, William G. Huey, 1815 Vine street.

**HARRISBURG, PA.**—A charter was granted to the Doylestown & Easton Electric Railway Company, to construct a line between the two cities. Capital stock, \$100,000. Harry J. Shoemaker is president.

**PHILADELPHIA, PA.**—John H. Fow is president of the Gray's Ferry & Woodland Avenue Connecting Street Railway Company, which has just been incorporated, with \$6,000 capital stock, to build one mile of road.

**BRADFORD, PA.**—H. L. Pierce, of Leominster, Mass., is president of the Olean, Rock City & Bradford Railroad Company, which was recently incorporated to build 10 miles of road from Bradford to the New York state line. Capital stock, \$100,000.

**HOMESTEAD, PA.**—The Homestead & Highland Street Railway Company is preparing to complete its connections for a through line to the heart of Pittsburg. To obtain funds the company has just given a mortgage for \$400,000 to the Union Trust Company.

**DOYLESTOWN, PA.**—The Doylestown & Easton Street Railway Company is getting right of way for 16 miles of road. No contracts for construction will be made for some time. Harry J. Shoemaker, president; M. H. Stout, secretary; and S. A. Hellyer, treasurer.

**TITUSVILLE, PA.**—Mayor Benedict has signed the ordinance granting the Titusville Electric Traction Company the right to construct and operate a street railway in Titusville. One year's time is allowed in which to complete the road in the city, after which it is proposed to extend to Pleasantville and Hydettown.

**BADEN, PA.**—The Baden Electric Street Railway Company has been incorporated to build a line from Allegheny to Baden, where it will connect with the Economy Electric Railway Company, controlled by the same interests. Capital stock, \$50,000; incorporators, Richard R. Quay, of Sewickley; John C. Oliver, Allegheny City; Edward G. Applegate, Braddock; Henry D. Atwood, Leet township, and James F. Burke, Pittsburg.

## Texas.

**CORSICANA, TEX.**—W. B. Brooks, of the Glenwood & Polytechnic College Street Railway, is looking over the ground with a view to constructing an electric railway in Corsicana.

**AUSTIN, TEX.**—Ira H. Evans, of Austin, has been appointed receiver of the Austin Rapid Transit Company at the instance of the International Trust Company of Boston, which holds \$343,000 of first mortgage bonds.

## Wisconsin.

**EAU CLAIRE, WIS.**—H. N. Bates and Arthur Appleyard, both of Boston, were inspecting the street car system here with the view of purchasing it. If the deal is consummated the system will be reconstructed throughout.

**WAUKESHA, WIS.**—S. I. Henderson and others have incorporated the North Greenfield & Waukesha Electric Railway Company. Summer pleasure travel will be catered to. The company has right of way and capital, and a traffic arrangement will be made with the Milwaukee Street Railway.

## Wyoming.

**CHEYENNE, WY.**—A franchise for 99 years has been granted the Cheyenne Electric Railroad Company. Three Denver parties are interested: M. S. Weller, A. N. Butler and J. M. Freeman also C. T. Metz and W. McGill, of this city. The proposed line is to be about nine miles long. The Cheyenne Street Railway Company also contemplates putting in an electric system.

## Canada

**ALGOMA, ONT.**—T. M. Kirkwood and others have petitioned for the incorporation of the Mineral & Timber Electric Railway Company to operate a railway from a point between Chelmsford and Sturgeon Falls north to Wahnapitae Lake, and south to a point between Killarney and French River.

**HALIFAX, N. S.**—The Halifax & Bedford Electric Railway Company has been incorporated. Capital stock, \$300,000; incorporators, William E. Crowe, Henry J. Crowe and A. E. Sulis.

## W. H. HANSELL.

William Henry Hansell, president of the Hansell Spring Company, was born in Philadelphia. At the age of 15, having been graduated from the Friends School in Philadelphia, he entered the University of Pennsylvania, where he remained for three years, working in the drafting room of the Baldwin Locomotive Works during the vacations. Leaving college, where he had pursued an engineering



W. H. HANSELL.

course, Mr. Hansell went with the Charles Scott Spring Company, where he remained four years, first as mechanical engineer, then as superintendent and finally as manager of the street railway department. In February, 1895, he left the Scott Company and purchased an interest in the old Keller & Cook Spring Company of New York. Within one month he bought the entire business and changed the name from the Keller & Hansell Company to the Hansell Spring Company. The business quickly responded to the energy and ability of Mr. Hansell, and outgrew the New York shops. The works were removed to Newark, N. J., and in August, 1896, increased to twice the size of the old plant. Within two months the capacity was again doubled by building a new two-story building



60 x 110 ft. On February 1, 1897, a further addition was made, and the present quarters are as shown in the illustration. The company manufactures all types of springs, but makes a specialty of elliptic and spiral springs for steam and street railway rolling stock. In his long experience Mr. Hansell has made many friends in the trade who wish him a continuance of prosperity.

## A CHAPTER OF ACCIDENTS.

Several bad accidents have occurred during the past month. A motorman on the Geneva, Waterloo & Seneca Falls road, mistook the conductor's signal, and on crossing the New York Central tracks, was struck by a passenger train. The car was wrecked and four passengers injured, none fatally.

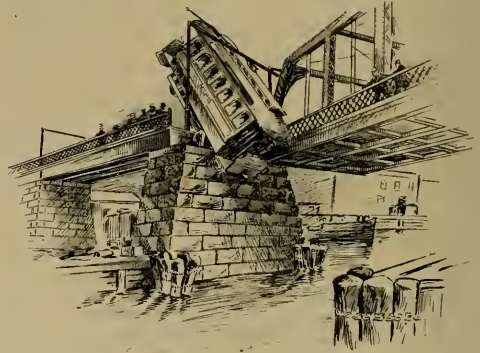
On the South Milwaukee line a car jumped the track on

down grade and turned over two or three times. The 18 passengers were more or less injured but none fatally.

In this city a Calumet car was run down by an Eastern Illinois passenger train and the motorman and two passengers killed and four others badly injured. The car was reduced to kindling wood.

One of the oilers on the Brooklyn avenue cable road, Kansas City, remained in the conduit while a car was passing and in some manner was caught by the grip and dragged nearly 100 feet. He died shortly after being taken out.

A West Side electric car took a good start toward going into the Chicago river. The draw had been partially opened



by the bridge tender for the purpose of more conveniently cleaning and oiling the machinery, and when this fact was discovered by the motorman of the approaching car, the slippery rails prevented his stopping. A horse and wagon that had been waiting for the bridge to be swung back into place were struck by the car and pushed into the river. Both drivers, the conductor and four passengers had ample time to escape. The car slid over the approach but the front end rested on the abutment, where it remained poised at an angle of 45° all day. The assistance of a floating derrick was necessary to dislodge the car.

## AN IOWA INTERURBAN LINE.

The Mason City & Clear Lake Traction Company is now building a line between these points in Iowa that is typical of the new class of electric railways, which in addition to the ordinary passenger traffic, handle express, baggage and mail and receive and distribute standard steam railway freight cars to various side tracks along the line. The cars ordered for this company consist of one combination passenger and baggage car with 32-ft. body and 42 ft. over all, two of the same style 22-ft. body and 29 ft. 6 in. over all, five 42-ft. open trail cars, one 40-ft. closed trail car, one 30-ft. milk car and two 16-ft. closed passenger cars. The motor cars are equipped with four 50-h. p. Walker motors and all of them mounted on Peckham trucks. A switching locomotive for handling the steam railroad cars is also ordered; it is to be a specially constructed car mounted on a Peckham extra heavy 7-B truck. The entire electrical equipment is to be supplied by the Walker Company, the steam plant by the E. P. Allis Company, and the rail bonds, of the horse shoe type, by the J. M. Atkinson Company.



**THE SADDLER SIGNAL SYSTEM.**

In a previous issue we have mentioned the signaling system invented by I. N. Saddler, and manufactured by the Saddler Switch & Signal Company, 309 Monroe street, Toledo, O. This month we present a description of the system with cuts illustrating its main features.

This system is entirely automatic and leaves but little to be desired in a simple, effective and economical method of electrical signaling.

The illustrations show the signal box in place upon a bracket, though it may be placed upon a span wire when desirable. The box, Fig. 1, is of iron with a short projecting arm, which is struck by a pin erected upon the top of the car, and is thus driven to one side in the direction in which the car is advancing. This action throws into permanent electrical connection the trolley wire and the projecting arm of the next box which is located at the farther end

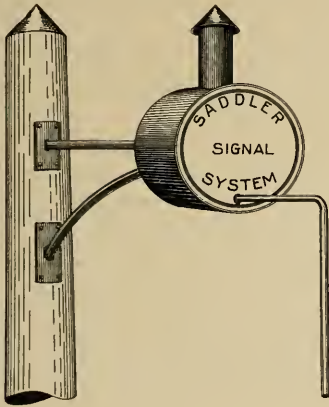


FIGURE 1.

of the block or running section. After the car has passed, the arm of the signal box returns to its vertical position.

The photophone box, Fig. 2, is placed upon the car, either overhead, or upon the sash in front of the motorman, and the binding posts are connected, one with the pin on the top of the car and the other with the gearing beneath the car, thus grounding that side of the box.

If now the car has passed the box as shown in Fig. 3, and has driven the arm to one side, the arm will return to its vertical position but the connection between the trolley wire at the box and the projecting arm at the next box will remain. If a car attempt to leave the switch ahead, its contact pin will strike the arm on the box, allowing current to flow through the photophone box, ringing the bell in the box and causing the lamp to burn.

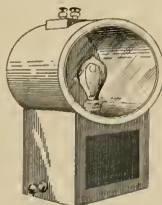


FIGURE 2.

After the car has run through the block to its end its pin will evidently strike the arm there in the opposite direction from that in which the connection was made at the last box. This action will cut the circuit at the box last left, at the

entrance of the block, and thus throw the second arm out of circuit. Thus the car throws on the connection at one end, and throws off the same connection at the other end of the block; no attention is required on the part of anyone, nor is

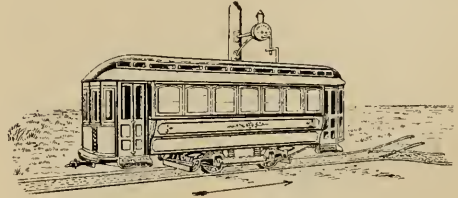


FIGURE 3.

the circuit grounded, nor the lamp burning except at the instant of giving the signal.

If a car having left the switch, and thus set the contact box in communication with the arm at the next switch ahead, should be compelled to back into the switch again for any purpose, the contact will be broken, thus allowing the car ahead to leave its switch and come on.

The advantages of the system are that it is automatic, simple, economical and not easily tampered with. No lamps or semaphores are required, as the signal is given on the car; the apparatus is simple and easily installed, the connecting wires being all numbered; not having ground connections, there is no danger from lightning; the signal wires need not be of good conducting material, but may be of common iron; the current consumption is trifling, as the contact is but for a moment; there are no parts under the car or on the track; the system works whether the trolley is in contact with the wire or not.

Boxes are provided at points between switches, so that in the event of a car breaking down, the car in the next block may be released and come to the aid of the former; or a device is provided by means of which the signal ahead can be thrown off at any point between switches.

**PROJECTED ROADS IN CONTINENTAL EUROPE.**

Among the many cities of Europe which have granted concessions for or contemplate the construction of electric railways are the following: Olmutz, Austria; Bekes, Hungary; Cologne, Germany; Vienna, Austria, for the Vienna Tramway Company; Prague, Bohemia, for the city council; Teplitz-Schonau, Bohemia, for the city council; Pressburg, Hungary, for Ganz & Co., of Budapest, and Temesvar, Hungary, for the Temesvar Street Railway Company. The following lines now operated with horses will be equipped with electric motors: Gyor, Hungary, for Jakob Lathesz & Co., of Budapest; Czernowitz, Austria, Hungary, for the city council; Aussig, Bohemia, for the city council; Herne to Recklinghausen, Prussia, for the Herne-Recklinghausen Street Railway Company, and Linz, Austria, for the Landerbank, of Vienna.

In the case of the seven men accused of shooting Motorman Breen during the street car strike at Milwaukee last spring, the jury disagreed after being out 65 hours. It is reported that 11 were in favor of conviction.



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

At Galveston a short strike was occasioned by cutting the men on extra list from 14 to 13 cents an hour. The men won.

A Rhode Island road has two damage suits pending, one alleged to have been caused by ringing the gong, the other because the gong was not sounded.

Additional tracks have been laid on the Brooklyn bridge and two new cables are in place. A sufficient number of new cars have been placed on the line to take care of the heavy traffic.

The report of the Syracuse (N. Y.) Rapid Transit Company showed a deficiency for the last quarter of \$2,537. The Syracuse & East Side road also reported a deficit for the quarter of \$2,895.

The Columbus (O.) Street Railway Company last month made its fifth semi-annual distribution of cash prizes to conductors and motormen for best reports of accidents. Two \$10 and six \$5 prizes were awarded.

On February 8 a car on the line between New York Mills and Utica, N. Y., left the track near the bridge at Yorkville and rolled down the embankment. The car was wrecked but none of the passengers were injured.

The old officers of the Milwaukee Electric Railway & Light Company, were re-elected as follows: President, William Nelson Cromwell; vice-president, Henry C. Payne; treasurer, Edward Edes; secretary, C. A. Spofford.

The war between the big iron companies which has brought the price of T-rails to \$17 a ton, has not materially affected the market price of girder rails. This difference has amounted to about \$4 per ton during the past two months.

The first electric locomotive built south of the Ohio river is a seven-ton machine now building at the Hood Machine Shops, Birmingham, Ala. It is to be used for mine work near Birmingham and will be operated on the overhead trolley system.

The city council of Cedar Falls, Ia., has refused to grant a franchise to the Waterloo & Cedar Falls Rapid Transit Company on the ground that it would kill the business interests of the town by furnishing cheap and rapid transit to Waterloo.

The Greensburg, Jeanette & Pittsburg Electric Railway Company is experiencing difficulty in getting a solid road-bed near Penn station. The ribs in a coal mine near there have been drawn and the ground is settling. The tracks have already been relaid four times.

The Amalgamated Association of Street Railway Employees, proposes to invest \$6,000 in discarded cassettes, which it can buy for \$200 apiece. The pleasures of a car-

ette ride as compared to street car travel makes the price of cassettes seem 200 per cent too high.

At Knoxville, Tenn., a dispute occurred between the Citizens' railway and the city over some track repairs and a small riot ensued. The police got the fire department to help them, and the 200 negroes in the railway's camp were routed when the hose was turned on.

A literal illustration of the scriptural text about the man who climbed up some other way, being a thief and a robber, was discovered in New York when the police arrested a man who for three months has climbed the elevated railroad posts, and thus got around the turnstile.

An accumulation of illuminating gas between the roof of the Boston subway, now building, and the temporary roadway, became ignited, and a disastrous explosion resulted. Three cars of the West End Street Railway Company were completely wrecked and the passengers injured.

Seemingly without provocation an electric car on the Pittsburgh (Pa.), Neville Island & Coraopolis road jumped the tracks at the approach of the Ohio river bridge and plunged into the river. Fortunately there were no passengers on the car, and the motorman saved himself by jumping.

At Rome, N. Y., one of Robert Hardie's new compressed air cars drew 10 loaded freight cars weighing 300 tons on a New York Central switch track. It is reported to have made 8 miles an hour with the load. This is the locomotive which will be tested on the Manhattan elevated in a few days.

The Midland Electric Railroad Company has received a bridal car from the St. Louis Car Works which is to be used by wedding parties wishing to take trips across Staten Island. It has a dining apartment, comfortable sofas and all modern conveniences to make the trip very pleasant and desirable.

J. A. L. Waddell read a paper in New York before the American Society of Civil Engineers on elevated road structures which he considered weak in design. This brought forth a statement from Thomas C. Clarke that in 20 years the Second avenue road had only cost \$300 a mile per year for repairs, which would not warrant Mr. Waddell's conclusion.

It is probable the General Electric Street Railway Company of Chicago, will apply for additional franchises to extend its lines to Pullman and Kensington, which with the previous grants will give it control of 40 miles of streets. Contracts for the iron work have been closed and a part of the material completed. Work will begin on the conduit as soon as the frost is out or the ground.

Lots of funny incidents are resulting from the "no spit" signs, which are now epidemic. A Des Moines conductor has adopted a sure cure method against spitters. When the offense occurs he doesn't say a word, but gravely goes in and industriously sweeps one spot on the floor in front of the guilty party. When he gets tired of this he gets out a cloth and polishes the "spit sign" and about that time the passengers are enjoying the discomfort of the man who is not apt to do it again.

The Manhattan Elevated Railway celebrated McKinley's inauguration by paying all its employes, from the section hands to the president, in gold.

Copious rains in many parts of the country have caused considerable inconvenience to street railways. At Springfield, O., Buck creek ran over its banks, flooding the street railway power house, thus cutting off the power and rendering the system inoperative for some time.

W. Walmsley has been appointed superintendent of the South Chicago City Railway. Mr. Walmsley has been connected with street railways for some years, but heretofore has had little to do with the operating department, devoting his attention rather to the general business and claim departments.

The Detroit street railways have instituted a new rule, requiring the conductors to make full returns at the end of every trip instead of waiting until through their day's work. The registers are to be used differently. On the register on which, heretofore only cash fares and six-for-a-quarter tickets were rung up, the cash fares and all paid tickets will be registered, while on the old three-cent fare register all transfers and passes will be rung up.

The following directors were elected at the annual meeting of the Westport (Conn.) & Saugatuck Street Railway Company: Wm. E. Nash, A. S. Hoyt, Wm. G. Staples, Loyd Nash, Samuel Purdy and Wm. E. Osborn. At a subsequent meeting, A. S. Hoyt was chosen president; Loyd Nash, vice-president; Samuel A. Purdy, secretary; Wm. E. Nash, treasurer, and Wm. S. Staples and Wm. E. Osborn, auditors.

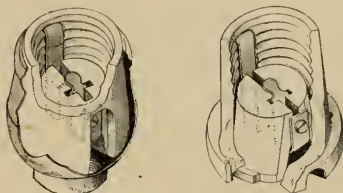
A rather unusual suit is reported from Dubuque, Ia. About two years ago a street car ran into the buggy of the late Dr. Staples. Motorman Cook now brings suit against the executors of the Staples estate, alleging that at the time of the accident he rang the bell and the accident was due to the carelessness and neglect of the doctor's driver. In the collision the motorman was struck by the shaft of the buggy and permanently injured, consequently a suit for \$10,000 damages is brought.

C. D. Wyman, general manager of the New Orleans Traction Company, has issued a very interesting little folder, of which the first edition of 20,000 was exhausted in a few days. It contains a map of the company's lines and a short description of the scores of historical and other points of interest in that quaint city, with directions for reaching it by street car route. Special inducements are also offered to visitors for the chartering of special cars to take in all the points of interest in the city.

Boston capitalists contemplate building 22 miles of electric railway at Kingston, Jamaica. Among those interested are Mr. Burnham, the wholesale coal dealer, and Mr. Preston, president of the Boston Fruit Company. President Charles A. Richardson, of the Worcester Construction Company, accompanied by W. B. Ferguson, the Boston capitalist, and J. W. Wolfe, attorney of the Boston Fruit Company, is now in Kingston to estimate the cost of building and equipping the line with a view to its construction next winter.

## WEATHER-PROOF RAILWAY SOCKETS.

The R. B. Benjamin Manufacturing Company, of Chicago, has lately introduced a line of incandescent lamp sockets of simple and strong design. The accompanying illustration gives a general idea of the construction of the socket. The porcelain base is cast in one solid piece and is of ample size to insure good insulation on a 500 volt circuit. The two brass terminals are of large size and well separated. A two-part shell, of brass or aluminum finish, with threaded



connection holds the parts together. The socket is designed for durability and all its dimensions are sufficient to insure it against breakage and to prevent arcing. One figure represents the standard weather-proof fixture socket which may be used separate or grouped in clusters suitable for lighting the interior of a car. Canopies are also furnished which make excellent reflectors and are suitable for outdoor work. The Union Elevated Loop, the Chicago City Railway and the North Chicago Railroad have adopted this style of socket in most of their lighting systems.

## SOLID FORGED CLIMBER.

The illustration shows a new climber manufactured by the Oshkosh Logging Tool Company of Oshkosh, Wis., which has proved to be popular wherever introduced. It is forged, including the spur and the loops for straps, entirely from



one piece of crucible steel, and in consequence is to be relied upon at all times. Strength is combined with lightness, and as the spur is not riveted or welded on it does not become loose or break off when subjected to hard knocks, as is so frequently the case with climbers. A patent has been applied for on the device.

## BATES ELECTRIC FANS.

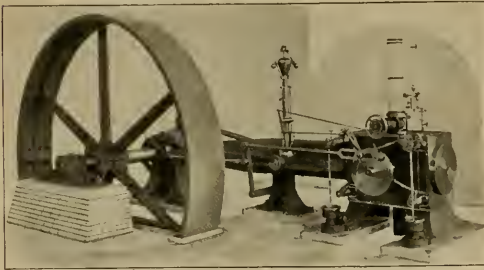
One of the most common uses of electric power in a small way is for driving ventilating fans, and all our readers who are renting power will be interested in the fans manufactured by D. L. Bates & Bro., Dayton, O. They are designed for currents of different voltage from 110 to 500, and may be run with two or more in series. Among the attractive designs are those with revolving lamps and also the "electrolier" column fans. They are finished in nickel, oxidized copper or polished brass as desired.



## MURRAY IRON WORKS.

Although Iowa is largely an agricultural state it possesses many factories and one of the best known of these is the Murray Iron Works of Burlington. The plant was established in 1870 and has steadily grown in size, especially since the hard times set in. The company foresaw that only the fittest could survive and took advantage of the low prices prevailing to equip the works with modern machinery, with the result of outstripping many competitors who had adopted the waiting policy.

The plant comprises foundry, machine shop and boiler works, admirably located on the C., B. & Q. The output has heretofore been throttling stationary engines, mining engines, ice and refrigerating machinery, boilers, heaters, etc. The company's experience in the engine business taught that the Corliss would soon displace other types, as more attention was given to economy in the power house, and especially in electrical plants since the increased use of low speed generators has robbed the high speed engine of its only claim of vantage. To save the time, labor and expense of developing a new Corliss engine, it decided to buy a good one outright, and accordingly purchased the business of a firm in Sioux City which was manufacturing engines under many disadvantages owing to the remoteness of the works from its sources of material and fuel. These



CORLISS ENGINE—MURRAY IRON WORKS.

disadvantages do not exist in Burlington, situated as it is in the midst of coal mines and on the Mississippi river, with low freight rates from iron furnaces and steel mills of the south and east.

This engine, known as the Sioux City Corliss, has earned an enviable reputation for its regulation and economy as well as for its excellent design. The Murray Iron Works Company secured the drawings, patterns, good will and even the experience of the old builders, for with the engine they secured the best of the men who had been building it. A new shop was built at Burlington, adjoining the old one, and has been in operation for six months, turning out many Corliss engines, both simple and compound.

Having facilities for building both engines and boilers, and supplying complete power plants, the Murray Iron Works Company will make a specialty of street railway plants. Numerous inquiries are reported and a good trade is confidently expected.

The tax of one per cent of its gross earnings paid to Marinette, Wis., by the street railway company for 1896 amounted to \$216.

## A TRAIN OF CEDAR POLES.

The opening for traffic of the extension of the Detroit & Mackinaw Railroad between Bay City and Alpena, Mich., was a boon to the cedar pole industry, as it gives easy access to the large cedar swamps along the route. For several years past W. C. Sterling & Son have bought nearly all the poles cut in this region and taken them to market by



A TRAIN OF CEDAR POLES.

driving them down the rivers and then rafting them to Monroe, an expensive and dangerous method. Since the opening of the railroad, the firm has established piling and sorting yards at various stations on the line, where poles can be delivered and loaded for shipment direct to the consumer by rail. Our illustration shows the first train over the new line. It consisted of 33 cars of cedar poles, the largest shipment ever made, consigned through to Monroe. Fifty cars had been provided and were all loaded, but the locomotive was able to haul only 38 of them.

CALIFORNIA LEGISLATURE DEFEATS  
LOW FARES.

Not in many years has anything called out as great interest generally and given occasion for as brilliant forensic battle in the California legislature as the iniquitous bill to reduce street car fares in San Francisco to 2½ cents during morning and evening hours. The period included in the cut rate represents the hours in which probably 80 per cent of the business of the road is done, and is, therefore, practically "the whole thing." On his own responsibility, without a single demand from any other citizen, one of the senators, who ought to have been in better business, introduced the bill, and at one time it appeared in a fair way to go through under a system of committee manipulation. When the case was once understood, however, there was a mighty protest. It came from the 5,000 street railway employes in San Francisco, who did not need anybody to tell them what the bill meant for them. They took matters energetically into their own hands; prepared a monster petition, and with a big delegation of their men went up to the halls of legislation. And they didn't stop out on the front steps, either. They gave each senator individually to understand what would happen to him if he let the bill go through, and the result was an overwhelming defeat for the bill and success for the boys.

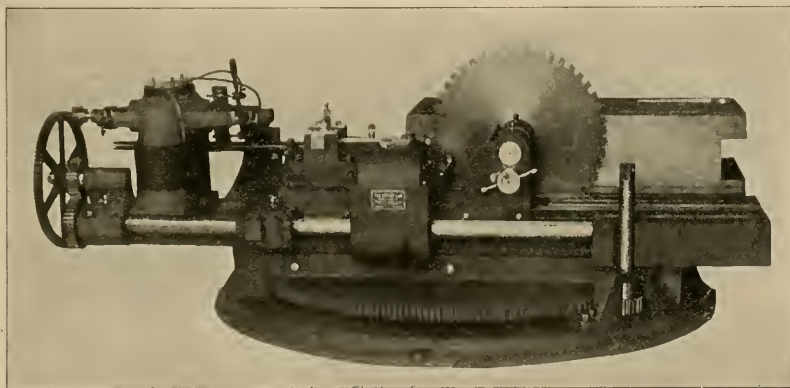
## THE BRYANT COLD METAL SAWING MACHINE.

The illustration represents a metal saw which will likely prove a valuable addition to the repair shops of street railways. It is the result of exhaustive study and planning by the engineers of the Q. & C. Company, Chicago, and has just been introduced to the trade. The machine shown is equipped with a motor and has a circular base. For street railway companies, any old motor in stock will serve for power, thus saving the price of a new one. This machine requires 3 h. p. to operate it; total weight, 7,000 lbs.; capacity, solids 24 x 10 in. at all angles; horizontal travel of saw, 28 in.; diameter of saw blades, 25 in. It contains several improvements, among which are increased feeding speeds, prolonged life of saw blades, lateral adjustment of saw blades. The feeding mechanism has been much improved and change can be made from slow to fast, or vice versa, without stopping the machine. The saw carriage is provided

An incident of the affair was the arrest of three young men, who to make a test case rode on the cars and refused to deposit their fares, demanding that a conductor collect them.

Judge Thompson, of the police court, heard the case and fined the young men \$5 each. In giving his decision he said:

"The naked question is this: Admitting that the street car people are wrong in refusing to put conductors on their cars, have these people the right to force them to do so by riding on their cars and refusing to pay to anyone but a conductor? Clearly, if we do not like their way of doing business we have a perfect right to refuse to ride on their cars, but to say that we have a right to ride and refuse to pay fare when properly demanded until they put conductors on their cars, is to assert a right in any class of citizens who may feel aggrieved by the conduct of another set, to substitute their private will in the place of the law, and to enforce that will by acts in violation of the laws of the land; in



THE BRYANT COLD METAL SAW.

with quick return by means of rack and pinion. All bearings are adjustable to compensate for wear and the machine throughout is made of best material, the saw arbor of Jessop's steel; worm wheel of phosphor bronze, engaging with steel worm. It is adapted for sawing out frogs, layouts switches, turnouts and any other iron work to be used in track construction. The South Chicago City Railway, the Metropolitan Street Railway Company of Kansas City, the Citizens Street Railway Company of St. Louis, the Milwaukee Electric Street Railway and several other roads are using similar machines to great advantage.

## CONDUCTORS FOR LOUISVILLE.

The Louisville Railway, the largest street railway in the country operating without conductors, will put them on some of its lines. The labor unions which wanted to see the company employ more men, started a crusade of "no conductor, no fare" by refusing to deposit fares in the cash box. The matter has been settled by President Speed promising to put conductors on the three lines of heaviest travel by October 1. The transfer privileges are also increased, and cars will be heated next winter.

other words, it is mob law. It means the usurpation by a part of the community, of that sovereign authority, which only resides in the whole body, and which can have no force or effect except when legally enacted into law. It is a principle, which if carried out, would wreck the whole fabric of our government."

There is a statute providing for a fine of from \$5 to \$10 for refusal to pay fare on demand, and the motorman had made a call for fares to be put in the box.

## "SHE FELL OFF THE CAR."

A female passenger sues the Des Moines street railway for \$10,000 for alleged damages caused by slipping on a rear step where ice had accumulated. She thinks if there had been a conductor somewhere around the car she need not have sued the company. It is not even claimed the car was moving. General Manager Hippee says that on the few light travel lines where conductors have been dropped the accident record is no greater than before, and by dispensing with conductors on such lines he is enabled to give a much more frequent service than the receipts would otherwise warrant.



A. G. Hathaway, Cleveland, reports an increasing number of inquiries in his line, and improved prospects for business.

The order for 20 closed cars and trucks for the Milwaukee Street Railway was given the Barney & Smith Company, Dayton, O.

The New Castle Car Manufacturing Company has received a contract to build 15 summer cars for the New Castle Traction Company, New Castle, Del.

The Northern Supply Company, of Chicago, reports numerous inquiries for cedar poles with promise of many orders the coming spring and summer.

The Brussels Tapestry Company, of New York, has sold its brussellette to the Metropolitan Traction Company for curtains for the 150 new cars building for that company.

The McGuire Manufacturing Company, Chicago, has been given the contract for the trucks for 15 summer cars now building for the New Castle, Pa., Traction Company.

Russell & Herbert, the well known theatrical agents of Chicago, have closed contracts with seven western street railway managers for park attractions during the coming season.

The Standard Air Brake Company, New York, in a booklet of sixteen pages illustrates its latest apparatus, and also the cars used on several of the lines that use the "Standard."

The Springfield Street Railway Company of Springfield, Mass., has contracted with the Wason Car Company for 6 modern snow plows to be equipped with Westinghouse 100-h. p. motors.

A contract has been closed by the Saddler Electric Switch & Signal Company, Toledo, O., with the Toledo, Bowling Green & Fremont Railway to install the Saddler signal system on its lines.

L. K. Hirsch, of 549 Rookery, Chicago, dealer in old and new railway material and relaying rails, reports that since the recent fall in the price of steel rails business has been improving in his line.

The E. P. Allis Company is extending its operations into foreign fields. Recently three 1,000-h-p. engines were sent to South Africa to be used in generating power for electric pumps in the mines.

A. Groetzinger & Sons, of Allegheny, Pa., report that business is keeping up exceedingly well. Dermaglutine pinions are always in demand and they have recently received a number of large orders for them.

M. A. Coolidge of Fitchburg, Mass., has been awarded the contract to build 4 miles of road for the Amherst &

Sunderland, Mass., Electric Railway Company. Work is to begin very soon and be completed in June.

The St. Louis Iron & Machine Works have issued a third edition of their catalog of the standard St. Louis corliss engine, which comprises descriptions, with illustrations, of the important details as well as of the engines in general.

W. W. Wilcox & Co., of Chicago, will remove on May 1 to 201 Lake street, a few doors west of their present location. The new factory will contain more space and be better equipped to handle their growing business in railway badges, ticket punches, etc.

Naugle, Holcomb & Co. have recently placed an order with J. H. McGill, representing the Ohio Brass Company, for about 3,000 type "D" hangers, equipped with Dirigo insulated bolts, and a like number of Walker ears. They are for the Chicago Suburban.

The Ohio Brass Company, Mansfield, O., manufacturer of the Walker trolley ear advises us that specialty is rapidly growing in favor and meeting with largely increased sales. The company confidently expects its sales of Walker trolley ears to aggregate 25,000 this season.

The Meaker Manufacturing Company has just shipped the Union Traction Company of Philadelphia, Pa., 865 additional equipments. This will make 2,800 car equipments for this register. This is the largest system and the largest register equipment in the world.

The Standard Air-Brake Company has secured the services of Herbert B. Taylor, late with the Consolidated Traction Company, as chief assistant in the electrical department to F. Uberlacher. Mr. Taylor entered the service of the Standard Air Brake Company on March 1st.

The Ball Engine Company, Erie, Pa., has recently built a 60-h. p. engine direct connected to a General Electric dynamo, for the Church Home & Infirmary of Baltimore, and a 350-h. p. horizontal cross-compound engine for the Wilmington Gas Light Company of Wilmington, Del.

W. H. P. Fisher so long and favorably known as one of the pioneers on the traveling force of the Hoppes Manufacturing Company, Springfield, O., has been placed in charge of the eastern office of the company which was recently opened at Room No. 604 Girard Building, Philadelphia.

Hooven, Owens & Rentschler, of Hamilton, Ohio, have been awarded the contract to furnish four 300-horse-power engines for the Cincinnati & Miami Valley Traction Company. The Barney & Smith Company, of Dayton has received the contract to build fifteen 45-foot cars for the same company.

The Lombard Hydraulic Brake Company, of Boston, has just issued a new catalogue with illustrated descriptions of the mechanism of its new street car brakes. It is claimed that at an instant's notice, the braking effect, from the slightest contact with the shoes to a full stoppage of the wheels can be produced, and this pressure remains absolutely constant until the motorman moves the handle.



The American Electrical Works, Providence, R. I., in remembrance of February 22d, sent to their friends a handsome steel plate portrait of Washington, and on an accompanying card presented a diagram of the cherry tree incident and called attention to the fact that they are the largest makers of the best bare and insulated electric wires and cables.

The Taunton Locomotive Manufacturing Company, Taunton, Mass., has furnished a number of street railways with snow plows and these have met with great success this winter. The Milwaukee, Racine & Kenosha Street Railway Company, the Portland & Cape Elizabeth road and the railway at New Bedford have all testified to the efficiency of these plows.

The Berlin Iron Bridge Company, East Berlin, Conn. has been awarded the contract for the new power house to be erected at Berlin by the New York, New Haven & Hartford Railroad. The building is to be 110 x 200 ft., divided into two rooms of nearly equal size, one for the boilers and one for the engines and dynamos. The entire frame work will be of steel, with the side columns enclosed by brick walls.

The G. C. Kuhlman Company, Cleveland, O., intends to make a specialty of suburban cars. The company is now delivering eight cars for the Cleveland & Chagrin Falls Electric Railway. They are 41 ft. long over all with reversible cross seats seating 44 passengers. The general lines are those of a steam coach, but with a large front vestibule for the motorman. The doors are double with a 42-in. opening.

The Conover-Goe Company, recently organized, is composed of men who have been actively engaged in electrical work for 15 years. The company will be factory agent in the west for several eastern firms, among them are C. S. Knowles and the Paragon Arc Lamp Company, of Boston, and the Gibbs Electric Manufacturing Company, of Hartford. This company also represents the Dicke Tool Company, of Chicago.

W. P. Van Dorn, of the Fitzgerald & Van Dorn Company, Chicago, advises us of the receipt of several large orders for its automatic couplers. The heavy double truck cars that are now used on so many interurban roads require automatic couplers, and to meet this demand a special coupler, No. 7, has been put on the market. The Van Dorn ball joint attachment for securing the body of the coupler to the car has also met with success.

The American Engine Company has just secured the order for the entire engine equipment of the new station of the Scranton (Pa.) Illuminating, Heat & Power Company, to be built on the site of the old station recently destroyed by fire. The equipment will consist of six American-Ball engines, five of which will be compound and one simple. Direct connected generators will be used on 4 of these engines, and the station will be modern in all its appointments.

The Forest City Electric Works, Cleveland, has just issued an extremely neat and interesting little pamphlet, describing and illustrating its roll drop and drop forged commutator bars. Several pages are devoted to testimonials with fac-simile autographs of well known street railway

managers, and a long list of roads in all parts of the country which are using the Forest City products. The protected rail bond and improved Cleveland bond welder are also explained.

The Abendroth & Root Manufacturing Company, 28 Cliff street, New York City, has through its St. Louis office secured an order from the Alexian Brothers for two Root improved water tube boilers, 150-horse-power each, to be installed in the new hospital in Chicago. The company has also secured in the face of a close competition the Schwarzhild & Sulzberger order for water tube boilers for the packing plant in Kansas City. This order calls for 1,000-horse-power.

While the fire engines were yet playing on the ruins of the power house of the Union Traction Company, Philadelphia, which burned March 3, the chief electrician of the company ordered 165 I-T-E circuit breakers of the Cutler Electrical & Manufacturing Company of that city for immediate delivery. Standard switchboard types were ordered so that the greater portion could be filled out of stock, and inside of 24 hours 116 circuit breakers had been delivered to the Traction Company.

Warren, Webster & Co., of Camden, N. J., report that they have been pressed with work for several months past and that the prospects continue good. The Webster system of steam heating, which is owned and operated by this firm, has been specified for the new post-office at Washington and a number of other large structures now building in various parts of the country. The firm also has several contracts for heating street car barns and its success in this line has elicited numerous inquiries.

The Standard Paint Company, 81 & 83 John street, New York, finds that the demand for its P. & B. compounds, preservative paints, armature varnish and insulating tape is constantly increasing, particularly among street railway men, as the consumers find that it is expensive to experiment with other than standard goods. The company makes a specialty of tape in all widths, which is free from rubber and will not carbonize. A new material, introduced last year is "ruberoid" motor cloth, a very elastic waterproof material.

After a shut down of only 10 days the Dornier & Dutton Manufacturing Company, of Cleveland, opened its works and gradually put on additional men, until now the works are running full time. The company is now finishing up an order for 10 trucks and two smaller orders. Large orders for gears and pinions have been received. H. A. Dornier has been relieved from the financial end of the business and made general manager, and is now enabled to devote his time to the mechanical and sales departments.

The Garton-Daniels Electric Company of Keokuk, Ia., has issued a small pamphlet to the trade which discusses the Garton lightning arrester as an investment, and shows that it is a good one. The company is looking forward to large sales in 1897, as the business for December and January was twice, and for February three times, as large as the corresponding month a year ago. The company has recently received orders from Mexico, Japan, France and England. Nine of the railways using the Garton arrester aggregate 520 miles in length.

On February 22 the property of the J. H. McEwen Manufacturing Company, at Ridgway, Pa., was sold to the Ridgway Dynamo & Engine Company. The new company comprises some of the strongest and most prominent business men in western Pennsylvania, and sufficient capital will be back of the business to enable every advantage to be taken of discounts. At present the company is engaged in perfecting the new organization and getting into shape for actively pushing the business. Mr. McEwen no longer has any connection with the company.

The Lombard Water Wheel Governor Company of Boston, has closed a contract with the St. Anthony Falls Water Power Company, of Minneapolis, to furnish the seven governors to be used in the new plant now building. These seven governors are to regulate four water wheels each, or 28 water wheels in all, aggregating 10,000 h. p. The style of governor to be employed in this plant is designated by the manufacturers as type "C." During the past year the Lombard governors have been used to regulate over 40,000 h. p. of water wheels in the United States.

Regardless of the great business depression of the last year, W. C. Sterling & Son, Monroe, Mich., dealers in cedar telegraph, telephone and electric light and railway poles, report a constantly increasing trade, and now have large orders for poles for future shipment. The firm has recently been compelled to seek more territory in the pole producing region, and has established new sorting yards at Omer, Turner, Rose City, Lupton and Maitby, Mich. The increase in trade is due the merits of the goods furnished, and the reputation for fair dealing which this firm has.

Brownlee & Co., wholesale lumber dealers of Detroit Mich., have long made a specialty of poles for electric railway work. The firm has been in business for 27 years and was the first to put on the market the octagonal pine poles which proved so popular. Recently they have begun manufacturing a pole built up of three pieces and like an I-beam in section, thus making it both light and strong. When desired the poles are creosoted under pressure, which process gives them an estimated life of thirty to fifty years.

S. C. Munoz, for some years special sales agent for the Heine Boiler Company and for the past year general sales agent for the Edgemoor boiler, and E. C. Darley, late of the Rankin & Fritsch Engine Company, St. Louis, and previously with J. P. Witherow the celebrated builder of steel works, have formed a partnership. The firm of Munoz & Darley has taken offices at 553-555 the Rookery, Chicago, and will act as general western representative of the Cahall vertical and Cahall-Babcock & Wilcox boilers, manufactured by the Aultman & Taylor Machinery Co., Mansfield, O.

The New York Steam Company, of New York City, has laid a new trunk line of underground steam mains from the East river to connect with pipes previously in use at 58th street and Fifth avenue. This line is composed of 16-in. and 20-in. pipe and is about one mile in length, believed to be the longest line of large steam pipe ever constructed. From the steam station to the extremity of this line of mains is more than one and one-half miles of continuous pipe. Altogether the company is successfully supplying steam by the Holly system for both power and heating through more than eight miles of underground pipe.

The International Register Company of Chicago, has removed from 197 South Canal street to 133, 135, 137 and 139 South Clinton street, where it has much better facilities for handling its increasing business. The company reports a much larger business for the winter months than a year ago, and that prospects for the spring are better than for several years. Many railway managers are now considering a change of register equipment who would not give a moment's thought to the matter under the unfavorable political conditions of last year. Others are beginning to realize that old and worn out registers are expensive affairs, and cost in loss of fares due to breakages, or incorrect registration, in a year, many times the price of a new equipment of the modern durable and accurate machines.

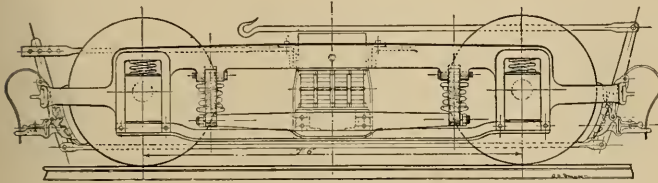
In the autumn of 1896 the Davenport Consolidated Gas, Electric Light & Steam Heating Company constructed nearly two miles of steam mains in the streets of Davenport, Ia., the largest being 10 in. and the smallest 5 in. in diameter, at a cost of \$30,000. This is what is termed an exhaust plant, the design being to heat mainly with the large amount of exhaust steam which the company had previously being allowing to escape into the atmosphere. The revenues from heating this season will amount to \$8,000 and this sum will be more than doubled in another year when time is given to secure additional customers adjacent to the line of mains. The company is well pleased with its experience so far; everything in the heating plant is working smoothly, and the people are delighted with the service. The underground work was done by the American District Steam Company, of Lockport, N. Y.

Among the recent sales of the Buckeye Engine Company, Salem, O., are two 11 x 18 in. engines for the Pennsylvania Railroad Company for lighting station and yards at Cincinnati; two 17½ and 30½ x 33 in. tandem compounds for the Marion City Railway Company, Marion, Ind.; two 17½ x 27, East Hamilton Light & Power Company, Hamilton, O.; one 14½ x 24, R. R. Donnelley & Sons Company, Chicago; one 9 and 13½ x 16, W. D. Wood Company, McKeesport, Pa.; one 13 x 16, Canby, Ach & Canby, Dayton, O.; two 17½ and 30½ x 33 and one 18 and 32½ x 33 tandem compounds, Carnegie Steel Company; one 15½ x 24, L. D. Rohrer, Cumberland, Md.; one 15 and 28½ x 16 vertical compound, Fall River Electric Lighting Company; one 13 and 22½ x 18 tandem compound, Water Works, St. Mary's, O.; one 14¼ and 25 x 18 tandem compound, Otis Steel Company, Cleveland.

Although J. A. Hanna, western manager for the Peckham Motor Truck & Wheel Company, has been in a critical condition for some time past through the bursting of a blood vessel in the brain, his energetic assistant, William Gray, has not missed anything in view for the Peckham Company, having secured the entire equipment for high speed double trucks for the Detroit River & St. Clair Railway, the entire equipment of double and single trucks for freight and passenger cars, also a switching locomotive for distributing standard steam railroad freight cars for the Mason City & Clear Lake Traction Company, Mason City, Iowa, and an order for single trucks from the Waterloo & Cedar Falls Rapid Transit Company. Suburban managers seem quick to appreciate the merits of Peckham's double trucks, the orders for which are almost equal to those for the famous single trucks, which are known the world over.

**THE SOLUTION OF AN IMPORTANT STREET RAILWAY PROBLEM.**

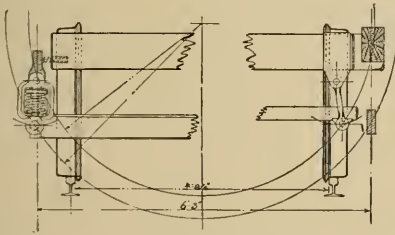
To the street railway man the interurban or long distance suburban service is especially attractive, not only on account of large profits, but because of its greater freedom from competitors. This special form of street railway work presents a most difficult problem to the engineer. He finds



NO. 27 BRILL TRUCK.

himself obliged within city limits and in paved streets to use a tram rail with paving close to his rail head. The head must be shallow so that traffic may not be too much inconvenienced, while the curves from the necessity of passing street corners must be very sharp. These conditions force him to use a wheel with a very narrow tread to avoid touching the paving and a shallow flange in order not to cut the tram of the rail at the bottom.

For economy of construction, stability of roadbed and

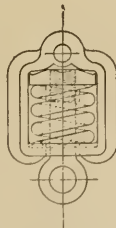


TRANSVERSE STABILITY COMPARED WITH M. C. B. TRUCK.

speed the track outside of city limits is laid with T-rails. For safety of operation on the T-rail wheels should have wide treads and deep flanges.

Under these diverse requirements the engineer has no alternative. He must use the narrow treads and shallow flanges and outside the paved streets either reduce his speed or trust to luck to keep his cars on the rails. Common experience is that the cars run just a little too fast and there is now and then a little "slip-up" in the matter of luck.

Late in the year 1895 an unexpected solution of this problem was reached, by which the narrow treads and shallow flanges are able to make any desired speed on T-rails without any danger of derailment. In September of that year the J. G. Brill Company put a number of trucks in operation upon the Buffalo & Niagara Falls Railway. This is a typical city and suburban line with a long haul in the coun-



SPRING LINK.

try. The terminals are both inside cities and there are so many miles of track along paved streets. The country portion of the line is laid with T-rails. Two competing steam roads, each running frequent trains, make high speeds necessary at any cost.

A pair of trucks of peculiar design were included in the order. These were of the type known as "No. 27." The object in the design was to obtain certain conveniences of operation and construction. Several experts in such matters were consulted in regard to their probable advantages, but none of them hinted at any superiority in riding qualities or in the matter of safety. Before New Years day, however, every railroad man in the city had heard of the performances of "No. 30" the car mounted on these trucks. A stranger a month later found the city conductors well posted as to the car and her trips and in one

instance was met by the volunteered information that "she was not riding very well on account of a flat wheel."

The first point that was noticed was the ease with which the car took the curves. The short curves in the city and the long curves in the country were passed with an ease and smoothness, at any speed, which was before unheard of. The next thing which caused surprise was the fact that the truck never left the rails at any time nor for any cause, and it may be added that from that day to this there never has been a case reported in which one of these trucks has been derailed.

The new truck solved the problem. It could run over T-rails at the highest speeds while using a  $\frac{3}{4}$ -in. flange and a  $2\frac{1}{4}$ -in. tread. At the same time it took the short city curves more smoothly than any standard trucks on steam roads pass around curves of 2,000 feet radius.

The features which have made this surprising record possible may be stated in a general way thus: There has been in the equalization of the load between the wheels a great improvement made over that employed in the Master Car Builders' standard truck. The load being placed at the center of the equalizer with the springs at its outer ends they are entirely freed from leverage and the load more perfectly distributed than in the standard M. C. B. truck. Journal springs are also introduced in addition to those ordinarily employed, adding fifty per cent to the spring carrying power. The swing links are made elastic by putting the equalizing springs into them. The latter feature makes it impossible to bring a blow upon the flanges of the wheels no matter how irregular the horizontal alignment of the track may be. Curves in the same way are robbed of their power to bring a jerk upon the truck. The links lengthen as the truck moves to one side and cushion what would have been a shock and the body follows with a motion so gentle and so regular as to be almost imperceptible.

It is difficult to write of the performance of the new truck and compare it with those of the ordinary standard patterns on steam roads without making statements which appear incredible to those who have not had an opportunity to try them.

The engraving shows some of the leading features of the truck, including the spring links and the equalizer, which it must be remembered forms a part of the spring plank and swing motion.



As a sort of confirmation of the case it may be added that the Buffalo & Niagara Falls road have just ordered 21 sets of these trucks, 19 of which are to replace pivotal trucks of the ordinary pattern, and several roads using these trucks have displaced other trucks for them.

### PROPOSED WATER POWER FOR DENVER.

James E. Rhodes, of Denver, interested in the Denver Power & Irrigation Company, is promoting an enterprise to furnish electric power. The plan is to build a huge reservoir on the south fork of the Platte river, at the mouth of a big canyon where the natural conditions are said to be perfect.

Nature has there formed a natural basin and all that remains for man to do to create an immense reservoir is to close the narrow gateway, where the great towering walls pinch almost together. By doing this a great lake four miles long will be formed. The dam will be built of solid masonry and will be over seventy feet in height.

From the reservoir a pipe line six or eight feet in diameter will conduct the water to Stevens' gulch, two miles below Deansburg in Platte canon, a distance of six miles from the dam. In this manner a fall of over 200 feet is secured.

After using the water for power it will be sold to irrigators. It is promised to furnish power delivered in Denver for 65 per cent of what it now costs to produce it with fuel. The Denver tramway would be a large user in event of the scheme being carried out.

In Brockton, Mass., there is rather a peculiar provision in the street railway franchise which reads as follows: "Whenever there shall occur a fall of snow of depth sufficient to allow the use of conveyances on runners on said streets, no snow plow shall be used on said tracks, nor shall said company cause or allow snow to be removed therefrom, nor use or allow to be used any salt or other substance or substances for the purpose of melting snow on said tracks, unless written permission be obtained of the board of aldermen or its committee on highways." Perhaps it was intended to have the cars put on runners, but it does not work in that primitive way. When the snow begins to fall, before a "sufficient depth" has accumulated, the snow plows are set to work.

The Peckham Motor Truck & Wheel Company reports orders aggregating 400 trucks, having received recently large orders from the following roads: Metropolitan Street Railway Company, New York City; Brisbane Tramway Company, Brisbane, Australia; Leominster & Clinton Street Railway Company, Leominster, Mass.; Olean, Rock City & Bradford Street Railway Company, Olean, N. Y.; Worcester Construction Company, Worcester, Mass.; Mystic Valley Street Railway Company, Mystic Valley, Mass.; Wakefield & Stoneham Street Railway Company, Wakefield, Mass.; North Woburn Street Railway Company, North Woburn, Mass.; Cleveland & Chagrin Falls Electric Railway Company, Cleveland, O.; Cleveland Electric Railway Company, Cleveland, O.; Tama Electric Railroad Company, Tama, Ia., and others. The works are now running on full time, and present indications point to a continuance of the same for the entire year.

### NEW PUBLICATIONS.

Catalog N issued by the Hilles & Jones Company, Wilmington, Del., is a pamphlet of 44 pages, on each of which is an illustration of one of the new or special tools built by this company for working iron and steel plates, bars and structural shapes.

No. 1, Vol. II of the Journal of the Western Society of Engineers, contains Edward Barrington's paper on "Street Railway Construction," read before the society November 18, 1896. The author discusses the subject in detail and the paper constitutes an epitome of what is the latest practice in street railway construction and equipment.

Whitaker & Co., of London, will shortly publish a Technical Railway Vocabulary, compiled by Lucien Serrailier. The book will contain over 5,000 French, English and American technical terms used in railway management, construction and working, and is destined for the use of engineers, railway men, contractors, patent agents and inventors.

"Caball" is the title of the new catalog just issued by the Cahall Sales Department, of Pittsburg. The introduction discusses the evolution of steam generators and the elements of perfection and is followed by an elaborate description of the Cahall boilers and the data of numerous tests. It is profusely illustrated, half of its 98 pages being full page illustrations.

We have received No. 10 of Vol. 1 of the Bulletin of the University of Wisconsin, on "Topographical Surveys, their Methods and Value," by J. L. Van Ornum, C. E. Like the other numbers of the bulletin which have appeared in the last two years, this is a report of a lecture delivered before the students of the university by an expert in the field treated, and constitutes a valuable addition to technical literature.

We are in receipt of "Electric Street Railways," a book of 331 pages issued by the Allgemeinen Elektrizitäts-Gesellschaft (General Electric Company) of Berlin, which contains much valuable information on this subject. After some remarks on electric railways in general and overhead trolley lines in particular and a note on the opposition to trolley lines by telegraph and telephone companies which use low potential current, the book is devoted to descriptions of the street railways in 24 cities in Germany where the overhead trolleys are used, on the system of this company. In each case full data as to line, grades, power house and equipment are given; there are many illustrations, showing track layouts, profiles of lines and interior views and plans of power houses.

### 100-MILE ELECTRIC INTERURBAN.

H. McFarland, of the Century Engineering Company, Cleveland, advises us his company has closed the contract and begun construction work on the Benton Harbor Electric Railway & Transit Company. The present plan is to make the road 100 miles long, running through a thickly populated fruit country and passing 27 lakes. Track to be standard gage, 15 miles 80-lb. and balance 70-lb. T-rail. Cars to be operated on steam road practice.



ing in the power house must be made on the 11.5 per cent, of which a little over half is for the coal bill. The maximum saving is only about 2.6 per cent of the whole operating expense, between inefficient and the most economical engines. While Mr. Davis states that he is in favor of concentration of power, compounding and condensing, yet in many cases the money spent upon other items, which are a larger percentage of the total operating expenses, would result in greater savings.

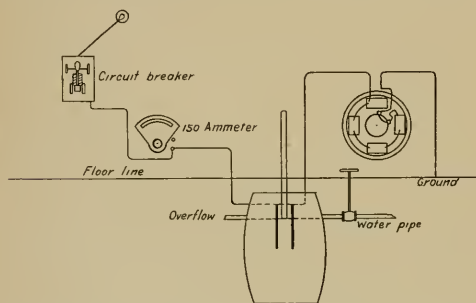
To corroborate his statements he compares the itemized expense of two roads.

	No. 1.	No. 2.
Length of track in miles.....	7.54	6.36
Average number of cars used.....	9	4
Indicated h. p. of engines.....	425	300
Indicated h. p. per car.....	47	75
Car-miles run.....	317,656	92,400
Operating expense, per car-mile cents.....	9.77	13.68
Cost of power plant.....	29,750	39,000
Cost of equipment.....	58,500	16,800
Cost of track and line.....	148,480	53,894

It will be noticed that the power plant of each road cost about the same, but the equipment of No. 1 is heavier and more powerful; also the track and line is much better and more substantially built. The expense per car-mile is largely in favor of the first line. Good rails and road bed, a high grade car equipment, with high speed service and a consequent less cost per car-mile for labor will be instrumental to keeping down the operating expenses and should receive no less attention than the power house.

### REPAIRS ON THE SOUTH CHICAGO CITY, RAILWAY.

The South Chicago City Railway has been very successful in keeping its rolling stock in first class order. A thorough system of inspection every night brings to light any defect in the cars or motors. The "stitch in time" saves any extensive repairs which would come from neglect. There are 42 cars in operation, and 6 men in the repair shop attend to all of these. All through the winter, when snow and frozen mud on the track are such a source of danger no armatures have been burned out and the armature winder



has been devoting his time to other work. Good care is also taken of the trucks and Mr. Powell, who has charge of the repair work, states that there has not been a flat wheel running on the road for over a year.

The arrangement for testing the fields and armatures is very simple and inexpensive, the connections being as shown in sketch. In the armature room, a discarded circuit breaker

was resurrected from the scrap pile and mounted on the wall. In series with this is a 150-ampere meter and a water resistance. This consists of a barrel beneath the floor with a pipe from the water main and an overflow. Two copper plates, 10 x 14 in. are fastened on the end of a rod extending above the floor. The resistance can be varied by raising or lowering this into the water. A wire leads from one plate into the armature room and to the car pits. If an armature is to be tested it is mounted in bearings on two trestles, and one terminal of this series connected to one brush, and the other brush is grounded. Any defective coil is quickly detected and replaced by one already in stock. When a field is to be tested it is placed in series with the apparatus and the fall of potential is taken across the terminals. Should the readings differ from the usual observations the indication would be that the insulation has been broken down and the necessary repairs are made.

### RICH BUY CHEAP TICKETS—POOR DON'T.

Several months ago we gave the experience of a street railway president who thought to educate people up to riding on a certain line by selling an 8-for-a-quarter ticket. The line connected a business and outlying manufacturing district, and was largely patronized by employes of the factories. For a considerable portion of its length the route was through a fashionable residence district occupied by the well to do. When the educating prices had been in force two months without any alarming increase in business a thorough count was made by the ticket sellers of the class to whom the cheap tickets were sold, when it was discovered fully 90 per cent were being bought by the bankers, merchants and professional men in the swell neighborhoods. The working people scarcely touched them. This practical experience is in direct opposition to the theoretical claims set up by alleged reformers who do their street railroading in their heads. The following from the Detroit News is along the same identical line as claimed by street railway men everywhere:

The talk about the relative benefits enjoyed by the city from the Detroit railway franchise as compared with those granted to the older companies has led Manager du Pont of the Citizens' company to do a little figuring and he admitted that the results were surprising to himself.

"The much-boasted 3-cent fare," he said, "is shown on investigation to include only from 10 to 12 per cent of all the fares collected. From 88 to 90 per cent of the street car patrons are still paying at the 6-for-a-quarter rate.

"Another surprising thing demonstrated by my inquiry," continued Mr. du Pont, "is that by far the greater portion of our so-called workingmen's tickets are collected on the Woodward avenue line. The real workingmen, who live on Michigan and Gratiot avenues, pay their nickel oftener than do the well-to-do people adjacent to Woodward avenue. The reason is, apparently, that the average workingman has very little capital to invest in street car tickets and prefers to pay for single rides."

The Union Traction Company, Philadelphia, is preparing a handsome book illustrating its route along the Old York road and the special features of Willow Grove park. For the coming season at the park Damrosch's Symphony Orchestra has been engaged.





WINDSOR & KENFIELD PUBLISHING COMPANY,  
 OLD COLONY BUILDING, - - CHICAGO.

TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.

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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. APRIL 15, 1897. NO. 4

THE article on "Reduction in Street Car Fares" in the February REVIEW has attracted widespread attention, not only from street railway officials, but the daily press as well. The article, in whole or in part, has been republished in the leading dailies in all parts of the country, from San Francisco to Boston. The street railway interests are indebted to those papers which did publish the article for having given even this much space in contradiction of the columns of matter which have been misleading and unjust. We ran an extra large edition of the issue in question, but it has been entirely exhausted. We have, however, a few hundred copies of the article in sheet form, and our friends are welcome to these as long as the supply lasts.

NO ONE seems to ever think of any possibility of going back temporarily to horses when once electricity sets the cars in motion, and it is a high tribute to the exactness with which the science of electric installation is made that when steam is turned on it comes to stay. A little city down in Connecticut, however, met with an accident in its power station, and for some reason several weeks were allowed to elapse before the current was turned on again. In the meantime the few cars were dragged about by horses. Once this was considered a first-class means of conveyance, but the way the dear

people stormed and ridiculed the honest old horses was a caution, and yet these same people, with thousands of others, not so many years ago did all they could to retain horses in front of their cars and keep electricity out.

WE print elsewhere in this issue extracts from a paper prepared by P. F. Sullivan, general manager of the Lowell & Suburban railway. It is entitled a "Comparison of Street Railway Conditions and Methods in Europe and the United States." It is the result of a most careful and thorough personal investigation by Mr. Sullivan, who has just returned from Europe. The writer has long been a close student of municipal conditions and affairs, and combines with it a most practical knowledge of American street railways growing out of actual experience as a successful, and progressive manager. His report is the most important treatise on the subject ever presented, and explains for the first time many things which American managers could not understand. He punctures the bubbles which theoretical writers have brought over and which have been floating in the minds of the American public. He emphatically proves the vastly superior accommodations of our roads, and shows the so-called penny fares to be higher rates than are paid by American riders. We call special attention to the section on "Rate of Wages." This shows that in the case of one American road alone, the West End, of Boston, *if it should pay the same wages as are paid in Glasgow, the company could afford to pay \$2,000,000 per annum for its franchises and still maintain its dividends.* The West End road, last year, paid in wages (and exclusive of wages paid contractors for track renewals) twice as much as the entire earnings of the Glasgow lines; and yet the population of Glasgow exceeds that of Boston and its suburbs by 58,000 persons. Mr. Sullivan, being a practical railway man, is able to go to the root of these matters as the average student could not and has not done, and in his investigations and report has rendered a lasting service to the entire railway interests. The article will be found intensely interesting and of great value.

THE meeting in Cleveland, on March 23 and 24, of street railway accountants, was in every respect a grand success, and resulted in the permanent organization of the Street Railway Accountants' Association of America. Not only was the meeting a most harmonious one, but we have rarely ever seen a deliberative body which was so thoroughly in earnest, or which conducted itself in so systematic and business-like a manner. Not a minute was allowed to be wasted. When a paper was read it was thoroughly discussed, but in not one instance did the debate wander from the question strictly before the house. The fact that a most excellent constitution and by-laws were adopted in just one hour and a half, where similar bodies often spend one or more days in accomplishing the same result, is but a single instance of their business methods. Nor let any one suppose the matter

was not thoroughly considered, for it was scrutinized in every detail. The exhibit of blanks and forms was a most excellent, interesting and instructive feature, covering several large tables, and representing the accounting systems of over 30 roads. These forms were carefully studied and discussed, and not a delegate present but carried home, not only sample forms, but suggestions for improvements in his own. The plainly evident spirit was earnest work. Before and after the sessions, the delegates were in constant conference, and even "talked shop" during meal time, arrangements having been made for a separate dining room. It was a matter of general comment and surprise that so much could be accomplished in so short a time, and also that the quality of the work surpassed the expectations of all. The roads not represented at the meeting are losers thereby.

\* \* \*

One of the chief opportunities of the association centers in the work of standardization. This has been put in motion by the appointment of a strong committee, which will report at the October meeting. This committee has a lot of hard work ahead, and must not be expected to have the question all worked out in the next seven months. It will doubtless be a work extending over two or three years at least, but will become easier all the time. For the first time the machinery is now in motion to undertake this task, and deserves the strongest support and encouragement from every street railway in the land. Every possible assistance has been freely afforded the operating departments in the way of outside experts in solving their hard problems, and no one questions for a moment either the advisability or economy of having done so. But the accounting department has been left to shift for itself, and each one has had to be his own expert.

\* \* \*

Economy is the watchword from now on, but general economies are fast reaching their limit; that is, those larger and apparent savings which can be readily discerned. But the lines are being so closely drawn on street railways that savings must now be made in all the smaller details which formerly were not considered of much account. But the rub is going to be to ferret out and determine what and where the further possible economies are, and it will be found that the operators will have to look to the accountants to furnish the data which will enable these discoveries to be made. In order to do this one road will have to exchange figures with other friendly roads; but the present system of diverse accounting gives but little opportunity for this exchange, even where mutually desired. It is to secure such a standardizing of accounts as will enable a valuable and intelligent comparison to be made that the accountants have organized. As the proceedings will show, this does not mean a radical change in every company's system of bookkeeping, or the throwing away of hundreds of dollars worth of unused ledgers and other books, but a gradual coming together along certain lines

as agreed, with a probable eventual system which will be generally adopted, because generally conceded to be the best. No one man, and no one company can possibly hope to work this all out alone; it can only come as a result of careful study, conference and interchange of ideas and methods.

\* \* \*

The managers and operating departments have really much more to gain from this self imposed task which the accountants have taken up, than the accountants themselves. It is evident that so far as the accountants are concerned that they can go on indefinitely with their present systems, and unquestionably save themselves much hard work in studying out a better one; but the fact that they realize as no one else can, the necessity and value in dollars, of a better system, is highly creditable to these hard but comparatively unknown workers. The steam roads have been through the same experience and evolution years ago, and street railways have now reached a point where they will surely have to do the same.

\* \* \*

The STREET RAILWAY REVIEW takes modest but genuine pride in the success of the accountants' meeting. All the preliminary work of securing a general expression as to the advisability of the organization, the correspondence necessary to selecting the place and time, and in fact all the arrangements up to the moment of electing the temporary officers was done by this paper. We are glad at the success, but had it been a failure we would have reported it so just as strongly as the facts have warranted us in commending it.

#### THE HUMPHREY BILLS.

The two bills now before the Illinois legislature and popularly known as the Humphrey bills, are sadly misrepresented by the daily press and held up to obloquy as the iniquitous conceptions of iniquitous men, principally street railway men, designed for the purpose of oppressing the people. They should properly be regarded as measures to protect good citizens and the street railway corporations, from being sandbagged by boodle aldermen.

One bill provides for a "Board of Street and Elevated Railroad Commissioners" composed of three men holding for terms of 15 years, with power to regulate the time of running cars; to prescribe the headway; to prescribe the cars used; to regulate the manner of heating cars; to establish rate of fare, provided that a rate once fixed shall not be changed for twenty years; to determine whether new lines for which franchises may be asked are necessary, and whether the law on the subject has been complied with, the granting of a franchise being obligatory upon the city council or county commissioners, when recommended by the state board; to authorize a change of motive power; to prescribe a maximum speed; to regulate signals; to regulate the manner of crossing the tracks of another company.

The other bill confers upon street railways the right to condemn property, compensation being ascertained and made in the manner provided by law for the exercise of eminent domain; consent of council or commissioners of high-

ways in counties, and full compliance with law is made a condition precedent to the laying of tracks; the railways may not be obstructed or their operation interfered with, by reason of street improvements; franchises are to be granted for 50 years and the franchises of existing roads are extended for 50 years from date; three per cent of the gross earnings of the companies is to be paid to the city in which they operate; a company may not use the tracks of other companies without the consent of the latter; consolidation of parallel or competing lines is prohibited.

Objection is made to these bills on the ground that the city would thereby be deprived of its right to control its street railways. This is one of the best reasons that the bills should become laws; any measure that will deprive the city council of its power to levy blackmail will weaken the influence of the corrupt politician and bring nearer the day of pure municipal politics. State control is better than municipal in that the legislature meets biennially instead of weekly.

As to what the Humphrey bill proposes: The exercise of the right of eminent domain by street railways is nothing to which exception should be taken. It is by this means that steam railroads, telegraph and telephone companies and other quasi-public corporations secure their rights of way and in the great cities of today the street railway is as important as is the steam road. Compensation for property condemned is amply guaranteed, as is the consent of municipal or county authorities to the building of the road, and the railroad commission would be a check upon granting franchises for speculative purposes only, and also upon the refusing of those really necessary and desired by those interested. The prohibition upon municipal authorities against obstructing or interfering with the operation of the railways by reason of street improvements merely closes an avenue through which the city fathers would be tempted to levy tribute.

The 50-year extension clause is bitterly attacked upon the ground that the term is too long, and that three per cent of the gross earnings is too little compensation.

The position taken by too many of our people is that of inviting capital to embrace an opportunity to invest with the proviso: "If you lose money, it is your own look out; if you make money, we shall take it away from you." Even if a corporation "has no body to be kicked and no soul to be damned," its stockholders have and should be protected against the irresponsible parties whom our people see fit to choose to make our laws and ordinances. The three per cent of the gross receipts, in addition to general taxes and licenses at present imposed, is an additional burden imposed upon the street railways, but it would be partly compensated for if it would secure exemption from burdens now imposed by the peoples' representatives in their private capacity from which the people receive no benefit.

The conditions that obtain in Illinois are no different from those existing elsewhere, but as this is about the only legislature which has not indulged in the sport of railway baiting, the amount of vituperation heaped upon these bills by the political "leaders" and particularly by candidates is very great. It is not proposed to rob the railways, hence the bills are bad.

It can easily be understood why the majority of the Chicago council are opposed to them—they cut off an important source of revenue, but it is remarkable that Mr. Harlan, the candidate for mayor of Chicago heading the "reform"

ticket, and a man who poses as honest in his purposes, should for the sake of gaining votes, deliberately mislead the public and falsify the fact, as he did a few days since in the following speech:

"Do you know that the dogs of Chicago—the common yellow curs that run about our alleys and shrink from carriage and street car wheels—are a greater source of revenue to the city of Chicago than are the miles and miles of street railways that fill our thoroughfares? Did any one ever tell you that the licenses issued to owners of dogs bring more money into the city treasury than all the fees that are paid by the cable and trolley lines? They don't wear out the pavements, they don't endanger human life, they make no money out of the people, and yet they do more to support the city government than the street car magnates, who pretend to the ownership of our streets."

The Chicago city controller gives the city receipts in 1896 from the dog tax as \$34,842, and the city receipts from street railways, exclusive of taxes, as \$317,068 (page 141 March REVIEW).

If Mr. Harlan will make such statements as this, what chance has the street railway with the other "reformers" who are trying to break into the city council!

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### THE SUBURBAN RAILROAD COMPANY, CHICAGO.

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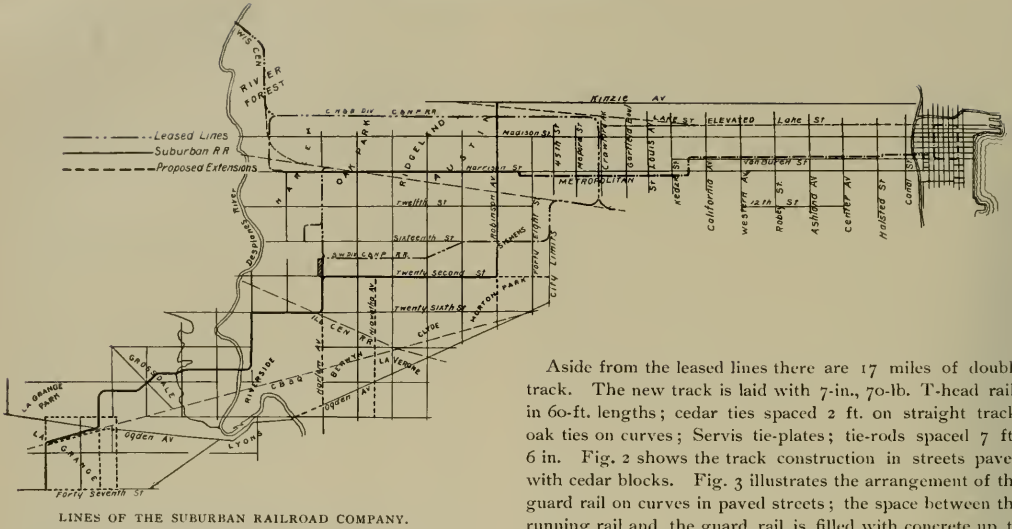
Although electric traction on suburban steam roads has been much discussed since its success on the Nastasket Beach road, the suburban lines of the Chicago & Northern Pacific Railroad were the next to be equipped electrically. The Suburban Railroad Company was incorporated May 8, 1895, to build and operate lines connecting the suburban towns to the west and southwest of Chicago with the terminus of the Metropolitan and of the Lake Street Elevated Railroads.

The capital stock authorized is \$1,250,000. The property is mortgaged to the Chicago Trust & Title Company as trustee to secure the payment of bonds, of which the issue is limited to \$3,000,000, to be issued as the construction progresses. The present officers of the company are: Charles H. Crossette, president; David B. Lyman, treasurer; Homer K. Galpin, secretary.

The company leased for a term of 50 years the Chicago, Harlem & Batavia and the Southwestern divisions of the Chicago & Northern Pacific Railroad, the two divisions comprising 9 miles of double track and 5.75 miles of single track; the lessee has the privilege of making the entire line double track. A more recent lease is that of 1.7 miles of single track of the Wisconsin Central, from its connection with the Northern Pacific at Viaduct Junction through River Forest to the Desplaines river. The rental for these lines is based upon the number of passengers carried, but the minimum rental is that due for 2,000,000 passengers annually. For the other portions of the line not over private right of way, the franchises are for periods of from 20 to 40 years.

The population of the towns lying west of West 48th street and served by the Suburban Railroad is about 175,000, and the estimated minimum traffic of 5,500 passengers per day appears to be a very reasonable one. The company proposes to run special funeral trains to the three large cemeteries, Concordia, Waldheim and Forest Home, which are reached by its lines; a conservative estimate of the traffic to these cemeteries is 1,000,000 passengers per year. The territory along the Desplaines river is very popular for picnics





LINES OF THE SUBURBAN RAILROAD COMPANY.

and the long suburban route and the loops will prove attractive for trolley parties.

It is intended to run trains consisting of motor car and one trailer at an average speed of 15 to 20 miles per hour on a 10-minute headway during the busy hours, and a 20-minute headway the remainder of the day.

The construction of the road was undertaken by the Suburban Construction Company of New Jersey, which contracted with Naugle, Holcomb & Co., of Chicago. This firm contracted to construct the track, overhead work, power

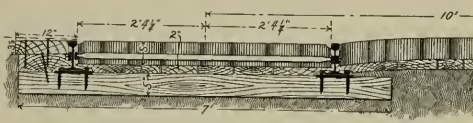


FIG. 2. TRACK IN PAVED STREETS.

house, furnish machinery, rolling stock, equip the road, and operate the same for two years from the date of completion; and took charge of the work December 3, 1896. Since that date Naugle, Holcomb & Co. have operated the leased lines of the Chicago & Northern Pacific by steam, using the main line from 40th street to the Grand Central Depot, under a temporary lease.

The engineer who has had charge of the design of the new work, as well as of the operation of leased lines is George Weston, manager of the construction department for Naugle, Holcomb & Co.

The map shows the system of the Suburban Railroad Company, the leased lines shown with dash and two dots and the companies' lines full, and also the Metropolitan Elevated over which the down-town district is reached. The company by making its entrance over this line is enabled to make use of the elevated Union Loop as its terminal. An approach to the Metropolitan at its terminus in 48th street is now building; it is contemplated to build a second one at the intersection of the main line at 40th street. These approaches are 820 ft. long with a grade of 2 1/2 per cent.

Aside from the leased lines there are 17 miles of double track. The new track is laid with 7-in., 70-lb. T-head rails in 60-ft. lengths; cedar ties spaced 2 ft. on straight track, oak ties on curves; Servis tie-plates; tie-rods spaced 7 ft., 6 in. Fig. 2 shows the track construction in streets paved with cedar blocks. Fig. 3 illustrates the arrangement of the guard rail on curves in paved streets; the space between the running rail and the guard rail is filled with concrete up to the tops of the cast iron distance blocks. About 40 per cent of the construction outside of the leased lines is over a private right of way making possible the use of the spiral curves shown in Fig. 4.

Current is supplied by overhead trolley wires, No. 00. Washburn & Moen furnished the wire and the Ohio Brass Company the insulators, trolley ears, etc. The present equipment consists of 14 motor and 10 trail cars. The motor cars are 42 ft., 6 in. over all with closed vestibules at the ends; 24 double seats of the Hale & Kilburn "walk-over" spring edged pattern, rattan covered; Gold hot water heaters. Push buttons are provided at each seat for signaling the motormen to stop. The trail cars are of the same dimensions but not vestibuled. The motor equipment consists of two 50-h. p. Walker motors. The controllers are of the series parallel type. The cars are mounted on two McGuire No. 26 trucks of 5 ft., 6 in. wheel base and 23 ft. between centers. The motors drive the forward and the rear axles of each car. Two trolleys are provided on each car, the rear one only taking the current; but as the third rail is used on the elevated portion of the route, the motor cars will also be equipped with shoes for taking the current in this manner. The cars are equipped with both hand and air brakes; the latter are furnished by the Christensen

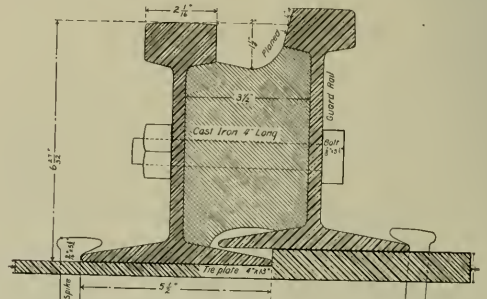


FIG. 3.—GUARD RAIL ON CURVES IN PAVED STREETS.

Engineering Company of Milwaukee, part axle-driven and part motor-driven compressors. The estimated weight of a motor car loaded is 38 to 40,000 lbs.; a trail car 30 to 34,000 lbs.

The power house and car barn are located at Harlem avenue and 22nd street. The layout of the buildings and tracks is shown in Fig. 5. Land being cheap the company could afford to arrange the car house and entrance tracks in this manner and gain the important advantage of removing the special work from the street and also that of permitting a car to be run into the car house for inspection or slight repairs, and out again to continue trip without loss of time by switching, etc.

The present power equipment comprises three 250-h. p. Stirling boilers, delivering steam to the engines at 125 lbs.,

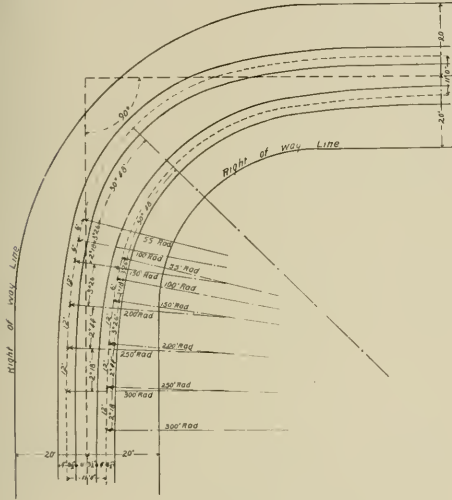


FIG. 4.—LAYOUT OF CURVES.

two tandem compound condensing engines, 17½ and 33 x 48 in. and 12 and 22 x 48 in. running 100 r. p. m. and direct connected to Walker generators of 400 and 250 k. w. capacity respectively. Deane jet condensers and pumps are used; Mesner stokers.

In the present building space is provided for engines and boilers for two more 100-k. w. units.

In the design of the boiler room there are several departures from the usual practice. The breeching is steel, lined with fire brick. The connection from each battery of boilers to the 16-in. steam header consists of a 12-in. wrought iron pipes bent in a semicircle of 7 ft., 6 in. radius. The openings admitting the furnace gases to the breeching are staggered, ensuring a better distribution of the currents toward the stack.

The stack is 115 ft. high above grade; the first 22 ft. of brick and the remainder of steel, 3¼-in. plates for 20 ft.; 1½-in. for 48 ft., 6 in.; ¼-in., for 56 ft., 7 in.; with the cap of ½-in. The height effective for draft is 113 ft., 6 in. The foundation extends 12 ft. below grade, the bottom course of concrete being 26 ft. square.

Near the stack is the house tank 12 ft. in diameter and 12 ft. high. Water is lifted to this tank from an 8-in. well 185 ft. deep by a Pohle air pump driven by a 10-h. p. electric motor.

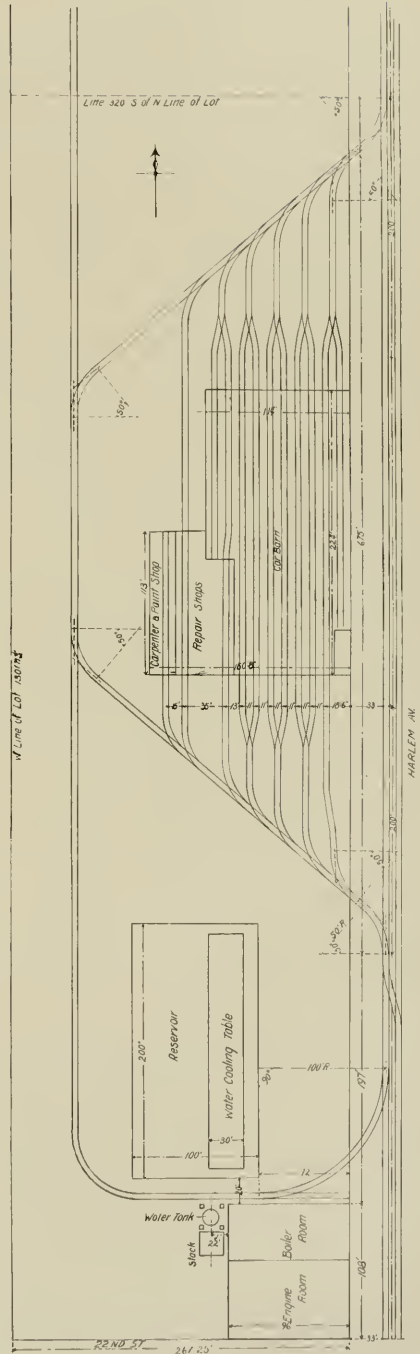


FIG. 5.—POWER HOUSE, CAR HOUSE AND SHOPS.

North of the power-house is a reservoir 100 x 200 ft., 7½ ft. deep with cooling tables for cooling the condensing water. The bottom is in blue clay and water tight. The sides have a slope of 1 on 1½ and are of concrete. To take the weight of these walls a concrete base was built. The bottom of the tank has been covered with crushed stone. The cooling tables are three in number 30 ft. wide and 184 ft. long, with a fall of 8 in. in 184 ft. These tables, one above the other and inclined in opposite directions, are of 2-in. matched flooring, laid on 2 x 10-in. joists spiked to 4 x 4-in. posts. There are three rows of these vertical posts 15 ft. apart; the posts in each row are 4 ft. between centres; at the bottom they are mortised into mud sills 8 x 12 in. extending along the bottom of the reservoir.

The system is divided into five portions; the first consisting of 5 miles of double track on the Chicago, Harlem & Batavia, is fed by two lines of 500,000 and 350,000 c. m. respectively; the second, comprising the remainder of the C. H. & B. and the Wisconsin Central line, by one of 350,000 and one of 216,000 c. m.; the Harrison street division has one feeder of 350,000 c. m.; and the remaining two divisions the Lagrange and the 22nd street, Robinson avenue and South-western (C. & N. P.), are each fed by two lines of 350,000 and 500,000 c. m. respectively.

The fact that the Wisconsin Central and the Suburban will operate trains over the same track, the one by steam and the other by electricity, has made necessary unusual precautions in the overhead construction. The Wisconsin Central specified that the trolley wire should be at least 22 ft. above the rails, and that the poles should be set at least 7 ft. from the outside of the rails. The poles are spaced 110 ft. apart. Along this branch, 1.7 miles, each pole has a cross-arm running in the direction of the track, to which two  $\frac{5}{16}$ -in. span wires are secured, being about 18 in. apart. The two wires are provided close together, so that if the trolley leaves its wire and strikes one of them, breaking it, it will in all probability be deflected downward by the reaction and pass under the second span without striking. Also at each pole a third span wire of  $\frac{1}{4}$ -in. steel is placed above the other two; these span wires support a  $\frac{1}{4}$ -in. steel wire parallel to and 21 in. above the trolley wire. Midway between poles the trolley wire is suspended from the longitudinal steel span wire by insulated hangers. Thus, if both the lower span wires should be broken the trolley wire would still be suspended at 110-ft. intervals. It is thought that this construction will protect brakemen on the steam trains from contact with live wires.

### THIRD AVENUE RAILROAD ABSORBS A STAGE LINE.

The Fifth Avenue Transportation Company has turned over to the Third Avenue Railroad the control of the stages which run from 88th street down 5th avenue to Washington square and thence down Broadway to Bleecker street. This service will be greatly improved by increasing the speed and making the coaches more pleasing in appearance. Transfers will be given between the horse car, cable lines and stage coaches.

Plans of a light railway from Kittybrewster to Oldmill have been filed by the Great North of Scotland Railway Company, which also is promoting the Skene & Echt Light Railway. The line will be 3 miles in length.

### MORE CAST WELDING IN CHICAGO.

During the coming season the Chicago City Railway will cast-weld the joints on about 25 miles of track; work was begun March 22, being done at night in order not to interfere with the regular traffic. In order to secure data as to cost of operating poor track, the company's dynamometer car, which was illustrated in the REVIEW for January, is run over the track before and after welding the joints. A representative of the REVIEW gladly accepted an invitation to accompany the trackmaster, Mr. Heidelberg and Mr. Price on the car's first trip out. Leaving 39th and Wallace streets at 1:30 a. m., a run was made on Wallace street to 29th and then east to South Canal, with the recording apparatus in gear, and then back over the other track. For hauling the dynagraph a motor car fitted with resistance coils for cutting down the current was used. The speed was about 6 miles per hour, which proved to be plenty fast enough for the comfort of the observers who were on the dynamometer car, which it may be remembered is unprovided with springs. The track on Wallace street was laid with 4½-in., 63-lb. rails about 9 years ago and was in good condition when electric cars began to operate over it in 1895; now the joints are in such bad shape that cars can not be run at more than 10 or 12 miles per hour for fear of derailment. The few blocks in 29th street is new track laid with 7-in., 83-lb. girder rails and as yet is in good condition, there being but few low joints. With the track on Wallace street there was no question as to whether the joints needed welding and the run was made merely to find out how expensive it is to operate over it, in its present condition.

### SINS IN CAR WIRING.

The REVIEW has several times called attention to a common carelessness in car wiring, a carelessness which, taking the United States over, results in numerous car fires in a year. But bad car wiring is more excusable in a street railway repair shop where some of the men may not know what is the most advanced practice, than it is in a car building shop where only the best work is supposed to be turned out. The car wiring that some car builders send out is a disgrace to the builder and a menace to property. A 500-volt grounded circuit is entitled to considerable respect but it is put in by some car builders in a way that insurance inspectors would not pass for a 50-volt circuit. This is a detail in car building that may well be looked after in car contract specifications and scrutinized carefully before accepting cars from the car builders.

### HANNIBAL STREET RAILWAY SOLD.

An eastern syndicate, represented by D. Thomson, of Ithaca, N. Y., has purchased the property of the Hannibal (Mo.) Street Railway Company. Many improvements and some extensions are contemplated, a new power house is to be built and a 300-h. p. engine with dynamo and boilers will be purchased. New lines to Riverside and Mt. Olivet cemeteries and to Oakwood are suggested. Indian Mound park will be made attractive for outing parties by constructing a dancing pavillion and refreshment booths. Mr. Thomson, the new manager has held a similar position with the Ithaca Railway & Electric Light Company. He is a brother of Elihu Thomson and a competent electrician.



## STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.

## Successful Gathering and Organization of the Accountants — Valuable Papers Read — Active Discussion — Imperative Need of Work in Standardizing.

A meeting of street railway accountants was held in Cleveland on March 23 and 24, and resulted in the permanent organization of the Street Railway Accountants' Association of America. All the preliminary work leading up to the date of assembling was done by the STREET RAILWAY REVIEW, and the results are equally gratifying to this publication, and to those present.

The meeting was well attended, particularly so for an organization meeting, and represented widely separated territory. Delegates were present from Minneapolis, Omaha, Toronto, Montreal, Boston, Baltimore, Washington, Augusta, Ga., Cincinnati, St. Louis and Chicago, and many cities within the range of the above.

As this was the first gathering ever had of members of the accounting departments, scarcely any one present had ever met more than one or two of the others, but no time was lost in becoming acquainted, and no convention was ever more pleasant and harmonious in all its details than was this. The whole proceedings were conducted with that systematic and business-like thoroughness which characterizes the daily official life of the delegates, and the amount of work accomplished in the brief space of two days was at once astonishing and highly creditable. Every one took hold with an earnestness and determination which showed unmistakably he was there for business, and the convention had not been in session 15 minutes when it was plainly evident that the Accountants' Association would be a great success. The meeting was fortunate in its selection of temporary officers, though there was no disposition to wander from the subject under discussion. When a question came up it was strictly adhered to until it was thoroughly discussed and then it was laid aside. The enthusiasm of all present, their willingness to take part and in short to do cheerfully whatever was to be done, was specially noticeable and reflects great credit on the new organization, which is now equipped for work. The value and amount of that work is now realized and appreciated as never before, after having had this opportunity to exchange ideas the Accountants' Association is beyond any question destined to prove of inestimable value to street railways, and to the American Street Railway Association. It has a work to do which the American has never yet been able to do, and which each year with its own growing labors will be less and less able to accomplish. But the new work is now plainly seen to be in no respect less valuable and necessary from now on, than has been the splendid record of the older society. The operating department is constantly increasing its demands upon the accounting department for data, present and past, and to evolve the most perfect yet economical methods of accomplishing this, is one of the things the new association finds to do.

## Tuesday Morning.

The rain was busily falling outside when the accountants assembled in the banquet room of the Hollenden, but failed to dampen the ardor of the delegates assembled. Introductions occupied an hour, and shortly after the arrival of the eastern trains the meeting was called to order at 11

o'clock, by H. H. Windsor, of the STREET RAILWAY REVIEW, who spoke as follows:

Gentlemen, the pleasant duty seems to have devolved upon me to call to order the first national gathering ever held of street railway accountants, and in doing so I congratulate you on the presence of so many earnest workers in this particular branch of street railway work. In this connection a few words as to the events which have culminated in this meeting may not be without interest. On November 23, last, just four months ago today, Mr. Brockway, auditor of the Toledo, Bowling Green & Fremont Railway Company, wrote me expressing the wish that a national gathering of the auditors of interurban roads might be brought about. He modestly insisted that his name should not be mentioned, so we will omit that.

On studying the matter, however, it was found so few roads comparatively are exclusively interurban, and even these in most cases use the tracks of urban companies to get into the city, making the relations of both very intimate for the accounting, even more than for the operating department; and in view of the fact that the need has long been felt for an effort toward standardizing accounts, it was decided that the accounting departments of all street railways should be invited to meet. Further correspondence resulted in a majority expressing a choice for the city of Cleveland as a central meeting point, and the latter part of March as the time. During the evolution of things an impression was erroneously conceived by some that the proposed organization might in some way prove antagonistic, or at least competitive with the American Street Railway Association. This was doubtless caused by this meeting for organization being called in March when the American Association always meets in October.

Right here let it be said, the idea of something in the way of a separate or individual association for the accountants was occasioned in this way. In the American Association almost all the time is occupied by the operating departments, leaving practically no time available for the accounting departments. The work of the American has grown larger each year and will continue to do so, making it more and more difficult to assign sufficient time to suitably take care of the accountants' interests. Again, the work of the operating and accounting department while intimate at many points, is in the main radically different, just as banking and manufacturing are related, but distinct. What most interests the operating men, and for which they attend conventions, is of little help to the accountant, and conversely, what would be meat to the accountants would be crumbs to the operators.

Hence the necessity and desirability of at least a separate meeting room and a distinctively accounting program. The very urgent need of getting the work started so that committees can be appointed at this meeting, and have the intervening months between now and October in which to work, was deemed sufficient to warrant a gathering now. \* \* \*

The first business before the house is the election of temporary chairman, and nominations are now in order.

Mr. Duffy: I nominate Morris W. Hall, of Camden, for the position of Chairman.

Mr. Hall: I thank you very much for your kindness; but I prefer that some more aged person be put in this position.

Mr. Windsor: We will put the age on for you if you come up here.

The question was then put on the nomination, and Mr. Hall was unanimously chosen Temporary Chairman.

Mr. Windsor: Mr. Hall, please come forward and take the chair. Gentlemen, Mr. Hall, of Camden.

Chairman Hall: Gentlemen, I thank you very much for this honor which you have conferred upon me. It is entirely unexpected. This is the first time I have ever had the pleas-

ure of meeting with my associates in the street railway work. It has been the privilege of the higher officers of our company to attend the conventions of the Street Railway Association. I have not been to them, with one exception, the Buffalo meeting, held in 1890.

I felt when I received the notice concerning this proposed organization, that it was a good thing for us to come together and exchange ideas and opinions in regard to the affairs of our companies which come under our supervision; and I hope that this meeting will prove to be what we all expect it to be. (Applause.)



M. W. HALL.

The next business in order will be the election of a Secretary pro tem.

Mr. Smith: I nominate W. B. Brockway, of Toledo. He was the first gentleman to suggest the formation of this association, and it is proper he should keep it up to date.

The question was then put on the nomination, and Mr. Brockway was unanimously chosen Temporary Secretary.

The Chairman: It will be in order, I presume, to have a speech from Mr. Brockway.

The Secretary: I made my speech as I was coming down the aisle. I said objections didn't go. I don't think a speech is necessary, and it is suggested that these slips be passed around for the names and addresses of all the gentlemen present, so that we will have a complete list of those in attendance.

The slips were then handed around and the record of those present made.

The Chairman: We will now listen to the reading of the names of

#### Those in Attendance.

Morris W. Hall, Secretary Camden & Suburban Railway Co. Camden, N. J.

M. C. Lytle, Wadsworth, Ohio.

W. W. Herrick, Adjuster Cleveland Electric Railway Company, Cleveland, O.

Frank R. Greene, Secretary Chicago City Railway Company.

A. F. Walker, Allentown & Lehigh Valley Traction Company, Allentown, Pa.

William P. Ham, Secretary Nassau Electric Railroad Company, Brooklyn, N. Y.

D. A. Keister, Auditor for the Marion City Railway Company, Marion, Ind.

W. B. Brockway, Auditor Toledo, Bowling Green & Fremont Railway, Toledo, O.

F. S. Borton, Secretary Akron, Bedford & Cleveland Railroad Company; Painesville & Eastern Railroad Company, Cleveland, O.

F. E. Smith, Auditor Lynn & Boston Railroad, Lynn, Mass.

Charles L. Wight, Auditor Toledo Traction Company, Toledo, O.

J. F. Calderwood, Auditor Twin City Rapid Transit Company, Minneapolis Street Railway Company, Minneapolis, Minn. The St. Paul City Railway Company, St. Paul, Minn.

E. S. Doud, Secretary Lehigh Traction Company, Hazleton, Penn. H. C. McJilton, Secretary Baltimore Traction Company, Baltimore, Md.

W. R. Avery, Auditor Cincinnati Street Railway Company, Cincinnati, O.

P. V. Burington, The Columbus Street Railway Company, Columbus, O.

W. G. Ross, Comptroller Montreal Street Railway Company, Montreal.

J. M. Smith, Comptroller Toronto Railway Company, Toronto, Ontario.

A. L. Linn, Jr, Book-keeper, Cleveland Electric Railway Company, Cleveland, O.

A. T. Walter, Secretary and Treasurer Allentown & Lehigh Valley Traction Company, Allentown, Pa.

Dana Stevens, Accountant Belt Railway Company, Eckington & Soldiers' Home Railway Company, Maryland & Washington Railway Company, Washington, D. C.

C. R. Keavis, Secretary and Auditor Augusta Railway & Electric Company, Augusta, Ga.

E. D. Hibbs, Auditor Consolidated Traction Company, Jersey City, N. J.

John Erhardt, Assistant Secretary Cleveland City Railway Company, Cleveland, O.

F. T. Pomeroy, General Manager and Treasurer Cleveland, Berea & Elyria Railway, Cleveland, O.

H. J. Davies, Assistant Secretary and Treasurer Cleveland Electric Railway Company, Cleveland, O.

W. G. McDole, Auditor Cleveland Electric Railway, Cleveland, O.

E. R. L. Tighe, Accountant Brooklyn Rapid Transit Company, Brooklyn, N. Y.

Walter N. Barnaby, Chief Accountant Brooklyn Heights Railway Company, Brooklyn, N. Y.

H. L. Wilson, Auditor West End Street Railway Company, Boston, Mass.

W. S. Dimmock, General Superintendent Omaha & Council Bluffs Railway & Bridge Company, Council Bluffs, Iowa.

C. N. Duffy, Secretary & Treasurer Citizens Railway Company, St. Louis, Mo.

Robert V. McCullough, Cashier Southern Electric Railway Company, St. Louis, Mo.

Henry H. Windsor, Street Railway Review, Chicago.

Edward E. Higgins, Street Railway Journal, New York city.

T. E. Crossman, Official Stenographer, Brooklyn, N. Y.

The Chairman: We shall now have the pleasure of listening to the first paper on the programme, by Mr. Wilson.

Mr. Wilson: When I was requested to write a paper on this subject, I consented without giving it much thought. Upon being able to take up the matter a few days ago, I found it was apt to be an introduction to everything that was to follow, and my payer will about cover that, and nothing more, I think.

#### From Horse Car to Electric Accounts.

BY H. L. WILSON, AUDITOR WEST END STREET RAILWAY, BOSTON

The first horse railways for the transportation of passengers of which there seems to be any record, were used in England early in the present century. These, however, were not operated on the street, but over private ways similar to the present steam railroads.

The system of transporting passengers by street cars may be said to be an American invention, as the first successful horse railway for this service was established in New York city in 1852.

We can, therefore, safely assume that the first accounts ever kept in our business were started at that time.

From the time the first horse railway started to the present the accounting methods have, no doubt, steadily advanced, but have probably progressed more during the last eight or ten years, or since the new method of electric motive power has been in use, than during the previous thirty-five. The accounting methods in nearly all lines with which I am familiar have improved lately, but perhaps in no business as rapidly as in this, and it is a great pleasure to say that the importance of this department is now generally appreciated. Some people think that neglect in this branch is as fatal to the success of a company as neglect in the operating division, as it should be a complete and perfect check on the skill and economy shown by every department. The people interested in it are not only the managers, directors, stockholders and railroad commissioners, but also bankers, investors and creditors, and I am sorry to say sometimes lawyers, judges and receivers.

At the present time there is no branch of accounting that does not come within the scope of street railways. It is necessary, or at least desirable, to have some knowledge, not only of what might be termed

commercial bookkeeping, but also of manufacturing, banking and insurance, as they all enter in a greater or lesser degree in railway accounts.

In the earlier days of the horse railways the stockholder's only interest seemed to be the answer to the question, "Is or is not the usual dividend to be paid?" and the management did not seem to care to know much more.

This is not true in all instances, but was in a majority of cases. I regret to say that even at this time there are some companies of considerable magnitude which keep what books they have in such a slack way that it would be impossible for any one to tell what their condition is by an examination of what they call their accounts.

As an instance, I have been told within three weeks of a company of considerable size in one of our largest cities which has paid on bills, rendered in different forms, three times for the equipment, and yet does not know it. It is easy to judge what might be done with that road under proper management of the accounting department.

The property accounts of the horse railways were generally few in number, and in most instances were only divided into Real Estate, Construction, and Equipment. At the present time the directors or officers of most roads who represent millions of invested capital in property of this kind where before it was only tens or hundreds of thousands, wish to know: What car houses, equipment of same, power stations, steam and electrical equipment of same, track, poles, overhead trolley lines, overhead feeder lines, feeder conduits, feeder cables for same, cars, trucks, motors, snow plows and other vehicles, machinery, tools, etc., cost, and in some instances want even greater detail than the above, or, in other words, what the different kinds or methods of construction cost in certain streets or districts, and what the different makes of equipment cost. To one who has not had the experience it may seem very much a task to keep all this information, but it is often very surprising to find how much can be accomplished with system when it is thoroughly understood. It is, of course, necessary to have more or less help from the men who are actively engaged upon the work. As a general rule they do not appreciate the importance of the accounting department, but will, in most instances, do all in their power when a system is laid out for them to follow, if it is not too complicated, and as these men are not hired for their ability to consider these matters any more than we are to build or equip the road, care should be used to make them as little trouble as possible.

While the accountant may not be employed for his knowledge about the practical mechanical construction, or operation of the railway, he will find that in many ways it is very desirable to obtain as much information on these subjects as possible. If he is able to discuss understandingly with the managers and heads of departments about the construction, equipment and operation, it will be found very much easier to keep records and accounts that will be valuable to all the parties interested in the management of the company.

At times it often appears as though the amount of detail which some companies have is more than would ever be required, but no one can tell when they may be asked to give some particular item of information and when the time does come the person requesting it is almost sure to be in a hurry and is usually very much surprised if it cannot be finished at once.

The managing director of a consolidated road in one of the large cities was in our office one afternoon when the president sent word that he wanted to know the number of feet and kind of track built on each street since the road was consolidated, and when word was sent back that the statement would be ready the following morning, he seemed very much surprised. He wanted to know if similar questions could be answered as promptly, and when told that they probably could, made the remark, "It must be a happy board of managers that can ask such questions and receive answers so promptly." It was only about a year afterward that the company which this gentleman represented was forced to go into the hands of a receiver. Possibly if its accounts had been kept in a different manner, its condition might have been brought so forcibly before it at some earlier date that this could have been avoided. If not there might have been some records that would have been of much value to the parties who reorganized the company.

In this connection it seems to me to be a very important part of the accountant's duty to make all the entries on the books so very plain and explicit that if referred to years afterward or by another person there can be no question about the meaning.

In the days of horse railways there were some companies, generally

owned by one or two men, who cared to keep few or no accounts. They knew how much money it cost to start their business and after that the only thing they thought of was how much they could get out of it. In one large city in the west that I know of, there was a road of this kind, where, so I have been informed, the man who practically owned it would walk into the office while the conductors' returns were being counted and help himself to whatever cash he desired. Whether he wanted it for the business of the company or for private use was never known. It is unnecessary to state that the books in this office were never balanced, and yet the owner grew rich and sold the road for about two million dollars. The condition of the equipment can readily be imagined when the riding public used to claim that the cars were devoted to them during the day and used to stable the mules in at night. The best managed roads kept comparatively few accounts, those in charge being generally satisfied if they knew what it cost to repair track, to repair cars, to repair buildings, to feed horses, to repair harness and general equipment, and to pay for operating labor. You might almost say this is as much as they know now, but the detail in any large, well managed company is kept in such a manner that these accounts are so sub-divided that very much more is available and constantly required.

John Locke, the eminent English philosopher once wrote. "The skill of keeping accounts is a business of reason more than of arithmetic." I think when a system is to be started that "reason" should enter very largely into it.

First. What is it we want to know?

Second. What is the shortest and best way of obtaining this information?

When the electric roads started, the first question was a very hard one to answer, and I think most companies found before long that they had more or less complete records of what they did not care particularly to know, and not enough of what they should have liked to have found out.

When anything new is introduced the projectors always claim a great deal and the electric companies which wished to introduce this system on the street railways were certainly no exception to this rule. The important thing to find out was whether or not all their claims could be substantiated, and this was where the accountant's duties began. As the company with which I am connected was the first to take hold of this new system of propulsion on a large scale, our experience may be as interesting as any.

The first line was built and the cars equipped by the electric company and it guaranteed to keep the equipment in order for a specified sum per car-mile.

Very shortly after, it wanted to pass this business over to the company, and it was agreed to take it. Naturally the managers and directors were anxious to see if they could do this work as cheaply as was claimed, that they might have some basis on which to work when they considered the advisability of adopting this method on other lines. The next time any new equipment was added it was of an improved pattern and the question came up, How much cheaper can this be maintained than has been the former? Improvements came along so very fast in the early days that this was considerable of an undertaking, but the information obtained proved so valuable that it is practically continued to the present time with constantly improving methods, which makes the same information available with very much less work.

When the electric road was in its infancy it was frequently almost an impossibility to get many of the small parts necessary to maintain the equipment, as most of the manufacturing companies were bending all their energies to get out complete new equipments. In many instances when parts were obtained the price seemed to be out of all reason. This drove some of the larger companies to the necessity of establishing what might almost be termed manufacturing plants, and this of course added new features to street railway accounting.

The more important companies as a general rule now divide their operating expenses into a large number of accounts, but how many they might have at this time if horse power had been continued is mere conjecture.

General expenses which can be, and in most instances are, separated into such accounts as salaries of officers and clerks, general expenses of offices, stationery and printing, legal expenses, inspector's services and expenses, insurance, rents, etc., would apply equally well to either.

The material and labor used in the maintenance of buildings was generally included in one account in the old days, but in many



instances is now subdivided into such accounts as repairs of car-houses, repairs of shops, repairs of power station buildings, repairs of miscellaneous buildings, and sometimes a separate account is provided for such items as maintenance of miscellaneous fences, sewers, etc.

The maintenance of track is now one of the most important accounts with which electric railways have to deal, and is capable of considerable analysis with good results. The total cost of this work on the West End Street Railway for the last fiscal year was over \$938,000, and this was separated into such accounts as superintendence, engineering and general expenses; labor, repairing track; labor, paving track; labor of teamsters; labor of watchmen, etc.; timber and ties; rails and fastenings; frogs, switches and guard rails; paving blocks; sand, gravel and cement; maintenance of track department carts and vehicles; maintenance of track tools and equipment; use of horses and miscellaneous expenses.

A small road would not care for all this information, but when the expenditures amount to almost a million dollars in any one department it is well to know for what it has been expended.

Experts when called upon in the early days decided that the wear and tear upon the tracks by electric cars was about 45 per cent greater than by horse cars, but the accounts show that this was underestimated, as the cost of the material and labor that goes to make up a mile of track in a large city at the present time would build several miles of old construction, and the life of the latter would be much longer if operated in the old way.

Maintenance of rolling stock was in most instances in the old days one account, but at the present time is generally so separated that those operating the company know what it costs to maintain the car bodies, the car trucks, the car fenders, the snow plows, and carriages, wagons and vehicles, and in some instances these are so divided that the cost of the summer or open car equipment, and the winter, or closed car equipment, is kept separate.

The principal difference in the operating expenses of the old companies and the new, comes in the subdivision of what goes to make up the cost of motive power. In the days of animal power, there was at most, provender and bedding, shoeing, veterinary, harness repairs, horse renewals and stable labor. Today there is labor in power stations, fuel, oil, water and miscellaneous supplies for power stations, maintenance of steam equipment of power stations, maintenance of electric equipment of power stations, maintenance of underground conduits, maintenance of underground cables, maintenance of overhead feeder lines, maintenance of poles, maintenance of overhead trolley lines, maintenance of track wiring or bonds, maintenance of motor armatures and fields, maintenance of motor gearing, miscellaneous maintenance of motors, maintenance of controllers or rheostats, and maintenance of trolleys.

The cost of power furnished from the stations is also capable of considerable analysis and quite often with very good results. Where there is more than one station, the cost per mile, or per car-hour, or both, or total cost per kilowatt-hour is information which it is often desirable to know. Some want to know the amount of water that is evaporated per pound of coal consumed, or cost of coal per kilowatt-hour, or answers to some similar questions.

This not only gives a basis for comparison between the different power stations on the company's own road, but if another corporation is willing to give its cost of operation there is an opportunity to compare the plants and the results often give some valuable knowledge as to what kind of boilers, engines or generators it is for the advantage of the road to purchase for some contemplated addition or new station.

Many of the horse railway companies kept a separate account of the cost per day or per meal of feeding horses in the different stables in order to compare the efficiency of the men in charge. The condition of the animals was, of course, a very good check, as if neglected in any way it would at once be apparent.

If the maintenance of motor accounts are kept separately by car houses and the total cost computed per car-mile run, it gives an extremely good comparison of what the different foremen in the car houses are capable of doing with the mechanical equipment in their care, as if a man is extravagant it is immediately detected and as they know that their expenditures are being closely followed they are extremely careful of both their material and labor, yet realize their work cannot be neglected as a delay on the street is now much more serious than it used to be.

This information is not only valuable for the purpose mentioned

above, but also as a basis of deciding when it is cheaper to buy new equipment than to continue operating the old, and the accounts are the only way that this knowledge can be obtained.

To some of those engaged in the business in the past, the present methods seem altogether foolish, as I found one day when a gentleman who was formerly the chief accountant of the largest horse railway in this country called upon me, after devoting about twenty minutes to looking over the methods used in the office, he informed me that it was all very pretty but that it was all nonsense.

The revenue accounts have received considerable consideration lately and this, to my mind, is a very important department of the accounts.

Not only is it important from the standpoint of the company, but equally so from that of the conductor, who has a large personal interest in knowing that he is to be protected as well as the corporation. No one is infallible, and if the collector of fares thinks a mistake had been made in the office he should be encouraged rather than blamed if he wishes to look the matter up. If he should call and the error is found to be a mistake of the clerical force it gives him a very bad impression and in the long run probably acts to the disadvantage of the company, as his experience will be thoroughly talked over by the men in the lobby of his car house and perhaps travel over the entire division.

On the other hand, if the seeker after information meets with a rebuff he is very sure that he has been cheated and is liable to try to get square with the company. The force in the office working in this department should, therefore, use every care possible to avoid mistakes and be sure and treat the conductor with proper courtesy if he wishes to investigate any shortage with which he may have been charged.

It is only within comparatively recent years that a registering device for fares has been in use on street railways. When this was first introduced in Boston, many conductors resigned, claiming that it was implying that they were dishonest, but at the present time any honest man ought to feel that this is only a mechanical device to help him keep his accounts.

The total miscellaneous earnings of many companies are divided among the different lines, but on some where the routes number away up in the hundreds and in many instance run over tracks used by several other lines, this is found impracticable. The best way that I know of to keep well informed about what the different lines are doing is to make a report once or twice a month of the passenger earnings per-car mile on each route operated. If this is done anyone interested can see at a glance whether the number of trips should be increased or diminished or allowed to remain as they are, and if the patrons claim that they are not having the facilities that their patronage warrants, this record will at once prove or disprove their claim. If it is figured only by trips it hardly give a fair comparison on a large road where the lengths of the rides vary.

Some of the largest companies have several divisions, any one of which is as large as a majority of the roads now operated, and have a separate superintendent in charge of each. Where this is the case if the transportation expenses are divided and the cost figured per car-mile run, the manager has an opportunity of knowing what his subordinates are doing. Of course when comparisons of this kind are made it is necessary to take into consideration the territory operated by the different divisions, as one might be largely in the crowded streets of the city, while the large part of the mileage of another might be made over suburban lines where the speed would make a considerable difference both in the earnings and expenses.

In many places the opinion prevails that an electric road is a veritable gold mine and that the management can afford to do almost anything in the way of extension of lines, and improvement of facilities as well as pay large sums for taxes of different kinds, and perhaps maintain the streets through which the cars are operated. One of the most important things that the accounts are frequently called upon to prove is that the company is doing all that ought to be expected of it considering the amount invested, the operating expenses, and the patronage given by the riding public.

Mr. Avery: I move that the report be received and placed in the record of the meeting, and the thanks of the meeting be tendered to the reader. Carried.

The Chairman: The next on our program is a paper on "Useful and Useless Classifications" by E. D. Hibbs,

auditor of the Consolidated Traction Company, Jersey City. I have just learned that the gentlemen is not present.

Mr. Hibbs (entering the room): Mr. Hibbs has just arrived. Gentlemen, I must claim your indulgence in this matter. I am sorry I have not prepared a paper. I did not until yesterday noon expect to be here. I have been busy with our annual meeting which occurred yesterday, and if you will accept my excuse this time, it will not occur again, I assure you.

The appointment of committees was then taken up, the number of members, on motion of Mr. Tighe, being placed at five. Committees were as follows:

#### Committee on Organization.

FRED. E. SMITH, Lynn, Mass.  
C. N. DUFFY, St. Louis, Mo.  
H. H. WINDSOR, Chicago, Ill.  
J. F. CALDERWOOD, St. Paul, Minn.  
WILLIAM F. HAM, Brooklyn, N. Y.

#### Committee on Nominations.

P. V. BURINGTON, Columbus, O.  
E. D. HIBBS, Jersey City, N. J.  
FRANK R. GREENE, Chicago, Ill.  
F. T. POMEROY, Cleveland, O.  
E. R. L. TIGHE, Brooklyn, N. Y.

The Chairman: We will now listen to Mr. Duffy's paper.

#### Suggestions for a Standard System of Accounts, Classification of Operating Expense Accounts, and Form of Report that Will Admit of Comparison and Diffuse Information between Companies.

C. N. DUFFY, SECRETARY & TREASURER CITIZENS STREET RAILWAY, ST. LOUIS.

When notified that I was expected to prepare and read a paper at the organization of the Street Railway Accountants, I signified my willingness to do so on the above named subject, with the understanding that the paper would be in the form of suggestions, with a view of opening the way to a thorough discussion. Fully appreciating the magnitude and importance of the subject and the task I have assumed in offering to present suggestions I ask your kind indulgence in the consideration of them.

Beyond any question of a doubt, I think it will be admitted by all the gentlemen present, as well as the operating officials at home, that a "Standard System of Accounts, Classification of Operating Expense Accounts, and Forms of Report that will admit of comparison and diffuse information between companies," is not only desirable, but a consummation most devoutly to be wished for. The operating officials meet annually to talk on all questions pertaining to the operations of their roads, read, listen to and discuss papers, exchange opinions and experiences, but have no means of knowing if they profit by the information received and imparted, by a comparison of results as would be possible with the adoption of a standard system. To demonstrate the truth of this statement, I will say that recently the general manager of one company in sending the annual report of his company to another general manager, took occasion to say that there was very little statistical information of interest or practical value in the report; that he would be glad to exchange information of this character with his correspondent, and hoped to see some form of report adopted by the members of the American Street Railway Association, that would provide for an exchange of such information.

It would be entirely practical to adopt a standard system, notwithstanding the objections we may all have to making changes. This need not prove a stumbling block, as a standard system could be conformed to without changing the methods and system now in use on any one road, provided, however, that the accounting officer would arrange his figures to conform with such standard as may be agreed upon, supplementing his present system with what would be found necessary to take care of such changed conditions as he may have to meet. For example, if any particular road objects to abandoning or changing its present system because the officers, directors and stock-

holders are familiar with it and can more readily comprehend and understand the figures, because they would not be willing to throw away the ruled account books, form of report, etc., now in use, or because they are obliged to keep their books and accounts as prescribed by a state board of railroad commissioners, as I understand is the case in some states; or for any other reason, it would be perfectly feasible and practical for the accounting officer to follow the classification of operating expense accounts as adopted, arrange his figures to conform with the same on blanks prepared for that purpose, leave his present methods and system unchanged and conform with a standard system, as well. Unquestionably it would be far better for all to follow completely from beginning to end any standard system that would be adopted, but it must be remembered that it may not be possible on some roads to do this.

With regard to the question of methods and systems now in use. One of the first things that suggests itself is the method of charging in operating expense accounts, purchases of material and supplies. On some roads it is the custom to charge such purchases when the goods are received, on others when the bills are paid, on others when the goods are used. Undoubtedly the last named is the only method that is absolutely correct, but it is not possible to use this method unless the road has a storekeeping system, which, of course, is the proper and best system. Small roads cannot afford the expense of a storekeeping system, as it is useless to have a storeroom without a complete system of bookkeeping and checking. The argument that unless goods are charged only when used, that the exact cost of operating for any one month cannot be determined is true, but is not of such great importance. The result of the year is what we all look to, and not of any one month. Besides, in order to get at even an approximation of the exact cost of operation for one month, it is necessary to estimate and prorate the month's proportion of the yearly expense of water license, taxes, insurance, interest and extra weekly pay rolls on roads that pay their employes weekly. Then, too, there is the damage account. With the liberality so characteristic of the juries of the present day a road may be called upon to pay and charge up in one month a sum equal to the average amount of any year. This is a condition that every road is ever confronted with, and one that cannot be controlled. On some roads the month's proportion of the estimated amount that will be charged up to damages in the year is prorated and carried like insurance, taxes, etc. Take the items of coal for heating cars and salt for track. On the majority of roads it is customary to buy these articles in large quantities in the fall of the year, pay the bills then, charge them on the office books to the accounts they properly belong to, and not put them on the storeroom books. On some roads, where purchases of material and supplies are charged when the bills are paid, the bills being paid regularly each month, purchases are made to conform with what a month's requirements are. I know of one system with a total expense account of \$765,000 in the year 1896, where the purchases of material and supplies of every kind charged in operating expenses were only 12 per cent of the total expenses; of that amount 40 per cent was for power house coal. Whatever may be the practice in vogue on any road as to the charging of supply bills, it will not affect the adoption and use of a standard system, but uniformity of methods is desirable, if not absolutely necessary, to accomplish the results to be attained.

The one object that should be uppermost in the mind of the accounting officer of a street railway, is to keep his operating expense accounts in such a way that the management of the road will profit by the information. In order to have a classification of operating expense accounts that will admit of this, there is great danger of having too much subdivision and itemization. This necessitates not only a mass of figures, but a corresponding amount of detail work that sometimes proves unwieldy. Another source of trouble is the difficulty of putting into practical operation any system or standard that may be adopted. I refer to the dependent position occupied by the accountant with reference to the necessary information and discrimination that must be relied upon from subordinates and heads of departments as to the basis of charges. This is especially true of



C. N. DUFFY.



pay roll charges. Printed classification books and special ruled and printed time books do not remove the difficulty. It is one thing to have a theoretically perfect system, another to have it properly carried out. Whilst this is true, it is highly essential for the accountant to have a system that will show in a comprehensive and practical way just how the money of the company is being spent, comparatively with the preceding year, with such details of statistics that he can answer any question put to him.

Above all the accountant should be something more than a mere book-keeping machine. He should be thoroughly posted on the affairs of the company and have a general knowledge of the operation of the road in all departments. Without these qualifications his sphere of usefulness and the value of his services will necessarily be limited.

One of the problems that is perplexing and troublesome to solve in actual practice, is the separation of maintenance charges from operation or transportation charges. On this question there is a difference of opinion as to what properly constitutes a charge to either one, separately. Some hold that certain expenses of the electrical plant, the car, motors and electrical car equipments, track and roadway are operation or transportation charges and not maintenance charges.

Others contend that such expenses are maintenance charges, for example, carbon brushes for the dynamos, repairs and renewals of fare registers, trolley cord, motor brushes, etc., are classed operation or transportation expenses by some, because these expenses are incurred or rendered necessary by the operation of the cars. Others argue that every expense of this kind is a maintenance expense, because it was incurred and rendered necessary in order to maintain the dynamos, fare registers, cars, motors, etc., in perfect condition, or in the same condition as prevailed when the operation of the road commenced, notwithstanding that the wear and tear was incidental to, and the result of operation of the cars. With regard to track and roadway the same difference of opinion and practice exists. The expense of cleaning and sanding the track and removing snow and ice is considered by some a maintenance expense, by others an operation or transportation expense. It appears to me that the expenses of the electrical plant, the cars, motors and electrical car equipments previously referred to are properly maintenance charges; the expense of cleaning and sanding the track, removing snow and ice, operation or transportation charges. This question of distinction between maintenance and operation or transportation charges is one that could be discussed to such length that our patience would be exhausted and our minds brought to a state of hopeless confusion. This distinction and the application of it applies not only to those items previously spoken of, but to many others. For example, shop machinery, tools and appliances, water, sand, and salt cars, snow plows, sweepers and scrapers, wagons and vehicles. It is the universal practice I believe, to charge to "Maintenance of Buildings," all expenses incurred in connection with the repairing of buildings. Some accountants keep a separation of power-houses, repair shops, car houses, stables, offices, etc., others do not. If it is thought proper to transfer the cost of maintaining any particular building or buildings to the account chargeable for its use in order to ascertain the total expense of that account, as for instance, power-houses to cost of producing power, car houses to the cost of operating the cars, etc., the separation should be made. Again we are confronted with the problem of making the proper distinction, as there will of necessity be charges to both maintenance and operation or transportation, in "Maintenance of Buildings" account. In the operation of the road, this question of distinction between charges is not one of great moment, although it is desirable that the lines should be closely drawn, that the separation will be clearly defined and as distinctly made as possible. Regardless of the separation of maintenance from operation or transportation, the practical general manager would probably be more interested in knowing, and the accountant should be able to tell him, the cost of power per kilowatt-hour, per mile, per passenger; the cost of repairs and renewals of the steam and electrical plant, with such itemization as would be considered important; the cost of fuel, water, lubrication, supplies and tools; the cost of lighting the power-house building and such other information concerning the operation of the power plant, as he may desire, the cost of each car, and car equipment per car-mile and per passenger separately, making a separation of car bodies, trucks, fixtures, and trimmings; the cost of wheels, brake shoes, painting, glass, seats, curtains, registers, etc.; the cost of oiling, lighting, cleaning and heating a car; the cost of lubricating the motors, the cost in detail of the different parts of the motors and car equipments; the cost of

the track per single mile, the track and the roadway, the line, the expense of watering, sanding, salting and cleaning separately; making a separation of the ties, rails, fastenings, joints, special work, paving, crushed stone and ballast, etc., with such other details and statistics as may be found valuable or important.

On the question of statistical information concerning the operating expenses of a road per car, per car-mile, per passenger, per mile of single track operated, conditions must be taken into consideration and complete data pertaining to them fully and explicitly set forth. It is important to know the kind of cars in use, whether single or double truck and how many of each, the number of open and the number of closed cars, the size of the car bodies, whether or not trail cars are operated, the type and capacity of motors, the number of car-miles made over each mile of single track operated, showing the motor and trailer miles separately, the passengers carried per car-mile, giving the adults and children, fare and transfer passengers, separately. The car-mile unit appears to be the only basis to figure on, but for the purpose of comparing results, it is sometimes misleading and unsatisfactory by reason of the conditions previously referred to.

Sometime ago a road operating double truck closed motor cars and single truck closed motor cars with closed and open trail cars, for its own information and education, gathered data and statistics to determine which was the best kind of car to operate, from every standpoint. In making up the figures it was found that the only way in which a comparison could be made with any degree of correctness or satisfaction, was to figure on the seating capacity available with each style of car operated. It must not be inferred from this that the basis of figuring operating expenses should be per passenger carried per car-mile, and not per car-mile run, as roads enjoying a heavy traffic would have a great advantage over those having a light traffic and there could be such a thing as running car-miles without carrying passengers.

With reference to construction and equipment accounts, too much care cannot be exercised in making charges. Frequently the management of roads charges to construction and equipment, expenses that properly belong in operation. This is all wrong and should not be done under any circumstances. This practice is apt to prevail on roads that do not make a favorable showing. Any expenditure that is not not absolutely and actually an increase, betterment or addition to the property of the company should be classed and charged as an operating expense. It is desirable to keep such subdivisions and itemization of construction and equipment accounts as will enable the accountant to have full and complete data, showing the cost in detail of each account, and of the items that compose each account. An indexed "Cost Book" will be found a convenient reference, having the cost of the principal items indexed under the proper headings. It is important that the accountant should be in a position to give any information that may be called for, concerning construction and equipment accounts, as he should be able to answer any question that may be asked him concerning operating expense accounts. Whilst on the subject of construction and equipment, it will not be out of place even at the risk of appearing to overstep the boundaries and duties of his position, or of assuming the responsibilities that properly belong to those higher in authority than himself, for the accounting officer to draw attention to the necessity of charging off annually a certain amount for depreciation, wear and tear, etc., of the property of his company, and of the creation of a sinking fund or surplus account, that will really be what it means, having the amounts credited to it invested in some safe interest earning investment, so that when the time comes, as it surely will come, sooner perhaps than is anticipated, when it will be necessary to renew the power plant, cars and motors, track, buildings, etc., that the money will be on hand available for that purpose. Then the company will not be obliged to increase its bonded indebtedness even if it is fortunate enough to be able to dispose of the bonds, open up a "bills payable account," in either event adding to its annual interest charge, or be forced to suspend dividends for a long period of time, in order to raise money to make the necessary improvements.

The argument that the maintenance of the property prevents any depreciation of wear and tear, and therefore there is no necessity of charging off an amount annually to such an account will not hold good in actual practice, as has been very forcibly demonstrated in the last ten years, in the change from animal to cable, and electric power, and still more so on those roads that first changed their power from animal to cable and then to electricity.



Before preparing this paper it was my intention to correspond with the accounting officers of every street railway company of the world, receive the benefit of their experience, learn their methods and system, find out their troubles, secure a set of the blanks and forms in use on their roads, and then present to you in a condensed form the result of the correspondence with such comments and suggestions as I would be able to make. Upon reflection I realized that 30 days would not be sufficient time to carry out my plan, so I was obliged to abandon the idea and had no alternative but to offer such suggestions as came from my own experience. In compliance with the request in Mr. Windsor's circular letter, I have brought with me a set of blanks and forms in use on the roads I am connected with, our classification of operating expense accounts, list of construction and equipment accounts, form of annual report, etc., representing the methods and system in use on our roads which I will be pleased to submit and explain to any one who may desire to go into the matter. Our system differs in many respects from those in use on the majority of roads; whilst I believe it possesses some advantages, I am fully aware of its disadvantages. In common with other of my fellow accountants and co-workers in the street railway office, I have troubles of my own which I am confident will be dispelled by the aid and co-operation of the Street Railway Accountants' Association and the adoption of a standard system.

On motion of Mr. Reavis a vote of thanks was given Mr. Duffy, and the paper ordered on the records.

Mr. Hibbs: I rise to ask if there has been any preparation made for the exhibition of the different forms which have been brought here so that they can be examined.

The Chairman: I do not think anything definite has been done in that direction. There is quite a collection of the forms here.

Mr. Hibbs: It is an important item, and should be cared for properly.

The Chairman: Will you have a committee appointed to take this matter in charge and arrange the exhibit?

Mr. Smith, Toronto: I desire to see the suggestion of Mr. Hibbs carried out. A committee should be appointed to put the forms in such shape that we will have an opportunity to see them in some place where we shall be quiet and undisturbed. A good many of the gentlemen have brought forms and we ought to have an opportunity to examine them all.

The Chairman: I will appoint E. D. Hibbs, Walter M. Barnaby and William R. Avery a committee to take charge of the blanks and arrange them for the inspection of the gentlemen in attendance.

Mr. Davies: I regard the subject of the last paper read as the most important that can come before this meeting. I do not desire to cut off any discussion that the gentlemen here may desire to engage in. It might be discussed at every session of this convention and no definite result be attained. I want to make a motion that a committee of five—perhaps three would be better—be appointed at this meeting to take this subject into consideration and report at a later meeting, perhaps in October, a recommendation as to a standard system of a street railway accounts. The subject is so important and diverse that no committee which could be appointed by this convention could devise a system which would be satisfactory to all or a majority to be presented at this meeting. Such a committee could correspond with the street railway fraternity, obtain blanks, study them, and possibly, I think probably, make some recommendations towards a standard system which would be adopted at a later meeting.

Mr. Avery: While appreciating the necessity for such a motion, it strikes me, and perhaps will strike a good many others here, that we are not a body of men like those who

attend the meetings of the American Street Railway Association, who are acquainted with each other and who know the different capabilities of the members. We are practically unacquainted. I know personally but one or two of the gentlemen present, and I suggest that the appointment of such a committee would be better made near the close of this session, when we get acquainted with each other, and perhaps learn the strength of some few men over that of the many. I would suggest the postponement of the consideration of this matter until tomorrow.

Mr. Davies: The suggestion is a good one, Mr. Chairman, and I will withdraw the motion for the present. I supposed the subject was being dismissed, and I did not want this matter to be overlooked.

Mr. Wight: I wish to inquire if any gentleman present is connected with a company which runs an electric lighting plant in connection with its street railway.

Mr. Reavis: Our company in Augusta, Ga., operates an electric lighting plant in conjunction with the street railway system.

Mr. Pomeroy: Mr. Chairman, some time tomorrow, after the business of the convention is completed, we desire to tender you arolley ride. There are lots of trolley rides out of Cleveland; the woods are full of them; they run from one mile to 35 miles. I would like to ask this question: Whether you desire a long ride, to go into the suburbs, or simply to ride around the city? This information might help us to decide upon some route. We are prepared to have you ride over them all, but Mr. Windsor suggested that the local people should come together and agree on some particular route. It may help us to know if you want a suburban ride, for instance, to Elyria, Painesville, Akron or Berea, or simply to ride around the city. We would be glad to have you give us some idea of what you desire, so that we can arrange for it.

The Chairman: Perhaps it would be well to have the members talk the matter over between themselves, and then we can find out what is desired, and you can get the information in that way and make the necessary arrangements. It must not be forgotten that we have a very limited time in which to consider a large amount of business, and we must subordinate amusement to business. We shall, of course, be delighted to avail ourselves of any ride that may be tendered to us provided it will not infringe too deeply upon the time at our command.

On motion adjourned until 2 o'clock.

#### Tuesday Afternoon's Session.

Chairman Hall called the meeting to order at 2:15.

The Chairman: The first item on the program this afternoon is the paper on "Earnings, Handling and Accounting," by John Hourigan, auditor Albany Railway Company. The gentleman is unexpectedly detained, and the secretary will read a letter from him.

The next was the reading of the paper:

#### Transfers.

BY FRANK K. GREENE, SECRETARY THE CHICAGO CITY RAILWAY COMPANY.

The subject of transfers is always an important one to street railway men, and should be given a great deal of thought and study on the part of street railway accountants as well as the general managers. While it is an important factor in the earning power of a road, it also presents problems that the auditor should become

familiar with, for, on close inspection, many loopholes for leakage may appear which, if not closed up, may prove costly to a company.

While I will not attempt in these lines to cover the subject in its entirety, I will touch briefly upon certain points of bad practice that have come within the range of my observation and experience. What is true of one road cannot always be applied to others, as circumstances alter cases; yet, there are general rules applicable to all. I will state in a general way how transfers are handled on the lines of the Chicago City Railway Company, and will refer to different changes and improvements that time and experience have taught us to make, and we are still making them, and shall keep on changing.

The company with which I am connected has its own printing office located in the general building, and in this manner we reduce to a minimum the chance of dishonest employes of the printing shop carrying on an illegal traffic in transfer tickets, which is more likely to occur where the tickets are printed at a public printing office.

We print about 100,000,000 tickets each year, or about one for each passenger carried, some passengers requiring two tickets on a single continuous trip, while others receive none. We, of course, print a considerable number more than we expect to use, and these are returned to the general office and destroyed. As the month, year and day are printed upon the face of the transfer, we usually print them from two to three months in advance. They are then assorted and put in packages and sent out to the several depots only one day before they are used. The conductor receives a package of new transfers each morning as he goes to work. All transfers unused by the conductor are turned in to the receiver at the depot when his day's work is done, together with those he has collected as fares.

After the cancelled ones have been duly examined and checked with his trip sheet, they are all thrown into a large bag and sent to the general office, where they are destroyed by being dumped into the furnace. The Chicago City Railway Company operates about 30 different lines, and originally printed about 50 different forms of transfers, while today we issue only 12 different forms. While formerly the conductor punched out the hour and the street after ascertaining from the passenger to which line he desired to be transferred, today he is able to punch his tickets before starting upon the trip, giving to all transfer passengers at the time fare is paid a like ticket.

This is an important improvement, as it gives the conductor more time to attend to the collection of fares and other duties. Thus you will see that the transfer ticket used today must be simple in form and less complicated in all details, yet covering all essential points claimed for the one formerly used.

It is important that it should contain these features, not only for the benefit of the conductor issuing it, but when the conductor takes up a ticket in payment of a fare he should be able to read it at a glance and thus lose no unnecessary time in working his train, and be able to collect all the fares.

In the good old days of horse cars the conductor had plenty of time to collect fares and issue transfers, but since the advent of rapid transit the conductor must necessarily hurry through his train for fear that some of his patrons will reach their destination before he has had time to present his bill. Thus you see a perfect transfer ticket must be one that can be "quickly issued," and "quickly collected." We of course use the different colors to represent different lines, which materially assists the receiving conductor in quickly reading the transfer correctly. As passengers on some of our lines are entitled to receive a transfer only on the payment of a cash fare, it is necessary to issue the transfer at the time fare is paid. On other lines where we issue a transfer on a transfer it was the custom formerly to collect the fares first and issue the transfer later. This, I think, is bad practice, as the passenger can easily impose upon the conductor in this way, and we have adopted a rule that all transfers be issued at the time fare is paid.

Next month we will make still further changes in the form of our tickets, by adopting the coupon style, which will permit us to issue transfers only upon payment of cash fares on all lines at time fare is paid. The time limit, one hour, has remained the same on our tickets, and we find that it is satisfactory for our system, but a shorter limit might answer for a smaller road where the conductor has more time to devote to this part of the work. As most of our patrons require one change of cars to reach their destination, the loss is very small in consequence of the passenger giving away his ticket. As we do not, as a rule, issue transfer except upon the payment of a cash fare, you can readily see that it would be a rare case where two people can make a complete journey upon a single fare. Formerly it

was the custom to ring up transfers the same as cash fares, but we soon found that this was bad practice, as the conductor could easily obtain unused transfers from conductors from intersecting lines, punch them accordingly and turn them in as part of his collection to balance the register account. Now our conductors only ring up cash fares or tickets that have been sold for cash. This I think is a very important item when considering the subject of transfers, and should be given thorough investigation by all roads that are in the habit of registering transfers. It is the custom of some roads that are in the habit of registering transfers, to have a separate register for transfers, and yet I doubt very much if this is any improvement over the old plan, as the passenger seldom notices anything beyond the usual tingle of the bell and does not look to see whether the bell is located over the door of the car, or up the conductor's sleeve.

We have found also that it is excellent practice to make the transfer read "good only at transfer point," and not allow the passenger to go shopping and then take transfer car at a point several blocks perhaps from the intersection of the two lines used by him in his journey. Thus the value of the transfer as a commercial commodity is reduced and the traffic in them becomes less when confined to a given point in a given time.

I doubt the advisability of using any form of ticket that does not have the date printed or stamped upon it, and yet I have not given this phase of the question sufficient thought to determine if other forms are not advantageous in some cases, when considering the question of economy as against fraudulent uses and abuses of the transfer ticket. Our custom is to "railroad" them, if I may use this phrase, as from the time they leave the strong room in the general office till they have become useless and have been duly consigned to the fire furnace, their brief existence of active life is measured by two nights and a day. It is an excellent plan to indicate "half-fare" transfers by punch in order that they may not be used in the latter half of the trip by an adult, as we have found cases in our system where persons living near a transfer point would send two of their children a few moments before making a journey who, paying a nickel, would each receive a transfer, which would be used by older members of the family in the second and longer half of the journey. However, these are rare cases, and would not apply to roads having a single fare for all ages. It is well, as is the custom with most roads to identify each transfer issued by the several conductors in order to trace irregularities by special punch or stamping the number of the conductor upon the face of the ticket before issuing.

The transfer ticket is an important tool in the hands of the general manager in educating the people to ride, which to a certain extent, is a habit on the part of the patron, and it is the auditor's duty to see that he does not overstep the boundary of liberality, and he should assist the general manager in throwing safeguards around the system in order to prevent frauds, etc., and to do this he should become as familiar with the subject in all its details as the general manager. It is for this reason that I have touched upon points that would seem to be foreign to the duty of an accountant; in fact, the auditor should be thoroughly informed upon all matters connected with the street railway business in order to satisfactorily discharge the duties imposed upon him.

As stated before, it is impossible to lay down any set of rules that would be applicable to all roads, and all I can say is that the accountant should become perfectly familiar with the conditions that exist on his road, and it is his duty to see that no loop holes are left open in the system adopted, for frauds, etc. With the general manager on one side pulling in the direction of liberality to patrons and trying to please a never satisfied public, as a positive pole, and the auditor on the other side pulling in the direction of conservatism and a properly guarded system, being the negative pole, there should be generated a system perfect in details which will result in a current of nickles that will flow into the treasury of the company with less ohms of resistance than when transfers were unknown, while the return current through the pockets of the employes will be in like proportion to the mysterious fluid that now makes its daily trips over the wire and rail like the beautiful stream down "Peaceful Valley," upon whose banks the street-car patron and the street-car magnate dwell in peace and harmony, and both are happy and contented.

The writer received a vote of thanks and the paper was ordered on the records.

Mr. Ham: There are two or three questions I desire to ask. Do you have the date printed on your ticket?

Mr. Greene: Yes, sir.





Mr. Hibbs: Did you ever check up with reference to the collection?

Mr. Ham: I have some of our tickets here, and I will hand them around. A certain man is running on a certain line. We have three punch marks on each transfer (which is the weak point). We punch from the line, say, 5th avenue, to the line, say 7th avenue, and the time.

Mr. Hibbs: Do they know when you are going to check these up?

Mr. Ham: No sir. Nobody knows this before hand. For instance, I may go into the office on Thursday, and say, "Take hold and sort Wednesday's tickets." We have about one hundred different designs of punches; it is impracticable to get more than one hundred plain designs.

Mr. Calderwood: Do the conductors keep the pad of transfers while they are off on a swing?

Mr. Ham: Yes, sir.

Mr. Tighe: You only issue transfers for cash fares?

Mr. Ham: That was originally our system, but we have modified it to the extent that a second transfer can be issued to reach some point that cannot be reached by one transfer. The conductor who originally issues the transfer punches the ticket from his line to two other lines. For instance, if a passenger is riding on a 15th street car, and wants to get to a point reached by Bergen street car, and it is necessary in some special case to take a 7th avenue car to do it, the conductor will punch the transfer ticket from 15th street to 7th avenue, to Bergen street. The conductor receiving the ticket on 7th avenue will issue another transfer to Bergen street.

Mr. Tighe: We are unfortunate enough to issue them for either transfer ticket or cash; only about 90,000 a day.

Mr. Ham: The weakness of adopting the plan of having one color of ticket for one day only is that we cannot have different colors for different lines. That is the point I want to get at—is it more valuable to have the different colors for the different days, or the different colors for the different lines?

Mr. Avery: We have thirty-six lines. When you have a large number of lines you do not want different colors.

Mr. Ham: Having different colors for different lines involve printing a great many more tickets. I am not able to get our transfers down to a very fine percentage of waste. One road represented here loses 15 to 20 per cent only. The best we can do is to get it down to 35 per cent.

Mr. Greene: Reference was made to the possibility of a conductor giving away transfers at a transfer point. A conductor who gives them away is not going to stamp his number on them, if they are going to be taken into a store and lie around, in view of the public, or handed out to any one who calls for them. He knows if he gives them away, and they have his number on, that he will likely be detected. Therefore, occasionally, we take all the transfers and look them over, and if we find there are some without the conductor's stamp, we know there is something crooked and investigate it at once.

Mr. Ham: Any outside party could easily get a little stamp like that.

Mr. Greene: That would be easily detected.

Mr. Avery: They forged the dates on us.

Mr. Wilson: Are your transfers registered as a fare by the conductor?

Mr. Ham: We have two registers in every car, different style of registers; one is the Stirling and the other is the Meaker. The system of ringing up is entirely different. As the conductor collects the cash fare he is obliged to ring it up immediately; but he cannot ring up the transfers that way. He has to go up to the front of the car after he passes a transfer point and ring up all the transfers collected at that point. Of course, a conductor might have a transfer ticket in his hand and when he received a cash fare he might pretend that he had collected a transfer; at the same time he has got to get the transfers from somebody else. He cannot turn in his own transfers. As the girls in the office count the transfers they look to see that none of the tickets turned in are the tickets of that particular man. If the tickets are swapped this frequent checking shows what tickets are punched incorrectly, and any which are punched incorrectly the conductor must make good in cash.

Mr. Tighe: You punch the line from?

Mr. Ham: From, to, and the time. The conductor receives the ticket only at the intersection of those two lines and at no other place.

Mr. Duffy: How many lines are there, Mr. Ham?

Mr. Ham: This transfer shows about twenty-two. The printer of the ticket says he has all the detail on the ticket that he wants.

Mr. Duffy: Suppose each one of the twenty-two lines had its individual transfer tickets, to be good on connecting lines?

Mr. Ham: That would increase the number of tickets which would not be used each day.

Mr. Duffy: As to the waste you speak of, they are not dated, and there is no waste at all.

Mr. Ham: You will have to date them.

Mr. Duffy: You have a ticket where the month and the day of the month is punched out.

Mr. Ham: That is what we want to get away from. We think it is more serviceable to have that ticket good only on the particular day, and run no risk whatever of the ticket being used again, than to consider the matter from any other standpoint. We think it is the most important thing in the matter of transfers.

Mr. Duffy: I think the percentage of the tickets misused that way would be small.

Mr. Calderwood: Why not have a ticket for every line, and let the conductor punch out the dates in advance?

Mr. Ham: Where a conductor takes on fifty transferred passengers, you cannot expect him to examine the tickets carefully; we try to make them; they are supposed to do it, but it is beyond reason to expect them to do so. If anyone gives the conductor a transfer a month old, he will not know the difference. If he knows that it is Tuesday, March 23, and it must be a white ticket, and a blue one is handed to him, he knows it is not the right ticket.

Mr. Wilson: We have had a transfer turned in a year late.

Mr. Ham: On our road March 23 another year would be another color.

Mr. Wilson: How many places do these lines end up with; how many car houses or things of that kind.

Mr. Ham: That would be difficult for me to say just now. I do not recall how many we have, but there are as many as there are lines. It is a more recent feature to have the name of the terminals on the ticket instead of the lines; and I think that would be an advantage.

Mr. Wilson: We have one division on an island which is entirely by itself, where all the cars at the end of the route center at the ferry. That is the only line or division where the conductor issues the transfers—everywhere else they are issued by transfer agents on the street. At that point we have a girl, and the transfers are turned in on every trip. They are numbered consecutively, and have the conductors' numbers printed on them; and in that way there is no question about which conductor issues them and the order in which they are given out. They are registered on the same register as cash fares, but as the conductor turns them in on his half trip, as soon as he arrives at the ferry, there is no question about his exchanging with other conductors, because the cars do not intersect, in such a manner as to make this possible.

Mr. Ham: We have one other device which I have not mentioned and that is at the end of each half trip the conductor has to put all of his tickets that he has received on the half trip into an envelope and deposit it in a box in the end of the car. With us we change conductors on the cars frequently. One car may be run by ten or twelve conductors during the day. By reason of these changes, there is much less opportunity for the conductor doing anything wrong in connection with the transfers, because he has to put them in the box in the car, and he may not be on that car again.

Mr. Avery: Do the conductors settle every trip?

Mr. Ham: Turn in their cash? No, only once a day; but the transfers are put in this box every half trip and collected at night by the starters at the depot.

Mr. Smith, Lynn: Suppose he forgets to put them in?

Mr. Ham: We have accompanying every car a pad of blanks, which blank is a complete statement of the cash and transfer register. Each conductor marks on this blank the state of the register at the time he takes the car and leaves it. He does that as well as putting it on his day card. This pad is with the car all day long; so that if there is any discrepancy either in the transfers or cash fares, we can locate immediately which conductor is at fault. I would like to ask if any one here has adopted the use of a separate transfer for the forenoon and the afternoon?

Mr. Wilson: We have an 8-cent check, good for two rides, which is different for the forenoon from what it is in the afternoon.



obtain bill without further delay, impressing upon the creditor in question the importance of always sending bills promptly. This should prevent future annoyance from that party.

When invoice covering an order is received, and proper time has elapsed for receipt of goods, if no manifest or receipt has reached accounting department, inquiry can be made. Before closing the month's business any incomplete transactions can be looked into and proper explanations reached.



DANA STEVENS.

All materials and supplies that are not properly chargeable direct to operating expenses, or other similar accounts, but are held for gradual consumption, are to be charged to stock, the storeroom clerk reporting daily to the head of the department all issues and the number of account chargeable (as shown by classification of expenses, etc.); the head of department will approve the report if correct and send same to accounting department where the reports will be compiled into a monthly distribution and credited stock account.

Each storeroom will furnish monthly a statement of amount of goods received, amount issued, and balance of stock on hand, which must agree with amount shown for that account on accounting department's sheet.

Pay rolls to be checked against previous rolls and current copies of pay roll authorities and distribution of expenses compiled for the monthly entry.

The accounting department should keep a list of regular monthly entries, such as pro rata of interest, insurance, taxes and all debits or credits that regularly occur each month. This list checked off monthly, as entries are made, is, perhaps, unnecessary, but is a safeguard.

Expenses and earnings accounts should have balances brought down monthly, but not to be closed into income account except annually.

The practicability of the foregoing ideas depends largely upon the volume of business to be handled, and also the efficiency of the clerical force in other departments, and the time that can be devoted by them to this branch of the service. In many instances it might be more feasible for the store department to voucher its own bills and pay rolls, simply turning them over to accounting department to check. Be that as it may, the same line could possibly be followed by store department, and in conjunction with the accounting department, result satisfactorily.

The Chairman: Gentlemen, you have heard the paper; what action will you take upon it?

Mr. Greene: I move that the paper be received and filed and entered in the minutes.

Mr. Calderwood: Does the gentleman run all his material, and and labor in connection with the material, through the store house?

Mr. Stevens: Yes, sir.

Mr. Calderwood: What difference does it make whether the bills come in or not, so far as closing the books is concerned?

Mr. Stevens: The store room may receive an invoice of one hundred dollars, and include materials in the stock, and yet failed to forward invoice to accounting department for voucher and entry.

Mr. Calderwood: That will not affect the closing of the books, so far as the operation is concerned.

Mr. Stevens: No; but it will show so much more stock than you have on your books. If through the negligence of the store keeper I do not receive it, my balance sheet will not show it, and the company's liabilities as shown by general ledger will be just to that extent incorrect.

Mr. Calderwood: Do you keep one material account?

Mr. Stevens: I have three different places. It is carried in the general books under one account for each store room.

Mr. Calderwood: Do you run separate power-house material accounts?

Mr. Stevens: They keep the sub-accounts. I keep one general account.

Mr. Brockway: Why would it not be a good idea for the person in charge of the store-room to insist on having the invoice come with the goods, or within a day or so, to properly check it up for the accounting department. In that way, you get your bill almost immediately, while the matter is fresh in your mind.

Mr. Stevens: You will always find that there are some who will not comply promptly, and there are other departments slack in sending in reports and accounts.

Mr. Avery: Adopt a system of receiving no goods unless on an order, recognized for the purchase of any material unless issued by the purchasing agent, or approved by the auditor, because of its being a contract; and that made in triplicate; one to you, one to the purchasing agent and one to the store keeper.

Mr. Stevens: That would be a pretty good plan. The trouble with me has been we have been carrying deficiencies all the time, and when we make up a statement of liabilities, we have to be sure it is complete and correct.

Mr. McJilton: I will explain our method of treating the supply account. At the beginning of each month requisitions are made on our supply department by the heads of the different departments for supplies required during the current month. The store-keeper honors the requisitions and delivers the material to the different stations as called for by the requisition, charging the different departments with the material delivered, and sending bill to them for their approval. If it should happen that he has not all the material in stock, the purchasing agent (who is also the storekeeper), after receiving quotations, issues the company's general order on firms from whom we make our purchases, which are mailed as early as practicable.

The goods, after being shipped, are received in our supply department, where record of same is entered in our receipt book. Upon receipt of bills by the auditor, they are entered in a small book and charged to the supply department, to which they are referred for approval, setting forth the date, name of firm, and amount. This is done in order to keep an accurate record of all invoices from the time they enter our office. When they have been checked up and found to be correct by the storekeeper, they are returned promptly to the auditor, who credits those returned by setting opposite the date sent out, the date returned.

At the end of each month before the books are closed, the account kept with the supply department (in book, as I have explained) is gone over to see what bills are still out, and those that cannot be approved for various reasons, are noted.

The order book (stubs of which are to be audited by the auditor when bills are approved) is then checked up, and all orders not audited are accounted for by bills held in the supply department for various reasons, or the same never having been received by the auditor. In the latter case, postal cards are mailed to the various firms, requesting that they forward their bills by return mail.

Failure to receive bills, however, does not interfere with the closing of our accounts, other than our liabilities are not as much as they would be had we received them—as the department receiving the goods has been charged by the supply department.

Upon closing our books for the year 1896, although we issued over two thousand orders during that year, we had failed to receive only forty-two bills. This is a very small percentage, and is all brought about by carefully checking up at the end of each month—not only the supply department but the order book as well.

#### The Relation of Accountants to Managers and Employees.

BY P. V. BURLINGTON, SECRETARY AND AUDITOR COLUMBUS (OHIO) STREET RAILWAY.

It is probably a recognized fact that the day has passed when the accounting of a modern equipped street railway can be successfully done by a clerk or stenographer to the superintendent.

The application of electricity brings with it a multitude of details that in old horse-car times were not thought of. These details practically constitute a new factor in accounting, not altogether unlike those of steam railways, and the process of working them out in the past few years to a satisfactory basis, has not as yet been entirely successful.

There has been little or no reciprocity or exchange of forms and ideas between street railways, emanating from the men who directly have to deal with the problems of proper classification of receipts and disbursements. As I understand it, the object of those assem-



bled here today is largely aimed to a closer union and acquaintance, from which may evolve a system of simple and comprehensive accounts, which shall recommend itself to both owners and managers, and bring with it a larger share of respect from employers, and naturally a wider range of independence for accountants.

A study of this subject has led me to formulate the views here presented as to the relation of accountants to managers and employes; believing that the proper relations being first established, the way to a successful method of accounting will be comparatively easy.

Managers as a class have well fixed ideas as to what the investors in street railways desire, but too often these ideas are far more local in the application than otherwise, and when data and figures are furnished as to operation, investors are often unable to make satisfactory comparison with the figures of similar corporations, in which they may have like interest, so that the value of one kind of securities placed beside another of like character cannot well be determined. One manager furnishes a statement of operations with an abnormally low operating per cent, while his construction and equipment accounts are apparently exorbitant; another reports little or no construction and equipment and an abnormally high operating per cent. These statements placed together in the hands of the investor naturally lead him to distrust them both; the first on account of the possibility of trying to shoulder upon construction and equipment, (to be lost sight of for the time being in property cost), what should have been in a great measure placed in maintenance; and the second on account of a possible scheme to wreck the value of the property and its net earning capacity by loading maintenance with all kinds of expenditures, and by this means discourage security holders to the brink of unloading their holdings at a sacrifice resulting to the benefit of promoters of the scheme.

Investors as a class are men able to closely scrutinize the conditions under which securities obtain their value, and are usually distrustful until well satisfied that proper figures have been given, and I only mention the two foregoing possible cases that I may more clearly bring out the great necessity of securing reports that shall come nearer to honest and judicious comparison.

Managers of the general affairs of a street railway are not always in the position to estimate from day to day how and in what account channels, expenditures are finding their way. The accountant lacking discretion, knowledge or backbone, whichever it may be, to put a check upon this and that distribution of expenditures, finds at the close of the month or year that his figures as to cost of operating are vastly out of joint, and his comparisons with previous months or years grossly out of proportion.

It is at this point I would have the accountant first school himself as to what to do and how to do it, and then systematically assert his independence. It is no credit to the accountant to go hit and miss in order to accord with the notions of this and that one. Neither is it a duty or a kindness to the manager not to set wrong matters right, and place things where they belong.

When I speak of independence, do not understand me to mean either arrogance or obstinacy, but rather a well-bred and well-schooled instance, if you please—just that kind of independence that gives character; and where is the sensible manager who will not respect this?

The Street Railway Accountant has superseded the book-keeper and is coming to a place in the official family. To maintain this promotion and command respect, he must of necessity be active and expert; not altogether unlike his brothers of the steam railways, among which some of the finest accountants in the world have been schooled. We may not for a time succeed in wholly gaining the relative rank they occupy, but we, as they, have intricate problems to master, and why should we not eventually succeed in our way as truly as they in their way?

I have spoken of the difficulties of owners and investors in comparing reports. I believe it within the province of the body of men here assembled to map out a system by which at least the greater defects may be remedied. It is true that local conditions of railways may differ in a way to effect comparison, yet cannot these varying conditions too be systematized so as to become adjuncts rather than factors? Succeeding in this we place ourselves at once in line with the needs of owners and investors, and at once through this channel bring ourselves into direct relation with managers who have the interests of these people at stake.

I bespeak for what may be accomplished at this convention a careful consideration by managers, and I believe they will in time more

fully appreciate the desirability of leaving the duties and problems of an accountant to the accountant himself, and to that end hold him responsible. The manager of any street railway of considerable size, should not attempt to be everything, and thus fail of doing anything well. The maintenance of the property and attention to the needs of patrons are the first elements to be by him considered, and if these are well worked out, the figures of the intelligent accountant will as surely and proportionately follow as evidence of vigorous and healthy management.

In securing the relations here outlined between managers and accountants, we shall be far more successful if we give due attention to the proper relations which should exist between accountants and employes.

When the writer first entered street railway service, some six years ago, it was with some misgiving as to whether the new era of electric power would bring with it a higher order of service than obtained in the horse car days. The then existing order of inferior intelligence and character of employes was too apparent everywhere, entailing lack of courtesy to the public, and far too often exhibiting acts of uncalled for brutality. Both arrogance and coarseness of superintendents and foremen, and rude and familiar intercourse of employes, was much too prevalent. Proper names were lost sight of in nicknames, such as Slim Jim, Fatty, Limpy, English John, Irish Ted, Dutch and a host of others of similar grotesqueness. It is gratifying to be able to say that the higher order of intelligence required from the highest official to the lowest employe to operate street railways by electricity, is rapidly and steadily relegating these unwholesome features from the service. With greater intelligence, naturally comes higher standards of character, greater respect for discipline and proper courtesy to the public.

In all this the accountant has a part to play. His position requires a steady and unremitting watchfulness of the manner in which reports of any character are made, noting the weakness of one and the thoroughness of another, promptly investigating the one and commending the other; each to be done with courtesy and without familiarity. If you find an employe in error in his reports, do not require correction without explanation, but rather call him to your office, go over the work with him and establish his confidence in your claim. You cannot spend a few minutes to the interest of the company more effectually than in this. Matters of this kind should never be submitted by accountants to employes on cars or before the public. When riding on a car be seated as a passenger, and insist that the clerk do the same, and that they enter into no familiar talk with employes. The familiarity of a clerk may often lead to telling important matters of the company not intended for general gossip; to the discussion of methods of checking reports and of detection of dishonest returns; of fancied favoritism shown one to the detriment of another, and a score of other things calculated to create uneasiness and distrust. If you have methods peculiarly your own by which to ferret out dishonest work, they should not be known outside the office. When results have resolved themselves into proof, they should be promptly submitted to the manager for his action. If an employe has a grievance which does not concern you, he should not be argued with, but rather referred at once to the proper officer.

The office should be understood as the only place where business is transacted, except such affairs as may be delegated to inspectors or other officers as a part of their duties, and as this place should have the business air of an express counting room or bank, in which transactions are made quickly and with business courtesy. Nothing will more surely establish confidence with employes than an observance of these, and nothing more surely be an incentive for them to perform their duties in a like manner. By adopting these higher business principles, the accountant not only paves the way of respect for himself, but contributes largely to the enforcement of correct rules of discipline desired by the management.

There are at times many exasperating errors committed by employes, which require great patience in treatment, but when you have a case of this kind, always remember that not all the virtues can be expected to exist in the average man. Patience and moderation will find the remedy. If you find upon investigation that the supposed error comes back to you as the fault of the office, be quick to both acknowledge and correct it. Give every man his just due, and he will be more likely to accord you like treatment.

In conclusion let me say that if the brief outline here given as to the relations of accountants to managers and employes shall serve to quicken a nobler and more efficient sense of what may be accom-

plished in the realm of street railway accounting, the object of this paper will have been accomplished, and I believe that we may safely anticipate the hearty approval of our superior officers.

Mr. Avery: I move a vote of thanks and the placing of the paper on the records. Carried.

Mr. Smith, Lynn: I would like to ask the gentlemen whether it is the custom in most roads to give the conductor the benefit of a reasonable doubt; whether you simply hold him down to the law every time, or when there is a reasonable doubt whether you give him the benefit. Our general manager thinks I am too soft, but I am inclined to be lenient with the fellows who only get twenty cents an hour. If there is a reasonable doubt, I think the company can better afford to lose a few cents than the conductor.

Mr. Calderwood: Give him the benefit of the doubt, or he will take it out of the road the next day.

Mr. Ham: The benefit of the doubt in what sort of cases?

Mr. Smith: Sometimes there will be a question in regard to the register; the proper record is not taken when they go out, or the register might be taken into a barn to be repaired and some of the mechanics neglect to make a record and rings up four or five fares to get the register in shape again. If we think the man is honest, and the foreman says it may have been done, we give the man the benefit of the doubt.

Mr. Wilson: I think it is no more than fair, in many instances, to give the man the benefit of the doubt. Liberality shown that way is of benefit to the company. Most of us probably have a complete record from our inspectors in the office, and I know personally that we have had a few instances where the registering clock has been claimed to have jumped a hundred fares; once in a year, or once in six months—something of that kind. The clock has been taken out and sent to the machine shop and tested and perhaps rung up a hundred thousand times, and nothing can be found wrong. However, if upon investigation we find the man has been with us a number of years, and that his record is good, we have given him the benefit of the doubt, with the distinct understanding and his being so informed, that it was only his good record which warranted us in doing so. We give him to understand that if he had a poor record this would not be done. I think such cases should receive careful consideration and the man's record looked up. This last week we had a ten dollar bill turned in, or what appeared to be a ten dollar bill, which had been changed from a two dollar bill. It was taken to the President, and shown to him with the remark: "Mr. Little, here is a ten dollar bill apparently, on the face of it, but it is really a two dollar bill which has been altered." He looked at it and said: "We cannot hire men for two dollars and a quarter a day, and expect them to be experts in detecting so good an imitation as this; let the company stand it." I think it is very beneficial to give the conductors the benefit of the doubt in a good many cases, provided you know your men. We have found it so, and the men appreciated it.

Mr. Hibbs: I think Mr. Wilson's remarks are true, provided always that his men are working for the interests of the company. We have labored under the disadvantage at times of having the men work for their own benefit and not the company. There are cases where the register has been claimed to have jumped a hundred fares. Has it jumped a hundred in registering, or taking the register?

Mr. Wilson: Registering.

Mr. Ham: We started in to give everybody the benefit of the doubt, and last summer it was surprising how many times the register jumped; and finally we decided that we would have to stop the registers jumping, and they did not jump so much afterwards. There is no doubt that they do jump once in a while.

Mr. Wilson: Within the last two years there have been two instances where we gave the men the benefit of the doubt.

Mr. Ham: We had them reported more frequently.

Mr. Hibbs: Without any corroboration?

Mr. Wilson: Only in looking over his daily reports and that sort of thing.

Mr. Duffy: As to the errors in the working of the registers and the ringing up of registers in the shop, we can all back that up by our experience. I know that the registers jump. I have known conductors to report when the records worked to their advantage a hundred fares. The whole question, perhaps, can be summed up in this way: Under all circumstances and conditions give your men the benefit of the doubt, particularly if you know your men; and if you exercise the proper discretion and judgment which you expect the conductors

to exercise under your rule book it will be to the advantage of the men and the company both.

Mr. Avery: It is a question in my mind whether it is the province of the auditor to decide such matters. I report such matters to the superintendent, and he holds the division foreman responsible, and he decides whether to give the conductor the benefit of the doubt or not.

Mr. Dimmock: Our auditor finds that the registers do jump, as the gentleman from Boston states; and these cases are always referred to the management. We keep the minutest record of every man in a record book, and if the man in question has had a good record—we record the number of times that he reports the registers jumping, and I believe as a rule the probability of their jumping is a hundred fares—we are inclined to overlook the first case or two. If the report comes in the second or third time it is investigated very closely, and special agents are put upon the man to see whether his other work checks out correctly, and if we find his record is not good he is dismissed from the service of the company; otherwise we give the man the benefit of the doubt.

Mr. Wilson: If there is any question the man is checked every trip during the day by a different inspector; no two of the latter being acquainted. They meet the chief inspector perhaps on the corner of one street one day, and a mile farther away the next day, and make their report to him; and if any inspector has any feeling against a particular conductor it will not work, because if he reports a man we put our other inspectors on and ride him every trip, and a book which the chief inspector keeps shows a complete history of the man from the time he entered our employ. This goes into the greatest detail, having such items as when the conductor was reprimanded for failing to call streets, etc., and all the minor errors which he has committed. We, perhaps, have a better record than some other roads from which to look up the character of our men.

Mr. Burrington: In relation to the matter of a register jumping, it is a fact that it does occur occasionally. We had a case in Columbus about a year ago, where a register jumped when it was impossible for the car to have carried the additional one hundred passengers. The corresponding runs probably had ten, fifteen or twenty passengers. There was nothing unusual going on in the vicinity of the line, and the inspectors could find nothing at all to account for the hundred passengers. We were satisfied that the register jumped, but to make sure we had it taken off and sent to the factory with instructions to determine whether the register jumped, and report the result. We did not want to trust it to our own machinist; we wanted to get the decision of the makers. They reported back that the register had unquestionably jumped on account of a defect in the works. The man, of course, made his claim promptly when he noticed it, and we held the claim in abeyance until we heard from the register people. We called him in and told him the machine was at fault, and he would be given allowance for the hundred fares. We have since had one or two cases in which we were almost as surely satisfied, taking all the facts into consideration. If you investigate the number of passengers calculated to be carried in a given half hour or hour, and compare reports, that is the best way you can satisfy yourself about the jumping of the register. It would be an unusual occasion for a conductor to have one hundred passengers above his regular run with ordinary travel.

If the conductor reports it at once—we would not think of making any allowance if he delayed doing so—there is no question that you can trace the matter out and satisfy yourselves without difficulty. It takes patience and work, but you had better do it. In that way you establish the confidence of the men. In minor things, even in the matter of a single ticket, go to the bottom of it and establish your position above all question. I find this has a great deal to do with the character of discipline which it is possible to maintain. If a man sees you are fair with him he will be fair with you. I believe the matter of dishonesty is a good deal overestimated. There is some of it, of course, but it can be easily traced in the majority of instances. We ought to get away from that idea, and hold our men honest until they are proven dishonest. Our business is to see whether they are dishonest or not by their returns.

#### A Simple System of Interurban Accounting.

BY W. B. BROCKWAY, AUDITOR TOLEDO, BOWLING GREEN & FREMONT RAILWAY COMPANY.

I confessed to Mr. Windsor when I was asked to read this paper to you that my interest in this convention had somewhat selfishly cen-







Recapitulation of Passenger Earnings for												180 Day of the week												Weather												Returns	
PLACES SERVED				LOCAL FARES				T. & M. V. Ry. TICKETS			COMMUTATION			MISCELLANEOUS			HALF FARES			PASSENGER			EXCESS			BALANCE											
No.	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets	Fares	Amount	Tickets											
SAMPLE PAGE FROM EARNINGS RECORD.																																					
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places on the line, from which record the time of himself and the motorman are figured. On his last report for the day he shows the hours and minutes in service claimed, and the closing numbers of his tickets.

When a conductor is relieved before completing the round trip he and the conductor relieving him make two separate reports, but use the same trip number. In other words, in having a trip instead of a daily report, we do not enlarge the conductor's labor, but lessen it. We have less work in the office and I think we obtain as satisfactory results.

In accounting return tickets we use the whole round-trip fare when the ticket is sold, giving that day credit for the whole value of the ticket instead of letting the day of sale have half and the day of return have half. When the returns come in, the report of the day shows how many were lifted and of course they are counted in the number of passengers carried.

The earnings book is almost an exact counterpart of the conductor's report, having columns provided for nearly all things shown on the report with the exception that all tickets sold by the conductor outside of half-fares, express and local city-fares are shown in one total number and their total value. Where two conductors have the same

round trip, one starting and the other completing it, the two reports are combined and shown as one on the record. As the round trips are numbered so also is there a space provided on the record so that it will show what any particular round trip was worth. At each change in time I affix a new time card to the page for the day of effect to show the changes in any particular run for comparison at any time. Each day's page is complete in itself, but the total receipts to date and the total passengers to date are carried forward from day to day. At the end of the month each day's several totals are carried forward to a page where the whole month is shown, and as already referred to, postings are made directly into the general ledger from this book.

As the tickets have no actual value when issued from the office, the conductor receipts for one hundred tickets at a time. A record is made of these issues and the conductor charged. Each day the tickets returned with their value punched are assorted numerically and checked in on a sheet having 100 numbers, as soon as the 100 tickets are shown as having all been returned, a simple check mark on the ticket register cancels the charge against the conductor. Should any ticket not be returned the conductor is required to pay the highest value of the ticket. The tickets are then assorted by stations from and to stations, and filed away in a case for the purpose, having a pigeon hole for each station from and to. By the way, when I wanted this case made, the price quoted was entirely too high and I would not order it, but obtained 49 cigar boxes with square ends, knocked out one end, tacked the covers down, piled them in the shape I wanted and fastened them together with light boards. It looks much better than I thought it would, fills all needs required of it, and best of all cost 18 cents instead of \$23. The tickets thus filed are counted each week to lighten the labor and at the end of the month a traffic statement is made, showing the number of tickets sold from one station to another. The tickets are then enclosed in rubber bands for ready reference, shelved for one month and then burned. It is customary, perhaps, to keep the tickets for a longer period, but we have had but a single instance to refer to the shelved tickets and that developed within two weeks after being filed.

As far as it applies to our needs. This classification is the result of the labors of a committee of the Association of American Railway Accounting Officers, an association similar to this. Their methods of charging items in operation is very clear and is the result of long experience, and I would suggest that their plan be examined before finally adopting one of our own. All payments made during or for any month in operation are distributed upon the vouchers and the several columns of the voucher record are charged directly from that record into the General Ledger. Car, line, and track foremen furnish a daily statement to the office of the amount, kind, and value of labor and material used; whether for repairs or for construction. The total material used from the storeroom is compiled in the office and charged from the Journal.

We pay but once a month, but the time allowed is kept daily. A record of the power house meter readings is also kept daily at a given time. This, on the office record, shows the reading of the ammeter, the number of watts used for the 24 hours, the total cost per day, the number of cars run, and the average cost per car per day. We buy our power, so that when the bill does not agree with our record we want to know why.

And now, in closing, just a word about the payment of vouchers. Since the road commenced construction up to the present time we have not paid out one cent by check, so called. All vouchers when ready for payment are stamped as good for payment at such and such a bank, when properly dated and signed; and we have no trouble, it is needless to say, about receiving the vouchers back, properly signed, and that quickly. Papers pertaining to the voucher are never attached, but bear the same number, and when the voucher is returned through the bank they are filed inside of it.

We close our books, of course, at the end of the month, but the voucher record is held open for several, usually 10 days, to permit the entrance of all bills for that month, so that when the balance sheet is finally taken off on the 15th, it shows the actual earnings and expenses for the month in question.

Thus, in brief, I have outlined the general points of our system of accounting interurban traffic. I believe it is simple, and it has proven itself effective; but, as I said in the beginning, circumstances are different and so must systems of accounting differ and still be similar.

I understand, of course, that we have not the only system of accounting, and I presume I shall understand it more fully after the discussion which may follow me, but preceding that discussion I feel as though we are at least not encumbered with a number of unnecessary ways of reaching the desired results.

I have also tried to keep in mind that simplicity of accounts means not only that my successor (for none of us always stay in the same place all our lives) may the more readily pick out my methods of work, but that it requires less time to work a simple system to the results, less clerical help in manipulating, and thus is more economical in the matter of office expenses, etc., as shown on the balance sheet.

As to the operating expenses and the distribution of them I have again gone to the steam railroads for assistance. I have taken the Official Classification of the Interstate Commerce Commission so

Mr. Wilson: I move that the report be accepted and placed on file, with thanks. Carried.

FORM No. 5-  
2-1-97.

## THE TOLEDO, BOWLING GREEN & FREMONT RAILWAY CO.

Conductor \_\_\_\_\_ No. \_\_\_\_\_ Conductor's Report of Round Trip No. \_\_\_\_\_

Motorman \_\_\_\_\_ No. \_\_\_\_\_ Car No. \_\_\_\_\_ Date \_\_\_\_\_ 189 \_\_\_\_\_

Direction.	CASH FARES.															Local Fares			No. Pas'sns Carried	Total Cash
	3	5	10	15	20	25	30	35	40	45	50	55	60	65	Tol.	Pg.	B. G.			
North Bound																				
South Bound																				
Totals																				

Direction.	Com. No.	Title No.	Passes.				Return T & IV Tickets Lifted		Half Fares		Express		Time of Leaving B. G.	M.
			An'l	Time	Trip	Emp	Lifted	Lifted	No.	Amount	No.	Amount		
North Bound													Arriving Tol.	M.
South Bound													Arriving Pg.	M.
Totals													Arriving B. G.	M.

Mr. McJilton: When you receive the cash for tickets sold, is that credited up immediately to earnings?

Mr. Brockway: Yes, sir.

Mr. McJilton: What do you do with tickets not presented?

Mr. Brockway: We have the duplex style of ticket and they must be presented.

Mr. McJilton: Suppose a man does not continue his passage?

Mr. Brockway: If he gets off, he loses it, of course.

Mr. McJilton: You do not have a number of stations on your line where you have a different rate of fare? It is five cents between two stations, and you do not permit a passenger to leave the car, and continue his passage later on?

Mr. Brockway: No, sir: the fares are so arranged that if a passenger wishes to make a stop-over at any point, by buying two tickets, one from the place of starting to the place of stop-over, and afterwards from the place of stop-over to his final destination, the fare is the same. Our tickets being of the duplex style they must be bought on the car.

Mr. McJilton: That is the only kind?

Mr. Brockway: Yes, sir, except commutation. We credit the day of sale with the value of the whole commutation ticket sold, and we keep a record, of course, of the numbers of the commutation tickets, and they are checked in as they come in, but not as earnings accruing to that day for carrying the passenger.

Mr. McJilton: The tickets are good until used?

Mr. Brockway: Yes, sir.

Mr. McJilton: You credit up in one month the earnings which, in many cases, you do not really earn until the next month?

Mr. Brockway: It has been part of our experience that they are used just as fast as they can be; in other words, people do not put a dollar or five dollars into a ticket unless they intend to soon use it up.

Mr. McJilton: We carry our ticket account as a liability, and we find that we have a balance always outstanding in the neighborhood of two thousand dollars, which we have to redeem by carrying the passenger. We do not credit up the earnings until the ticket is received.

Mr. Brockway: As fast as the tickets come in you credit your earnings, I understand. We figure this way, that if our tickets are credited to the day of sale, irrespective of when they are returned, and in consideration of the almost immediate use of the commutation tickets, and that we sell just about the same number of commutation tickets every day, we find that we can do that and save ourselves much labor.

Mr. McJilton: One of the reasons that we carry it as we do is that our conductors have an exact manifest of every fare they receive and, of course, our earnings have got to tally with the manifests of the conductors; and for this reason it is necessary to treat the account in the manner we do.

Mr. Brockway: I tried to do away with a general ledger account, and that is the method we have adopted.

Mr. Pomeroy: In regard to the round trip tickets picked up after they are sold, do you check them back with the conductors' stubs?

Mr. Brockway: We do that about once in two or three weeks.

Mr. Pomeroy: You require the conductors to put their money in an envelope and turn in every round trip or single trip?

Mr. Brockway: Every round trip. The nature of the line is not such that they could do it at the end of the trip, but we have adopted an arbitrary place as the end of the line.

Mr. Pomeroy: I go further and require where they can that they shall deposit on each trip. They make the eastern trip, and when they leave the west to go east our office is part way on the line, and they are required to deposit their east bound report on the first trip west, and vice versa.

Mr. Ham: You said in the paper that you did not pass anything through the journal, but posted directly from the original books. In your opinion that is sufficient to save enough time to make up for the disadvantage of not having everything in one book?

Mr. Brockway: I told you why—because the ledger record shows the page of reference, and by getting back to the original book you have the whole transaction there, and there is very little chance for error such as you would have by putting it through the journal first and then into the ledger.

Mr. Higgins: Do you make your voucher book a distributing book?

Mr. Brockway: Yes, sir.

Mr. Ham: I have gone on the principle that it is desirable to have one book which would contain a summary of everything, and consequently I have journalized everything.

Mr. Pomeroy: You charge five cents for a part of a division?

Mr. Brockway: We have, of course, the regular rates between stations. If a passenger goes five hundred feet beyond a station he must pay to the next station.

Mr. McJilton: I should like very much to get some information as to the handling of ticket accounts where you exchange passengers with an entirely foreign company, and both companies sell a continuous ride good over one another's lines. I refer particularly to suburban traffic.

Mr. Brockway: We do not do it.

Mr. McJilton: Is there any one here representing a company that has such an arrangement? We have an agreement with a company whereby we both sell round trip tickets good between the city of Baltimore and Emory Grove—the round trip being 35 miles—and our company carrying the passengers 14 miles of the entire distance. We transfer our passengers to the foreign company at the terminus of our line. Commutation books are also sold, but are only good during the month purchased. If there is any one present representing a company having such an arrangement, I should like very much to have the method of accounting, sale of tickets, etc., explained.

At this point, on behalf of Mr. Ehrhardt of the Cleveland City Railway Company, and Mr. Davies of the Cleveland Electric Railway Company, complimentary tickets good on these lines were distributed to the delegates.

The Chairman: I believe street railway men are never known to decline anything, and we accept the tickets.

Mr. McJilton: I move that a vote of thanks be returned for the courtesy. Carried.

#### Depreciation.

BY H. C. M'JILTON, AUDITOR BALTIMORE TRACTION COMPANY.

Having been selected by your committee to prepare a paper upon "Depreciation," I have consented somewhat reluctantly to give a treatise on a subject of so great importance to either corporate or private enterprises; embracing as it does features so difficult to handle I would much rather it had been left to one who may have had more greater experience than myself.

I will first take up what the definition of the word "Depreciation" is. As laid down by Webster's Unabridged Dictionary, it is as follows: 1st. The act of lessening or seeking to lessen price, value or reputation. 2nd. The falling of value; reduction of worth. Burke. 3rd. The state of being depreciated.

The second definition seems to most clearly define the subject to be treated, and with that view my next step will be to divide the subject under two heads, as follows:

First. What should not be charged to depreciation, and

Second. What should be charged to depreciation.

For convenience I will give, first some of the most important items which should not be charged under the heads of the different subdivision of accounts.

#### TRANSPORTATION EXPENSES.

Renewal of fare registers, punches, etc.

#### MOTIVE POWER.

Repairs or renewals of dynamos and their parts, the labor in removing and replacing; renewals or repairs of the switchboard equipment and labor making such repair or renewal.

Renewal of armatures, commutators, bearings and boxes, fields gears, pinions, trolleys, lightning arresters, rheostats, switches, etc. the cost of labor replacing same and making connections with those damaged or destroyed.

Renewals or repairs to steam plant in power houses including boilers, engines, pumps, shafting, belts, piping, steam fitting, station fixtures, etc., nor the cost of labor necessary in making such renewals or repairs.

Repair or renewals of tools, machinery, shafting, boilers, engines, etc., in shops of the company, including labor, etc.

#### MAINTENANCE OF WAY.

Renewal of conduits (cable or electric), rails, cross-ties, paving, trolley poles, feed and span wires, and appliances for suspension and insulation of same; track bonding, drains under tracks, flooring bridges, frogs and switches, joint fastenings, tools, implements, wages of laborers engaged in this work; repairs to power stations, car houses, car shops, repair shops, blacksmith and machine shops; coal chutes and bins; pits in car houses and shops; cranes in power houses; buildings, wharves, etc.

#### MAINTENANCE OF CARS.

New cars taking the place of old to make the number good; repairs, including labor to keep cars up to standard; renewals of trucks, axles, wheels, brakes, headlights, brake shoes, axle boxes, springs, sand boxes, etc.

None of the above items should be charged to "Depreciation," for the reason that the first cost has either been charged to construction or plant account, or carried as an asset in other accounts and to which nothing should be added except for the first and original cost of the property, and therefore if not chargeable to either of the above accounts, repairs of every description and character must necessarily be chargeable to operating expenses—less amounts received from sale of removed or defective parts—in order not to wrongfully increase the assets of the company.

Further, inasmuch as the operating of the road receives all benefits of the cost of the first installation, operating expenses should stand the cost of repairs, including labor and all renewals. This is essential, notwithstanding they all add materially to the present or future

value of the property; but in order to get at the correct cost of the operation of the road as a whole, or per car-mile, you do not arrive at a proper basis for calculation until the second or third year of operation, and it is not fair to compare a newly equipped road with one which has been in operation a number of years.

#### WHAT SHOULD BE CHARGED TO DEPRECIATION.

It is, no doubt, a well understood fact that it matters not how much is spent and charged to operating expenses in order to keep the plant of a street railway company or manufacturing corporation in A No. 1 condition, it is never after once put in operation considered as good as new, for the reason that more improved machinery, etc., can be purchased later on to replace same, often at a reduced cost.

This is most important in the case of loss by fire when you are making up your schedule, preparing for settlement of your loss with the insurance companies (as those having gone through the experience of fires know), there is always a certain amount deducted by insurance companies on account of depreciation, whether apparent or not. And the same state of affairs applies to the sale of any particular piece of machinery, etc., which has been discarded.

Therefore, conceding the above to be true, that is, by charging the cost of repairs and renewals to operating expenses, your property is virtually in as good a condition physically at the end of each year as it was in the beginning, at the same time agreeing that there is a depreciation, it is wise and appropriate for corporations to set aside at the end of each year such an amount as is warranted after a thorough and impartial inspection of the property.

I further believe that it is thoroughly understood that circumstances alter cases, but by carefully following out the above method, it is the opinion of the writer that you will not go wrong, but will be protecting the assets of your company, and I know of no better way of doing this than by charging to operating expenses all renewals and repairs, as I have indicated in the first part of this paper, and by the accumulation of a fund as an offset against such depreciation as cannot be covered by charges to operating expenses.

Mr. Greene: I move that the paper be received and spread upon the minutes, with thanks. Carried.

Mr. Hibbs: How do you ascertain depreciation?

Mr. McJilton: The depreciation can be arrived at by a committee appointed from the board of directors in conjunction with the heads of the different departments.

Mr. Hibbs: How would you treat a car purchased to replace one which has seen service?

Mr. McJilton: When a car has seen all its service, and is done for and is replaced by a new one to make good the number, the cost of the new car should not be charged to depreciation, but should be charged direct to operating expenses; operating expenses receiving credit for whatever may be derived from the sale of the material, etc., from the old car.

Mr. Hibbs: Have you had any difficulty with insurance adjusters on account of depreciation?

Mr. McJilton: I have, and I have been unable to find any one that has not, in adjusting a loss.

Mr. Brockway: My experience in steam railroad accounting has been that they have no depreciation account there, but as Mr. McJilton says, when a new car is purchased or built to replace an old one, it is repaired; but when one railroad company destroys another railroad company's car, depreciation is figured at 6 per cent per year. In the interchange of freight cars, when one is wrecked belonging to another company, the bill is rendered with 6 per cent depreciation; otherwise, there is no depreciation.

Mr. Ham: There is an inconsistency in calling it a depreciation account, because you are not charging all items into it; if it has the effect of a sinking fund, it is a bad term. When the car is depreciated, you do not charge it to depreciation.

Mr. McJilton: What would you do when there is a large fire?

Mr. Ham: That would come in under insurance.

Mr. McJilton: What would you do with the amount knocked off by the insurance company for depreciation? You cannot charge that into operating expenses. The difference between the actual worth of the car to you, and what the insurance company allows you should go to depreciation.

Mr. Wilson: When you replace a thing, is it your opinion it should be charged to operating expenses?

Mr. McJilton: I beg your pardon; I do not want you to think that



everything replaced should be charged to operating expenses, because you may replace something that has not actually seen service; but my idea is, that after you have gotten all the service possible out of a thing, upon replacing it the cost is properly chargeable to operating expenses.

Mr. Barnaby: That would give one little item placed against depreciation fund to reduce it, but if you happen to have the cars insured, you would practically have no need of using the fund.

Mr. McJilton: The insurance companies in our State will not insure for over 80 per cent and you, therefore, should have some provisions made for the depreciation which is claimed by them.

Mr. Duffy: I should like to hear from Mr. Higgins on this subject.

The Chairman: Will Mr. Higgins kindly give his views.

Mr. Higgins: In trying to get at the net earning power of certain properties, I had occasion to go into the question of depreciation a good deal, because it was a new thing—that is, this electric railway business was new; and it is difficult to apply to it the same plan of procedure which obtains in steam railroad practice. As some one has said, it is not customary in steam railroads to have such a reserve fund; but it is because they have been in operation longer and have found by experience how much per annum can be charged up to maintain the property perpetually. With the electric railway, the system is too new to do this; but in order to get at something which might approximate correctness—that is to say a method of procedure which would be at least better than mere guess work—this plan was hit upon; that is to say, to have in each particular case under consideration the engineer of the road called in, as Mr. McJilton says, the different department heads, and for them to determine the probable average life of the different sections of the plant; which will be, we will say, 15 years; electric station plant, which will be we will say, 25 years; the life of the cars exclusive of trucks, which will be, we will say to years, or including trucks and motors, 10 years; the life of the track, we almost dare to hope with the modern construction, 10 years. If we have the initial investment of the different sections of the plant, and estimate what it is probable we may be able to replace those for at the end of their respective lives, and allow something for scrap value, we will get a sum of money which at the end of the life of the track, we will say, that it will take eighty per cent of the initial cost to replace the track at the end of that time, or when the track has to be replaced. Meanwhile, all the ordinary current repairs are going on from year to year, and there must be an estimate of the average repairs, or at the end of the time the track is worthless and must be thrown away. Some money must be provided to do that, and it is easy, mathematically, to figure a sum, which put at interest from the beginning of operation in the first year, will at an agreed rate of interest, say, four per cent, amount at the end of the 10 years time to the sum fixed upon to replace the track.

That annual sum figured for every section of the plant, in its different estimated life, will be, it seems to me, a true depreciation, always supposing the time is correct, and the sums are large enough to cover these renewals so that the accumulating sums for the reserve fund, or depreciation fund, if you call it so, passed every year to the fund, will just balance the increased depreciation year by year, and the sum of the value of the plant, the operating value of the plant, not the selling value (for the instant you put a car into service the selling value depreciated) but the operating value of the plant as it decreases is balanced by the depreciation fund, so that the two together make up the original investment, and there you have your assets constantly kept up to their original value by the operation of this reserve fund. Charges to this reserve fund should be charged to operating expenses, to some definite department, such as reserve fund, not general expenses, or to the depreciation fund, or something like that.

That scheme of finding the true earning power of street railway property, and incidentally the depreciation of the plant, has passed muster with some of the brightest lawyers in New York. They have adopted it as a plan for action and are at the present time engaged upon a more definite plan for accomplishing that in their books.

Mr. Brockway: Is not that guess-work, to a certain extent?

Mr. Higgins: It is, but it is guess-work based upon a principle, which is less guess-work than simply saying 5 or 10 per cent is depreciation. It presupposes a definite life, which from the past experience of engineers and judgment of probabilities can be arrived at with a sufficient approximation to correctness to serve the purpose.

Mr. Dimmock: We have a bridge on our road between Omaha and Council Bluffs where attention has been given to certain parts of its depreciation which may be of interest while we are discussing the

matter. While the bridge is made mostly of steel, time would cause a depreciation in its value provided it was not properly protected by paint. I refer to that part of the bridge composed of iron and steel. The floor of the bridge is made entirely of wood. The life of certain parts of the wood might be estimated to be 10 years, while the life of the paving blocks might be 5 years, according to the wear and tear from vehicles, etc. Therefore at the end of every 5 or 10 years the owners of said bridge would be called upon for an amount of money sufficient to renew these parts as well as to repaint the bridge, say, every three or four years. In our case we opened a paving and painting fund (which may be called a depreciation fund) and charge off each month of the year a proper proportion of said sum, which of course we would be compelled to estimate, from the fact the cost of repaving and repainting the bridge this year might be entirely different on account of a change in the markets 10 years hence, therefore when a monthly statement is presented to the directors showing how much it cost to operate the road, we include in said expense the proportion per month of this depreciation account, crediting the paving and repainting fund each month and debiting cash as said amount is laid aside for paving and repainting when the proper time comes.

While these repairs will not take place for 5 or 10 years, when that time arrives, the directors will not have a surprise in store for them on the grounds that they knew nothing of such an expense from the fact that we have laid it before them each month as time progressed.

Of course, if labor and material had advanced after the 5 or 10 years had elapsed, the fund would not be sufficient to cover the repairs to the extent of the difference of our estimate and the market value. On the other hand, if labor and material had depreciated the fund would exceed the repairs and could be transferred to some other account and put to some other use. Again, if the travel over said pavement increased its depreciation, said repairs would have to be made sooner or later than the estimated time, which would cause another discrepancy in the account. However, is it not better to have the matter always before us (although on account of being estimated it may not be exactly correct) than it would be to have nothing at all to remind us that sooner or later we would be called upon to renew these parts of the bridge, and when said time arrives be unprepared for it, and surprised also at the cost. While such an account has its advantages, it has its disadvantages, and it is an account which I think will bear discussion. You might also apply this to all parts of a road or its equipment, but in doing so it would be almost impossible to open an account for each department or part of the road, as the accounts would become too numerous; therefore, if a depreciation account is kept at all, which is a question according to argument here today, every department should be gone over thoroughly, and an estimate made of the depreciation of each particular item and one depreciation account opened to cover all.

Mr. McJilton: Acknowledging that you do put the pavement in proper or first-class condition, when you get the pavement down do you consider the bridge as good as the day you built it?

Mr. Dimmock: The pavement is.

Mr. McJilton: I mean the bridge in its entirety.

Mr. Dimmock: No.

Mr. McJilton: For that reason you have got to set aside a certain proportion for the depreciation you cannot see.

The meeting was then adjourned until 10 o'clock Wednesday morning.

### Wednesday Morning Session.

Chairman Hall called the meeting to order at 10 a. m. and called for the report of the committee on organization. Mr. Smith, of Lynn, chairman of the committee, presented its report, which after careful consideration was adopted article by article, as follows:

### Constitution and By-Laws of the Street Railway Accountants' Association of America.

#### Constitution.

##### NAME.

1. The name of the Association shall be "The Street Railway Accountants' Association of America," and its office shall be at the place where the Secretary resides.

##### OBJECT.

11. The object of this Association shall be to bring together those engaged in the accounting department of Street Railway Companies, for the interchange of ideas, to promote the adoption of a uniform system of accounts, and to improve the work of the accounting department.

## MEMBERS.

III. The members of this Association shall consist of American Street Railway Companies, or lessees, or individual owners of street railways; and each member shall be entitled to one vote by a delegation presenting proper credentials.

## AMENDMENT.

IV. This Constitution may be amended by a two-third vote of the members present at a regular meeting, after 30 days' notice thereof has been given to each member in writing by the Secretary.

## By-Laws.

## APPLICATIONS.

I. Every applicant for membership shall signify the same, in writing, to the Secretary, enclosing the requisite fee, and shall sign the Constitution and By-Laws.

## OFFICERS AND EXECUTIVE COMMITTEE.

II. The officers shall consist of a President, three Vice-Presidents, a Secretary and Treasurer, and four others, who shall constitute the Executive Committee. The Executive Committee shall have entire charge and management of the affairs of the Association. The Officers and Executive Committee shall be elected by ballot, at each regular meeting of the Association, and shall hold office until their successors shall be elected. The duties of Secretary and Treasurer shall be performed by the same person.

## DUTIES OF OFFICERS.

III. The Officers of the Association shall assume their duties immediately after the close of the meeting at which they are elected; they shall hold meetings at the call of the President, or, in his absence, at the call of the Vice-Presidents, in their order, and make arrangements for carrying out the objects of the Association.

## PRESIDENT.

IV. The President, if present, or, in his absence, one of the Vice-Presidents, in their order, if present, shall preside at all meetings of the Association and of the Executive Committee.

## TREASURER.

V. The duties of the Treasurer shall be to receive and safely keep all money of the Association; to keep correct accounts of the same, and pay all bills approved by the President, and he shall make an annual report to be submitted to the Association.

## SECRETARY.

VI. The duties of the Secretary shall be to take minutes of all proceedings of the Association and of the Executive Committee and enter them in proper books for the purpose. He shall conduct the correspondence of the Association, read minutes and notices of all meetings, and also papers and communications, if the authors wish it, and perform whatever duties may be required in the Constitution and By-Laws appertaining to his department.

## MEETINGS.

VII. The regular meeting of the Association shall be held at the same time and in the same place as the meeting of the American Street Railway Association. Special meetings may be held upon the order of the Executive Committee. Notice of every meeting shall be given by the Secretary, in a circular addressed to each member, at least 30 days before the time of meeting. Ten members shall constitute a quorum of any meeting.

## ORDER OF BUSINESS. (1.)

1. The reading of the minutes of the last meeting.
2. The address of the President.
3. The report of the Executive Committee on the management of the Association during the previous year.
4. The report of the Treasurer.
5. Reports of Special Committees.
6. The election of officers.
7. The reading and discussion of papers, of which notice has been given to the secretary at least 30 days prior to the meeting.
8. General business.

## ORDER OF BUSINESS (2.)

IX. At other general meetings of the Association the order of business shall be the same, except as to the 3rd, 4th and 5th clauses.

## NOTICES.

X. The Secretary shall send notices to all members of the Association at least 30 days before each meeting, mentioning the papers to be read and any special business to be brought before the meeting.

## EXECUTIVE COMMITTEE.

XI. The Executive Committee shall meet one hour before the opening of each annual meeting of the Association; and on other occasions when the President shall deem it necessary, upon such reasonable notice, specifying the business to be attended to, as the committee shall, by vote, determine. A vote of the Executive Committee may be taken by mail when deemed advisable.

## VOTING.

XII. All votes, except as herein otherwise provided, shall be viva voce, and in case of a tie the presiding officer may vote.

## READING OF PAPERS

XIII. All papers read at the meetings of the Association must relate to matters connected with the objects of the Association, and must have the authority and approval of the Executive Committee before being read. Persons to whom subjects are assigned must signify their intention in writing to prepare the paper, and to forward the paper to the Secretary at least 30 days previous to the date of meeting.

## PAPERS, BLANKS AND FORMS.

XIV. All papers, blanks and forms submitted to the meeting of the Association shall remain the property of the owner, subject, however, to be retained by the Executive Committee for examination and use.

## FEES.

XV. Members shall pay annual dues of ten dollars, payable in advance. The Executive Committee shall have no power to expend, for any purpose whatever, an amount exceeding that received as hereinbefore provided for. It shall be the duty of the members to make such returns to the Secretary as shall be required by the Executive Committee.

## ARREARS.

XVI. No member whose annual payments shall be in arrears shall be entitled to vote.

## WITHDRAWAL.

XVII. Any member may retire from membership by giving written notice to that effect to the Secretary, and the payment of all annual dues to that date; but shall remain a member and liable to the payment of annual dues until such payments are made, except as hereinbefore provided.

## EXPULSION.

XVIII. A member may be expelled from the Association by ballot of two-thirds of the members voting at any regular meeting of the Association, upon the written recommendation of the Executive Committee.

## RULES OF ORDER.

XIX. All rules not provided for in these By-Laws shall be those found in Roberts' Rules of Order.

## AMENDMENT.

XX. Notice of all propositions for adding to or altering any of these By-Laws shall be given to the members of the Association at least 30 days before the meeting at which they are to be acted upon.

## COPIES OF CONSTITUTION AND BY-LAWS.

XXI. Each member of the Association shall be furnished by the Secretary with a copy of the Constitution and By-Laws of the Association, and also a list of members.

Mr. Calderwood: I move the adoption of the Constitution and By-Laws as a whole, as amended. Carried.

The Chairman: The next business is the report of the Nominating Committee.

Mr. Greene: Mr. Chairman and gentlemen—Mr. Burington was named as the Chairman of the Committee, but afterwards turned the matter over to me. It has been difficult for your Committee to get a ticket which will please all, or which will be even satisfactory to ourselves, when there was so much good timber to choose from, but we present the following:—

President, Henry L. Wilson, Boston, Mass.

First Vice-President, C. N. Duffy, St. Louis, Mo.

Second Vice-President, J. F. Calderwood, St. Paul, Minn.

Third Vice-President, C. B. Reavis, Augusta, Ga.

Secretary and Treasurer, W. B. Brockway, Toledo, O.

The Executive Committee, the foregoing and Dana Stevens, Washington, D. C.; W. S. Dimmock, Council Bluffs, Ia.; W. G. Ross, Montreal, Can.; E. R. L. Tighe, Brooklyn, N. Y.

The Chairman: You have heard the report of your nominating committee. What will you do with it?

Mr. Avery: I move that the report of the committee be received Carried.

On motion Mr. Keister cast one ballot for the ticket and the chair declared the gentlemen named as duly elected.

The Chairman: Mr. Davies made a suggestion yesterday morning that a committee be appointed to take charge of the matter of standardizing our accounts. The matter was postponed until today. I regret that he is not here to take the matter up again.

Mr. Hibbs: I move that a committee of three be appointed to correspond with the different roads represented, and receive blanks and other information, showing the different sub-heads that they have in use at present, and that the committee tabulate the matter for action at the next meeting. Carried.

The Chairman: There is yet one paper to be read by J. P. E. Clark, of Binghamton, who is unexpectedly detained at home. The secretary will read his regrets as telegraphed and the paper.

## Naming and Standardizing Apparatus.

BY J. P. E. CLARK, GENERAL MANAGER BINGHAMTON RAILROAD COMPANY, BINGHAMTON, N. Y.

Upon glancing over the list of papers to be read at this convention I am inclined to think the subject assigned me, a mis-allotment, as I find myself the only general manager upon the list, surrounded by a number of the most efficient and widely known Street Railway Auditors and Office Men of the country, whose practical experience

enables them to treat much more intelligently the various timely subjects of interest, than a man who looks on from the outside and whose principal duty as far as the office is concerned is to find fault and create as much work for the department as possible; however, an interchange of ideas between our respective departments at this time may not be amiss.

With the advent of rapid transit upon street surface railways and the almost universal adoption of electricity as a motive power, came an entire and complete revolution in the manner and mode of operation of the street railways of this country. The relegation of the horse and mule to the pasture and bone yard and the substitution of the electric motor opened up an entirely new and uncultivated field to practical street railway men, who, for the time being, were in an almost dazed condition, owing to the radical changes demanded, and the then largely experimental condition of the new theory; however, with the never failing resources and undaunted energy and courage with which the average up-to-date street

railway man is necessarily endowed, one by one the various obstacles have been overcome, and today, notwithstanding the extreme youth of the modern street railway system, it has developed into a strong, robust child, with promise of a useful maturity.

While the development of the street railway systems of this country for the past few years has been rapid, it has at the same time been thorough, and from the chaotic and experimental stages have almost universally emerged thoroughly systematized and well managed plants, organized to best subservise the interests of the people and to produce the best financial results for their owners. This condition is due, in a large measure, to the advantages afforded in various ways for an interchange of ideas pertaining to the practical management and operation of street railways.

The most approved methods of construction, cost of maintenance and the efficiency and life of electrical equipment, appliances and trucks, the cost of larger and more commodious car bodies, the care and inspection of equipment, the best means of stimulating traffic, how to select employes, and many other practical operating questions of vital importance have been satisfactorily demonstrated by practical results, and thoroughly discussed at the various State and American Street Railway Association Conventions, and commented upon at length by the various Street Railway journals. The time devoted, even by the busiest of street railroad officials, in attending those conventions and the careful perusal of the various articles upon practical subjects written by practical men, has proved time well expended, much benefit being derived by the free exchange of ideas and the comparison of results obtained by different methods adopted.

Until I received notification from the Editor of the Street Railway Review of the proposed convention of Street Railway Accountants, it had not occurred to me how completely the Auditor, Accountant and Office had been ignored at conventions, in the preparation of papers read thereat, the general discussion ensuing and even through the columns of the various journals published throughout the country devoted to Street Railways and their interests.

Active and thorough research for data, useful in compiling this paper, revealed to me forcibly that the Auditor, Accountant, and the best method of office work and record has been "lost in the shuffle," as, in looking over carefully the files of street railway journals and reports of several State and National Conventions, I found absolutely nothing relative to the subject, except in a brief and general way.

When the important relation of the office to the practical managing department of the street railway is considered it is surprising that the state of affairs just mentioned exists. That this condition is radically wrong, none will gainsay. I am pleased that the Street Railway Review has taken the initiative in what I consider a move in the right direction, which should prove of incalculable benefit, not only to the auditing department, but to every person directly interested in the management and operation of street railways.

This conference of Street Railway Accountants, called for the purpose of considering different forms, methods and plans used by the various roads represented in compiling accounts, records, etc., and to arrange, if possible, a standard, which can be adapted to meet the requirements of both the larger and smaller roads, thereby affording a correct basis of comparison and the diffusion of general valuable information, will have accomplished valuable results, if the purpose of the convention is fully carried out and a standardized form of accounts generally adopted.

In order to successfully accomplish the desired end it becomes necessary, as far as practicable, for the operating department to standardize and name equipment, apparatus, and parts of every description, also materials of all kinds used in construction, in order that the various articles purchased as new outfit or used in repairs and maintenance will be charged under the proper heads. In view of the fact that a store-keeper's catalog, recently published by an enterprising street railway manager, for the general use of street railways, contains two hundred and twenty-five different headings, with numerous items under each, in many instances upward of one hundred, a person is overwhelmed at the outset by the vast number of articles used in the operation and maintenance of a street railway system, and the first general impression gained, is that the naming and standardizing of the apparatus and equipment is a hopeless task; but a more detailed investigation of the catalog reveals that a majority of the articles mentioned therein are of minor importance and could be easily disposed of by a more general classification, so that, from the standpoint of the number of articles used a standard could be arranged without great difficulty. There is, however, in my mind, a greater obstacle to overcome in standardizing and naming apparatus than the one I have just commented upon, and that is the fact that no two electric railways are equipped alike; the style and pattern of car bodies, trucks, type of motors, station apparatus, the miscellaneous equipment and the character of work and material used in track and overhead construction varying according to the requirements of the respective roads, thereby precluding the possibility of as complete a standardizing of equipment and apparatus as might be desired or has been attained by steam railroads.

I am also frank to confess that I do not consider it altogether essential to street surface railways that an absolute standard should be adopted. I do, however, firmly believe that there should be a formula arranged that would enable the accountant to enter charges under their proper headings and that there should be an understanding and agreement between the practical managing department of the various street railways as to what constituted motor parts, trucks, car bodies, generators, engines, boilers, station appliances, and all other classified equipment, and I submit that there should be detailed accounts and necessary forms for same, showing exactly the expense of maintenance and repairs, not only of the different classifications; for instance,—"maintenance of trucks" should show the cost of repairs to brakes, renewal of wheels, general repairs to truck frame; likewise, "repairs to electrical equipment," "repairs car bodies," etc., should be classified in detail showing the cost of repairs and maintenance of each classification. I consider that a standard form giving the various sub-classifications and what should constitute same, could be easily arranged, which would prove of incalculable benefit; and in preparing same, name and standardize as far as practicable the apparatus, equipment and parts used.

If you will permit me to digress (which I have assumed the liberty of doing throughout this paper, as the subject allotted me did not afford the opportunity to state all I desired to say), I think the most important suggestion in accomplishing the desired standard, and arriving at a fair and equitable basis of comparison, is that there should be a plain straightforward distinction made between cost of maintenance, repairs, renewals and betterments, and a standard form agreed upon so that when operating expenses of various roads are compared, the official, director, stockholder or bondholder making the comparison would at least have the satisfaction of knowing that the figures shown demonstrated the expense of operation based upon similar charges and computed according to the standard adopted by the most competent street railway auditors of the country.

The same suggestion applies to construction, as at the present time there are as many systems of division of accounts in this department as there are street railways, and it is generally understood, not only by street railway men, but by investors, that the manner in which repairs, renewals, and new construction are divided and charged has an important bearing on the account "operating expenses." There-



J. P. E. CLARK.



fore, if a proper and equitable standard and division can be arranged and universally adopted, whereby the charges in this department belonging to "operating expenses" are properly assigned it will redound to the benefit of the general street railway interests of the country, and when understood by investors that a standard form of charges has been adopted and is prevalent it will beget confidence, thereby directly affecting and strengthening street railway securities.

As I have observed above, the standardizing and naming of material used in the construction department, as far as practicable, is as necessary to the accountant as in the operating department, and in my opinion can be more easily accomplished. While a perfect standardizing and naming of apparatus, equipment and material used in the operation of street railways may not be possible, a classification sufficiently explicit and complete can be arranged and the parts and material pertaining to the respective classification properly assigned, whereby the accountant will be enabled to enter charges under proper heads, and when statements are submitted to the operating department the latter may have the pleasure and satisfaction of knowing that the account "repairs to steam plant," does not include any charges properly belonging to "removal of snow and ice."

An important factor in enabling the auditors or accountants to make proper classification is to familiarize themselves as far as possible with the practical operating department of their respective roads, become acquainted with the appliances and apparatus in use and the parts necessary to the repairs and maintenance of same. The operating department should in turn afford the office daily classified reports of repairs made and material used for same and give necessary details and information, thereby enabling the accountants to perform their work intelligently and with confidence.

The necessity of a standardized form of accounting is plainly apparent; obvious reasons demand it, but as a basis of satisfactory comparison and information to the individual road, it is particularly essential and of paramount benefit, and I believe the association of the Street Railway Accountants will be an invaluable adjunct to one of the largest and most enterprising business interests this great nation possesses. I prophesy a useful and busy future for the organization, and think the annual interchange of ideas and practical results and hours of social pleasure passed at forthcoming conventions will enable all present to render their respective interests renewed and improved service.

Mr. Burlington: I move that the paper be accepted and entered on the minutes, with the thanks of the meeting. Carried.

Mr. Reavis: I move a vote of thanks be tendered to the local members of the Association for their courtesy, and also to Messrs. Windsor and Higgins of the street railway press.

Unanimously carried.

Mr. McJilton: There is one point I do not think we are up to date on, and that is in the matter of notifying conductors properly about their shorts. I would consider it a particular favor if the members who are here would send me a copy of the blank which they use for that purpose. I do not like to rob the table over there and I would like to get blanks on the subject.

Mr. Barnaby: Our people are anxious to get a good storekeeper's method of reporting. We find sometimes that several thousand feet of track will be missing, and it takes a great deal of labor to trace it.

The Chairman: I have the pleasure of introducing to you, not a stranger, but one who is known to us all, our new president, Henry L. Wilson, of Boston.

President Wilson: Gentlemen, I accept this position rather reluctantly; but as it is only for a short time, as our next meeting occurs in a few months, I will try to fill the position in the meantime. This election puts me in mind of a story of an occasion where a small infant died, and the wake which followed was attended by very many people. The master of ceremonies got up and said he wished to apologize, he was very sorry he was obliged to present so small a corpse to so good an audience. (Laughter.) I feel in the position the corpse must have felt, and I think the committee which nominated me owes the rest of you an apology for having nominated so small a man for this position. I know we are in a hurry, and I will not go into any elaborate remarks. (Applause.)

I think there is one committee which failed to report, the committee on blanks, but perhaps it was discharged by its own acts when it fulfilled its duties. There is one other thing which comes up before us, and that is the committee which is to be appointed on the standard-

izing of accounts. I have had that delegated to me. I would appoint C. N. Duffy, St. Louis; William F. Ham, Brooklyn, and J. F. Calderwood, Minneapolis. The Chair is now open for further business. Is there any?

Mr. Burton: I move a vote of thanks be extended to our retiring chairman and our secretary, who succeeds himself.

The motion was put and carried.

Mr. Hall: I want to thank you for the courtesy which you have shown me in electing me as your temporary chairman, and also for the vote of thanks which you have just passed. I do not want to weary you with a long speech, because I am not a speech maker; but I want to express to you what I have heard from everyone to whom I have spoken since we have been here, and that is, that this meeting has been a success. It seems to me we have accomplished the object which brought us together. Some of the members in speaking this morning have mentioned about our getting through with the business and attending to it properly. I do not think that is anything more than should be expected from such a body of men as we are, occupying the positions which we do in our companies. That has been our education; that is what we are employed for, to attend to the business in a systematic manner, and in such a way that we may show the results of what we do, and we have done that here in our meeting. Personally I came here to learn, and I feel that I have been individually amply repaid by coming, and that I can go back to the company which I represent and make myself of more value to them in dollars and cents than I was before coming here. It may have been a narrow, contracted and selfish view which I took in regard to having the meeting in October, but I reached that conclusion simply because I cannot be with you, and this I regret now, and shall regret it until the time of the meeting is changed, which I believe is only a question of time. (Applause.)

The President: What further business is there?

The secretary called for the payment of dues, which was promptly responded to, and at 1 o'clock the meeting adjourned.

At 2 o'clock the delegates were taken in charge by a committee of Cleveland street railway officials, including: J. B. Hanna, F. T. Pomeroy, A. E. Aiken, W. G. McDowell, John Erhardt, F. S. Burton, W. W. Herrick and A. L. Lynn, Jr. The trip was made in a handsome interurban Brill car of the Painesville line, and went over some 40 miles of the Cleveland Electric and the Painesville, Cleveland & Eastern lines. An enjoyable lunch was served on board by the Cleveland roads, and the trip was a most delightful and interesting one. The return was made in time to catch the early evening trains, and it was with genuine regret the hosts and visitors parted. An inspection was also made of the offices of the Cleveland Electric, which are unusually well arranged, and which suggested several improvements to some of the visitors for their own office work.

#### Convention Notes.

Several of the accountants took advantage of the trip to visit several cities going and returning, to study other system of accounts and office methods.

The convention was under obligations to J. B. Rutherford, of the Steel Motor Company, who has headquarters in Cleveland, for appreciated courtesies.

H. A. Dörner, manager of the Dörner & Dutton Manufacturing Company, distributed neat souvenir gears.

The proceedings were reported by T. E. Crossman, who has reported the meetings of the American Association for so many years.

It was generally conceded that the accountant who can always figure out a dividend is a valuable man.

The Hollenden hotel management took splendid care of the convention. The large banquet room was tendered for the meetings and set with small tables around which the delegates sat and upon which they could spread their papers and take notes.

The display of blanks and forms as arranged by the committee was a most interesting feature and was constantly surrounded by delegates examining and studying the exhibit. At future meetings a



F. E. SMITH.



J. F. CALDERWOOD.



E. R. L. TIGHE.



C. B. REAVIS.

large room will be required for the classified display and the committee in charge promises a collection in October, which alone will be worth a trip to examine.

During the trolley ride several of the famous Cleveland viaducts were crossed, and afforded F. E. Smith, who has made quite a study of viaducts, an opportunity to entertain and enlighten his comrades on the subject.

C. B. Reavis, auditor of the Augusta, Ga., lines, wore a fine new knight templar watch charm, which with a highly complimentary letter from Colonel Dyer, was presented him by the employes of the company just as he was leaving to attend the Cleveland meeting.

The illness of H. J. Davies, of the Cleveland Electric, which prevented him from attending any but the first session, was greatly regretted. Mr. Davies is an acknowledged authority on accounts, whose assistance would have been most gratifying.

The discussion of what date is best for subsequent meetings was extended and earnest, and the matter will probably come up for action and possibly change at the October meeting. The advantages of meeting at the same time as the American are an opportunity to

even one session of the Cleveland meeting could fail to mark the earnest, business-like, hard-working character of the convention; and only those who were present can realize the amount of work accomplished in the two days.

## LOCOMOTIVES AT STREET RAILWAY CROSSINGS IN WASHINGTON.

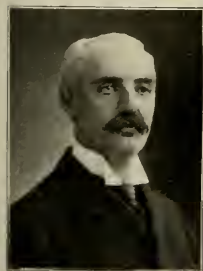
The Commissioners of the District of Columbia have revoked their order, requiring all trains to stop at street railway crossings and have substituted the following regulation: "No locomotive or train with or without a locomotive attached shall pass over any street railroad crossing where the cars of a street railroad are propelled by cable or electric power, except in obedience to signal given by the gateman employed by the corporation owning the tracks over which such locomotive or train is to pass and such signal shall not be given until the crossing gates are closed in such manner as to effectually prevent access to said tracks from the highway."

## THE FIRST ELECTRIC LINE IN MEXICO.

Up to the present time, mules have held full sway as a motive power for street car lines in all the cities of Mexico. One insurmountable difficulty in nearly every locality is that mechanical power is so expensive as to be prohibitory. The coal for steaming purposes is brought from England and the meager railroad facilities make its cost very high. It is predicted by engineers, who are cognizant of the conditions in Mexico, that the future of electric street railways is not very promising unless coal is discovered in considerable quantities. However, there are some water powers which might be used with great profit. It would almost take the breath out of an American street railway engineer to learn that a mule car line, 15 miles long, conducts visitors and the people of Guadalajara to see the beautiful falls of Juanacatlan, the "Niagara of Mexico." There is a water power of some importance near the city of Jalapa and it is now used to generate power for electric lights. This same station is to be used to operate an electric line from Jalapa to Cordoba, 25 miles distant.

The contract for the line and equipment has been given to C. E. Loss & Co., railway engineers, 621 Pullman building, Chicago. Six cars are to be run on the line, freight as well as passenger service being rendered.

An electric road is proposed between Balza and Ubeda, Spain.



W. S. DIMMICK.



FRANK R. GREEN

meet the large number of operating men and managers, study the exhibits and secure the same reduced rate of fare. It would also permit such operating men as have much to do with the accounting department, as is the case with many small roads, to attend at least a part of the Accountants' sessions, while in attendance on the American Association meetings. On the other hand it is very hard for many roads to spare all the men at one time that ought to be in attendance at both meetings. There will also be many questions which the Accountants' Association will want to refer to the American for advice and opinion, and this can better be done if the two meetings had an interval of some months, so as to permit a proper consideration and study of the questions. The unanimous sentiment also was that the new association would have to put in long hours of work and did not want to be thought desirous of seeking the pleasure trips which are prominent features of the other. No one who sat through



# 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.

At 11:45 p. m. on March 24, a fly-wheel burst at the Edgar Thomson steel works, Braddock, Pa. The wheel was 24 ft. in diameter, weighed 60 tons, and was in two segments; the engine cylinder was 54 in. in diameter and 60 in. stroke. It was set to run at 67 r. p. m. being controlled by a Porter-Allen governor. The engine was used for driving rolls; when the accident occurred a rail had just left the rolls causing the engine load to drop from 2,000 h. p. to friction load, and the belt to the governor breaking, the engine ran away. Before the engineer could shut off steam the wheel had burst. It is said that one segment struck a double 12-in. I-beam 20 ft. long and cut it in two without bending it more than 1 in. The engineer was fatally injured by a piece of the wheel which fell upon him.

\* \* \*

Cheap coal, most frequently slack or culm, requires for its combustion specially constructed furnaces and grates, and even with the so-called smokeless furnaces, so many types of which are on the market, it is an extremely difficult matter to avoid producing smoke. Culm has been successfully burned for several years at Scranton, Pa., and the Delaware, Lackawanna & Western Railroad burns the finer sizes of coal, rice, buckwheat, etc., on most of its locomotives. With a view to utilizing dust that is too fine to burn on any grate, and perhaps more particularly to avoid the production of smoke much attention has been given to various types of dust burners. The finer the coal the more difficult it is to secure a proper supply of air, and in burning dust it is essential that the coal be thoroughly mixed with or suspended in the air as it is introduced into the furnace, so that air may reach each particle and complete combustion ensue. In one form of burner, known as the Lindenstrasse Market apparatus the chimney draft carries the dust into furnace. In this apparatus the only entrance for air is through a pipe, at the intake of which is placed a wind wheel, given motion by the draft. The motion of this wheel operates to shake a screen placed in the lower part of the dust reservoir, and thus a supply of dust is constantly shaken down into the air current and carried into the furnace. In other types the dust is fed to the burner by means of an Archimedes' screw or other positive motion, and then blown into the furnace by a current of air under pressure or by a jet of steam which, by its inspirator action, draws air for combustion with it. The form of chamber or nozzle where the coal and air meet is such that the two are thoroughly mixed, and the stream spread it as it enters the furnace. Experiments at Scranton some years ago showed that culm would give from 70 to 90 per cent of the heating effect of the screened coal. Recent experiments by Herr Schneider, chief engineer of the Steam Users' Association of Berlin, gave the heat utilized in making steam as from 66 to 77 per cent of the theoretical heating value of the fuel; the type of boiler was not mentioned in the report giving these figures. With our

ordinary low grade fuels this means an evaporation of from 7 to 9 lbs. of water from and at 212°.

\* \* \*

EDITOR STREET RAILWAY REVIEW: In making comparisons between the crank and flywheel pump I never thought of the large pumps used in waterworks, and since you refer to them you must acknowledge that nearly all waterworks pumps of a size to be compared with feed pumps are decidedly not of the crank and flywheel type. As reported in your paper the city of Chicago has just closed a very large contract for pumps. Are they of the crank and flywheel type? One reason for the popularity of this type of pump in England is because they are usually plunger pumps, which are much better for feeding boilers than piston pumps, and thus the type got some credit that really belonged to the water end only.

I have already made the test you recommend, except that weighing the steam used is much better than figuring the consumption from the cards, and the result is that a first class compound single steam jacketed pump will do a horsepower on a good deal less than 60 pounds steam. How much less the electric driven pump will do it on I don't know, but not enough to make the steam pump the least desirable under the circumstances.

In marine work where it has been customary to drive all the pumps from the main engines, the practice is being abolished and they are using the very apparatus that you want retired from the power plants. Even on the rivers the cumbrous old doctor is giving way to the better pump for feeding boilers, and simplicity is too much of an item in power plants to permit the universal application of electric driven pumps.

ENGINEER.

\* \* \*

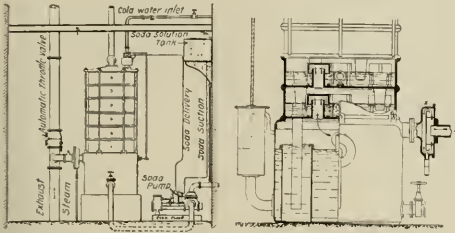
## The Chevalet Feed Water Heater.

The illustrations for which we are indebted to the Electrical Engineer, London, show the general arrangement of plant and a sectional view of the Chevalet feed water heater. Exhaust steam enters at B, the baffle plate E, acting as a separator to remove any oil, and passes, as shown by the arrows, up through a series of six rings or trays. Cold water enters at the top of the heater and runs by gravity from each tray to the one below. In each tray are six or more inlets for steam and three water overflow tubes.

By boiling the water, the carbonic acid is driven off and the carbonate of lime precipitated; the sulphate of lime if present is eliminated by a solution of carbonate of soda introduced at the same time as the crude feed water. The supply of soda solution is proportioned to the water drawn from the heater by the feed pump, the soda pump being actuated by one of the moving parts of the feed pump. About one-fifth of the exhaust steam is required for the heater.



This heater has been in use at the electric lighting station at Brompton for about a year and has resulted in keeping the boilers free from scale. The heaters must be cleaned



every six or eight weeks; but although the amount of incrustation is great, the scale is soft and easily removed. This is thought to be because the heat transferred to the water is not transmitted through the plates on which the scale accumulates.

\* \* \*

### Economy of Condensing.

There is no question as to the advantages of condensing over non-condensing engines when the power house is located where water for condensing may be had for the taking. Recently, however, a number of railway power plants have been built remote from such sources of water, and in these cases it is merely a question of whether the saving in cost of operation and interest charges on the plant will justify the additional investment necessary to secure water, or other means of condensation. The bulk, cost and difficulty of maintenance preclude, for large plants, all those air condensers in which the steam is condensed in pipes or closed tanks presenting a large surface to the atmosphere. Where other conditions than economy require that the steam shall not escape to the atmosphere these air condensers are often used to advantage on a small scale as on the steam tram cars in France.

For condensing in large plants two plans are in use for cooling the condensing water so that it may be used over and over again. The simpler is to discharge the water onto broad tables, slightly inclined, over which it flows to a shallow basin. This method, however, requires a relatively large area, which is a decided disadvantage where the price of land is high. The second is by means of a cooling tower, which being vertical, takes up but little ground area, but is much more expensive to install. The Worthington tower consists of a cylindrical steel shell open at the top and filled with layers of cylindrical tubular tiling. The water is pumped to the top and flows over the tile while a current of air is at the same time forced upward by means of a fan or blowing engine.

The Barnard cooling tower made by the Wheeler Condenser & Engineering Company, consists of a rectangular casing in which are suspended the requisite number of mats woven of steel wire and galvanized, over which the water flows. The casing is preferably of steel plate but may be of wood or brick. At the top of the tower the water is distributed so that each mat receives its due portion. A fan is provided to force a current of air upward through the tower. The cost of this tower, including fan, fan engine, surface condenser and circulating pump, may be taken as

\$6 per horse-power (f. o. b.) for an engine with an economy of 15 lbs. of water, and the power for fan and pump as from 3 to 5 per cent of the i. h. p. of the engine.

In Chicago, H. M. Sloan, general manager of the Calumet Electric Street Railway, was the first to use the cooling troughs. He excavated a pond 80 x 200 ft. and 6½ ft. deep, and built three troughs 15 x 85 ft., giving a cooling surface of over 24,000 sq. ft. The soil is stiff blue clay and practically water tight, making the cooler very cheap to construct, the total cost being \$1,200, to which is added the value of the land, \$2,500, making in all \$3,700. This same method for cooling condensing water is to be used by the Chicago Suburban Railway.

The scheme adopted by the West Side Metropolitan Elevated was more heroic, and consisted in building two tunnels, 5 ft. in diameter, from the Chicago river to its power plant a mile distant.

The following table taken from that of Dr. Charles E. Emory by Mr. McElroy, shows where we may expect a saving by condensing. A comparison of the reported performance of power houses with the economy given in the table will show the figures in the latter to be in close accord with modern practice.

	Indicated horse-power for 500 h. p. net.	Steam pressure by gage.	Water per i. h. p. per hour.	Commercial h. p. per horse-power.	Cost of engines erected and con- densed per net horse-power.	Cost of buildings and stacks per net h. p. of en- gines.	Total per net h. p. of engines.
Simple high speed.....	542	100-120	33	596	\$17.50	\$26.22	\$58.00
Simple low speed.....	556	100-120	29	537	25.00	23.03	62.85
Comp. high speed.....	542	100-120	26	470	21.00	20.68	54.81
Triple high speed.....	542	150-170	24	434	26.00	21.70	60.25
Simple h. s. condensing.....	542	100-120	22	397	21.00	17.47	59.42
Simple l. s. condensing.....	556	100-120	20	371	27.00	16.32	54.85
Compound h. s. condensing.....	542	100-120	22	391	24.50	15.88	51.74
Compound l. s. condensing.....	556	110-125	18	334	30.00	14.70	55.62
Triple h. s. condensing.....	542	150-170	17	307	29.00	15.35	54.81
Triple l. s. condensing.....	556	150-170	16	297	37.50	14.75	62.07
Triple l. s. condensing.....	556	160-170	15	278	45.00	13.90	67.25

Taking up now the case of the Calumet. The maximum net power of the station may be taken as 2,000 h. p. in summer and half that in winter. Assuming the average load for 24 hours to be one-fifth of the maximum, we have as the output 300 x 24 x 365 or 2,628,000 horse-power-hours per year. We see that the condensing engine will give a water rate at least 6 lbs. less than the non-condensing engine of the same class. Assuming coal at \$1 per ton of 2,000 lbs. and that this coal will evaporate 6 lbs. of water per lb., this means .05 cent per horse-power-hour, or \$1,314 per year. Aside from this return of 35 per cent on the cost of the cooling troughs a saving of the cost of feed water is also effected as the feed pumps draw from the cooling tank.

The Metropolitan Elevated power house has four units, two of 2,000 and two of 1,000 h. p. with an average output at the switchboard of 2,000 h. p. for 24 hours per day. With the former assumptions as to cost of coal and boiler performance there is a saving of 24 tons of coal per day by the use of condensing engines, which amounts to \$8,760 per annum. The reduced first cost taken at \$3 per horse power, the saving being effected in the boilers and buildings, is \$18,000.

If the reduction in the coal bill be capitalized at 8 per cent we have \$109,500, and that with the saving in the cost of the plant gives \$127,500 as the maximum which could be profitably invested in the tunnels for supplying condensing water, which is somewhat in excess of their cost. From these figures it appears that even with the present

capacity of station and the cheapest coal the tunnels show a small margin of profit, which will be increased as the output of the station is increased.

The simple non-condensing engine is not without friends and the new power house of the Chicago City Railway, which will eventually have a capacity of nearly 12,000 h. p. at the switchboard is equipped with engines of this type and with return tubular boilers.

In a future issue we hope to be able to present the records of these plants which will enable interesting comparisons to be made as regards the economy of condensing.

\* \* \*

### Power House Record.

Through the courtesy of G. B. Coleman, secretary and general manager of the Metropolitan Railroad of Washington, we have received itemized statements of the cost of power generated at the 9th street station of that company during the six months ending February 28, 1897.

#### OUTPUT, COAL CONSUMPTION AND COST.

Month.	Coal, lbs.	Kilowatt-hours.	Coal per kilowatt-hour, lbs.	Total power expense.	Cost per kilowatt-hour.
September.....	880,800	234,455	3.757	\$ 1,908.53	\$.00814
October.....	934,200	252,595	3.608	1,867.70	.00750
November.....	970,303	254,190	3.852	1,913.81	.00753
December.....	1,003,403	273,050	3.674	1,963.50	.00719
January.....	1,034,500	309,295	3.334	2,041.66	.00661
February.....	907,300	271,305	3.505	1,842.95	.00679
	5,799,500	1,594,800	3.620	11,538.15	.00723

#### DISTRIBUTION OF COST.

Month.	S'pt'mb'r	October	Nov'mb'r	Dec'mb'r	January	February
Engineers.....	\$ 177.77	\$ 183.71	\$ 177.76	\$ 183.70	\$ 183.70	\$ 165.92
Firemen.....	120.00	124.00	120.00	124.00	124.00	112.00
Oilers.....	158.41	161.00	157.50	170.25	167.00	154.00
Engine and fire room help.....	87.93	93.00	90.00	93.30	93.00	84.00
Cylinder oil.....	45.03	50.83	44.75	51.66	52.76	48.00
Engine oil.....	16.14	16.08	18.06	15.54	15.12	12.00
Pump oil.....	16.80	12.43	11.38	12.60	15.12	13.65
White waste.....	8.30	8.37	8.10	8.50	8.08	9.38
Store room.....	36.52	27.08	34.14	25.45	72.71	20.08
Time book (Shop). Water.....	25.07	19.17	15.30	23.15	17.18	12.82
Coal.....	119.51	12.63	18.61	5.61	5.61	7.10
Total.....	1,007.05	1,163.55	1,219.72	1,249.74	1,288.48	1,204.95
Credit, oil barrels returned.....	1,908.53	1,872.75	1,916.31	1,963.50	2,043.66	1,845.70
	5.05	2.50	.....	2.00	2.75	.....
Total.....	1,908.53	1,867.70	1,913.81	1,963.50	2,041.66	1,842.95

This station is equipped with three 250-h. p. water tube boilers; Goubert exhaust heaters; three slow speed compound condensing Green engines, 17½ and 32 by 48 in., direct connected to 300-k. w. General Electric generators; steam feed pumps and steam pumps for lifting water from an artesian well which furnishes the supply. The fuel is Georges Creek Cumberland run of mine coal costing \$2.79 per long ton. The boiler pressure carried is 120 lbs. The station is operated about 20½ hours per day.

In the REVIEW for November, 1895, page 716, a statement of the performance of this station was given. At that time the daily output was 3,444 electrical horse-power-hours; the total cost per electrical horse-power-hour (including repairs, but not including interest) \$.00916, and the interest charges on cost of plant \$18 per day. The rate of interest is not stated but an estimate on the cost of the plant leads us to think that it was 5 per cent. In July, 1896, a portion of

the F street division began to be supplied with power from this station and the present output is between 10,000 and 14,000 horse-power-hours per day.

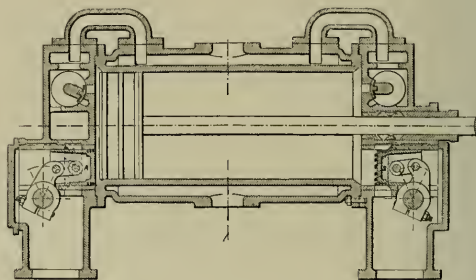
From the data furnished by Mr. Coleman, the cost per electrical horse-power-hour has been computed. As no additions have been made to boiler or engine equipment the interest charges are the same as before, \$18 per day. For January this makes the interest charge per h. p.-hour .13472 cent or the total cost of power .62602 cent. The excessive water cost in September is due to a break in the piping making it necessary to use water from the city mains.

#### ITEMIZED COST PER ELECTRICAL HORSE-POWER-HOUR— CENTS.

Month.	S'pt'mb'r	October	Nov'mb'r	Dec'mb'r	January	February
Engineers.....	.05656	.05246	.05218	.05010	.04416	.04562
Firemen.....	.03818	.03662	.03522	.03388	.02980	.03080
Oilers.....	.05040	.04755	.04623	.04651	.04015	.04235
Engine and fire room help.....	.02708	.02747	.02643	.02549	.02236	.02335
Cylinder oil.....	.01433	.01501	.01313	.01411	.01268	.01345
Engine oil.....	.00514	.00502	.00556	.00425	.00364	.00330
Pump oil.....	.00535	.00367	.00334	.00344	.00364	.00375
White waste.....	.00264	.00247	.00238	.00232	.00216	.00256
Store room.....	.01162	.00800	.01003	.00695	.01748	.00552
Time book (Shop). Water.....	.00798	.00566	.00151	.00632	.00113	.00353
Coal.....	.03802	.00373	.00546	.00153	.00135	.00195
Total.....	.60727	.34967	.35800	.34112	.30975	.33130
Average daily output—e. h. p. h. . . . .	10,476	10,923	11,358	11,807	13,361	12,988

### CYLINDER WITH SMALL CLEARANCE.

A steam cylinder of novel design, adopted by Bollinckx & Co., of Brussels, is shown in "The Engineer," from which we reproduce the cut. As shown, the cylinder is in three pieces and is steam jacketed, the jackets serving as the steam chest. Steam is admitted to the barrel jacket at the top and passes to the heads, thus making the jacket of the barrel act as a separator. The admission valves are of the



corliss type but being placed across the end of the cylinder the clearance space is very much reduced. The exhaust valves are of the piston type and move in the direction of the axis of the cylinder; when closed the piston is flush with the head of the cylinder. The clearance by this design is reduced to less than 1 per cent, and the surface which is alternately heated and cooled is a minimum, with consequent smaller loss from cylinder condensation. The valves and valve chests are of hard cast iron and the wear is said to be very slight.

## ELECTRIC SNOW PLOW AND LOCOMOTIVE.

Unlike most snow plows the one built this last winter by the Akron, Bedford & Cleveland Railroad does not rest inactive during the summer months, but, with the snow scrapers removed, serves as a locomotive, and is used for hauling excursion trains from various steam roads to Silver Lake, a summer resort located on the A., B. & C. Our illustration shows this plow, which was built at the company's shops and is known as No. 100.

The plow is 43 ft. long over all, the main body being 35 ft. long, 7 ft. 5 in. wide and 8 ft. high from bottom of main sills to roof. The weight is 44,000 lbs.

The construction throughout is very heavy, oak being used for all the framing. The two center sills are 7 x 9 in., 35 ft. long, and the two side sills are 7 x 9 in., 29 ft. long; all the cross timbers are 7 x 9 in. except the two which are directly above the bolsters at each end of the car, these being 14 x 9

three windows in each end and two in each side of the car. On each side in the middle is a sliding door 5 ft. wide and 7 ft. high with two windows. The entire outside of the car and the roof inside are painted white; the walls inside are dark red.

The snow scrapers consist of a large blade on each end of car and set at an angle of 45 degrees. These scrapers are 3 ft. wide, 3 in. thick and 11 ft. long, built of oak throughout, bolted together by large bolts and slabs of  $\frac{1}{2}$  x 6-in. steel. On the inside and at the same angle is a 4-in. shaft with tumblers; these are connected to the scraper with  $\frac{3}{4}$ -in. chains. Additional safety chains are provided which take most of the weight of the blade. Three  $\frac{3}{4}$ -in. chains run from the extreme ends of main sills to the bottom edge of the scraper to withstand any end or side thrust when the plow is working a heavy snow bank. A 4-in. toggle shaft 6 ft. long, with one end fastened to the main side sill of the car and the other to the scraper blade, also adds stiffness to the scraper. On the rear side of the blades are fastened steel brushes



ELECTRIC LOCOMOTIVE AND SNOW PLOW—AKRON, BEDFORD & CLEVELAND.

in. All the cross timbers are mortised into the main sills, the mortises being white leaded, and the frame tied together by six heavy bolts. To stiffen the main timbers two truss rods are placed under the outside sills, passing over the ends of the bolsters and fastened to the extreme ends of the side sills, with turn buckles in the middle.

The bolster proper is built up of two pieces of steel  $\frac{5}{8}$  x 6 in. by 7 ft., with oak between them and on the sides, and bolted together. The bolsters are bolted to the cross-timbers by eight  $\frac{3}{4}$  x 16-in. bolts, making solid bolsters 14 in. wide by 15 in. deep. The framing above the floor is all of oak timbers 6 x 7 in. mortised together. Eight mortised braces on each side stiffen the car against end thrusts. On each side a truss runs from the ends of the side timber up over the door posts. The side frames are tied together by six vertical bolts. The inside of the car is ceiled, hiding the framing and truss rods.

The floor is laid with 2-in. matched Norway pine. The roof is of  $\frac{5}{8}$ -in. white pine matched ceiling, laid on rafters spaced 16 in. apart, and is covered with heavy canvass, the latter being given three coats of heavy paint. There are

which clean the rail when the blades are down. In order to raise and lower the blade of the scraper, either a lever or compressed air may be used. As the plow is equipped with automatic air a jam cylinder is used for this purpose, the piston of which is connected to a chain which connects to a tumbler on the shaft. Air being admitted to the cylinder the piston at once rises, carrying with it the scraper. Letting the air out of cylinder lowers the scraper.

The plow is mounted on two heavy trucks of 5 ft. 6 in. wheel base; the axles are 4 in. in diameter and the wheels 33 in. with double plates and 1 in. flanges.

The electrical equipment comprises four No. 38 50-h. p. Westinghouse motors, one on each axle, two rheostat controllers, one at each end of the car, and two 500-ampere circuit breakers. The wiring in the car is of ample capacity for the heaviest current that the motors can stand. The rheostat was built in the company's shops. It is constructed of wire such as is used for heater coils, over 17,000 ft. of wire being used; it measures 4 ft. x 5 ft. x 14 in. Two trolleys are used, and are so arranged that it is unnecessary to turn the poles when the direction of the car is reversed.



The plow is equipped with automatic air throughout. An independent air compressor is located inside the car. Westinghouse engineer's valve, brake cylinder and triple valve are used, and the air reservoirs are of the standard size, to fit the car for its summer service where it replaces a steam locomotive.

At each end and within easy reach of the motorman are two sand boxes of about two bushels capacity each. The mechanism for these boxes was designed in the home shops and they have been found to be a decided success.

Recent trial trips have shown that the car can easily make 30 miles per hour.

Those interested in working out general design and details of construction were William Christy, general manager; F. J. J. Sloat, superintendent; L. M. Sheldon, electrician, and Z. Mostellor, master carpenter.

### ELECTRICITY FOR THE "ALLEY L," CHICAGO.

The South Side Elevated Railroad of Chicago is to be equipped for electrical traction at an estimated cost of \$1,500,000, and it is probable that the work will be completed by October 1. The city council has granted the company permission to connect with the Union Loop, building an elevated structure through Harrison street to Wabash avenue.

Sargent & Lundy, consulting engineers, have completed the preliminary plans which were accepted by the directors of the company on March 27. The power house is to be at the northeast corner of State and 40th streets, with a frontage of 191 ft. on State and 93 ft. on 40th street; the first installation will be of 5,000 h. p. capacity; four units consisting of cross-compound condensing corliss engines and direct connected generators; eight water tube boilers of 500 nominal h. p. each; Green economisers; approved coal handling machinery and mechanical stokers. The stack is to be of steel, 200 ft. above the grates and 13 ft. in diameter. The company owns a lot with 50 ft. frontage, just north of the power house location, so that the plant may readily be increased when it becomes necessary.

The initial voltage is to be 650, with a drop of 25 volts on the line. The line is to be divided into 18 sections, each supplied by a separate feeder; at stations, which so far as possible will be at the ends of sections, the rail from which the motors take current at starting will be connected to both sections, so that advantage may be taken of both feeders at starting. A third rail, similar in design to that on the Lake Street "L" and the Union Loop will be used, with perhaps a different type of insulator. At the yards the tracks will have the third rail so that switching may be done by motor cars.

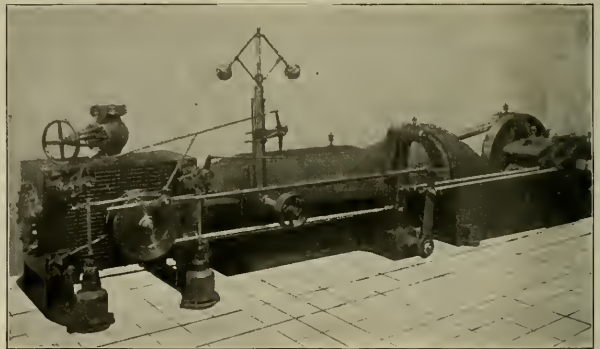
The present plan is to operate trains of one motor car equipped with two motors of about 135 h. p. each, hauling two trailers, and making an average speed of 14 miles per hour. Extensions of the line are contemplated but nothing definite has as yet been decided.

The Piedmont & Mountain View Electric Railway is to have cast-welded joints,

### ST. LOUIS CORLISS ENGINE.

The illustration shows a view of the "heavy duty" corliss engine which has been designed by the St. Louis Iron & Machine Works to supply the demand in recent years for an engine which combines great strength, constant regulation under wide range of load, economy of operation, and ability to operate continuously under great overload. This combination makes the engine especially suited for electric railway power houses and for service in rolling mills and other places where the conditions are very severe.

The main frame is of box form, stiffened by heavy ribs, and designed to resist all stresses due to the weight on the main bearing and to the working of the engine. The guide frame is circular in section, and has a pillar or foot extending the length of the guides and resting on the foundation. The cylinder is made with heavy walls and flanges, and in this type is designed for a working pressure of 150 lbs. On the gear side the cylinder feet are extended to receive the self-contained dust-proof dash pots. The valve gear is of the standard hook type and operated by double eccentrics and wrist plates. This movement gives a cut-off variable between zero and three-quarters stroke, with a constant exhaust opening and compression. The valves are made single or double ported according to the type and speed of



"HEAVY DUTY" ST. LOUIS CORLISS.

the engine. All rods and pins are forged of crucible steel the crosshead and crank of 60,000-lb. open hearth steel and the crank shaft of selected wrought iron. The governor is of the centrifugal ball type, provided with a weighted lever for changing speed, dash pot to prevent chattering, and an automatic safety stop which closes down the engine in case of accident to the governor.

The St. Louis Iron & Machine Works have had an experience of 40 years in the manufacture of engines and machinery, and have every facility in the shape of modern works and abundant capital to enable them to undertake works of magnitude and guarantee satisfaction.

The Consolidated Traction Company of Newark, N. J., has a rather interesting case pending. It has brought action in the Court of Chancery to restrain the Howard Savings Bank from paying \$1,400 which a former conductor, accused of dishonesty, has deposited there. No action has yet been taken.

## STREET RAILWAY LAW.

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

*The Doctrine of Comparative Negligence no Longer the Law.*

The law of contributory negligence forbids the recovery by one who by his own fault brings any injury upon himself, and it is no longer a question of comparison as to who was most at fault.

Justice Shepherd in giving the opinion of the Court says:

In a suit for personal injuries received by the appellee, he recovered a verdict against the appellant for \$3,800, which was remitted down to \$2,000, and judgment for that amount was entered upon the verdict. The circumstances of the accident under which the suit arose were, briefly, that the appellee was driving his team south on Stony Island avenue, between 76th and 75th streets, on which avenue the appellant operates a double track line of electric cars. About the time he reached 75th street he turned his team and attempted to cross the tracks, but before he got over, the rear of the wagon was struck by an electric car going north and he was thrown out and sustained the injuries complained of.

Appellee seems to have driven both slowly, and at nearly a right angle with the track. But whether under the circumstances rendering such a course wise and prudent, he should have attempted to cross in front of an electric car which was coming toward him at so short a distance away, as in this case, and which he saw before he started to cross the tracks, the very important and close question whether he was not guilty of contributory negligence to such a degree to bar him from any recovery.

It is wrong to say that the question of his contributory negligence in bringing the accident upon himself was the controlling question of fact in the case. We need not at this time say that the want of evidence upon that subject was so clearly opposed to the verdict as to justify our reversal of the judgment on that ground, although it is made our duty under the law to consider the evidence, and to set aside verdicts that are not so supported by it: *C. & E. R. R. Co. v. Meech*, 163 Ill. 305; *C. & N. W. Co. v. Holdom*, 66 Ill. App 201. But there was, at least, so much evidence tending to show contributory negligence by the appellee, as to require a critical examination of the instructions that were given considering that question.

The 7th instruction asked by the appellant, was as follows:

7. "If the jury shall find from the evidence that both the motorman and the plaintiff supposed that the plaintiff would get across the track without being struck by the car, and that in so doing they both erred in their judgment in respect to the matter, and that the accident was due to such error in judgment on their part, then the plaintiff can not recover, and the verdict must be for the defendant." Instead of giving it as asked the court modified it by inserting after the words "in respect to the matter" the words, "and both exercise ordinary care and caution up to the time of the collision."

The theory upon which the instruction was drawn was that both the motorman and the appellee were chargeable with the exercise of ordinary care and judgment in the situation in which they were placed, and that if in such regard they both erred, and the accident resulted in consequence of such joint error, no recovery could be had. If both were

equally negligent there could be no recovery, is well settled law.

The instruction was warranted, under the evidence that tended to show that the appellee erred in judgment in supposing that he had time to cross the tracks, and that the motorman likewise erred in judgment in not beginning sooner than he did to try to stop his train, and should have been given as requested.

The modification of the instruction was equivalent to telling the jury that appellee could recover, unless both himself and the motorman were in the exercise of ordinary care. In other words, if the motorman was exercising ordinary care and the appellee was not, then appellee could recover, which was much the same as saying that the degree of care on the part of the appellee was immaterial, however careful the motorman may have been.

Such is not the law. The law of contributory negligence forbids the recovery by one who, by his own fault brings any injury upon himself, and it is no longer a question of comparison as to who was most at fault. The appellant had a right to have the instruction squarely presented to the jury, the law, that if the accident were due to the joint negligence of the motorman and the appellee, no recovery could be had, disconnected with other and inconsistent elements embodied in the modifying words inserted by the court.

For the fault in modifying the instruction, and upon the question of whether the appellee was guilty of a degree of negligence which should bar his recovery, we think there should be another trial.

(Appellate Court of Illinois, South Chicago City Railway Co. v. Adamson, 29 Chicago Legal News 240.)

[NOTE. In the case of Calumet Electric Street Railway Co. v. Nolan, 29 Chicago Legal News 240 the same court said of the doctrine of comparative negligence. The old doctrine of comparative negligence formulated by Judge Breeze in *Galena and Chicago Union Railroad v. Jacobs*, 20 Ill. 478, and running its course through several volumes of Illinois report, after being often nibbled at, has been formally repudiated in *Lake Shore & Michigan Southern Railway v. Hessions*, 150 Illinois 546." E.D.]

*Crowded Condition of Car—Duty of Conductor to Stop—Reasonable Time Should be Allowed to Alight.*

This was an action by Frances Waniata, as administratrix of the estate of William Waniata, deceased, to recover damages for the death of her intestate, caused by the alleged negligence of the West Chicago St. R. R. Co. Appellant was bound to afford the deceased a reasonable opportunity to alight with safety.

The crowded condition of the car was no excuse for lack of attention to the request of the deceased that the car stop for him to get off. The conductor was bound to pay heed to the manifest movements and desire of the deceased that the car stop for him to get off, and appellant was negligent in not holding the car until the deceased had a reasonable opportunity to get off at a place and in a manner that he would not be injured by a passing team drawing another car.

The judgment for \$3,000, in the opinion of the court, not being excessive is affirmed.

(Appellate Court of Illinois, West Chicago Street Railway Company v. Waniata, 29 Chicago Legal News 198.)

## THE COLUMBIA & MARYLAND RAILWAY.

By S. W. Huff, Electrical and Mechanical Engineer.

(Continued from Page 154.)

### THE BOOSTER SYSTEM.

The choice of a system of distribution for the Columbia & Maryland Railway lay between the Three Wire System, and the Booster System. The Booster System, as proposed and finally adopted, differs in several respects from that now used in Railway Service. The use of the series booster to compensate for a heavy drop during periods of excessive load in feeders supplying isolated sections is familiar to railway engineers. But in this system it is not proposed to boost an isolated section, but the ends of the main line, which ends are not insulated from that portion of the line fed direct from the generators. It is proposed that the point on the line where the booster-fed and direct generator-fed portions of the trolley unite shall not be fixed by section insulators, but be allowed to move backward and forward over the line with the shifting of the load.

It will be seen that careful adjustment in the boosters and feeders is necessary to prevent the boosters from raising the potential of the line fed through them higher than that portion of the line fed by the generators, and thus force the division point above referred to into the power station and the boosters boost upon a short circuit. To avoid serious results from this cause it is proposed to so design the boosters, so that their characteristic will be as near a straight line as possible and the voltage supplied the trolley through them under normal conditions be kept under the voltage supplied to the trolley direct from the generators. It is probable however that a certain amount of current will flow back through the short circuit whenever there is a sudden falling off of the current through the boosters, the magnetism of the boosters keeping up the voltage for a moment after the current and its resulting drop of potential has disappeared. It is hoped however that the loss from this cause will not be appreciable. With this system it is proposed to use boosters placed upon the same shaft with motors that derive their power from the standard generators that supply that portion of the line within economical reach of the power stations. The generators and motor-boosters are controlled from the same switchboard and provision is made for feeding the various portions of the line either through one or more boosters, or from the generators direct.

### OVERHEAD CONSTRUCTION.

The necessity for high speed and a reliable schedule made the overhead construction a very serious problem. In view of the unsatisfactory experience of several roads attempting high speed, it was thought advisable to look for something different from the standard overhead construction. A suspension cable carried directly over the trolley wire similar to that described and shown in Figs. 2 and 3 under the Three Wire System was considered. There is however serious doubt whether the trolley wheel could be relied upon to stay on the ordinary copper trolley for long runs at 60 miles per hour and under adverse conditions of weather. It would seem that something more reliable is needed for high speed service.

The use of a slotted tube with an internal sliding shoe was considered. The tube it was proposed to suspend from a

suspension cable running directly over it by means of adjustable clamps. The section of the tube with the attaching clamp is shown in Fig. 4. The clamps are formed of half round iron, and the ends threaded into sections of pipe cut to the desired length. The ends of the pipes are threaded internally with right and left hand threads, and afford a cheap means for suspending the tube from the suspension cable and one which is capable of ready adjustment.

It seems practical with this system to attach the conductor to the side of the car, and hence it is unnecessary to suspend the line conductor out over the centre of the track. This permits of a much stronger construction, as the suspension cable can be attached directly to insulating blocks bolted to the sides of the centre poles. The method of attaching the suspension cable and tube to the insulating blocks, and the blocks to the poles is shown in Fig. 5. It was found that this tubing made from hard steel and shaped as shown in Fig. 4, could be gotten in 40-ft. lengths. By placing the poles 80 ft. apart only two tube lengths are required per pole section. It is however entirely practical to place the poles 120 ft. apart. At the tube joints between poles it was proposed to make a permanent and rigid joint as shown in Fig. 6 by the use of a coupling of the same form as the tubing but larger and cut into lengths 12 in. long. At the poles the tube ends are attached by means of a casting Fig. 9, which allows a limited movement of the tube so as to provide for expansion and contraction. On slight curves the tubes are cut longer than for the straight line, the length varying with the degree of curvature. The ends butting at the poles the centre swings out to make the curve. Sliding in the tube are as many shoes or current collectors as may be necessary, usually two. The shoes as shown in Fig. 8 are shuttle shaped and connected to each other and to the car by a spring connector through which passes the cable carrying the current. Some experiments were conducted to determine whether the heat due to the friction of the shoe moving at high speed would give trouble. A fly wheel was selected, the periphery of which was travelling 70 miles per hour, and upon this periphery was first allowed to rest lightly, and then pressed, a piece of metal similar to the shoe. The heating was found to be inconsiderable. With this construction, which consisted, with the exception of the centre poles and suspension blocks, of steel, it was thought that by allowing the same factor of safety used in suspension bridges the resulting structure would be as durable as these bridges and thus be more reliable than the standard overhead structure in which a copper trolley wire of uncertain strength figures so prominently. As it is practical with this construction to dispense with the bracket arms and the usual insulating material, the cost of construction is considerably less than with the standard construction of equal conductivity.

Owing to the experimental nature of this structure, and the little value of the old material in the event of its failure, it was decided to equip the two ends of the lines (the portions to be operated first) with some form of copper trolley, while a test of this tube structure was being made over a four or five mile section.

The form of copper trolley wire construction adopted for the ends of the line consists of a centre pole construction in which iron bracket arms are formed by passing pipes through wooden poles and bracing them to the poles. Attached rigidly to these pipe bracket arms and projecting downward are suspensions similar to that shown in Fig. 2, except that these arms are made of pipe and are shorter. At the lower





## TEXAS STREET RAILWAY ASSOCIATION.

The Texas Street Railway Association convened in Austin, Texas, March 17th, and ended its two days' session at 11 p. m., Wednesday, the 18th. The meeting was called to order by Carl F. Drake, vice-president. The companies represented were the Laredo Electric & Railway Company, the Austin Dam & Suburban Railway Company, the Austin Rapid Transit Railway Company, the Elm Street Line of Dallas, the Dallas Rapid Transit Company, the Fort Worth City Railway Company, the Houston City Electric Street Railway Company, the San Antonio Street Railway Company, and the San Antonio Edison Company. After the minutes were read Mr. Drake spoke as follows:

## ADDRESS OF THE PRESIDENT.

"Gentlemen:—It gives me much pleasure to welcome you to Austin in attendance on the fourth annual convention of the Texas Street Railway Association, and while I thoroughly appreciate the honor conferred upon me in permitting me to preside over so representative a body, at the same time it is with a feeling of regret that I am called to the chair.

"Our association has met with a very great misfortune during the past year in the death of its president, and there is probably no man interested in street car work in Texas who will be able to represent us as was Colonel Sinclair. In his death the association and the street car interests of Texas suffered an irreparable loss. The citizens of Galveston, which was his home, have testified in the many eulogies which have been published from time to time as to his sterling worth and their appreciation of him as a citizen. The Texas street railway men, and the citizens of Galveston and the state of Texas lost, in his death, an earnest worker and a faithful citizen, full of energy and progressiveness.

"Street railway men are called upon from time to time to become acquainted with municipal officers, and I want today to introduce to you what we consider a model mayor, one who embodies all the progressive elements of a nineteenth century man, coupled with the discretion necessary to make a perfect head for a municipal government. Gentlemen, I have the honor of introducing to you Mayor Hancock of Austin."

Mayor Hancock, of Austin, made a neat, short welcoming address, and the convention proceeded to business, appointing of committees were as follows:

On Resolutions—C. B. Hendricks, Ft. Worth; H. C. Chase, Houston, and J. D. Chiles, Austin.

Constitution and By-Laws—H. C. Chase, C. F. Yeager, Laredo, and C. L. Wakefield, Dallas.

Topics for Next Meeting—George D. Hartson, Dallas; R. S. Wakefield, and D. D. Willis, San Antonio.

Membership—A. H. Hayward, Houston; D. D. Willis and B. M. Hammond, San Antonio; Henry Carrett, Dallas, and J. K. Urie, Galveston.

Legislation—F. E. Scovill, Austin; I. H. Evans, Austin; W. H. Weiss, San Antonio; Julius Runge, Galveston; C. L. Wakefield, Dallas.

The last three named committees were, by motion, made permanent.

Invitation was extended by the Austin Club to all the delegates, and by the Austin Dam & Suburban and the Austin Rapid Transit companies to inspect their lines. The

meeting adjourned until 2:30. At that time there was first introduced the following resolution:

Resolved, That we oppose the passage by the Texas legislature of House Bill No. 416, entitled "An Act to Amend Article 651, Chapter 3, Title XXI of the Revised Statutes," etc.

Because the proposed legislation is not responsive to any public demand, and is for the benefit of a particular class and affords no advantages to the general public.

It leaves a dual responsibility, uncertain in its enforcement, for the maintenance of the street railway tracks on the streets of the city. There is no more important feature of modern city government than the right and power on the part of the municipality to regulate street railway properties in this respect, and in a manner resulting in the best maintenance of the roadway in a city. The shifting of blame from one corporation to another would be fruitful of litigation, damaging to the general public, and to a great extent prevent the proper and speedy regulation of the corporation by municipal authorities.

It will defeat the effort of street railway companies to adopt regular schedule and time cards for the running of cars, and will result in great confusion, to the damage and inconvenience of the traveling public.

Resolved, further, That this resolution be at once printed and a copy be mailed by the secretary to each member of the Texas legislature.

This was referred to the committee on resolutions, which recommended its passage.

The Committee on Resolutions made its report on the death of Colonel Sinclair, and the following resolution was adopted:

Resolved, That in the death of our honored and esteemed President we have lost a valued guide and counselor, a worthy citizen, a true and tried friend and co-worker, who was so intimately associated with us that we experience a sense of personal loss in his sudden taking off in the very fruition of his career.

Resolved, That we extend to his bereaved family our sincere condolence and sympathy in this their time of mourning.

Resolved, That a copy hereof be transmitted to the family and also a memorial page be suitably inscribed upon our records.

The Convention then went into the discussion of

## UNIFORM RATE OF WAGES AND NUMBER OF HOURS WORKED.

It was developed that in the main 12½ cents per hour was paid. Several roads had the three men to two car swing system. A few had long hour days, with third or fifth day off; in the latter case, the wages were from \$40.00 to \$55.00 per month. There seemed to be no uniformity as to the number of men worked in barn or repair shops.

Discussion was had on the "Life of Pinions and Gears."

## LEGISLATION, STATE AND MUNICIPAL.

This was opened by a few impromptu remarks by C. L. Wakefield, in the course of which he said that the Association should be careful that its vigorous action and remarks on legislation should not be such as to suggest the idea to the general public that there was more in the matter than there really is. That many legislators introduced anti-corporation bills because they did not feel that personal sense of responsibility, or fear of doing a personal wrong, as they would were the parties individuals instead of corporations. He said further, that we should try to live as closely to public men as we can, frankly stating our position, and frankly admitting that there may be wrongs done by corporations which ought to be stopped, and that our efforts will be directed that way. Make no statements to legislators that you cannot prove beyond a reasonable doubt.

Mr. Willis spoke upon the bill about which a resolution had been previously introduced, in which he said that he understood that the nature of the bill was to provide that a

street railway in any city in the state could have the use of the track of another street railway by getting permission from the City Council, and paying a portion of the expenses of construction and maintenance of that portion of the track over which it runs, the length of track the use of which the bill contemplated legalizing being 2,500 feet, or nearly half a mile.

In the next day's proceedings the bill itself was presented by Col. H. E. Barnard of San Antonio, from which it appeared that it sought to legalize the use of 2,500 feet of another railway company's track, but compensation was to be fixed by arbitration, and this compensation was not limited by the bill to the payment of its proportion of the expense of construction and maintenance, and this could only be used in order to connect terminal points. No reconsideration of the action of the Convention, however, was had. Messrs. Drake, Hendricks and Evans, followed with remarks on the bill.

Mr. Yaeger asked if there was a law enabling municipalities to pass ordinances fixing a penalty for interfering with wires, cutting them, stealing power, etc. So far as the members could tell, there was no such a bill. Mr. Hendricks moved that the Committee on Legislation prepare a bill covering the point in controversy, and report to the Convention during its present session.

Mr. Drake suggested the advisability of each road sending to the secretary copies of the franchises under which it operates; a motion covering this was carried, and further that any road wishing a copy of these franchises should apply to the secretary, and pay the necessary expense.

The pass question, among city officials, was then taken up, and very generally discussed. Most of the roads, it was found, were very liberal in this regard; some, however, were more fortunate. The question of passes to newspapers was taken up also under this discussion. With only three exceptions, it appeared that the newspapers gave full value for all passes they received, in the way of advertising entertainments, etc.; and it also generally had the effect of making them get both sides of a story in case of an accident. It was found that in every case policemen and firemen are passed on their badges; the means of passing were discussed, and, with two exceptions, a coupon ticket was used; and this, in two cases, bore on each side the stamped name of the holder.

Adjourned until Thursday, March 18, at 10 A. M.

At that time the first question taken up was the resolution on the joint track bill, known as the O'Connor bill, previously set out.

The Committee on Topics for the Next Meeting, reported as follows: 1st, Power Construction; 2nd, Overhead Construction; 3rd, Construction and Maintenance of Car Bodies; 4th, Brakes; 5th, Discipline of Employees; 6th, Rail Joints; 7th, Methods of Increasing Traffic. On recommendation of the committee the list was left open, and afterwards the committee was made permanent for further suggestions.

The Committee on By-Laws recommended an increase in dues to \$10.00 per annum, which was passed.

(The three papers read at this session of the Association and abstracts of the discussion follow the report of the proceedings.)

The following nominations were made:

Carl F. Drake, president for the years 1897-1898; A. H. Hayward, vice-president; C. L. Wakefield, secretary.

Both Ft. Worth and San Antonio were put in nomination for the next place of meeting, San Antonio winning by one vote.

The meeting adjourned until 1:30, at which time the proposed trip up the lake above the Austin dam was taken. The Austin dam is a magnificent piece of stone work, and stands about 65 feet high. There was about three feet of water running over it, making a beautiful cascade. The lake above the dam extends up the river 27 miles. The water power is considerable and the city, which owns the dam, has an electric light and power plant and water works all operated from this water power. The cost of the dam was one and a half million dollars, and although it has been in operation but a short time, has already gone far toward paying interest and sinking fund. Ex-Mayor McDonald, the father of the dam, was with the party. A trip was made eight miles up the lake and proved a genuine surprise to most of the party. At Fish Pond House a stop was made; here are large private grounds belonging to the Austin Fish Club. The dam is reached from the city by a fine system of street railways, operating cars by power furnished by the city from the water power.

The Convention was called to order for the night session at 8 p. m., when Col. Barnard was heard on the joint track legislation.

#### HOW TO MAKE STREET RAILWAY EMPLOYEES HONEST.

Mr. Wakefield suggested that to get them honest was better than to attempt to make them honest. Mr. Drake suggested that a wrong hypothesis was held by the majority of the street railway and steam railway managers, by starting out with the idea that all men are dishonest. He believed that the majority of men (provided they are below the rank of manager or superintendent) are honest.

Mr. Hartson keeps a record of each trip, using it as a check on the motorman, showing the aggregate at the end of the month to stimulate each man, and checking also the men who collect the fares.

Mr. Hendricks agreed with Mr. Wakefield that honest men should be got in the first place, and fired as soon as they fall from grace.

After a general discussion the subject of

#### THE REPAIR SHOP

was taken up, which was largely technical in its nature.

One member advised the use of all copper and brass in having new bearings made. Raw hide pinions were found in some cases to have lasted from five to eight months, and in some cases were found to be entirely unsatisfactory.

Mr. Hendricks, of Ft. Worth, said that after his brass bearings have worn down he fills them with rabbit, and finds them very satisfactory.

Mr. Scovill explained a scheme that he had seen at the National Convention at St. Louis, of fitting the axle with a pipe clamped to the motor, making a long bearing, and an arrangement for filling the pipe with oil; it was represented to him there that the amount of oil used was less than in the old way, and the bearings lasted a great deal longer.

R. S. Wakefield's experience with magnolia metal bearings had not been satisfactory.

Trolley wheels were found to last from three to six months.

Car wheels in some cases cost 50 cents to press on, 50 cents to press off, and one dollar a wheel to have the wheel bored. In other cases \$1.30 for boring, and in some cases 75 cents



each way for pressing. There seemed to be no uniformity in the length of the life of the wheels. It was suggested that the life of a wheel was frequently shortened by the use of a brake shoe that is too hard, and by the carelessness of the motormen in skidding the wheel.

Double as against single trucks were here brought up, and Mr. Chiles entered into considerable discussion, holding that the double truck was far superior in every way; some contended that for short cars they would not do. Mr. Chiles, however, contended that in the one case you have the whole weight distributed in eight parts, while with the single truck you have it distributed in four parts, making the weight on the truck much less, and more evenly distributed, in the case of double trucks.

Mr. Hendricks asked that special discussion be had at the next meeting on the weight of rails.

This completed the discussion on topics.

The Association went into the election of two directors, who with the president, vice-president and secretary are the five officers provided for under the by-laws.

Thanks were extended to the Austin street railway men for their entertainment, to the Driskill Hotel for the use of its parlors, to the Austin Club for its courteous manner of receiving the members and giving them the prize fight returns.

Mr. Drake then brought up the question of allowing supply men to join the association as associate members. On motion, the constitution was so amended, fixing the fee at \$1.00 initiation and annual dues of \$5.00.

Mr. Drake thanked the members of the Association in behalf of the citizens of Austin, etc., and said that what little courtesies had been extended them had come straight from the heart, assuring the members that they would always be welcome, and expressed the hope that they would visit Austin frequently.

The meeting officially adjourned, to meet again in San Antonio on the third Wednesday in March, 1898, unless sooner called together by the president.

The badges furnished the members on the 17th of March, the date of the meeting, were bright green, printed as follows:

"Fourth Annual Convention of the Texas Street Railway Association, March 17th, 1897, Austin, Texas."

#### Accidents; Their Liability and How to Prevent.

BY R. S. WAKEFIELD, SUPERINTENDENT, SAN ANTONIO EDISON COMPANY.

This subject is one that at every national and every state convention is imposed upon some manager or superintendent, who tells us all about the liability, and on this part of the subject we are all thoroughly posted. But how to prevent accidents is one of the things on which the street railway man is not nearly so well informed as the lawyer on the plaintiff's side, and whose advice is too often taken by the "twelve good men and true."

We are all satisfied as to their liability, not only in the street railway business, but, as ancient history tells us, in the best of families, so that part of the subject we will pass, and suggest a few ways to prevent some accidents, at least.

I have found by sad experience that Texas is inhabited largely by a race of people whose ideas as to the correct thing in driving are quite crude, and you will often see them sitting in their conveyances with lines hanging loose, engaged in some deep reverie, from which they will likely be awakened by the sound of an approaching street car. Our hero then pulls up his lines, and in many cases pulls too strongly on the wrong one, and the result is a broken wheel, sprung axle, and many other ailments to a buggy, which is never over a

year old, and which always costs \$195. Now, the way to have prevented that accident would apparently be to have given instructions to the motorman that when approaching a rig he should slow up and allow the driver to have right of way. I have found that many motormen seemingly think that because they ring the gong they have done their duty, and if the property of someone gets injured, it is the fault of no one but the driver of the vehicle.

The motorman should be given to understand that everybody is not always looking for a car, and for that reason he should have his car under perfect control before attempting to pass anyone.

In the majority of the accident reports I have seen, where a wagon or buggy was damaged, I have noticed that the vehicle was on the right side of the street, going in the same direction as the car, and; as the motorman usually puts it, "I rang the gong and thought he would drive straight on, and just as I got to him he swung onto the track and the car struck the wheel." It takes a great deal of reasoning with a motorman before he will learn that he is not the only one who has a right to the streets, but a few minor accidents for which he has to pay, will diminish their number.

As to the damage to persons: These are very often caused by the lack of proper diligence on the part of the injured person, and I don't believe a preventive will be discovered which will restrain some people from being careless, and I think that so long as people ride on street cars, street railway companies are liable to have such accidents; but there are, in my estimation a few rules that may be made which might reduce them, and the reduction of one accident in a thousand is good.

Very few motormen exercise the proper amount of care when running a car past little children playing in the streets. A company can very well make a rule that motormen shall run very slowly when passing children who are on the street, whether they be on the sidewalk or on the roadway. When children are playing, they are apt to suddenly take a notion to run across the track, and it takes an incredibly short space of time for a child to get to the center of the average street, and I have known some excellent motormen to have accidents of that kind, whereas a rule as before mentioned would have avoided trouble.

Too many motormen rely on the gong to warn people of their approach. The gong is a good thing, and cannot be used too much at the proper time, but all people cannot hear. There are a great many people who use the streets who are deaf, and motormen should be cautioned on this line.

Too much cautioning is impossible, and a superintendent should be blessed with a perfect vocal organism, so that he can indulge in continued cautioning.

I think it is advisable to require a deposit of employes, and believe it reduces the accident list. I also believe that a penalty should be attached to every accident, either in the form of a "lay-off" or cash fine.

In discussion, C. L. Wakefield said: An ordinary wagon or buggy in this country makes more noise than a street car, and therefore the man that is in the buggy cannot hear the car, and it is not safe for the motorman to attempt to pass until he knows he has the attention of the driver. He advised, in towns that were not too large to make it impossible, a close acquaintance with all possible jurors, so that, although they might not be friendly, some of the prejudice might be obviated.

Mr. Willis, of San Antonio, said that he made it a rule to get on the ground as soon as possible, and interview personally outside witnesses immediately, and get both sides of the case; and if the accident is serious, get a photographer and have a picture taken as nearly as possible giving the place where the accident occurred and the position of wagons, cars, etc. Have measurements made by the civil engineer, and get ready for a law suit. If there seems to be a possibility of a settlement, settle at once, with the cash in hand and displayed to the plaintiff. If there seems to be no possibility of a settlement, pay no attention to it. In small cases, we advise settlement, as the chances for a corporation in a justice court are very small.

Mr. Hendricks advised fighting every case that the company was not to blame, as the reputation for so doing would deter a great many from bringing suit.

Mr. Chase: I consider no accident, when a car is going in the same direction as the vehicle, excusable. A motorman ought never to form the opinion that a wagon is not going to cross the track in front of him. I advise settlement for small damages at once.

Mr. Hartson, of Dallas, cited a case where suit was brought, when, he believed, no accident had occurred. Such a case had come up also in Dallas on another road, in which considerable damages were obtained.

Mr. Scovill, of Austin, instanced a case in St. Paul where in a collision there were 74 passengers on the car and 122 suits were brought against the company.

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### Amusements.

BY J. K. URIE, SUPT. GALVESTON CITY RAILROAD COMPANY.

In an unguarded moment I accepted the request of your secretary to prepare a paper on the subject of amusements as a source of revenue to street railway companies.

What follows will be a reflection of my own views, gathered from personal experience, rather than an attempt to discuss the subject from the standpoint of one qualified to properly present the matter. If the reading of this paper will result in the free and frank discussion of the subject, and an interchange of views between the members of the Association, I shall feel that the short time devoted to the matter by me will have been more or less repaid.

The word amusement is a very comprehensive one, and it will be necessary for me to confine my remarks to the usual class of attractions furnished, or to a greater or less extent, supported by street railway companies.

Attractions of any character (provided, of course, they are reasonably meritorious), undoubtedly increase the gross receipts of the local street railway; they cannot be obtained without compensation, however, and as the average street railway manager or superintendent does not employ attractions for the amusement of himself or friends, the all important question to him is the difference between the cost of the attraction, including cost of extra cars, etc., and the increase in fares as the result of the attraction.

As a general proposition, I think it cannot be denied that the amusement feature is an important one in the larger sized towns and cities. The larger the city, the more important the matter becomes on account of the natural demand for relaxation on the part of the inhabitants of the more thickly populated portions of the city.

The selection of the location of a pleasure resort is the most essential feature. It should naturally be the most attractive available spot in your city, and its naturally attractive features should be added to as much as possible; it should be just a little too far from the center of population to encourage pedestrianism, and at the same time not too far to make a trip on a more or less overcrowded car an unpleasant journey. My experience is that ten people will go out to see a free show to one that will attend where admission fee is charged, even though the charge be a merely nominal one.

Band concerts and vaudeville attractions of the better class have always taken well in Galveston, and I believe in most cities of the state.

There is another class of attractions which might be termed local, such as base ball games, foot ball games, bicycle tracks, etc., which deserve encouragement on the part of the local street railroad companies. Very few of the last class became self-sustaining, and without proper encouragement they would, to a certain extent, cease to exist.

A body of water in the shape of either a lake, natural or artificial, or a running stream is one of the best possible features of any pleasure resort. People who spend eight, ten or twelve hours a day in the busy parts of a city are naturally inclined to seek something akin to nature.

Pleasure resorts are the essential features of the summer season, and the patrons of them should be provided with as many comforts and luxuries as the street railway company can reasonably be expected to provide in anticipation of a remunerative return.

The question of entertainments is one which, like almost any other feature of the street railway business, must be handled with due regard for local conditions. In the larger cities in the state, Sunday invariably proves to be the banner day of the week, and attractions on that day are demanded by a large proportion of the population who find very little time for rest and recreation on week days. In some of the small towns and cities it might be found advisable, if not compulsory, to omit Sunday attractions.

Wherever your resort will be located you will invariably find that a certain proportion of visitors to it will accept your hospitality without contributing anything in return. In other words, they walk. In case

your resort is enclosed, or can be enclosed without too much expense, I think each person entering the ground should be required to produce a street car ticket, such ticket to entitle the party to free admission to the grounds. This could be readily accomplished by having a man stationed at the main entrance to sell car tickets at five cents each. Those who come on the cars would be nothing out, being simply compelled to purchase their return tickets in advance, and the walking brigade would have to buy their tickets whether they wanted to use them or not.

The street railway manager who attempts to make a success of attractions by building a cheap theater on a bare prairie several miles from the heart of the city, is doomed to disappointment. His profit may be represented in the shape of experience, but it will appear on the wrong side of the profit and loss account.

A resort which is worth establishing and maintaining should be so attractive in itself as to draw to it without the aid of additional attractions a greater or less number of people daily. The constant dropping of the nickel helps to wear away the interest on our bonds and other indebtedness.

In discussion Mr. Hendricks said that he had success with balloon ascensions, one in particular. The same success had attended the roads represented by C. L. Wakefield and H. C. Chase in this regard.

The value of popular price theater shows was discussed, and it was found that they did not pay the street railways.

Base ball was conceded to be a good thing, but rather expensive, in that the base ball people generally demanded considerable assistance.

It was suggested by Mr. Drake that each member of the association furnish the secretary with a list of the attractions he found good, the terms on which they are secured, and the measure of his success. A motion covering this was carried.

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### How to Obviate Public Prejudice Against Corporations.

BY GEORGE B. HENDRICKS, SUPERINTENDENT FT. WORTH STREET RAILWAY COMPANY.

I regret exceedingly that the subject which you have seen fit to allot to me is one of such vast and vital importance to every enterprise of our national and social existence, and I feel totally unable to cope with its magnitude. The thought inspired by this momentous question that is disturbing every element of our government, leads me into a labyrinth of confusion from which I fear shall never extricate myself with any degree of credit.

How can prejudice be overcome? Prejudice, like rumor, rides on slanderous tongues, filling the ears of men with false reports; prejudice is unthinking, unreasoning, intangible and insidious in its nature. How the finite mind can apprehend or grapple with the illusive monster is a problem of which the solving is doubtful.

Notwithstanding all this, there is a cure for this growing evil, at least a check that can prevent its further growth; if the public has no cause for this feeling of hatred, if it only springs from a diseased mind, it will die of pure nature, but if it is well founded by actual deeds of aggression from the corporations that persist in turning a deaf ear to the complaints of the people, then let the public apply the remedy it holds in its own hands.

In the first place the tendency of human nature is to abuse power. Corporations, with their boundless opportunities from centralized wealth, are somewhat to blame for the great prejudice that now exists in the minds of the people. The dominant feeling in the minds of the public is that corporations are nothing more or less than trusts, or combines formed for the purpose of defeating, so to speak, individual competition, and thus necessarily absorbing all of a nation's most fruitful resources, conserving them to further selfish gains. There is no prejudice against corporations, pure and simple. The public know that the corporation, individually, is of boundless benefit. A benefactor to the country, for it brings wealth and prosperity in its train, makes the desert bloom, and converts the wilderness into thriving towns and fertile farms. Trusts and corporations have, in the minds of the people, been thrown together, and trusts are inimicable to the best interests of the masses, and to good government, because they are in total disregard of the people's rights and in defiance of the law. The public sits in judgment only upon avarice and greed, and the people demand that corporations be made amenable to ordinary law, and held to a strict accountability or deeds done by them. If corporations wish to take the initiative in allaying

the bitterness that is manifested by the people, they should return to first principles and live up to the spirit of their first dealings, that is the individual should act toward his fellow men as he would have others to do unto him. Let corporations from their vantage ground of wealth and power, teach the public, by their glowing example, that liberty does not mean license, and that by the law and under the law it is intended that all men should enjoy just and equal legislation. Capital and labor are so vital to each other's very existence, and yet sometimes we might as well ask the lion and the lamb to live together in peace on the same plains.

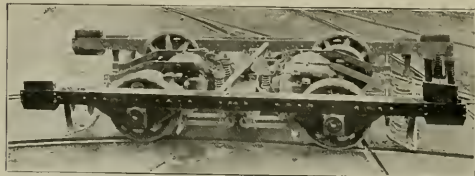
I do not wish to convey the idea that I hold the corporations responsible for all the wrong doings, but I do believe, in the majority of instances, they have been initiative in a natural result arising from moneyed power that had grown too rapidly.

I think we too often forget that we are a part of this great public that forms our nation, that as our influence may be felt or our lives lived, so are others around us. We forget that we, also, have wrongs and injuries at times, of which we wish to talk to some sympathetic friend, and the best educator which the heads of corporations can use for the working people is kindness and patience. We should never allow an opportunity to pass us to speak a kind word, give a pleasant smile, or do a kind act to the most humble citizen of our community; be not selfish; think of those around us, who, possibly, have much less cause than we with which to be happy; and be ever so humble, a coal heaver or a track greaser, a kind word or a pleasant good morning is never lost upon him, and he learns to look upon the members of the corporation as his friends, and not as men who use him simply as a machine to do their work. If your employes realize that you are kind and considerate and patient, do you not know that your influence among them is much greater than that of a man who is seeking to get all he can from those under him, and then drop them? He should realize that through our employes the public form its opinion of the men employing them.

I have tried to treat this subject in an impersonal manner, for I certainly have no selfish aims in view, am not a demagogue, nor an applicant for political favors. It is only the honest opinion of one man who has tried, through a life of hand to hand fight with adverse fate, to look things squarely in the face and judge the world charitably. I have learned that while all men are not honest, yet they are not all desperately wicked. If the people themselves live in rigid observance of the laws there would be nothing of which to complain. They cry out against unjust legislation, and yet, year after year, they persist in sending irresponsible men to represent them, to fill responsible positions, and to make their laws, which are detrimental to the country's good. The people are responsible for the abuses they endure. That honesty is the best policy is not a meaningless platitude, but a wholesome proverb to be applied to the daily conduct of life.

### HOME MADE TRUCK.

We illustrate herewith a truck designed by Thomas Elliott, master mechanic of the Atlanta Consolidated Street Railway Company, which embodies some new features. In appearance it is plain and stiff, and the effect of stiffness is



HOME MADE TRUCK—ATLANTA, GA.

increased because of the springs being all concealed. As shown in the cut the springs are a sort of series parallel arrangement. The centre spring carries the empty car, and at the same time is in series with the other two, giving greater travel and flexibility than a single spring. The com-

pression of the center spring is limited by the yoke and can not be injured by excessive loading. This arrangement was adopted because most trucks ride easier when the springs



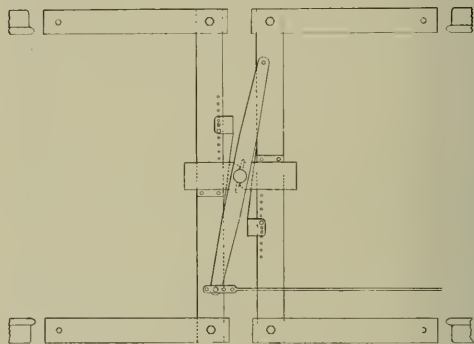
CAR AND TRUCK—ATLANTA, GA.

are well loaded. The spring boxes shown in the center are for extra springs to suit heavier cars. Four helical springs 5 in. long are placed over each journal box.

The journal boxes are very large, holding a gallon of oil, and are provided with ring oilers. The dust guard has a double ring and keeps the box free from dust without the use of wick or felt. The box is threaded and the lid screws in, butting against the journal brass, which fits down over the end of the axle. The axle ends are plain and not liable to be injured in the wheel press.

The pedestals are solidly braced, and the truck itself well braced diagonally. Across the center is a 12-in. 1-beam. The car body rests on the four corners of the truck.

The brake rigging is peculiar. The brakes are inside



BRAKE LEVER AND BEAMS.

hung and applied by spreading the brake beams apart by the partial revolution of a center shaft shown in the plan. The brake beams turn upon knife edges. Adjustments are made by sliding taper wedges along the faces of the beams. The brake hangers are rectangular links, four to each half of the rigging, so that it may swing free without sliding of rods.

The fenders will swing either way or in case the car leaves the track will raise up. Ordinarily, stiff springs hold the fenders in place with sufficient pressure to remove obstructions on the track, but flexible enough to give way to solid obstacles.



TRAMWAY AND OMNIBUS DIVIDENDS IN ENGLAND.

The following table from the London Economist shows the dividends of the principal tramway and omnibus companies of the United Kingdom for the last five years.

Company.	1895.	1895.	1894.	1893.	1892.
	%	%	%	%	%
Belfast .....	6½	6½	6½	7	7½
Birmingham and Aston .....	14	13	13	13	12½
Dublin United .....	5	5	5	4½	4½
Edinburgh and District .....	6½	5½	5½	5	5
Edinburgh Street .....	2½	4	6½	5	5
Glasgow .....	7½	nil	4½	5	5
Imperial .....	2½	1½	1½	1	nil
Liverpool .....	5	5	5	5	5
London .....	10½	9½	9½	8½	6½
London, Deptford, and Greenwich Prof. ....	5	4½	4½	2	nil
London General Omnibus .....	10½	8	8	8	5
London Road Car .....	7½	6	5½	5	4½
London Street .....	4	4	4	4½	4½
Manchester Car and Tramw. ....	10	10	9	8½	7
North Metropolitan .....	6½	8	8	8	7½
North Staffordshire .....	3	4	4½	5½	5½
Nottingham and District .....	5½	5½	5	5	4
Provincial .....	2½	1½	1	1	1
South London .....	4	2½	1½	1	nil
Sunderland .....	4	4½	4½	4½	4½
Wolverhampton .....	5½	4	3½	3½	3½

The year has been a very good one and in most cases the reports showed an increase in gross revenues, while the low prices for forage enabled the working expenditure to be kept down. The London omnibus companies did particularly well; two reasons are given, there is no permanent way to keep up and no provisions to make against the purchase of their undertakings by the local authorities. The North Metropolitan Tramways Company was compelled to reduce its dividend for the last half-year of 1896 from 4 to 2½ per cent, although its gross earnings were \$75,000 in excess of those for the last-half-year in 1895, for this latter cause. The reduction in the case of the North Staffordshire Company was due to the cost of maintaining the permanent way and equipment.

STRIKE LEADERS EXPOSED.

Hiram Lutz and William H. Copeland, two self-constituted leaders in new organizations, which it was attempted to form among the employes of the Union Traction Company of Philadelphia were exposed by the company on March 22. Lutz is the labor agitator, who, two years ago, organized the strike among street railway employes in Philadelphia. Lutz and Copeland having made propositions to "sell out" to the company, they were invited separately to interviews with the assistant general manager. A committee of the company's conductors and motormen was placed in an adjoining room and one of them describes the interview with Lutz as follows:

"Lutz came into Mr. Shanley's room alone. We heard him tell Mr. Shanley that if the company would give him \$15 a week he would be loyal to the company and expose all the workings of the organization. These were the terms he stated in his written agreement. He said he was in a position to do the company good service, and that the thing could be worked on the dead quiet. We couldn't stand it any longer and we rushed in on him."

Copeland was more avaricious and wanted \$25 per week for a year or \$1,000 cash.

SHUNT MOTORS FOR HIGH GRADE SERVICE.

In early electric railway lays it was considered an open question by some as to the relative desirability of shunt and series wound motors for street car service. This contest, as all know, resulted in the survival and almost complete victory of the series wound motor. Nor is it likely that the shunt motor will ever come into extensive use for ordinary street railway service in connection with a 500-volt trolley system. It is being used on a street road at Barmen, Germany, but the conditions there are exceptional. There are some heavy grades on that road which the cars ascend and descend by means of a rack. By using shunt motors the cars are made to generate current which is fed back into the line when the cars are going down grade, thus accomplishing the double object of a safety brake and recovering part of the energy that would otherwise be wasted. However, not many street railways are so situated that much energy can be recovered by the use of shunt motors, and what little power would be thus saved would be more than compensated for by the objections to shunt motors. Shunt field coils for a railway motor must necessarily consist of a large number of turns of fine wire, which fact not only brings up the first cost, but makes insulation difficult. Controller combinations and connections would also be rather complicated with shunt motors, and the inductive kick when the shunt circuit is broken causes break-downs in insulation that can only be prevented by a still further complication in the way of a non-inductive resistance in parallel with the field coils.

However, on elevated roads and on those which are closely related to steam roads, the conditions are somewhat more favorable to the shunt motor, and the advantages to be gained are more marked. As indicated before, the chief advantage a shunt motor offers in railway work is the possibility of turning it into a generator which can return power to the line at times when the car speed is to be retarded, thereby saving the energy that would otherwise be expended in wearing out brake shoes. On a street car where the speed is not high it is manifest to any electrical engineer that it is not possible in making an ordinary stop to return much energy to the line. Suppose a pair of shunt motors be wound to run a car 18 miles an hour maximum speed on a level when in multiple. By connecting them in series when making a stop it would be possible to use them as dynamos to brake the car and feed back into the line until the car speed fell to something less than one-half the maximum. When this point is reached it is impossible for the motors to generate a voltage in excess of the line voltage, and consequently they will begin to act as motors again instead of generators. It is apparent from this that very little energy would in practice be recovered by using shunt motors as brakes in ordinary city street railway service. The maximum speed is high, the stops are at fairly regular intervals and there are few places that call for slow running, so that quite an amount of energy could be recovered with every stop made. The motors would also be operating under cleaner conditions and the shunt coils would not be so hard to insulate. Series motors have practically the field to themselves now, but the development of higher speed and heavier suburban service may bring back to the shunt motor some of the consideration it formerly received.



avenue line at 146th street. Recently the company has purchased a piece of land at 96th street on North river, upon which a station of 20,000 horse-power ultimate capacity will be built. Another station of the same capacity is projected in the southern part of the city, but its exact location has not yet been determined.

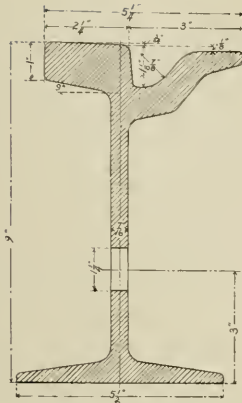


FIGURE 4—STANDARD RAIL.

The accompanying map indicates how extensive this new system is to be, and it is likely only a step in changing all the lines of the Metropolitan Company to electric conduit.

The heavy dark line represents the extent of the Lenox avenue line and the dotted lines the proposed extensions. As the lines stretch from one end of the island to the other they go far toward giving New York a system of rapid transit.

### CINCINNATI SUBURBAN SERVICE.

D. G. Edwards, president of the Cincinnati, Hamilton & Dayton Traction Company, which has been incorporated by several officers of the Cincinnati, Hamilton & Dayton Railway Company, to operate rapid transit lines in connection with the latter company, writes as follows:

"We have not decided to equip our suburban lines with electricity; on the contrary, we are opposed to the overhead trolley as being cumbersome, to some extent dangerous and not the highest type of service for interurban work, in its present condition.

"We do not propose to make any radical changes on our suburban lines until conditions are more settled and we know positively that such a change would be an improvement.

"With the exception of the Illinois Central Railroad in Chicago our suburban business between Cincinnati and Hamilton is probably better cared for in the matter of train service, accommodations and low rates than in any other section of the country. Our commuters have the benefit of a train service of 52 trains a day in the space of about 14 hours; the rates are as low as any interurban rates I have heard of; the accommodations, consisting of standard passenger coaches well warmed and ventilated, comfortable riding, on the highest type of railroad in the country, will not allow any electric service being compared with them.

"We are trying to find some method of handling this travel cheaper than we are doing at present if this can be done without destroying the character of the service, and, for that purpose intend to equip one or two branch lines with some motive power that will enable us to run a more frequent service during the hours of the day, when travel is very light, than we can afford to do with regular passenger trains. If the result of the experiment on our branch lines is satisfactory, the service will be extended.

"We are investigating electricity, compressed air and steam motors. So far as our investigations have gone, we do not consider that either electricity or air compares at all

favorably with steam. The question presented to us is to find out what character of service we can adopt that will enable us to run at high speed through the country and not be objectionable in traversing the streets of the town."

### THE HEILMANN LOCOMOTIVE AGAIN.

The original Heilmann locomotive was described in the REVIEW for April, 1894. As a result of the trials of the "Fusee," as she was named, the Western Railway of France ordered two electric locomotives on the same general design, and one of them has been completed. The new locomotive is more than twice as powerful as the old one, developing 1,300 h. p. It is designed to haul 300 tons at a sustained speed of 60 miles per hour. The total weight is about 265,000 lbs., equally distributed on 16 wheels. The length over all is 59 feet. The boiler is of the usual locomotive type, but with a larger fire box than is common in French practice. The two engines are vertical with three cylinders each, the cranks being 120 degrees apart, but connected to the same crank shaft. The balance is made as nearly perfect as possible. The generators are direct connected to the engines, but are excited by a dynamo driven from a smaller independent engine. It is claimed for this machine that the admitted loss of 12 per cent caused by transforming mechanical into electrical energy is more than compensated by the advantages due the uniform tractive effort secured and the absence of hammer blows on the rails. If the use of this engine proves economical electric traction certainly has a clear field in France.

### STREET RAILWAYS IN JAPAN.

The Japanese have been so occupied by the great wave of industrial progress which has rolled over the empire during the past few years that not much attention has been given to street railways. This condition will not be lasting, for many of the cities of Japan are very populous and the smaller towns are so close together that electric traction will certainly prove the best and cheapest means of transportation. The government has been educating engineers in the United States and Europe and the electrical profession has not been neglected. These young men are now returning to their native land and as a result electric lighting and other applications of electricity are making great advancement. In many places water powers are situated near the cities and some of these are being developed and electricity used as a means of transmission.

In Kioto the street railway system is electric and in the capital, Tokio, there is agitation to convert the present extensive system into trolley lines. A horse car line is in operation between the cities of Kodzu and Yumoto. Perhaps the most notable motive power is that between Atami and Odawara where the cars pass from the former to the latter place by force of gravity and are returned by "man power."

The Union Street Railway of New York, prohibits the ringing of gongs on its cars except in cases of absolute necessity.

At the suit of holders of third mortgage bonds Charles Green, president of the Peoples Railway Company, St. Louis, was appointed receiver for the company.



## METROPOLITAN OF WASHINGTON IN WINTER.

During the winter, street railway men have watched with interest the working of underground electric conduit roads. The Metropolitan of Washington has been put to severe tests. On January 27 occurred the most severe snow storm of the winter, five inches of snow falling in eight hours. When it became evident that a snow storm was at hand, the sweepers were ordered out and kept going the entire night. Not a car was stopped and no hitch of any kind occurred. The full schedule was operated, demonstrating that snow is not an impediment to the operation of this road.

The carrying capacity of the road was thoroughly tested in March, when thousands of visitors were drawn to Washington to witness the inaugural ceremonies. G. B. Coleman, general manager, in speaking of the car service this week says:

"The greatest test came on March 3, 4 and 5, when we carried about 300,000 people. On the 4th, owing to the program of that day we could only operate the cars until 11 a. m. and again after 6 p. m. From that time until midnight every car was loaded to its utmost capacity. In fact, people were hanging from all parts of it. In addition to the regular number of cars we put on everything we had and within the space of about five hours carried 96,000 people, and this without a mishap of any nature; not a circuit breaker or a fuse blew out. This we consider the greatest test the road ever had. From the inception of its operation to the present time the road has demonstrated to us that this is the greatest system on the face of the earth."

## CARS RUN AT LOW VOLTAGE.

The Oakland Railway Company, of Detroit, was temporarily embarrassed recently by the burning out of both dynamos in the power house. Very soon after the accident arrangements were made with the Detroit Citizens Street Railway Company to have power supplied over its trolley lines to the Oakland trolley. As shown in the diagram the two roads have a common terminus at Palmer Park which is the farthest point on each road from their respective power-houses. When the dynamos at the Oakland power house were disabled the trolley wires of the two lines were joined at Palmer Park. This transmission of power was under the most unfavorable circumstances, as the source of supply was at one extremity of the road, about 21 miles in length, and this was aggravated by a hill of 5 per cent grade a quarter mile long at the outer terminus. The voltage dropped as low as 250, which causes considerable heating of the motors and dim lights in the cars at night. The feeder system is roughly represented by the sketch. The Detroit company has a 1,000,000 circular mil feeder extending 21,200 ft. from its power house and the rest of the line is

fed from a conductor of 500,000 circular mils, connections to the trolley wire being made at suitable points. The Oakland line has but one feeder and that of 500,000 circular mils. Thus it may be seen how inadequate were the provisions for a long distance transmission, but still the system is so flexible that the cars could be run even at half the normal voltage. For three days the cars were operated on a one hour schedule and little difficulty was experienced in making the 12½ mile trip in one hour. When everything else is sacrificed to service it shows that there are few accidents which will confound a resourceful railway electrician and his apparatus.

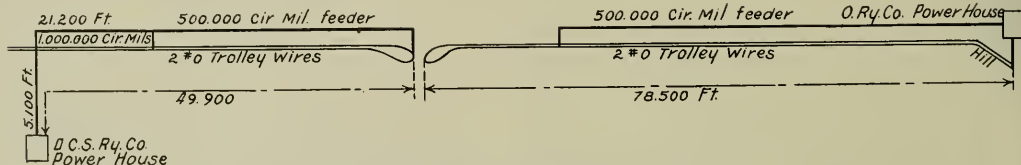
## CHEAP POWER FOR THE LEAVENWORTH ELECTRIC RAILWAY.

The Leavenworth (Kan.) Electric Railway has operated 18 cars on 15 miles of track by power supplied from the company's dynamos which have been in the station of the Leavenworth Light & Heating Company. The state penitentiary is located at Lansing, a suburb of Leavenworth, and the convicts are partially occupied mining coal for the state. L. M. Erb, manager of the street railway, recognized that this might prove a source of cheap power and entered into negotiations with the directors of the Kansas penitentiary. As a result a contract for fuel has been closed which goes into effect June 1 and continues for six years. The street car company is to extend a line to Lansing and remove its four boilers, four dynamos and large engine within the penitentiary walls. This will save all expense of hauling and switching the coal and the power house labor will be attended to by the convicts.

## A CORRECTION.

Thomas C. Pole, president of the company operating the gasoline motor in Washington, hands us the following correction:

I noticed an article on page 157 of the March issue of the STREET RAILWAY REVIEW, under the head or title of "Gasoline Motor Objectionable." I wish to state that I am the president of the company operating the gasoline motor and that you are misinformed. The fact is that the car was run on that branch of Henyon street several times and no complaint was made of the running; but the Brightwood Railway Company had not any room in its car house and the car was compelled to stand at the said corner or on the street (Henyon). On account of the motor standing there the citizens there complained of its standing and therefore asked the commissioners to have it removed. I appeared before the commissioners myself and was requested to either run it or take it out of the way. The said motor ran upon the Anacostia track for about three months and no complaint was entered against it.



LINES OF THE OAKLAND AND DETROIT CITIZENS' RAILWAY.

## NEW BRIDGE OVER NIAGARA GORGE.

A new steel arch bridge is being sprung across the Niagara gorge just under the existing railway suspension bridge, which it is intended to replace, and this without the slightest interruption to traffic on the railroad or the highway which it supports. The erection of a bridge of such proportions over the gorge is, of itself, a task of no small magnitude, but to build such a structure in the place of a bridge that is in use, is an undertaking that requires engineering ability. The engineer in charge is L. L. Buck, who had the supervision of the rebuilding of the railway suspension bridge with steel in 1880, and who also took charge of the work of replacing the stone towers of the structure with towers of steel in 1886. The changes were made, as is the present one, without interfering with travel on the bridge at any time.

The illustration shows the progress made in building the arch up to date, and how it is being fitted in the place of the suspension bridge. A portion of the false work is seen at the left of the picture.

The new bridge was made necessary by the business of the Grand Trunk Railway, which required a second track.



NEW BRIDGE AT NIAGARA.

It compares favorably with any bridges of its class. It will have a span of about 550 ft. between the end piers, and a trussed span will connect it with the cliff on each side of the river. The main span is formed by an arch with horizontal upper chords. At the skewbacks it will be hinged. Each truss has a batter of 1 horizontal to 10 vertical. The width between the axes of the top chord is 30 ft., while between the axes of the rib at the crown the width will be 56 ft. 7 $\frac{3}{4}$  in. Above the centers of the skewbacks the axes of the upper chords will be 134 ft., and the axes of the ribs at the crown 114 ft. above the skewbacks. On the American side the bed plates of the arch rest on abutments built on Clinton limestone half way between the water's edge and the top of the high bank. On the Canadian side the abutments rest on a concrete foundation built about half way up the slope.

This new arch will have two decks. On the upper one will be laid the railroad tracks, while the lower will have ample room for a carriage way, sidewalks and trolley tracks. It is probable that the first trolley car to pass from the United States into the Dominion of Canada on its own

wheels will cross this bridge, for one incentive to the construction of the arch is to afford trolley connection between the two sides of the river in what will probably be a belt line service around a portion of the gorge.

The Pennsylvania Steel Company has the contract for building the arch, and has made rapid headway considering the season of the year, and the dangerous point of work. It is expected that the arch will be sprung early in April, but the bridge will not be completed until the latter part of June or the first of July.

The total weight of steel work is estimated at 3,000 tons. The bridge is expected to carry on each track two 160,000-lb. locomotives with train of 3,500 lbs. per ft., and on the lower deck a live load of 3,000 lbs., making in all a live load of 10,000 lbs. per foot.

The suspension bridge will be carefully taken down and rebuilt at another point on the gorge, perhaps Lewiston. It will be used until the new bridge affords crossing facilities. At present the suspension bridge rests on the lower floor beams of the new arch, and the upper floor beams will be left out until the suspended structure of the present bridge is raised clear of the new one.

## WATER IN VESTIBULE WALLS.

A weak point in vestibules, or one that will some day be a weak point if neglected, is the leakage of water down behind the wainscoting when the front window is lowered. This point is one which has not received attention but will force attention on itself as vestibules on electric cars get older. Probably the majority of vestibules in use today have a solid wainscoting, between which and the outer panel the windows are lowered. This arrangement would be all right if the windows were lowered only in fine weather but unfortunately they almost invariably have to be lowered when there is a storm. In such case the motorman does not usually let the window entirely down but only opens it enough so he can see out over the top. The rain or snow strikes what glass is exposed and follows it down between the outer and inner vestibule walls. When once in there, unless some special provision is made, the only way for water to get out is to slowly leak out and consequently the platform where the vestibule walls come down is kept constantly wet and in time will rot. The effect of this continued dampness on the controller wiring is also bad. The remedy is of course to make an outlet somewhere for the water that gets in the vestibule wall. The presence of water in that place will not usually be noticed except by accident even by employes that are handling cars daily hence it is so commonly neglected.

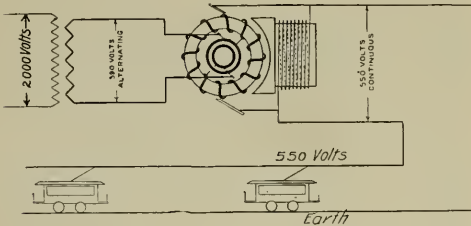
## ELECTRIC TRACTION FOR RHEIMS.

Rheims is a city of over 100,000 inhabitants and has about 10 miles of horse car lines. The Campagnie des Tramways de Rheims is very desirous of introducing electric traction, and has made propositions to that effect to the city council. There is considerable opposition to the trolley, and the council has not yet given its consent. Several other systems of mechanical traction have been proposed, but the general manager states that the company will stick to electricity. It is proposed to put 40 cars in operation and install 1,200 h. p. of engines, boilers and dynamos.

## COMBINED POWER PLANT FOR ELECTRIC LIGHTING AND STREET RAILWAY SERVICE.

This has not been a potent question in American practice as different companies usually control the electric lighting and the electric railways. In England and many places on the Continent this subject has been freely discussed and the circumstances there warrant its consideration. Electric light stations have long been established, either by private companies or by the city corporations. The question of electric traction is just presenting itself and the engineers are careful figuring on the cheapest as well as the best plans for its inauguration. They have large and well equipped power plants, to furnish electric light, with day loads which are almost negligible. Recognizing that the heavy service for street railway purposes are at times when the light load is a minimum they are trying to devise alterations in the machinery which will make it suitable for both systems.

In London Lightning John H. Rider and Wilfred L. Spence discuss this subject at some length. As far as possible the same machinery must be used, so a summary is made of the current installation. The systems can be classified under three headings, viz.:—1. Continuous current stations, generating at between 400 and 550 volts. 2. Con-



tinuous currents under 400 and over 550 volts. 3. Alternating currents of any pressure but generally 2,000 volts. In the first case either the 3 or 5 wire systems are in use for lighting. The voltage is such that the machines can be used directly for street railway service, but the objection to this is that one side of the lighting system would be permanently connected to earth by the rail return. The railway service must not be supplied direct from a machine which is feeding the lighting system, but it may be supplied indirectly through the medium of a motor-generator, used simply for the purpose of keeping the traction and lighting mains separate. If permission could be obtained either from the municipal authorities or from the underwriters for an earth connection, the best plan would be to ground the middle conductor, as is the case in Manchester.

For the second class of stations, voltages under 400 or over 550 are unsuited for street railway work. Machines of 220 and 250 volts might be connected in series, as is done at Gera, but the switch board complications make this plan undesirable. The alternative is to use motor-generators in conjunction with accumulators and the current may be taken from the station bus bars if desired.

The alternating current station offers the most flexible solution. The voltage is usually high, as much as 2,000 volts and must be transformed down and be converted to a continuous current of 500 volts, as no suitable alternate cur-

rent motors are designed for street railway service. There are two ways in which this change may be accomplished: (1) by means of static transformers in conjunction with rotatory converters, and (2) by means of alternate current motor-generators.

In the first method, the arrangement of connections may be as shown in the diagram where the voltage is transformed from 2,000 volts down to 390. The rotary converter gives a continuous current of 550 volts. The speed at which the machine runs will depend on the frequency of the alternating current and the number of magnet poles. It will run in synchronism with the generator, and must be brought to speed before switching in. The ratio between the mean alternating pressure at one side and the continuous pressure at the other will be  $1 : \sqrt{2}$ , and the current value just the reverse. This ratio is not absolutely constant for a considerable range of voltage on the direct current side is caused by varying the field strength so as to control the phase relation. With a weak field the alternating current will lag and the direct electric motive force will diminish, while an over-excited field will cause a leading current and an increase in the voltage. Phase displacement may be objectionable in a steam-driven plant, on account of the reduced plant efficiency or power factor it entails. A good plan would be to partially separate the two windings on the armature, so that an independent field control may be obtained over one of them, and in this way very considerable variations in the ratio can be effected without any corresponding loss in the plant efficiency. The same machine can then feed the trolley wire direct or, with the same primary e. m. f., charge storage batteries at 30 per cent greater voltage.

One great advantage of a rotary-converter is that it need only be large enough for the maximum alternating current and for the highest continuous current voltage, thus saving the double wound armature and double machine of the motor-generator type. It is stated that the larger machines are liable to spark at the continuous current commutator, owing to the armature current, and the consequent field distortion, varying as the armature is acting first as a motor, then as a dynamo. In spite of the opinions of some of the learned European electricians, large machines of this type are in successful operation, as at Niagara and Salt Lake City. Also at Geneva 100-k. w., 220-volt machines are giving perfect satisfaction with an entire absence of sparking. Should these methods be applied, the all day efficiency of a plant will be greatly increased, much to the benefit of its earning capacity. There are many places where these plans are feasible and careful thought can be given to them with much profit. Such considerations have been taken into account in designing the great water power plants at Niagara, Sacramento, Portland and elsewhere.

### A NEW BENEFIT ASSOCIATION.

The employes of the Middletown and the Portland street railways have formed a benefit association, adopted a constitution and elected the following officers: Superintendent, E. A. Goss, president, and Charles H. Chapman, secretary and treasurer. The by-laws of the association are really a part of the rules of the street railway companies as all employes are required to belong to it and pay 25 cents a week dues. After being in the employ of the companies one month, a man is entitled to draw a daily sick benefit of 50 cents.



## COMPARISON OF STREET RAILWAY CONDITIONS AND METHODS IN EUROPE AND IN THE UNITED STATES.

BY P. F. SULLIVAN.

Statements have been seen and heard from time to time of the marvelous results obtained by street railways in Europe, of the low rates of fare which prevail there, and of the very favorable conditions, for the municipalities, upon which franchises were granted. I never doubted the statements. Some of them appeared strange, to say the least, in the light of experience; yet the only conclusion I arrived at was that if the conditions and accommodations are the same in Europe as in America with respect to street railway transportation, then we have much to learn from that side of the water.

Without intending to reflect upon the enterprise and ability of the people of Europe, I must state that my experience taught me that the men engaged in street railway transportation in this country were an industrious, energetic, enterprising set of men. I knew that no men engaged in any enterprise on this or on the other side of the water devoted so many hours of thought and labor to their duties, and notwithstanding that no enterprise on earth showed such marvelous progress in the last ten years as street railway improvements in this country, I knew of no investment that has up to the present time given so little return. I had also met several street railway gentlemen from Europe who had come to this country to study street railway methods here, and they appeared about as fallible as others; and they invariably left loud in their praises of the wonderful results achieved in American street railways. It seemed, then, that the only way in which one could learn what to American street railway people was a secret was to go to Europe, and look into the methods. With that purpose in view, I visited several cities in the United Kingdom, in France, and in Germany; but inasmuch as the principles and methods are practically the same in all the large European cities with the exception of Paris, I will select only two typical cities—Glasgow and Berlin—the former owning and operating its own street railway, the latter granting a franchise to one or more stock companies for a period of years. I stated that Paris is an exception with reference to principles and methods; therefore a word relative to that city may not be out of place here.

I shall use the same terms as are used in the United States, and the value of foreign money will be stated in United States values.

Paris.

The street cars and omnibus lines of Paris are operated by a stock company as they are in this country, the franchise being granted for a limited term of years. The rate of street car fare is usually a fixed sum, 6 cents for first-class and 3 cents for second-class fares; the second-class passengers are compelled to ride on the roof seats regardless of the weather. First-class passengers are entitled to "correspondence" or transfers. Second-class passengers can obtain transfers by paying 1 cent in addition to the previous 3 cents. All transfers can be used only at regular stations, in the same manner as if the holders of transfers had not previously ridden on a car. The carrying capacity of all cars is limited to the seating capacity and four additional who may stand on the rear platform. Passengers are compelled to take cars at regular stations or stopping places, situated apart in distances varying from one-quarter to one-half mile. A person who intends to take a car goes into the station and signifies his intention, whereupon the attendant gives him a check numbered. When the car arrives the conductor announces the number of vacant seats, and a number of persons holding the lowest numbers given by the attendant and equal to the number of vacant seats is allowed on the car. Payment is made after boarding the car. Persons have frequently to wait from ten to twenty minutes before they can get a vacancy. It strikes me that this is a European "improvement" that would not work very satisfactorily in this country.

Glasgow.

Glasgow has the second largest population in the United Kingdom, there being practically 840,000 persons in the territory of

14,661 acres through which its horse car system runs. It is one of the best governed cities in the world, and in respect to the management of its various departments suggests a good subject for all reformers who can see no chance for improvement in anything but street car franchises.

## STREET CARS.

The street cars of Glasgow are practically the same style as those of all other cities of Europe, viz., double-deck close cars, usually fourteen-foot car body and seating eighteen persons inside and twenty-two persons on the outside or roof seats. There are no open cars. Passengers are not allowed to stand in the cars, so that in wet or other stormy or cold weather they are compelled to ride on the roof seats. A car, therefore, will seat nearly twice as many as an ordinary size close car in the United States. This, coupled with the fact that there are no open cars, means that in this country it would require four times as many cars to accommodate the same number of persons as would be accommodated in Glasgow.

## RATES OF FARE AND COLLECTIONS.

The principles and methods of street car fares in Glasgow are the same in general as those employed throughout Europe with the exception of Paris; viz., a distance rate upon the same principles as railroad fares are made in this country. The rate in the United Kingdom is limited by an Act of Parliament to a maximum of 2 cents a mile. In subdividing routes, however, the companies do not adhere strictly to the mile basis; the limit may exceed it, but one will find that to go two miles, or upward to about five, will cost from 4 to 6 cents. In all cities in the United Kingdom other than Glasgow 2 cents is the minimum fare. In the latter city, however, a subdivision of this fare is made so that the minimum is 1 cent for approximately one-half mile. The fares are 1, 2, 3, 4, 5 and 6 cents. It is not possible to get such long rides in Glasgow as are obtained regularly in any city in this State, and the longest ride in that city costs 6 cents, whereas a ride of a similar distance would cost only 5 cents in any city of the United States.

Conductors are provided with distinct colored tickets consecutively numbered and usually representing one or more distinct rates of fare on each route. A passenger signifies to the conductor what his destination is, and, after paying a proper amount, receives a ticket or receipt which shows the amount paid and the limit of ride. When approaching a fare limit or station each car is usually boarded by an inspector who examines each ticket, and if he should find a passenger without a ticket or with one beyond the fare limit the passenger must pay again or get off. It does not matter if the passenger in ignorance threw his ticket upon the floor with many others which he may see there; the inspector performs his duty, and properly, too. This method of fare collection and regulation is an absolute protection to the company, and is regulated by a by-law. Under the general street railway law of 1870 each railway company is authorized and empowered to adopt by-laws for its own protection, and these by-laws have the same force as an Act of Parliament. Under the by-laws in question each passenger is compelled to receive and exhibit the ticket or receipt given by the conductor, under a penalty of about ten dollars. It would be interesting if such a by-law should be adopted in any part of this state, and if it were, to see whether it could be legally enforced.

## STREET RAILWAY SYSTEM.

The street railway system of Glasgow consists of seventy-three miles of well constructed track in thirty-seven miles of streets and operated for the fiscal year ending May 31, 1896, by an average of two hundred and seventy-seven horse cars. The tracks were constructed and were always owned by the municipality. The original line was built in 1871—when the city had a population of 478,000, and operation began in August, 1872; and from that time until May 31, 1864, the road was leased to and operated by a stock company. Upon failure to agree to terms for a renewal or extension of the lease the municipality assumed control, and began operations July 1,

1894. The basis upon which the original lease was made was practically the same as that upon which the municipality does business with the street railway department now, viz., annual payment or sinking fund of sufficient amount to liquidate the capital invested; payment of the interest upon the capital invested; and annual payment to meet the expense of renewals and a rate of \$750 per mile of track. After the original investment the municipal authorities found that "public convenience and necessity" required that extensions should be made, but the lessee could not see its way clearly to do so under the original contract. Accordingly amended contracts were made by which the municipality invested \$717,475.00, for which no provision was made with respect to sinking fund for liquidation. The mileage payments made by the lessee were a varying and increasing amount, depending upon the amount of operation, and was therefore greatest in 1894. The amounts paid to the "Common Good" or general municipal treasury for three years were as follows:

By the lessee for 1894.....	\$28,300 00
By the Street Railway Dept. for 1895..	41,300 00
By the Street Railway Dept. for 1896...	45,000 00

In other words the municipal treasury received \$16,700 more in 1896 from its own operation than it received in 1894 from the lessees, but there was this difference that in 1894 the municipality had only \$717,475.00 invested; in 1896 \$2,582,780.00 with the added responsibility. It must be added, however, that the street railway department paid the interest on the loan at a rate less than 2%.

The department is well managed by John Young, Esq., and an able corp of assistants, and the method of accounts is conducted upon the most substantial basis. The equipment and appointments are good, and its operations are "up-to-date" and the service is excellent so far as it goes, but it does not go far enough, a fact which its present management appreciates, and it gives only about one-fourth the accommodations for the same population as are given in American cities. To this I will refer later at length.

The street railway results in Glasgow are frequently referred to in this country in language which makes practical men wonder, but which in Glasgow is attributed to American humor. For instance, it has been said that municipal control reduced the rates of fare one-half, and that sufficient profit was made to remove the necessity of further taxation, and that the sinking fund from the operation of the street railway would in a few years liquidate the entire municipal indebtedness. The facts do not seem to bear out the assertions, and the assertions are ridiculed by those who manage the Glasgow street railway.

The facts are that under the new management a rearrangement of routes was made, and such change made necessary new station limits, and in addition the fare of 2 cents was reduced to a minimum fare of 1 cent. This change did not mean that one could ride as far for 1 cent as he could previously for 2 cents. It simply made shorter fare limits. With reference to profits and taxation. The city of Glasgow has an average of 10,000 employes, to whom, together with other expenses, it disburses annually \$10,000,000, or six times as much as the gross receipts from the street railways; and the net returns to the municipal treasury from the street railways are only \$45,000.00. When it is remembered that the debt for water, gas and electric lighting, markets, and street railways is \$39,852,175, which expires on an average in 1934, it does seem as if the municipal millennium is a few years off even in Glasgow.

#### Berlin.

Berlin may be cited as a representative continental city with respect to surface transportation. It has a population of 1,800,000 in an area of 17,500 acres. Its street system is practically owned or operated or both by one company, and its franchise from the municipality is granted for a term of years. The present franchise expires in 1911. At the present time negotiations are pending between the municipality and the operating company. The former desires extensions and a modern system of motive power. The latter has decided to make no changes unless an extension of the franchise is granted. This was the experience of Glasgow. The municipality sees the necessity for extensions and accommodations, and the operating company cannot afford to make the changes under the old contract.

This company operates one hundred and eighty miles of tracks in ninety-five miles of streets, and owns all of the tracks which have

been built and extended from time to time since 1865. All of the above tracks are not built and operated under the same general franchise. In general it may be stated that the company pays rates from 4 to 8 per cent. on its gross receipts. Notwithstanding these payments, the company paid and has paid 12 per cent. dividends on its capital stock. This will not surprise any street railway man when he considers that there are only one hundred and eighty miles of track for 1,800,000 people.

#### CARS AND FARES.

Cars are pretty much the same as those in the United Kingdom, and the company operates on an average one thousand and fifty. It has one thousand and eighty-seven cars, three hundred and forty-eight one-horse and seven hundred and thirty-nine two horse cars. The two-horse cars are usually about sixteen-foot body and most of them have double deck seats. Fares are graded and collected in the same manner as those in the United Kingdom. In Berlin, however, the minimum fare is 2½ cents. The fares are 2½ cents, 3¼ and 5 cents. On one route within the city limits two 5-cent fares are necessary. These rates are higher than those of any city in the United Kingdom.

#### Comparison Between American and European Methods.

From the above, therefore, I will endeavor to show:

First, that the rates of fare in Europe are actually higher and not lower than the rates of fare in the United States, and when the earning capacity of the people is considered, that they are relatively higher still.

Secondly, that the principle of charging a distance rate works injuriously against the laboring and artisan classes, the very classes that street cars are chiefly intended for; that it has resulted in such crowding, such density of population as to cause the municipalities the greatest concern; upon which they spend as much, if not more, to regulate than is received from street railway franchises; and that such a condition, with respect to density of population, is not known in the United States because of superior street railway facilities.

Thirdly, that under the conditions which obtain in Europe with respect to high rates of fare, low rates of wages and prices, density of population, low mileage and therefore low capital invested, and owing to the protection which capital receives, street railway investments are more desirable and are better than street railway investments in the United States.

#### RATES OF FARE.

The prevailing general opinion in the United States is that street car fares in Europe are 2 cents regardless of distance, and that because of this fact, together with the fact that some of the companies in the larger cities make money, the 5-cent fare generally prevailing in this country should be reduced. I have shown above what the rates are and such rates prove that it costs more than 2 cents for a general ride. In November I paid 6 cents for a ride in Glasgow, and in December 10 cents for a ride in Berlin, a longer ride than either of which I could regularly obtain for 5 cents in any city of Massachusetts; and in neither city, in fact in no city in Europe, with the exception of Paris, are transfers issued.

When we look at a car of the West End Street Railway Company and see all seats occupied and a few persons standing, we are led to think that such a condition of things represents a large income. We do not stop to consider how long some of the passengers rode in that particular car, nor do we further consider that in the morning most cars are comparatively empty going in one direction and in the evening comparatively empty going in the other direction; and that there are many trips the receipts of which do not pay the actual wages of the conductor and motorman. What is true of the West End Company is true of every other company in the State. The West End Company averaged for the fiscal year ending Sept. 30, 1896, to carry fewer than seven persons per car mile. How, then, can we account for thirty or forty persons that we see so frequently upon one of that company's cars? It means that if you divide thirty or forty by seven, they averaged to ride four and two-sevenths or five and five-sevenths miles, and when we know that many ride a longer distance than that for 5 cents we can account for some who ride shorter distances. If those passengers paid 5 cents for limited distances of about one mile or so, the West End Company would then average to carry instead of seven persons per mile at least

thirty persons per mile. You will then account for the fact that Glasgow cars averaged to carry over eleven persons per mile in its last fiscal year as against seven by the West End cars. From investigations and comparisons made in the last two or three years I find that the rate of fare in this State averages between 1 and 1 1/4 cents a mile.

The above 5-cent rate of fare is paid principally by laborers and mechanics who average between \$1.50 and \$2.50 a day, as against a rate of wages for the same classes averaging between 75 cents and \$1.25 a day in Europe; and assuming that the American pays twice the average rate, or 2 1/2 cents a mile, he pays from one-sixtieth to one-hundredth part of his wages, while the European pays from one thirty-seventh to one sixty-second part of his wages. In other words, a European gives twice as much labor as an American for a car ride. And when it is remembered that every American city and town which changed from animal to mechanical traction extended its lines and in many instances nearly doubled the length of ride without increasing the rate of fare, the additional advantage is apparent.

This point is so well covered editorially by the Street Railway Journal in its issue of July, 1896, that I have taken the liberty to quote it in full, adding Glasgow and Berlin as follows:

### CHEAPNESS OF MUNICIPAL TRANSPORTATION IN AMERICA.

"In view of the occasional agitation of the question of reducing fares on our street railway systems we have sought information as to the longest rides given for a 5-cent fare in American cities above 50,000 inhabitants, and as to the regulation of transfers within those cities. The results of our inquiries are found in some detail on another page, while here we wish to call attention to a little table containing some figures upon the street railway systems of cities above 100,000 inhabitants, which are significant and interesting to an unusual degree.

CITY.	Approximate Population, 1890.	Track Mileage.	Longest ride for 5 cent cash fare, miles.	Transpor-tation rate per mile.
New York, N. Y. . . . .	1,851,060	458	12.5	.0040
Chicago, Ill. . . . .	1,100,000	760	15	.0033
Philadelphia, Pa. . . . .	1,047,000	462	11.75	.0043
Brooklyn, N. Y. . . . .	839,000	393	18	.0028
Boston, Mass. . . . .	678,000	275	9.9	.0051
St. Louis Mo. . . . .	452,000	335	15	.0033
Jersey City-Newark, N. J. . . . .	388,000	175	8.25	.0060
San Francisco, Cal. . . . .	299,000	269	12	.0041
Minneapolis-St. Paul, Minn. . . . .	298,000	222	12.94	.0039
Cincinnati, O. . . . .	297,000	263	13.44	.0037
Cleveland, O. . . . .	261,000	269	10	.0050
Buffalo, N. Y. . . . .	256,000	143	13.75	.0036
Lynn, Mass. . . . .	250,000	153	6	.0083
New Orleans, La. . . . .	242,000	169	7	.0071
Washington, D. C. . . . .	230,000	138	9.5	.0053
Detroit, Mich. . . . .	206,000	202	10	.0050
Milwaukee, Wis. . . . .	204,000	159	9	.0056
Kansas City, Mo. . . . .	171,000	142	11.2	.0045
Louisville, Ky. . . . .	161,000	150	9	.0056
Rochester, N. Y. . . . .	124,000	93	9	.0056
Denver, Col. . . . .	107,000	212	11.5	.0043
Indianapolis, Ind. . . . .	105,000	107	11	.0046
Glasgow, fare 6 c. . . . .	840,000	73	5.37	.0117
Berlin, fare 10 c. . . . .	1,800,000	180	7	.0143

"In the first place, the size of the systems as shown in the third column commands attention. The city of Chicago, for example, contains as much track as would reach from New York to Cincinnati, while the length of line would reach from New York to Rochester—a very respectable size for even a steam railroad system. Large mileage in street railway system necessarily means a widely ramified network of lines, and indicates a far greater convenience to the public than would be the case with a smaller system in the same city. It also means, or may easily mean in many cases, that the street railway corporations of a city, taken as a whole, may be operating more mileage than would really yield them the greatest percentage of profit upon the investment. Corporations are not always philanthropic, but they are, when prosperous, almost always more generous and more far sighted in their treatment of the public and in their plans for the future than is the case when they are ground down to

the lowest possible margin of profit or compelled to fear too much the effect of possible contingencies.

"In the fourth column will be found the longest rides which can be taken for a 5-cent fare on the different city systems by a passenger desiring to get from one point to another by the shortest possible route. On several of these systems the transfers are so arranged that a passenger can ride indefinitely, if he so desires, but the longest legitimate rides, so to speak, are those given in the table. The figures in column five will, we imagine, strike our foreign friends with amazement as showing how wonderfully cheap is municipal transportation in America. A penny (2 cents) for the first mile, and a half a penny per mile thereafter is the usual English charge for horse car transportation on the generally short routes of their principal cities. Here in our larger cities a passenger may ride at one-quarter penny per mile or less, and ride at much greater speed and in comparative luxury and ease. It is not too much to say that American street railways afford the cheapest transportation in the world—and yet it is sought in some cities to bring down rates even lower.

"We have recently commented at some length upon the tremendous advantages which have accrued to the American public from the policy of liberal street railway franchises which has usually been adopted by our municipalities, in comparison with the restrictive policy common abroad, and nothing further need be said upon this point here except that a reversal of this American policy would be in the highest degree unwise, and its effects would never be tolerated by the American public. Foreign cities are beautiful and most attractive as places of residence and enjoyment for the rich, but the living conditions for the poor—alas, the poor must live as they may.

"The longest ride possible in our cities of 50,000 inhabitants and above varies from about eight miles in the smaller cities to from twelve to eighteen miles in the larger, this variation being, of course, due to local conditions. In all but a few cases these longest rides can be had at a single 5-cent fare, there being but three or four cities in which double fares or special higher rate transfer checks are issued. In fact, we have been much surprised to see how universal is now the custom of issuing free transfers to all parts of the company's system. Only nine cities out of thirty-eight from whom we have heard refuse this, and in several of these latter there are genuine reasons for such refusal. For example, a passenger can ride in any part of St. Paul or in any part of Minneapolis for a 5-cent fare. The same company, however, controls a line from St. Paul to Minneapolis, and for a 10-cent fare will carry a passenger from any point in St. Paul to any point in Minneapolis, so that he may ride for twenty-four miles for 10 cents. Before the advent of electricity the steam railroad running between St. Paul and Minneapolis carried passengers between its own stations in the said cities for 30 cents each way, and ran trains not oftener than once in thirty minutes, instead of once in seven minutes as by the electric lines at present.

"In Philadelphia the consolidation of three great systems has made it exceedingly difficult to arrange transfers properly without a strong probability of their abuse, and while free transfers are given upon many lines, an 8-cent fare is charged on some of the longest routes—from fifteen to eighteen miles. In Boston the conditions are somewhat the same, the West End Company having a number of long lines extending far into the suburbs, but even there reductions are constantly being made in the direction of a general 5-cent basis.

"Altogether it does not seem just or reasonable to demand further concessions from the street railway companies in most of our cities. The public is being served by them as no other public in the world is served, and is getting more for its money than would ever have been thought possible until the advent of electricity. Enormous investments have been made, and are still being made, with a view to better service of the public. Dividends are being withheld from the stockholders in a large number of cases, and turned back into the property. A few men have undoubtedly made larger profits from the manipulation of franchises and in the building up of the street railway systems, but the great body of security holders is surely not receiving unusual or extortionate profits."

And again, bearing upon this point, we have the following from Mr. Alex. McCallum, of Glasgow, in the Herald, of that city:

"Recently I received a commission from the Glasgow Herald, which occupies a foremost place among the great daily provincial newspapers in Britain, to pay a visit to the United States and make a series of inquiries on the spot as to the position now reached in the application of mechanical power to the propulsion of street cars.



In Glasgow, as some readers may be aware, the street railways are not only owned, but are operated, by the municipality for the benefit of the citizens and consequently the general interest in methods of traction is much more keen than can be expected in cases where the lines are worked by companies. It is nearly two and a half years since the lease under which the old tramway company operated expired, and since then the Town Council has had the whole business entirely in its own hands. It has been fairly successful so far, and has given a much improved service, but both it and the Glasgow public are very desirous to have some better method of traction than the present horse system which on all hands is found to be insufficient. Delegations from the council have in recent years made many excursions for the purposes of inquiry, the last of which was to the United States, and at present it seems as if their long investigations and deliberations would soon reach a point and result in action. These things being so, I was asked to get whatever information was available in America, particularly in regard to electric traction, and as its mechanical success is already thoroughly established attention was largely turned to its financial aspect.

"Evidently one of the greatest, if not the greatest, benefits that electric traction has conferred on the public is the removal of the working classes from crowded areas to healthy suburban homes. Thus electric traction is one of the greatest social and sanitary reformers that America possesses. Without the system of uniform fares, however, the thing would be impossible. Of this admirable system it seems scarcely possible to speak too highly from a reformer's point of view. No doubt it is a hardship that a man cannot ride a hundred yards without having to pay 5 cents, but the compensating advantages are immeasurable by comparison. In Great Britain, where almost as much has to be thought of a penny by the poorer classes as in America they think of a nickel, I am afraid we are very far from the uniform five, no matter what sort of traction we adopt. The tendency in fact is quite the other way, as witness the adoption of half-penny (or 1 cent) fares for a half-mile ride in Glasgow and London. A uniform fare of a penny would probably mean ruin to many British tramway companies. Three half-pence might suit at a pinch in some cases, but it is a very awkward sum, necessitating the payment of two coins of different values, the penny and the half-penny, or else three separate half-pennies, so that there would be endless waste of time, and continual worry for the conductors in finding small change. Two pence might suit, but in relation to wages and prices it is rather a higher figure than the American 5-cent fare, and would probably lead to a ruinous diminution in the amount of short distance riding.

"While it is the case that in Britain we shall not be allowed to drive electric cars at as high a speed as is common in the United States, I think this will to a great extent be counterbalanced by the lower rate of wages paid to employes as compared with the scale in America."

#### Density of Population.

##### GLASGOW.

In "Municipal Government in Great Britain" we find the following statistics relative to Glasgow:

"The density of London according to the census of 1881 was 51 to the acre, while that of Glasgow was 84, which was increased to 92 by the census of 1891, the annexed suburbs not being included. The average density of sixteen of the twenty-four sanitary districts, moreover, is above 200, and the average density of five districts is 300. Localities are not few where single acres contain a thousand or more people. The tenement house is almost universal. The best as well as the worst of the laboring class, and a large majority of the middle class live in the 'flats' of stone buildings three or four stories high. In some cases two or three hundred people use a common staircase and much greater numbers may be found using common passage-ways, or 'closets,' as they are called in Scotland. For no other English speaking city, so far as I am aware, are the statistics for house room and inhabitancy so complete as for Glasgow. To quote Dr. Russell, the distinguished medical officer for the city, '25 (24.7) per cent. (of the inhabitants of Glasgow) live in houses of one apartment; 45 (44.7) per cent. in houses of two apartments; 16 per cent. in houses of three apartments; 6 per cent. (6.1) in houses of four apartments; and only 8 per cent. in houses of five apartments or upward.' This simply means that 126,000 of the people of Glasgow lived in single-room housekeeping quarters in tenement

buildings and 228,000 in two room quarters, at the time of the census of 1881. In Scotland the word 'tenement' is usually applied to the entire building, and the word 'house' to the one or more rooms arranged for the occupancy of a family; thus the ordinary 'tenement' contains many houses. The census of 1891 shows a cheering improvement. Dr. Russell informs us that whereas in 1871 the Glasgow people living in houses of one room amounted to 30.4 per cent. of the whole proportion had fallen to 24.7 per cent. in 1881 and to 18 per cent. in 1891. The proportion of the two room dwellers, on the other hand, had greatly increased. Thus in 1891 there were only 100,000 people living in one room houses, while nearly 264,000 were in two room houses, this class of dwellers constituting 47.5 per cent. of all the people within the city limits at the time of the census. A population thus housed might well give employment to an army of sanitary inspectors. 'Small as these abodes are, great numbers of them take lodgers in addition to the regular family,' Dr. Russell, the medical officer remarked. 'Nor must I permit you, in noting down the tame average of fully three inmates in each of these one apartment houses, to remain ignorant of the fact that there are thousands of these houses which contain five, six, and seven inmates, and hundreds which are inhabited by from eight, even to thirteen.'

The effect of such living upon the public health is considered of such importance that the apartments are "ticketed" to show how many persons may lawfully live in each, and fines are imposed for violations.

It may be noted here that the percentage of one-room dwellers decreased in the periods between 1871 and 1881, and between 1881 and 1891. It may be interesting to note in that connection that Glasgow had no street railway accommodations in 1871, when its population was 478,000; that from 1871 to 1881 it built and operated forty miles of tracks and between 1881 and 1891 seventeen miles additional. It is, therefore, a fair inference that transportation facilities had something to do with the above healthful change.

The effect of street railway accommodations upon density of population may be further shown by the impartial testimony of Messrs. Young and Clark, present general manager and engineer respectively of the Glasgow street railways. In September and October, 1896, they visited the United States and Canada as a committee from the government of Glasgow to investigate American street railways. They visited as follows: New York, Brooklyn, Jersey City, Staten Island, Philadelphia, Baltimore, Washington, Pittsburg, Cincinnati, Chicago, Detroit, Cleveland, Buffalo, Niagara, Toronto, Montreal, and Boston. In a very able report presented by these gentlemen December 9, 1896, they spoke as follows (page 30):

"We never were prouder of Glasgow than when we heard of the high place assigned to her as a municipality by the Americans. But we have not served twenty years in the Health Department, and been acquainted with 'life in one room,' without knowing Glasgow's blemishes—and they are common to all of our older cities. One great city improvement scheme has been carried out in our city, and another is now being favorably considered. In Glasgow as it was five years ago there was a population of 565,714 on an area of 6,111 acres, giving ninety-two persons to the acre, or 58,880 to the square mile. In the present Greater Glasgow, apart from the adjoining but still separate burghs, we have a population of 705,000 on an area of 12,311 acres, giving 57 persons to the acre, or 36,480 to the square mile. When the four separate burghs now served by our tramway system are included, we have a population of 841,000 persons on an area of 14,661 acres, which also gives fifty-seven to the acre, or 36,480 to the square mile. No American city, with the exception of New York, is half so densely populated. No one wishes our citizens to continue so closely packed together as they now are. How are they to spread out? In our humble opinion and judging from what we have been privileged to see in America, the most powerful instrument which lies to the hands of the municipality for effecting this purpose is the best and cheapest possible tramway service radiating from the center of the city outward in every direction.

"Such a system must be safe, rapid as far as consistent with safety, elastic as to speed, clean, comfortable, and attractive, flexible enough to apply to all routes and meet all contingencies of street traffic, and, of course, as cheap as possible, and it would be all the better if each route had its suburban attractions in the shape of a park for music, and the usual facilities for amusement and recreation generally. As surely as you give cheap and rapid transit, which will enable all sorts and conditions of people living at a distance to travel com-

fortably to and from their work in the city, so surely will houses to accommodate them be built on cheaper ground—meaning cheaper rents—and with healthier surroundings.”

BERLIN.

In volumes 17 and 20 of Berlin statistics of 1893, by Herr R. Bodkh, Chief Statistician of the city of Berlin, we find statistics which are very ably described in "Municipal Government in Continental Europe," as follows:

"All thorough students of the problem of life in modern cities are now agreed that the housing of the people is the question that requires, from this time forth, the deepest consideration and the boldest and most serious treatment. It is a subject that has many phases. It was the unapproached excellence of their statistical work that enabled the Germans to grasp the social importance and pressing nature of this problem. Circumstances that I have recounted were and are causing their cities to grow very rapidly. The temptation was strong upon property owners to make their tenement hives hold the largest possible swarms. Rear-buildings were hastily run up to fill court-room spaces that ought to have been spared for necessary air and light. The German cities were beginning to repeat in aggravated form the mistakes of the great British industrial towns a half century or more ago, which left the housing question unregulated by the authorities, with the consequence of frightful overcrowding and horrible slums in which some form or other of epidemic was prevailing almost constantly, in which infant mortality was shockingly great, and in which vice and crime were nurtured as in an irresistibly favorable soil and environment.

"In 1885 it was found that 73,000 persons in Berlin were living in the condition of families occupying a single room in tenement houses; 382,000 were living in houses (I mean by 'house' the distinct apartments of a household) of two rooms; 432,000 occupied houses of three rooms; and 398,000 were quartered in the luxury of houses having at least four rooms. It was found that although the one-room dwellers were only one-sixth as numerous as the three-room dwellers, their rate of mortality was about twenty-three times as high and the actual number of deaths among them was four times as great. Compared with the dwellers in houses of more than four rooms, the mortality of the one-room dwellers was at a thirty times greater rate. In a total population at that time of 1,315,000 the 73,000 people who lived in one-room tenement quarters suffered nearly half the entire number of deaths. Their death-rate per thousand for the year was 163.5, or about one-sixth their entire number; while the two-room dwellers sustained a death-rate of only 22.5, the three-room dwellers escaped with the marvelously low rate of 7.5, and the well-to-do people who had four or more rooms for their household suffered by death only at the rate of 5.4 per thousand of population.

"I am of the impression that the relation of mortality in cities to the character of the housing of the people was never before shown with such frightful distinctness as in these Berlin statistics which were compiled and published in 1888. We are wont to regard an annual city death-rate of about 20 per thousand of the entire population as normal and satisfactorily small. We have not, however, become accustomed to the minute analysis of such a rate which might show up of rates for different classes varying from 3 to 4 per thousand to 200 per thousand. Half the mortality of the Berlin one-room dwellers occurred in households where five or more persons occupied the one enclosed space.

"It would require many pages to give anything like an adequate idea of the wide range of the Berlin inquiry of 1885. To have discovered that in one great ward of the city the death-rate among children of all classes and conditions under one year of age was five times as great as the death-rate for infants in another great ward was to reveal a fact of thrilling—even of alarming—significance. It was important to have learned that in one locality the deaths of young infants constitute half the total deaths, while in another locality only one-fourth of the death-rate is due to infant mortality. It was worth while to have ascertained the precise effects of residence in basements and in garrets.

"Berlin's population as yet is almost wholly housed in tenement or apartment buildings. The number of households or distinct housekeeping establishments was in 1890 about 367,000, and these were included in some 21,600 buildings. The average was about seventeen families under each roof, comprising about seventy-five persons. Including the Emperor and his nobles and all the rich families of Berlin, there were only about 2,200 households of 10

367,000 that had rooms on more than one floor; and of the 2,200 nearly 1,400 were connected with business rooms. That is to say, the 1,400 families had a living-room or two 'back of the shop' and some more space upstairs. Fewer than six hundred families had private houses totally separate from business uses for their own individual occupancy. Not one family in six hundred in Berlin lives in what Americans call a 'house,' as distinguished from a 'flat' or an apartment in a tenement building. The average size of Berlin's tenement buildings has been increasing materially. The buildings that shelter less than about forty people were not in 1890 so numerous by one-tenth as in 1880. Those occupied by from fifty to one hundred people had increased about 40 per cent. in number, while those that house from one hundred to three hundred people had increased from 50 per cent. to 300 per cent., the increase being more rapid according to size. About half the inhabitants of the city now live in buildings containing not fewer than one hundred people. Such a system has its advantages and its disadvantages. It makes the distribution of water and gas easier and renders perfect sewer connections more feasible. Everything depends upon the question whether or not the building is a proper one of its kind. In 1885 about 120,000 Berliners lived in cellar or basement rooms. The actual number of such subterranean dwellers was about the same in 1890, but the relative number had decreased somewhat. It is the policy of the authorities to discourage or forbid, as rapidly as possible, the occupancy of unwholesome basements."

COMPARISONS BETWEEN AMERICAN AND EUROPEAN CITIES.

That the foregoing instances of deplorable density of population are not isolated may be seen by glancing in columns on next page at the figures given for Manchester and Birmingham, representative British cities, Paris and Lyons, representative French cities, and Berlin and Hamburg, representative German cities. It will be seen that the cities of Europe and the cities of the United States form two distinct classes with respect to density of population:

CITIES.	Population.	Acres	Population per acre
New York . . . . .	1,851,060	37,059	49.95
Chicago . . . . .	1,700,000	116,480	14.6
Philadelphia . . . . .	1,047,000	82,560	12.68
Brooklyn . . . . .	1,053,398	44,800	23.29
St. Louis . . . . .	644,000	40,000	16.1
Baltimore . . . . .	613,965	26,880	22.8
Boston and suburbs accommodated by West End Street Railway Co. . . . .	782,859	65,102	12
Cleveland . . . . .	368,895	20,480	18.01
Buffalo . . . . .	360,000	26,880	13.4
Detroit . . . . .	280,000	17,280	16.2
Glasgow . . . . .	840,000	14,661	57.3
Manchester . . . . .	520,000	12,911	40.2
Birmingham . . . . .	500,000	12,365	40.4
Paris . . . . .	2,500,000	19,200	130.2
Lyons . . . . .	416,000	10,800	38.2
Berlin . . . . .	1,800,000	17,500	102.8
Hamburg . . . . .	600,000	14,200	31.2

The foregoing list of cities and the figures given in connection with them prove a lesson in themselves. New York City is an exception to American cities, regarding density of population; yet a study of it will explain it more clearly. New York within its municipal boundary can grow in only one direction, viz., north, and the greatest growth of New York, in what may be called Greater New York, is toward Brooklyn, Long Island, and New Jersey. New York proper, then, may be compared to old Glasgow, in which exists at present a population of 595,714 in 6,111 acres, or 92 persons

an acre. The figures prove beyond question that the conditions are not the same with respect to population in European cities as in American cities. In European cities there is a dense population crowded into very small space; no suburbs as there are in this country, and consequently a smaller track mileage, therefore less capital invested, and greater population per mile than exists here. Under such conditions is it any wonder that street railway companies in Europe are profitable investments?

### EFFECT UPON RENTS.

The matter of cheaper rents referred to above bears important relation to surface transportation. This is best illustrated in the city of Berlin. Owing to the graded fare and the low rate of wages, suburban residence is beyond the means of the masses. They are therefore compelled to reside near to their places of employment. This leads to demand for apartments or tenements in the central portion of the city. The effect is that rents are abnormally high. How this item compares with American tenement property may be learned when we know that an average working man would pay all of his earnings for two rooms on the first floor front of a tenement building, and would pay the income of 125 days' labor for two rooms of the third floor of a court in the rear of the same building, while an average working man in any of the suburbs of Boston would have a five or six room tenement or cottage with modern conveniences, and light and air, for which he would pay the earnings of from 85 to 95 days' labor. Assuming, then, that the American wage earner rides to and from his labor every working day, and that the European wage earner does not ride at all, it is clear that the former is still better off even viewed from a pecuniary standpoint only.

### Comparison of Accommodations.

Having shown that the conditions affecting street railways are not the same on both sides of the water we come to the next point—comparison of accommodations. They are as follows:

CITIES.	Population.	Miles track.	Population per Mile Track.
New York . . . . .	1,851,060	458	4.042
Chicago . . . . .	1,700,000	595	2.857
Philadelphia . . . . .	1,047,000	462	2.266
Brooklyn . . . . .	1,053,393	393	2.680
St. Louis . . . . .	644,000	335	1.922
Baltimore . . . . .	613,965	225	2.728
Boston and suburbs . . . . .	782,839	290	2.700
Cleveland . . . . .	368,895	269	1.371
Buffalo . . . . .	360,000	143	2.517
Detroit . . . . .	280,000	202	1.386
Paris . . . . .	2,500,000	184	13.587
Berlin . . . . .	1,800,000	180	10,000
Glasgow . . . . .	840,000	73	11,507
Liverpool . . . . .	600,000	60	10,000
Manchester . . . . .	520,000	50	10,400

In the foregoing figures the elevated railroads of New York, Brooklyn, and Chicago are not included, therefore these cities should properly be not included; and should they be omitted we find that seven representative American cities have an average population of 2,127 persons, while the five representative European cities have an average population of 11,099 persons per mile of track. In other words the people of American cities are accommodated on an average in excess of five times better than are the people of European cities. When we take into account, therefore, the pro rata rate of fare and the limited track mileage, is it any wonder that the people of European cities are crowded into buildings in a condition of grave menace to the public health, and is it any wonder that in American cities there are so many individual houses with an abundance of light, room and air?

But it may be urged that the American cities have too many miles of track, that the European cities have about enough, that they are satisfied with the accommodations, and that the people of the latter are satisfied with their conditions of living and do not need suburban houses. If one would say that the American cities have too many miles of track for the investors it would be right, for the greater amount of track and therefore of capital invested the less return can be obtained from the investment; but that the American public does not think that there are too many miles of track, too many accommodations, may be evidenced by the fact that the public is always petitioning for more tracks and more cars; and the people have never accused street railway companies of providing too many cars. In European cities, on the other hand, the public authorities deplore their transportation facilities and are trying to improve them. It was shown in the case of Glasgow, when the municipal authorities gave easier terms and conditions to the lessees so that additional accommodations might be obtained in particular localities. It is also true of Berlin. As bearing upon this point, the following may be of interest:

"At a meeting of the Liverpool City Council on June 3, Mr. Rutherford moved: 'That it be an instruction to the Health Committee—or in the alternative that a special committee be appointed—to inquire into the present means of inter-communication and locomotion, such as railway, omnibus, tramway, etc., between various portions of the city, with special reference to (1) the absence of the means of locomotion on certain routes and from certain districts in the city; (2) the inadequacy of the present means of locomotion in point of speed and accommodation on certain routes and from certain districts; (3) whether any other, and if so, what systems of locomotion could be advantageously made use of in Liverpool, and to report thereon to the council as early as possible, together with any scheme or schemes of improvement which they may consider desirable.' He brought forward this motion in no spirit of hostility to the Tramway Company. Inter-communication was a working-man's question. Cross-city traffic in Liverpool was entirely neglected. Some parts of Toxteth Park and Everton were without direct communication with the city. There were routes in Liverpool which occupied forty minutes, a similar distance in London being covered in twenty-five minutes. The rates in Liverpool were charged in proportion to time, and not in proportion to distance. With the exception of the Overhead Railway, no improvement has been made in Liverpool in inter-communication during the last seventeen years, while other municipalities had adopted electric, oil, gas, or cable cars. There were some streets in Everton in which a cable tram service could be adopted without infringement of any agreement in existence. He trusted that in the interest of the city generally, and of the working class in particular, the council would accept the motion.

"Mr. Lloyd seconded.

"After further discussion the motion was agreed to."

### ADDITIONAL CITIES OF THE UNITED KINGDOM.

The following list of cities shows that the lack of accommodations in the few larger cities is general throughout the country:

CITIES.	Population.	Miles track.	Population per Mile Track.
Bradford . . . . .	216,400	21	10,304.8
Bristol . . . . .	221,600	18	12,311.1
Cardiff District . . . . .	129,000	2.33	55,364.8
Leicester . . . . .	174,700	9	19,411.1
Newcastle and Gosworth . . . . .	186,300	13	14,330.8
Nottingham . . . . .	213,900	10.25	20,868.3
Sheffield . . . . .	324,300	9	36,033.3
Sunderland . . . . .	131,000	5	26,200
Aberdeen . . . . .	109,800	10.25	10,712.2
Dundee . . . . .	153,000	7.25	21,103.4
Edinburgh . . . . .	256,400	13.5	19,000
Belfast . . . . .	256,000	20.	14,800



The above list shows an average of 21,703 persons per mile of track against an average of 2,558 in all the cities of Massachusetts except Boston and cities accommodated by the West End Street Railway Company. In fact, the exception in the United States is the rule in Europe, viz., that there are few cities under 50,000 population which have no street railway facilities, and very few suburban towns which are not connected by tracks with a city or with other towns, while in Europe very few of such cities or towns have any street railway accommodations.

If anything further were needed to show the difference in accommodations on both continents, it may be noted that the United Kingdom in 1895, with a population of 40,000,000, had 982 miles of street railway tracks and in round numbers \$70,000,000 invested; while the State of Massachusetts alone had 2,500,000 population, 1,368 miles of railway tracks, and in round numbers \$60,000,000 invested.

#### Municipal Ownership.

A few words regarding municipal ownership and operation of street railways may not be out of place here. The impression intended to be conveyed by its advocates is that there is a universal demand for such a change in Europe, but the facts do not warrant any such conclusion. It is true that ways and means are discussed at present with a view of adopting policies at the expiration of present contracts. All the street railways in the United Kingdom were constructed and are operated under the general act of 1870, and as all contracts were made for periods not less than twenty years, they have expired or are about to expire within a few years. Glasgow has acquired its own plant and London is attempting to purchase the rights and property of a few small companies. In London, however, the acquisition is not for the purpose of operating the railways, but in order that contracts may be made which will remove the objections to the present unsatisfactory service.

Huddersfield and Leeds are referred to as cities which own and successfully operate their own plants. Huddersfield is a city of nearly 100,000 population and twenty miles of track, an average of 5,000 persons per mile greater than the average of any city in the United States. The city acquired the street railway property in 1891 and up to 1896 it has just about paid the interest at less than 3 per cent. on the investment since the acquisition. In one year a tax of 2 1-12 per cent. was added to the general tax to help pay the deficiency of the street railway department. Leeds has a population of 368,000 and acquired the ownership of the tracks of the street railway company in 1894. It is too early yet to look for results, but we shall hope that the municipality will succeed better than the late stockholders, who lost \$392,095 out of an investment of \$800,000.

Birmingham, one of the most progressive and best governed cities in the world, with a population of nearly 500,000, does not take kindly to municipal ownership and control. At a meeting of the city council of that city, held July 7, 1896, after a very full discussion upon the report of the Public Works Committee, it was voted to extend the present lease for a period of twenty-one years to a syndicate represented by gentlemen, one from Toronto and one from Montreal. The following quotation comes nearest to expressing the business sentiment of England: "That the opinion of competent judges is that the lines, etc., should rest in the local authority, but the working be left to private enterprise, and that this would be a just settlement of the question."

I stated previously that the conditions with respect to density of population were such as to cause the municipalities to spend more than they received from street railway franchises. This is illustrated in the case of Glasgow. In that city it has been decided that the public safety and health could best be protected by having all common entrances to dwellings and stairways cleaned and lighted by the municipal authorities. These items alone cost the city in the last fiscal year \$130,064.

#### Street Railways as an Investment in Both Countries.

Street railways in Europe in their relation to public accommodation are about in the same condition as they were in the United States twenty years ago; therefore, there is need of improvement. To bring about improvement, however, will require a revolution in rates of fare, for in order to get people to and from the suburbs cheaply, the fare must be brought within their income, but

that cannot very well be done owing to the conditions which prevail. There is, as shown above, a very large population to be accommodated, and that fact insures good business; for it is safe to apply to European cities the same general principles as are applied to American cities, viz., that large cities are better than small ones, owing to a larger population.

#### CAPITAL INVESTED.

Owing to prices of material, rate of wages, and local conditions, it will require less capital to perform the same work in Europe than in the United States. For instance, Glasgow street railways have invested \$3.48 for each person in its population; Berlin, \$5.25; Boston, \$33.72. In the one item of cars alone to accommodate about the same population, Glasgow has \$249,740, and Boston \$5,510,544.66 invested. The interest on the capital invested in street cars of the West End Company alone, at 6 per cent. per annum, would be \$330,632.68, an amount greater than the whole capital invested in street cars in the city of Glasgow. But it may be asserted that the West End Company is over-capitalized. That is hardly so, for among the twenty-four largest and leading street railway companies of the United States the West End Company has the lowest capital invested per mile of track, while it is second in amount of track.

#### RATES OF WAGES.

The rates of wages are so low in Europe (although the rate of wages paid by the street railway companies is higher than the general rate prevailing elsewhere) that the cost of operation is reduced to a minimum. The scale of wages in Glasgow, adopted in September, 1896, is higher than that in Berlin. Hostlers receive from \$0.83 to \$0.87 a day; laborers, \$0.95 to \$1; conductors and drivers, from \$0.85 to \$1.12; all per day of 10 hours' duty performed. The total receipts of the Glasgow Street Railway from all sources for the last fiscal year were \$1,671,801; of Berlin, \$3,890,201.50; while the amount of wages paid by the West End Company was \$3,812,230 without taking into account wages paid to contractors for track renewal, etc., an amount nearly equal to the total Berlin receipts and more than twice the total Glasgow receipts. If the West End Company, therefore, paid the same rate of wages as is paid in Europe, it could afford to pay \$2,000,000 per annum for its franchises and still maintain its dividends.

#### PROTECTION TO CAPITAL.

The street railways of the United Kingdom are constructed and operated under the General Parliamentary Act of 1870. That act in practically its present form has been the basis upon which all contracts and franchises were made and granted. Those who invested their capital, therefore, knew with reasonable certainty what the conditions would be with respect to legislation during the existence of the contracts. Inasmuch as petitioners are compelled to pay all parliamentary expenses, which usually reach the sum of about \$20,000, there are very few changes in local affairs. The same situation with respect to changes exists in Germany. The financial departments of municipal governments are skilled in all matters relating to finances, so that when the government and those seeking a franchise meet, both parties are fully informed, and the result is usually satisfactory to both parties. After contracts are signed, there is no disturbance. How different in the States! Capital is invited to embark in an enterprise, the public is enthusiastic in its applause, and in a very few years the same public is clamorous against the particular investment which it fostered and encouraged.

#### TAXES, ETC.

Street railways in Europe pay no taxes upon the capital invested in tracks. In Massachusetts, in addition to paying the local tax, they pay a tax into the State Treasury upon the net capital invested, and said net capital is represented by all items of investment. Glasgow paid in the last fiscal year for all taxes \$23,072, and the West End Company \$338,996.

#### Summary.

It therefore follows that the conditions and accommodations are not the same in Europe as in the United States, and that the people of the United States could better afford to subsidize the street railways to maintain the present conditions at any price, and that the European cities have a grave problem on hand to obtain the same conditions as obtain in American cities.

### LATEST ADVANCES IN ELECTRICAL CONTACTS.

The illustrations show a new form of rail bond called the E. C. A. (elastic copper amalgam) and made by Thomas A. Edison and Harold P. Brown, of the recently discovered elastic copper. This form is designed for rebonding girder rails without disturbing the pavement and is the only bond which permits of this being done. A large electro-magnet whose pole pieces fit the head of the rail, is used to hold the drill to its work and to support a hardened steel templet with a pair of intersecting holes. These holes are bored in the tram at the end of each rail so that one is in each and so that they bottom  $\frac{1}{8}$  of an inch on the upper edge of the angle plate, as shown in Fig. 1. The terminals are cylinders with one side flattened, made of the Edison elastic copper, welded to flexible copper conducting strips which are bent into the shape of a U. The surfaces are covered with the Edison flexible solder which serves to make a perfect electrical contact and to prevent rusting. After the holes in the rails are amalgamated, the U-shaped portion of the bond is passed through the slot connecting the holes, and the termi-

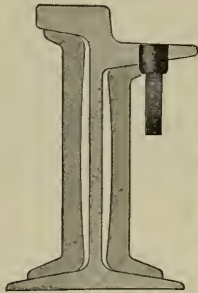


FIGURE 1.

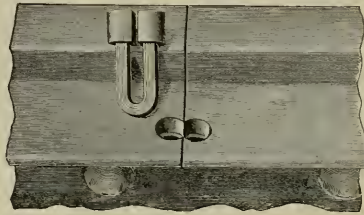


FIGURE 2.

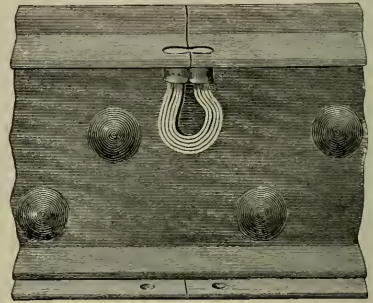


FIGURE 3.

nals driven home, their flattened sides coming together with  $\frac{1}{8}$  in. compression. This establishes two paths for the current; one through the U, which is heavy enough for the maximum current, and the other directly across the terminals.

The elasticity of the copper maintains the latter contact even when the rails have slackened apart  $\frac{1}{8}$  in. The terminals are driven below the surface of the rail and the steel is burred over to retain them in place. The edge of the angle plate also shares in carrying the current. Fig. 2 shows the bond ready for service and Fig. 3 is a section of rail and angle plate showing position of bond. Tests of the leading rail bonds were made in February by a Franklin Institute committee, and the E. C. A. bond was found to carry 1,500 amperes with but 0.018 volt loss, the temperature of the bond being practically the same as the rail. The rails were then slackened  $\frac{1}{8}$  in. without increasing the drop, proving the elasticity of the copper. With the angle plates entirely removed, and the rails separated  $\frac{1}{2}$  in. and the same current passed through the U, the drop was still less than one-half that of the best of the ordinary copper bonds and its temperature below 110 degrees, while the copper bonds of same section were from 200 to 496 degrees with same current. For new construction, when the shape of rail or angle plate will not permit the use of the standard plastic rail bond, other forms of the E. C. A. are found very advantageous.

It is stated that most of the new work in New York city will be done in this way. Many roads with an old stock of copper bonds on hand are following the suggestion of George W. Knox, of the Chicago City Railway, and applying the Edison amalgamation and flexible solder to the bond terminals, thus cutting the resistance down to one third and preventing corrosion. But the E. C. A. is the only bond which can be applied to girder rail on paved streets without disturbing the pavements and it has already met with great favor.

### AIR MOTORS IN WASHINGTON.

The Hoadley-Knight compressed air motor has been given a preliminary trial on the Eckington & Soldiers' Home Railroad. There are 34 "bottle" air reservoirs, under the seats of the car, charged to a pressure of 2,000 pounds and of sufficient capacity to run the car for 15 miles. The car is 33 feet long, weighs 21,000 pounds and is lighted by the Pintsch gas system. In the test, the car started and stopped without jarring or jolting and ran at a good rate of speed. It is said that 15 motors for this road have been ordered and will be delivered inside of 90 days.

### COST OF STREET PAVING OPPRESSIVE.

The officials of Sioux City seem to have a mania for paving the streets upon which the lines of the Traction Company run. Wherever there is a double track the company is compelled to pay one-third the cost of improvement. As long as the paving was being done in the business portion of the city or where public traffic required it, the company offered no objection. But when it was proposed to put down costly pavements on streets where its use was not justified, the company protested and said that one of its tracks would be removed rather than pay for paving one-third of the street with asphalt. As most of the property owners are opposed to excessive taxation, the company will probably carry its point.

The Municipal Council of Paris granted leave for the construction of five new tramway lines on condition that 20,000,000 francs would be contributed to the exposition fund. One of these lines was being constructed across the Champs Elysees, when the Minister of Public Works ordered the work to cease. There seems to be a clash between government and municipal authorities with justice on the side of the city officials. These electric roads would much facilitate traffic during the exposition of 1900.

## INSULATORS FOR HIGH POTENTIAL.

The development of water power and the transmission of electricity to distant points for distribution has made very high voltages necessary and consequently there has been a recent demand for line material of the highest class. Line



FIG. 1.—HIGH POTENTIAL INSULATORS.

insulators, exposed to the deleterious effects of rain and sleet, have presented quite a problem for successful solution. The two cuts represent high voltage insulators manufactured by F. M. Locke, Victor, N. Y. The picture to the left in Fig. 1, is the triple petticoat "Niagara" type used in the transmission lines from the Falls. This is made of china as are also the other two styles, "No. 6" and "Pony" which are represented in the same cut. Fig. 2 shows the two part insulator, one being of porcelain and the other of the same material with a glass center and the two fused



FIG. 2.—TWO PART INSULATOR.

together. Being thus made, the parts are quite thin and can be thoroughly vitrified. A test of 120,000 volts has been made upon these insulators without affecting them in the least. It is mounted on a high carbon steel pin with a cap of locust wood. These insulators are made of high grade material throughout and are mechanically and electrically well suited to stand the arduous service expected of them.

## HUNT AIR BRAKE NOTES.

I. E. Storey, president and general manager of the Storey Motor & Tool Company, Philadelphia, becomes consulting electrical and mechanical engineer of the Hunt Air Brake Company. Mr. Storey has had 20 years' experience in mechanical engineering, has been engaged in electric

engineering since '85, and is the inventor of the Storey motor used with the Hunt brake. He will make a valuable addition to the company.

During March, orders were received for 10 double truck brake equipments for the Olean & Bradford Mountain road, to go on Peckham trucks, the cars seating 90 passengers; a second order from the Loraine (O.) road. Brakes were installed on 12 cars of the Mt. Clemens fast line and trial equipments sent to Washington, Boston, Cleveland and Wilkes Barre. Good work is reported from the trial equipment on the Second Avenue line, Pittsburg, working on heavy grades. A new feature is the storage cylinder for trail cars, by which, if a trailer breaks away the air is instantly applied stopping the car automatically.

The combined motor compressor is now handling five and more trail cars in train and is interchangeable with the Westinghouse system and thus steam cars when desired to be taken off a steam road to go over the electric line can be coupled up and air used on all the cars.

## WORK OF COMPRESSED AIR.

Two compressed air motors of the American Air Power Company have been operating in New York city several months, and from this service valuable data is now obtainable. The two air cars took the place of two cable cars on the 125th street line, the round trip being 4.11 miles. Each car makes 19 round trips, or 79.09 miles daily except Sunday. Each car runs from 12.50 to 16.67 miles on a single charge of air. On the line are two grades, one of 1.96 and one of 7.7 per cent. Fires were kept under the boilers the entire 24 hours, although the compressors were worked only 7 hours daily, while of course the engine room help necessary would have been no greater for a much larger car service. Under these unfavorable conditions, however, the following records are given out over the signature of E. E. Pettee, engineer of the American Air Power Company:

Actual average cost per car-mile for entire period—seven months—125.16 miles per day.

Coal .....	\$.0563
Water .....	.0103
Oil and waste .....	.0013
Power plant labor.....	.1261
Conductor and motorman.....	.0608
Repairs, car equipment.....	.0038
	\$.2586

Average present cost per car-mile, with one car service performed—78.09 miles per day.

Coal .....	\$.0675
Water .....	.0113
Oil and waste.....	.0017
Power plant labor.....	.0833
Conductor and motorman.....	.0608
Repairs, car equipment.....	.0038
	\$.2284

Average present cost per car-mile, with two car service—156.18 miles per day:

Coal .....	\$.0433
Water.....	.0103
Oil and waste.....	.0013
Power plant labor.....	.0833
Conductor and motorman.....	.0608
Repairs.....	.0028
	\$.2018

The mechanical features of the motors are practically identical with those of a steam locomotive, minus the fire box and boilers. Air brakes of course are used.



## EXPLOSION AT ELMIRA, N. Y.

A boiler in the power plant of the West Side Railroad Company, Elmira, N. Y., exploded on the morning of March 29, wrecking the station and badly damaging the car house adjoining. The plant consisted of three tubular



INTERIOR OF STATION.

boilers 60 in. x 16 ft. with 72 4-in. tubes; they had been in use four years, and were regularly inspected by the Hartford Insurance Company. The boiler which exploded parted near the middle transverse seam; the rear end was blown through the wall into the engine room; the front portion with the tubes was carried through the opposite wall, pass-



AFTER THE EXPLOSION.

ing completely through the car house, wrecking two cars, and landing 180 ft. from the boiler room. The fireman was found dead and the engineer very badly injured. No fire broke out in the ruins and the engines and dynamos though covered with debris were probably not badly damaged. No cause is assigned for the accident; both the men about the plant were known to be competent and careful.

Swansea, Wales, has voted in favor of the electric railway and lighting project.

## WHITE TRANSFER TABLE.

The illustration shows a 12-ton flush transfer table made by the White Manufacturing Company, 556 West 34th street, New York, designed for electric roads. The one shown is operated by an electric motor, current being taken by a trolley from the overhead lines; but hand mechanism may be used if desired. These tables are made in sizes desired up to 20 tons capacity, and are designed for cable as well as electric roads. The material is of special grade and rolled to suit the table; the gearing is cut from solid blanks,



THE WHITE TRANSFER TABLE.

machine fitted and interchangeable; roller bearings reduce the friction to a minimum. Among the roads using the White transfer tables are the Broadway and the Lexington avenue cable roads, the Metropolitan and the Union Railroad Companies of New York; the Brooklyn City, the Brooklyn Heights, the New York & Queens County and the Coney Island & Brooklyn roads of Brooklyn; the Steinway of Long Island; Consolidated Traction, Newark, N. J.; Scranton Traction, Scranton, Pa.; Lynn & Boston Railroad Boston; Newburgh Electric Railroad, Newburgh, N. Y.

## BUILDING STREET RAILWAYS IN AUSTRALIA.

Although most parts of Australia are very sparsely settled, yet some of the cities are quite populous and have all the modern municipal improvements and conveniences. Melbourne is as large as Boston, Sydney contains more inhabitants than Detroit, and Brisbane and Adelaide are cities of considerable importance. Street railways have been introduced for many years in Melbourne and Sydney, and recently an electric system has been put in operation in Brisbane.

J. J. Walklate has been connected with this installation as resident engineer and has been quite successful in his efforts. Before returning to the United States and thence to London, he has visited Rockhampton in Central Queensland, and has suggested that the city would be a good field for street railway work. Mr. Walklate has drawn up plans for three lines, which will be about six and a half miles long, and the estimated cost \$200,000. English capital supplemented by local backing will likely make the project a certainty.



### California.

**SAN PEDRO, CAL.**—The city council has decided to grant John T. Gaffey his desired street car franchise.

**SAN DIEGO, CAL.**—The San Diego Electric Railway Company will build an addition to its power house at an expense of \$2,000.

**SAN FRANCISCO, CAL.**—The Market Street Railway has just started the work of reconstructing the tracks on Market street from Jones west to the junction of Valencia and Haight street.

**LOS ANGELES, CAL.**—The application of A. S. Short and others for an electric railway franchise has been referred to the city attorney with instructions to prepare a notice of its sale by auction.

**SAN JOSE, CAL.**—An effort is being made by some of the principal owners of the San Jose & Santa Clara Railroad Company and some of the creditors of the First Street Railroad Company, each having \$500,000 stock, to bring about a consolidation and operate under one management and from one power house. Those most active in this move are J. H. Henry, president, and J. P. Burke, vice-president of the San Jose & Santa Clara Railroad Company.

### Chicago.

**CHICAGO.**—A bond for \$20,000 given by the Chicago Electric Transit Company to guarantee the construction of 2 miles of road has been accepted by the county commissioners.

**CHICAGO.**—An ordinance giving the Calumet Electric Railway right of way in Erie avenue has been passed. Another ordinance giving right to extend in 3 streets has been introduced in council.

**CHICAGO.**—Sargent & Lundy are preparing specifications for the 40 to 50 motor cars to be built for the Alley L. The power plant is to consist of compound condensing engines direct connected to generators.

**CHICAGO.**—Commissioner of Public Works Downey issued a permit to the Chicago Transit Company to put down a trolley line on Irving Park boulevard between the Chicago river and Milwaukee avenue. The line will be operation by May 1.

**CHICAGO.**—The Chicago City Railway has been given another year's time in which to extend its lines in Sixty-third, Fifty-first, Thirty-eighth and Forty-seventh streets and Archer, Western and Kedzie avenues, because of the interference of track elevation and sewer building.

**CHICAGO.**—The North Shore Interurban Railway Company has been incorporated to build 17 miles of electric road between Waukegan and Highland Park, as another link in the Chicago-Milwaukee interurban system. The capital stock is \$340,000, and the incorporators are William J. Louderback, Arthur D. Wheeler and William P. Sidley.

**CHICAGO.**—Aside from a slight difference in the question of fares, the Cicero town board has practically agreed to permit the Suburban Electric Railroad to extend its lines in two branches; one will run through Clyde, Berwin and Hawthorn to Riverside and La Grange; and the other will run through Austin, Ridgeland and Oak Park to Maywood.

### Connecticut.

**NEW LONDON, CONN.**—The charter of the New London Street Railway Company has been amended to permit it to furnish electric light.

**BRISTOL, CONN.**—Pierce & Norton have arranged for the construction of a cable road from the lake shore to the top of Comjounce Mountain.

**WINSTED, CONN.**—Judge A. H. Fenn has granted the petition for a trolley line from Winsted to Torrington, paralleling a portion of the Naugatuck division of the New York, New Haven & Hartford Railroad.

**SOUTH MANCHESTER, CONN.**—A 500-h.-p. direct connected unit will be erected in the station of the Hartford, Manchester & Rockville Tramway Company to provide power for the extension this spring to Rockville. The boiler capacity also will be doubled.

**ROCKVILLE, CONN.**—The charter granted the East Windsor, Broad Brook & Rockville Street Railway Company has been approved by the governor. The construction of the road is said to be assured. Among the incorporators are H. L. James, Frank Grant and C. E. Harwood, all of Rockville.

**NEW BRITAIN, CONN.**—Work has commenced on the trolley line which will connect this place with Hartford, and as the consolidated electric companies have purchased the supplies, rails, poles and wire necessary, rapid progress is expected. The New England Railroad has also commenced preparing its tracks for a third rail and the power house is under way, five boilers having already arrived.

**BRIDGEPORT, CONN.**—The construction of an electric railway between Westport and South Norwalk and between Westport and Southport is favored by the people. The Norwalk Tramway Company and the Westport & Saugatuck Street Railway Company are rival applicants for the franchise between Westport and Norwalk; while the Bridgeport Traction Company and the Westport & Saugatuck Company are competing for the franchise between Westport and Southport.

**MILFORD, CONN.**—Directors of the recently organized Milford Street Railway Company met in New Haven at the office of Attorney S. Harrison Wagner, to arrange for the early construction of the line. A large amount of the necessary land for the layout has been already purchased and the company has obtained option on the balance. Contracts for the construction and equipment have been drawn and will be awarded as soon as a few matters which are now pending are disposed of. It is expected now that the work of construction will be commenced by May 1 next, and that it will be completed in time for the summer traffic. Connection will be made with the Winchester Avenue Electric Road at Woodmont and the Bridgeport Traction Company at Washington Bridge. Ex-Sheriff Charles A. Tomlinson has been elected president; Dumond P. Merwin, vice-president, and Frederick Tibbals, secretary and treasurer.

### Delaware.

**WILMINGTON, DEL.**—The Wilmington & West Chester Electric Railway Company has been incorporated to construct a freight and passenger line to West Chester, Pa. The capital stock is \$200,000, with privilege of increasing to \$500,000, and the incorporators are Joseph A. Bond, Harry Emmons, Thomas Mitchell, Philip R. Clark, Charles M. Townsend, F. Harvey Day and J. Jackson Peirce.

### District of Columbia.

**WASHINGTON, D. C.**—The Eckington Railroad Company's equipment for compressed air traction has been made ready for trial.

**WASHINGTON, D. C.**—Condemnation proceedings have been begun by the Washington & Great Falls Electric Railroad Company to obtain right of way.

### Florida.

**JACKSONVILLE, FLA.**—The Jacksonville Street Railway Company is installing a 200-h.-p. dynamo for commercial lighting.

### Georgia.

**ATHENS, GA.**—Track repairs will be made by the Athens Street Railway Company.

ROME, GA.—Manager J. B. Marvin of the Rome Street Railway Company, says the line to Moberly Springs will be completed by May 1. A pleasure resort will be established at the Springs.

### Illinois.

PEORIA, ILL.—The Central Railway Company will extend its Knoxville line to Glen Oak park along Nebraska street, and will relay its tracks on West Jefferson street. Work will begin about May 1.

EAST ST. LOUIS, ILL.—The St. Louis & Belleville Rapid Transit Company has been granted its franchise, over the mayor's veto. The line will connect with another to be constructed between Belleville and East St. Louis.

AURORA, ILL.—The project to build an electric railway up the Fox River, noticed some time ago in the DAILY BULLETIN, has now been incorporated as the Aurora, Yorkville & Morris Railway Company. Capital stock, \$10,000; incorporators, Vine A. Watkins, H. P. Harde and Fayette D. Winslow.

HARVARD, Ill.—H. S. Williams of Harvard, Ill., Herbert T. Windsor and George K. Wheeler of Chicago, are applying for a franchise for an electric railway to run from this city to Lake Geneva, Wis., distance thirteen miles. The territory is densely settled with big possibilities for summer travel to the lake. A large amount of freight is created along the proposed route.

### Indiana.

INDIANAPOLIS, IND.—George W. Armentrout, an employe, has brought suit for the appointment of a receiver for the Indianapolis & Broad Ripple Rapid Transit Company, alleging that \$1,623 is due employes for wages.

MARION, IND.—"Noah Clodfelter has filed a \$5,000 bond at Marion as surety that he will put in the electric road from Marion to Anderson, and do the roads of Grant county no damage. Clodfelter does this every spring, and like the budding leaves he can't help it."—Elwood Call Leader.

### Iowa.

WATERLOO, IA.—The Cedar River Park Board has voted to give right of way and \$500 bonus to the Waterloo & Cedar Falls Rapid Transit Company.

CEDAR FALLS, IA.—C. W. McElyea, of Ames, has petitioned the Cedar Falls council for right to construct a street railway to be operated by storage batteries, compressed air or gasoline motors.

### Kentucky.

LOUISVILLE, KY.—The Louisville Railway Company is putting up poles and wire on Oak street for electric cars.

LOUISVILLE, KY.—The Metropolitan Railway Company has been incorporated to construct 150 miles of electric lines on the following streets: Main, Story, Frankfort, Market, Jefferson, Green, Walnut, Chestnut, Broadway, York, Breckinridge, Kentucky, St. Catherine, Oak, Ormsby, Weisinger, High, A, B, C, First to Thirty-ninth, inclusive, Brook, Floyd, Preston, Jackson, Hancock, Clay, Shelby, Campbell, Wenzel, Underhill, Barrett and Morton. The capital stock is \$1,000,000, and the incorporators are George H. Harries, Washington, D. C., 5 shares; Robert M. Kilgore, 5 shares; P. Gault Miller, 5 shares; J. W. Woolfolk, New York City, 5 shares; Hugh R. Garden, 5 shares; John H. Dewitt, 5 shares; James F. Grinstead, 5 shares; Thomas F. Hargis, 5 shares.

### Maine.

PORTLAND, ME.—The Portland & Cape Elizabeth Electric Railroad Company is making preparations to extend its tracks from Willard to Delano Park.

LIVERMORE FALLS, ME.—Business men of Jay and Livermore Falls have formed the Electric Railroad, Water Works & Power

Plant Company to build 2½ miles of electric road from Jay bridge to Livermore Falls. Eastman & Clifford, of Lewiston, have been invited to go into the deal.

NORWAY, ME.—The Oxford Central Electric Railroad Company held a meeting March 11 and voted to build from Norway to Rice's Junction, thence a branch to South Waterford and another branch to East Stoneham; distance, 21 miles. It will be the first long-distance freight electric line in Maine. The work of construction will begin as soon as the frost leaves the ground, and the estimated cost is \$200,000. Towns and individuals along the line have raised \$40,000. Fred C. Wilson, of Boston, furnishes the balance. The officers are: President, Fred C. Wilson, Boston; vice-president, L. H. Burnham, Albany; treasurer, S. S. Stearns, Norway; clerk, Freeland Howe, Norway; chief engineer, L. B. Wilson, Boston; directors, Fred C. Wilson, Boston; L. H. Burnham, Albany; B. G. McIntire, Waterford; A. S. Haggood, Waterford; Jonathan Bartlett, Stoneham; Freeland Howe, Norway; E. W. Eastman, Auburn.

### Maryland.

BALTIMORE, MD.—The new barn of the City & Suburban Railway will soon be completed. It will be 450 x 140 feet, with one short and 12 long tracks.

BALTIMORE, MD.—For the second time has the council granted the Edmondson Avenue, Catonsville & Ellicott City Electric Railway Company an additional year in which to complete the construction of its road in Baltimore.

BALTIMORE, MD.—The reorganization of the Columbia & Maryland Railway is progressing, all bond and stockholders having deposited their holdings. All the claims of the Baltimore & Catonsville Construction Company are being settled on the basis of 75 per cent cash and 25 per cent stock of the railroad.

BALTIMORE, MD.—Judge Dennis has dismissed the bill filed by L. Robert Coates against the Baltimore, Middle River & Sparrows Point Railway Company for a receiver. Coates was granted an order for an accounting against John T. Smith and Henry Y. Brady, co-defendants. Smith & Brady build the road while Coates financed it.

### Massachusetts.

WESTFIELD, MASS.—Contracts for the construction of the Woronoco Street Railway will be awarded about May 1.

WORCESTER, MASS.—Receiver Phineas W. Sprague has been authorized to sell the Blackstone Valley Street Railway.

WORCESTER, MASS.—The contract to supply ties for the Worcester & Marlboro Electric Railway has been awarded to Allen & Knowlton.

BOSTON, MASS.—Extensions of its car service to East Lexington, Lexington, Lincoln and Waltham are said to be contemplated by the West End Railway Company.

FALL RIVER, MASS.—The Globe Street Railway Company has leased the Fall River Street Railway for 99 years, guaranteeing 6 per cent dividends on the \$50,000 capital stock.

BROOKFIELD, MASS.—The Warren, Brookfield & Spencer Electric Railroad Company has ordered a 450-h.-p. engine of the Slater Engine Company, and will put in a new boiler and generator.

HOLYOKE, MASS.—The directors of the Holyoke Street Railway Company have voted unanimously to extend their lines over High, Hampden, Washington, Lincoln and Cabot streets. A franchise will be asked.

MANSFIELD, MASS.—The Mansfield & Easton Street Railway Company will be incorporated with \$100,000 capital stock by William S. Reed, Leominster; Joseph A. Prescott, Foxboro; C. W. Shippe, Milford, and Frank E. Lowe, Greenfield.



**SUFFIELD, MASS.**—The Springfield & Southwestern Electric Railway Company is to be granted a charter, with all rights and privileges, without opposition, with the condition that it be forfeited to the Suffield & East Granby Company, June 1, 1898, provided that the said Springfield & Southwestern Company does not have at that time an electric railway fully equipped and operated from the state line to West Suffield, through Crooked Lane to Suffield Center. The town is unanimous for an electric road, and this compromise seems to provide for the speedy building of one.

### Michigan.

**DETROIT, MICH.**—J. N. Bick, of Toledo, will have charge of construction for the Jacobson syndicate's proposed electric road from Monroe, Mich., to Toledo, O.

**BENTON HARBOR, MICH.**—Seeley McCord will use horses at first on the proposed street car line to Eastman Springs via Morton Hill. Electricity will be installed later.

**MANISTEE, MICH.**—The Manistee, Flier City & East Lake Railway Company contemplates laying out a park and extending its lines. Modern pleasure resort features will be included.

**SAGINAW, MICH.**—The council has declared the Consolidated Street Railway franchise forfeited and instructed its attorney to take steps toward preventing operation until the track is rebuilt.

**MONROE, MICH.**—The council has annulled the franchise granted the Monroe & Dundee Electric Railway Company for not complying with the terms of the contract requiring 1 mile of track material to be on right of way previous to March 15. The company forfeits \$500 deposit. Jacobson & Johnson were given the forfeited privileges.

**BENTON HARBOR, MICH.**—Four power stations will be established at Benton Harbor, Dowagiac, Decatur and Paw Paw, by the Benton Harbor Electric Railway & Transit Company. The company on May 1, will place a line of steamers on the run between Chicago and St. Joseph, and also operate a car ferry to Milwaukee. J. M. Hamilton, of Chicago, is president; W. H. Hollis, of Puget Sound, Wash., secretary, and H. D. Deam, of Benton Harbor, general manager.

### Minnesota.

**STILLWATER, MINN.**—Flint & Scott, the new owners of the Stillwater Street Railway, are preparing to tear up and remove the entire plant.

### Missouri.

**ST. LOUIS, MO.**—Bondholders of the People's and the Fourth Street & Arsenal Railway have prepared a plan for the consolidation of the two properties.

**HANNIBAL, MO.**—The Hannibal Street Railway was purchased March 15 by an eastern syndicate represented by D. Thompson of Ithaca, N. Y. The property will be improved and extended.

**ST. LOUIS, MO.**—William J. Leinp, Charles F. Orthwein and others, have purchased the large interests of Louisville parties in the Southern Electric Railway. About 6,000 shares of preferred and 2,000 shares of common stock changed hands at \$82.50 for the former and \$40 for the latter. Mr. Orthwein will probably be elected president in place of Claude Kilpatrick.

**ST. LOUIS, MO.**—The East St. Louis Electric Street Railroad, better known as the Scullin line, and which recently changed hands, has elected the following new board of directors: Julius S. Walsh, E. P. Bryan, C. K. Walsh, H. D. Sexton, F. C. Daab, James Hanna and C. T. Jones. Julius S. Walsh was elected president of the reorganized company in place of John Scullin; E. P. Bryan succeeds H. D. Sexton as vice-president; C. K. Walsh was elected secretary, and F. C. Daab was chosen treasurer.

### Montana.

**BUTTE, MONT.** The Massachusetts Loan & Trust Company brought suit against the Butte Consolidated Street Railway Company to foreclose a \$500,000 mortgage by reason of default of interest on January 1.

### New Hampshire.

**CONCORD, N. H.**—The Rockingham Electric Railroad, with a capital stock of \$150,000, has been incorporated, and will build a line between Exeter and Hampton.

### New Jersey.

**BELMAR, N. J.**—The Atlantic Coast Electric Railway Company has been granted a franchise through F street. The line must be in operation by July 1.

**BEVERLY, N. J.**—The Beverly Construction Company has been incorporated to build a trolley line in Burlington County. Capital stock, \$100,000, with \$1,000 paid in.

**BRIDGETON, N. J.**—At the Master's sale of the property and franchises of the South Jersey Traction Company, F. L. Lewis, trustee for the bondholders, was the successful bidder. The price was \$90,000.

**BRIDGETON, N. J.**—The South Jersey Traction Company's lines, which recently were purchased by bondholders, will be relaid and extended through Port Norris, Fairton, Cedarville, Newport and Durding Creek.

**NEWARK, N. J.**—The Compressed Air Power Company has been incorporated to manufacture air motors. Capital stock, \$50,000; incorporators, Hayward A. Harvey of Orange; Hobart Tuttle of Paterson, and Lawrence S. Mott of Newark.

**BELLEVILLE, N. J.**—The Belleville township committee has given the Consolidated Traction Company the right to operate a trolley line on Washington avenue, the cars to run from the Pennsylvania railroad station in Newark to the Franklin township line.

### New York.

**CORNING, N. Y.**—An electric railway franchise has been granted the Corning Construction Company, of which F. C. Frenyear is president.

**NEW YORK, N. Y.**—The 146th street power house of the Lenox avenue conduit railway is to be enlarged by the Metropolitan Street Railway Company.

**CATSKILL, N. Y.**—The railroad commission has granted the Catskill Electric Railway Company a certificate to construct its line from Catskill Landing to Jefferson Heights.

**CANAJOHARIE, N. Y.**—W. J. Arkell is one of the leading men interested in the proposed electric railway from Sharon Springs to Canajoharie. Right of way has been obtained and work is soon to begin.

**BUFFALO, N. Y.**—The Buffalo Railway Company, it is said, will assume control of the Buffalo, Bellevue & Lancaster Railway. The line is to be relocated and double-tracked to reduce the distance from 8 to 6 miles.

**BUFFALO, N. Y.** The Buffalo Traction Company has obtained the consent of abutting owners to the construction of 15 miles of road. It is proposed to construct 30 miles of road this year. Niagara Falls power will be used.

**PORT JERVIS, N. Y.**—M. B. Waller, president of the Electric Street Railway, is looking for a suitable location for the car house of the proposed electric line. Work must begin by June 1, '97, or else the company must pay the forfeit of \$2,000.

**PENN YAN, N. Y.**—The Penn Yan, Keuka Park & Branchport electric railroad has deposited a bond of \$2,000 to insure for failure to leave the streets of the village on which the company expects to operate its line in as good condition as when occupied.

**BUFFALO, N. Y.**—Permission has been given the Buffalo Railway to lay and operate trolley tracks in Clinton street, Jefferson street, Parkside avenue, Tonawanda street, Amherst street and the Military road for a period of 40 years, after which time the city may buy the lines.

HUDSON, N. Y.—The Hudson Electric Railway was sold March 6 by auction. A. V. S. Cochrane bought the road for \$55,000 on behalf of William H. Traver and Smith Thompson, who represented two banks of Hudson. A company of local capitalists may be organized to operate the line.

SEA CLIFF, N. Y.—A trolley line, connecting the village with the depot, will be built by the North Side Construction Company. Among those interested are James Norton, of Glen Cove, John Graham, William Schoelles and George Muller, of Sea Cliff, and C. E. Silkworth, of New York.

OLEAN, N. Y.—Those interested in the Olean, Bradford & Rock City Railway Company will organize the Rock City Park Improvement Company to establish a pleasure resort on the line. H. L. Pierce, of Leominster, Mass., who is the prime mover in the enterprise, says the road will be in operation by June 1.

PALMYRA, N. Y.—A party of gentlemen interested in the proposed electric road from Palmyra to Marion recently went over the ground. Among them were V. R. Nash of Providence, R. I., who represents Syracuse capitalists; C. E. Prun of Syracuse; A. J. Grant and Le Grand Brown of Rochester and G. R. Stetson of Palmyra.

GLOVERSVILLE, N. Y.—The new Mountain Lake Electric Railroad Company has elected Charles King, president; James G. Haggart, vice-president; Myron Hiltz, secretary; A. J. Zimmer, treasurer, and Elman Hiltz, superintendent; directors, Charles King, George Kendrick, Richard Ansell, James G. Haggart, S. L. Foster, A. J. Zimmer, Elman Hiltz, R. J. Williams, William A. McDonald and Myron Hiltz.

NEW YORK, N. Y.—The New York & North Shore Railway Company, of Long Island, has been incorporated with a capital of \$1,000,000, to operate a street surface road in the county of Queens. The directors are: Rudolph T. McCabe, W. R. Heath, Garret H. Perkins, E. L. Bushe and W. A. Pease, of New York City; E. J. Matthews, of Philadelphia; James B. Radel, East Orange, N. J., and C. D. Simpson, of Scranton, Pa.

SAVONA, N. Y.—J. D. Nares of Corning, represents New York capitalists who contemplate constructing an electric railroad from Savona to Lake Keuka to be operated by a company known as the Lake Keuka & Savona Railroad Company, capital stock, \$200,000. Mr. Nares and C. A. Cockroft of the Chenango Engineering Company, Binghamton, have been making measurements of bridges, culverts, for the line, which for the greater distance, will follow the old Sodus Bay road.

GREENBUSH, N. Y.—The Greenbush & Nassau Electric Railway Company has been incorporated to operate a street surface road from Greenbush to Brainard station in the town of Nassau, Rensselaer county, seventeen miles distant. The capital is \$180,000 and the directors are: William D. Barnes of Brainard Station; S. C. Curran of East Greenbush; Fred Carr, B. R. Lansing and W. H. Nichols of Greenbush; C. J. Field of Brooklyn; T. D. James, Gardner Morey, G. W. Whitbeck and J. T. Morey of Nassau; C. J. Smith of Bath-on-the-Hudson; J. L. R. Davis, L. N. S. Miller and J. V. B. Garrison of East Schodack, and T. W. Cantwell of Albany.

NEW YORK, N. Y.—Valter A. Pease, a director of the newly incorporated New York & North Shore Railway Company, says that the company proposes building a trolley line from Newton to points in Jamaica, and also other lines connecting the towns of Jamaica, North Hempstead, Middle Village, Flushing, Whitestone, Willets Point and Manhasset. "While this is virtually an independent company, the roads to be built will really be a part of the Brooklyn, Queens County & Suburban Road, as the same men are interested in both companies. Work will probably be commenced on the new lines this summer, and we hope to have them in running order by next winter."

BUFFALO, N. Y.—The Buffalo, Hamburg & Aurora Railway Company has been incorporated with its principal office in Hamburg, Erie County, to construct a street surface electric road 18 miles in length from the Buffalo city line along the Abbot road and the Hadlem and Big Tree roads, and in the towns of West Seneca, East Hamburg, Hamburg and Aurora, to the villages of Hamburg and Orchard

Park, and to East Aurora. Capital stock, \$200,000; directors, William W. Wheatley, of Brooklyn; John A. Donaldson, Arthur W. Hickman, Lester J. Chase, Ernest Wende, Willis G. Gregory, U. L. Upson, Frank W. Everett, George R. Vaughn, Loren F. Boise and William J. Wright, of Buffalo.

### North Carolina.

ASHEVILLE, N. C.—The Asheville Electric Street Railway Company has been incorporated to build a car line.

CHARLOTTE, N. C.—An extension to Dilworth will be constructed by the Charlotte Electric Railway Company.

### Ohio.

LIMA, O.—The ordinance granting the Lima Railway an extension has been passed by the council.

CINCINNATI, O.—Work on the extensions of 5 car lines has been begun by the Cincinnati Consolidated Street Railway.

COLUMBUS, O.—Vice-president Stewart, of the Columbus Street Railway, petitions for a change of route on the Livingston avenue line.

CANTON, O.—The survey of the Canton-Akron Electric Railroad is progressing. W. A. Lynch says its completion this summer is certain.

AKRON, O.—Creditors of the Akron Street Railway, on March 29, petitioned for the appointment of a receiver. An assessment of stockholders is wanted.

TIFFIN, O.—Samuel B. Sneath, owner of the uncompleted Tiffin & Fostoria Electric Railway, has decided to take up 2 miles of track and relay on the Fostoria line.

CLEVELAND, O.—Henry W. Avery, of Painesville, will superintend the construction of the electric road between Painesville and Fairport, which is soon to be begun.

CINCINNATI, O.—Superintendent H. P. Bradford, of the Main Street Railroad, has petitioned for a 25 years' franchise, offering to pay the city 5 per cent of the gross earnings.

EAST LIVERPOOL, O.—The judicial sale of the East Liverpool & Wellsville Street Railway will take place May 6. The claim of the Cleveland Trust Company is \$280,000.

CLEVELAND, O.—The route of the proposed electric railroad from Cleveland to Orwell will pass through New Lyme, Dodgeville, Andover, Espyville, Conneaut Lake and Meadville.

COLUMBUS, O.—The Columbus Central Railway has absorbed the Worthington line running from North Columbus. An extension of 18 miles from Worthington to Delaware is considered.

NEWARK, O.—James F. Lingafelter, receiver of the Newark Consolidated Electric Railway states that new trucks will be placed under the car bodies, the cars painted, and the roadbed graded.

UPPER SANDUSKY, O.—John V. Beery, of Fremont, is interested in the proposed electric railway from Upper Sandusky to Port Clinton, Catawba Island and Lakeside, by way of Fremont and Tiffin.

CINCINNATI, O.—The Cincinnati Street Railway Company has been granted a franchise for a single track extension to Cheviot, giving a bond of \$10,000 to guarantee the performance of the contract.

DAYTON, O.—It is said the county commissioners have denied the franchise asked by the Dayton, Johnsville & Eaton Electric Street Railroad Company, and will give the right to the Dayton & Western Company.

CINCINNATI, O.—W. A. Davidson, attorney, of Cincinnati, says he represents Pittsburg capitalists who will build an electric railway from Cleves to Anderson's Ferry. William L. Kayser represents citizens who want the car line between Home City and Delhi.

ELYRIA, O.—The Elyria & Oberlin Electric Railway Company was incorporated April 1 to carry freight, passengers, mail and express between the two cities. Capital stock, \$100,000; incorporators, A. E. Akins, F. I. Pomeroy, S. C. Smith, A. G. Hutchinson and M. J. Mandelbaum.

DAYTON, O.—The Dayton & Western Traction Company has purchased a two-thirds interest in the Dayton & Western Turnpike Company, thus obtaining control of a portion of the right of way for the proposed electric railway. This move, it is believed, kills the Dayton, Johnsville & Eaton Company.

TROY, O.—Promoters of the Troy, Tippecanoe & Dayton Electric Railroad met citizens in Tadmor recently to interest them in the project. Among those present were Judge Theodore Sullivan, president of the company; John T. Knapp, J. W. Cruikshank, Frank T. Workman, Dr. W. S. Thompson and George S. Long, attorney for the road.

COLUMBUS, O.—Although Mr. Shipherd's option on the Clintonville & Worthington Street Railway has expired the road will be preserved for the Columbus Central by T. A. Simons and Receiver Worthington, who now have possession. A road is planned up Summit street to Clintonville, as well as a theater at Minerva Park, with a toboggan slide and other pleasure resort features.

## Oregon.

SALEM, ORE.—Archie Mason, in behalf of the Salem Consolidated Street Railway Company, purchased the Salem Motor Railway. An extension reaching to Highland is being discussed.

## Pennsylvania.

PITTSBURG, PA.—The franchise for a line on the Hilltop has been granted to the Pittsburg & Mt. Washington Traction Company.

PHILADELPHIA, PA.—The Union Traction Company has applied for a right to extend its trolley line down Broad street from Porter to League Island.

COLUMBIA, PA.—The Columbia & Ironville Electric Railway project seems to have fallen through since the death of H. H. Heise. The ties are being removed from Eighth street.

POTTSTOWN, PA.—Work has been begun by the Pottstown & West Chester Electric Railway Company on a new bridge which will form part of its new line from Pottstown to West Chester.

ALTOONA, PA.—Local capitalists have projected a trolley line to run to Elmwood Park, 5 miles distant. A franchise will be asked by a company which is being organized with \$75,000 capital.

ALLEGHENY, PA.—The North Side Traction Company has been granted certain franchises by the council, in consideration of a promise to pay 2 per cent of the gross receipts into the city treasury.

NEW CASTLE, PA.—The New Castle Traction Company has purchased 70 acres 2½ miles from the city, for \$16,000, to be beautified as a pleasure resort on the line, which will be extended to the grounds.

WILKES-BARRE, PA.—As soon as the weather permits the Wyoming Traction Company will begin double tracking its Nanticoke line. The double track will save 10 minutes between Wilkes-Barre and Nanticoke.

WEST NEWTON, PA.—Surveys have been made and part of the right way obtained for the West Newton Northern Street Railroad. Seventeen miles of road are to be built. W. W. Patterson, of Homestead, is president.

PITTSBURG, PA.—The Homestead & Highland Street Railway Company has begun the extension of its line up the Monongahela River to Harden. Superintendent J. C. McFarren says cars will be running from Bradlock to Pittsburg by July 4.

MCDONALD, PA.—P. Hoey and other business men of McDonald, are considering the formation of a company to build an electric railway from Carnegie to Canonsburg via McDonald, Walker's Mills Hays station, Greigs, Oakdale, Noblestown, Sturgeon and Laurel Hill.

TAMAQUA, PA.—A franchise has been granted by the council to the Tamaqua & Lansford Street Railway Company. The company must use a "T." rail and give a bond of \$5,000. When finished the road will connect Tamaqua and Summit Hill with all towns in the Panther Creek Valley.

SOUTH BETHLEHEM, PA.—The South Bethlehem & Hellertown Street Railway Company will be incorporated to build to Hellertown and operate in connection with the Bethlehem Traction Company. Pascoe & Crilly will do the construction. The incorporators are Hon. John H. Pascoe, Hugh E. Crilly, W. O. Pass, Joseph R. Wieand and P. F. Cannon.

POTTSTOWN, PA.—The Ringing Rocks Electric Railway Company, of Pottstown, has just been granted right of way by the town council of Boyertown. The local company intends to extend its line from Ringing Rocks Park to New Hanover, and thence to Boyertown, and if arrangements can be completed the extension will probably be made this spring.

BRISTOL, PA.—Although permanently enjoined from occupying the Bristol turnpike, the Philadelphia & Bristol Electric Railway Company will complete its line, leaving a gap of 800 feet, over which passengers will have to walk. As the trolley fare will be only 15 cents, against 55 cents over the steam railroad, it is expected travelers will not object to the walk.

SHAMOKIN, PA.—The Shamokin-Mt. Carmel Electric Railway Company will extend its lines down the mountain from Centralia to Ashland during the summer. This extension will be two miles in length, and will connect with the line of the Schuylkill Traction Company at Ashland, thus completing a continuous trolley line from Shamokin to Shenandoah, Mahanoy City and East Mahanoy Junction, a distance of nearly thirty miles.

MONONGAHELA, PA.—The Monongahela Valley Traction Company has been incorporated to build 18 miles of electric railway connecting various towns in Washington County. The road will extend from Monongahela to Phillipsburg and West Brownsville. Capital stock, \$200,000; president, John D. Rively, Pittsburgh; directors, F. W. Wentz, Charleroi; James D. Irons, Wilkingsburg; W. W. Staub, Avalon; F. F. Wentz, Pittsburgh.

TAMAQUA, PA.—President Riley, of the Lehigh Coal & Navigation Company, is authority for the statement that in a few days the Tamaqua & Lansford Street Railway Company will begin the construction of the electric railway which will connect Tamaqua with Mauch Chunk by way of the Switchback Railway at Summit Hill. The power house will be located at Lansford. The work is to be pushed forward toward completion by August 1.

PHILADELPHIA, PA.—Directors of the East Penn Traction Company met at their office, 1345 Arch street, and elected additional officers as follows: T. Howard Atkinson, of Buckingham, vice-president, and John C. McNaughton, treasurer. A. S. Cadwallader, of Yardley, is president. The capital stock was increased to \$1,000,000 and an issue of \$1,000,000 bonds approved. It is now said construction will begin at an early date.

NEWTOWN, PA.—Permission has been granted the East Penn Traction Company to build and operate its line along Washington avenue, and ordinances have been introduced in Morrisville and Yardley, the two other boroughs between Trenton and Newtown. An effort will also be made to get right of way between Newtown and Doylestown. The distance by the proposed trolley would be 2½ miles, a saving of 50 miles of travel between Trenton and Doylestown.

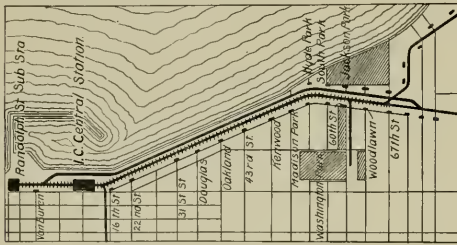
MEADVILLE, PA.—The project to build an electric road 51 miles in length between Erie and Meadville appears to be making progress. The road will pass through Cambridgeboro, Edinboro, Saegerstown, Venango and California, in addition to a number of smaller towns and hamlets. Cambridgeboro, Edinboro and California are expected to contribute the largest number of passengers to the road. In the latter places are State normal schools, while Cambridgeboro is a summer resort of considerable note. A hotel, which will cost \$500,000, is now in course of construction in that place. One of the power houses will be located at Meadville and the other at a point between that city and Erie, which has not yet been definitely decided upon.



## ELECTRICITY ON THE ILLINOIS CENTRAL.

When provisions were being made by the Illinois Central for the heavy traffic incident to the World's Fair, J. F. Wallace, chief engineer, prepared careful and itemized estimates for the substitution of electric for steam traction. While the estimates indicated a considerable saving in operating expenses for electricity, yet the directors felt the experiments at that time gave no satisfactory evidence of the reliability of such motive power for that kind of service and the matter was dropped.

Since then electric traction has been given a thorough trial on the elevated roads, the Nantasket Beach road and a number of interurbans and its success demonstrated. Its application does not present so many problems now, and last fall a committee was appointed to again study the question for the Illinois Central and report to the directors. The recommendation was that the tracks used for suburban service from Randolph street to Jackson Park should be equipped for electric traction. On March 25 the directors gave their approval to the suggestions embodied in the report and authorized the president to take steps to carry out the plan. As yet the details are being worked out and no bids have been let or construction work commenced.



## INDIANA LEGISLATURE PASSES 3-CENT FARE BILL.

Applies Only to One City However—Injunction Asked by Indianapolis Road.

The fight which has been waged by certain parties against the Citizens' road of Indianapolis, has been carried into the state legislature, where a most unusual and remarkable bill has become a law. It provides for a 3-cent fare in "any city having a population of 100,000 or more, according to the census of 1890," and this, of course, limits the law now and for many years to come to one city—Indianapolis. The bill gives every evidence of malice and persecution as will be clearly evident from a perusal of its strange provisions. It puts a premium on dishonesty. Under the law, any conductor who refuses to accept a 3-cent fare, or give a transfer on a 3-cent fare, brings a fine on himself, also on the company, and forfeits the franchise of the company. Any corrupt employe could, under the provisions of this law, absolutely wreck the company, leaving it without a franchise. The employes could be hired to do this by people who wanted to annoy the company. \$100 of the fine goes to the person who was refused the fare or transfer. Employes could stand in with such parties, and get a portion of the penalty.

The bill is so evidently a persecution, and legislation against one individual interest that it does not seem possible the courts can sustain it.

An injunction has been asked restraining the city from enforcing the law until the case can reach a decision in the courts.

Following is the text of the bill:

"Be it enacted by the General Assembly of the State of Indiana, that Section 9 of an act entitled, 'An act to provide for the incorporation of street railway companies,' approved June 4, 1861, the same being Section 4,151 of the Revised Statutes of 1881, being the same, is hereby amended so as to read as follows: 'Section 9. The directors of such company shall have power to make by-laws for the management and disposition of stock, property and business affairs of such company, not inconsistent with the laws of this state, and prescribing the duties of officers, artificers and servants that may be employed, and for the appointment of all officers for the carrying on of all business within the objects and purposes of such company, and for regulating the running time, fare, etc., of said road or roads. Provided, however, that in cities in this state having a population of 100,000 or more, according to the census of 1890, the cash fare shall not exceed 3 cents for any one trip or passage upon the street railroad or roads of the same, and every passenger upon such road or roads shall, upon his or her request or demand, without any further cash fare or charge, be transferred from the line upon which he may take passage to and upon any other line or lines in such city owned, controlled or operated by such company to which he paid his cash fare, and such company, its officers, servants, agents or employes shall, upon the request or demand of any passenger give transfer ticket or pass to such passenger, entitling him to passage upon the line or lines to which he desires to be transferred, so that he may have one continuous trip or passage over and upon any two of its lines, without additional cash fare or charge to the point nearest his destination.

"Be it further provided, however, that such directors may provide reasonable regulations for the transfer of such passengers as to the place where such transfers shall be made, and when such transfer tickets shall expire, but every passenger desiring to be so transferred shall be given a reasonable opportunity to do so and to be carried upon the line to which he desires to be transferred. And should any street railroad company in any city charge, receive or collect more than 3 cents cash fare, or refuse or neglect to transfer passengers as herein provided, then said company shall forfeit and pay to the person from whom it receives, charges or collects the said cash fare in excess of 3 cents, or whom such company refuses to transfer as herein provided, the sum of \$100, to be recovered in a civil action in any

court of competent jurisdiction, and the city in which such railroad company is doing business, running and operating its line or lines of road or roads may, upon the failure of such street railroad company to comply with any of the provisions of this act, declare the rights, terms, contracts and franchises of such company to the use and occupancy of the streets, alleys and highways of such city for street railroad purposes forfeited and at an end, and may proceed to oust such company from the use and occupancy of such streets, alleys and highways and may contract and let to any other street railroad company the use and occupancy of such streets, alleys and highways for street railroad purposes, the same to be granted and let in accordance with the provisions of this act and the laws governing cities having a population of 100,000 or more, according to the census of 1890.

"That it shall be unlawful for any company organized under the provisions of this act, and owning, controlling, running or operating any street railroad, or system of street railroads, in any city having a population of 100,000 or more, according to the census of 1890, or any officer, agent, servant or employe of such company, to demand, charge, receive or collect from any passenger upon its road, or system of roads, a cash fare of more than 3 cents for any one trip or passage upon the same, and for any violation of the provisions of this section, such company, officer, agent or employe shall, upon conviction thereof, be fined in any sum not less than \$50 and not more than \$500.

"That it shall be unlawful for any company organized under the provisions of this act, and owning, controlling, running or operating any street railroad system or street railroads in any city having a population of 100,000 or more, according to the census of 1890, or any officer, agent, servant or employe of such company, to refuse or neglect to transfer any passenger upon the same from any of its line or lines upon which he may have become a passenger to any other of the lines of such company owned, controlled, run or operated by it in such city, and to which he may have requested or demanded to be transferred; or neglect or refuse to give to any passenger upon demand or request a transfer ticket or pass, entitling such passenger to be transferred or carried upon any other of its lines in such city to the point of his destination thereon, or who shall neglect or refuse to receive and carry any passenger after he shall have received a transfer ticket or pass entitling him to be transferred and carried by and upon some line or lines other than that upon which he originally took passage, shall, upon conviction thereof, be fined in any sum not less than \$50 and not more than \$500.

"Whereas, an emergency exists for the immediate taking effect of this act, the same shall be in force from and after its passage."

The application for restraining order set for April 12 hearing did not come up, and will be heard April 14 before Judge Showalter, of Chicago.

## TWIN CITIES GOOD YEAR.

The Twin City Rapid Transit Company, Minneapolis-St. Paul, is out with its annual report for the fiscal year and shows gross receipts of \$2,059,217, an increase of 3½ per cent. The debt was reduced a quarter of a million and \$300,000 spent in improvements, chiefly relaying track and cast-welding. The passengers carried numbered 41,232,149; car mileage was 11,015,938. Wages were maintained and an increase in the net earnings is shown. A lease for water power, for 40 years was closed. All repairs and improvements are being made of as permanent a nature as possible with a view to future economies in maintenance. New tracks are all laid in concrete, no wood being used in the construction.

Three axles on the new motor cars on the Brooklyn Bridge have broken during the past month. The stresses in these axles are especially severe, due to torsion when starting and stopping. Steel axles of larger dimensions will be substituted for those now in use. Fortunately the accidents have not been attended by any loss of life or serious property damage.

## STOPPING ANOTHER LEAK IN ELECTRIC RAILWAY OPERATION.

BY J. R. CRAVATH.

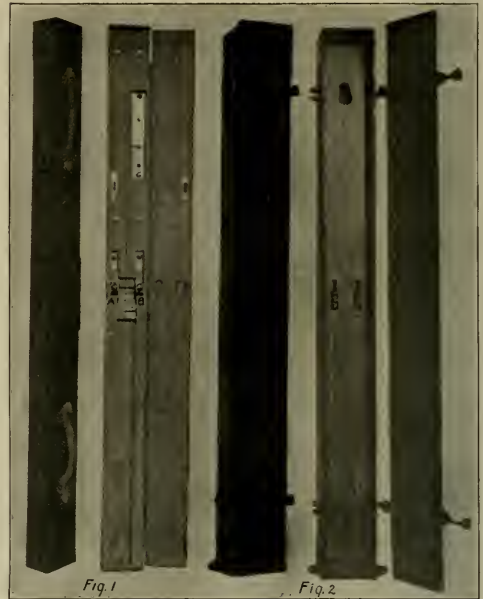
It is hardly necessary to tell any experienced electric railway man that under the present methods of operating there is a considerable waste in power and repairs, due to the carelessness of motormen. This fact has been fully recognized ever since the first electric roads were started. There are two things directly responsible for this waste, human nature and a certain characteristic of the electric motor. Even when skillfully handled the electric motor is not an efficient machine when starting; but when in careless hands the waste in starting is something enormous, and but a relatively small per cent of the power used gives any useful results in the way of accelerating a car, the balance serving only to heat motors and resistances and wear out the equipment. On the other hand, it is not human nature to be careful and economical of anything that costs the user nothing and of which no record is kept. The motorman has a full and free supply of power. He has been thoroughly taught how he should handle his controller, but it is less trouble to be careless than to be careful, and it is natural to want to crowd the power on with scarcely a pause at each notch, or leave the power on until the brakes are partly set. There are evidently only two directions in which to hope for relief from this evil. There must either be changes in the motors and controllers or in the men that handle them. Series-parallel control has greatly lessened the necessary waste in starting cars, and the education and more careful selection of motormen has in a measure reduced the waste due to carelessness in starting and other bad habits, but that there is still room for much improvement no one familiar with the way cars are handled on all large roads will deny. The well known tests made by Hermann Hering at Baltimore, published in 1895, showed that even and above the average motorman used 20 per cent more power than was necessary to get his car over the road on time, which result has doubtless been confirmed by many railway electricians in private tests.

It has long seemed evident to the writer, in common with many other electric railway men with whom he has talked, that the only way to strike at the root of the evil and get permanent results in the way of proper handling of the equipment at all times, would be to keep a continuous record of the performance of each man. This is simply in a line with the recently adopted practice of our best steam roads, of keeping a ton-mile fuel record for every engine crew on the road and comparing the records of all those in similar service. The Chicago Great Western Railway has by this plan reduced its fuel bill 26 per cent from what it was under the old plan, where no check was kept on the performance of an engine crew.

It is manifest, however, that before any comparative record of all motormen can be kept there must be an instrument to keep it with. The ideal thing for the purpose would in theory evidently be a recording watt-meter of the portable type, but financial reasons prohibit the adoption of such an instrument for every motorman, to say nothing of its doubtful ability to stand hard knocks.

The requirements of an instrument for such a purpose are many and severe. It should first of all be reliable, so as to do justice to all the motormen concerned. It must be low

in first cost, simple to operate, easy to repair, and not liable to get out of order or break. It must be detachable from the car after the plan of a stationary fare register, so that each motorman can turn his instrument in to the clerk or receiver at the end of his run, thereby saving the labor and time that would be necessary to read the instrument on the car between shifts where a car is run by two crews each day. It should be able to stand hard usage without interfering with its accuracy, and for that reason should preferably be free from delicate adjustments, magnets and the like.



RECORDER AND RECORDER CASE.

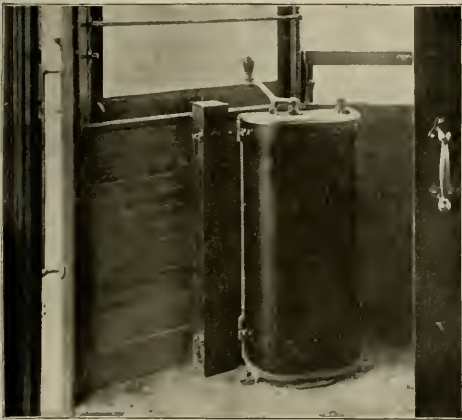
The writer having been engaged in the development of an instrument to fill these requirements, and having thoroughly tested it in actual practice, it will no doubt be of interest to electric railway men to learn of the commercial results attained. The instrument in its present form consists of two parts. The recorder proper, Fig. 1, is given to every motorman before he starts out on his run, is put in position on the car by him, and at the end of the run turned in by him at the office. This recorder fits into a recorder case, Fig. 2, which is a fixture on the car and contains the car circuit terminals. The act of pushing the recorder into its case closes the car circuit through the recorder, and unless the recorder is in its place the car circuit is open and the motorman can not run his car. The recording device consists of two very simple elements—a horizontal German silver wire held between the terminals A B and of such cross section as to be heated by the current operating the car which flows through it and a thin strip of alloy of low melting point. This strip of alloy is supported in vertical guides above the wire and held against the wire by a weight clamped to its lower end, as shown in the illustration. When the temperature of the wire has reached a certain point due to the passage of current through it, the wire begins to melt



its way through the alloy strip and the strip and weight descend. The amount of strip melted through in a day is used as a record of the motorman's efficiency. In practice the hot wire is made of such a size that a good man under ordinary conditions will melt through but little of a strip—the strips being 17 inches long—while some of the more careless men will go through the full length. The proper size of wire is determined by actual experiment with a careful motorman in regular service, and of course will need to be varied with the weight of the car and local conditions. While this instrument is not a recording ammeter (because it does not record current below a certain amount) that fact in no way detracts from its value for the special use in which it is employed. The superintendent wants chiefly to know which motormen are in the habit of running with the least starting current, for it is the excessive starting current that wrecks the equipment, wastes power, makes necessary the running of a large amount of generating machinery in proportion to the average load, and a needlessly heavy

strip, a hot wire and two terminals, which terminals are provided with switch lugs on the back which fit into switch jaws in the iron recorder case on the car, to complete the circuit when the recorder is pushed into position. It contains also an automatic short circuiting device as a precaution to prevent injury to the instrument or stoppage of the car should the hot wire melt under an abnormal current. This however seldom occurs. Mr. motorman having received his recorder may drop it on the floor while on the way to his car without likelihood of serious injury to anything it contains. It is but the work of a few seconds for him to shove the recorder into the case, close the case door and be off. At the end of his run he turns it in at the office and the clerk unlocks and reads it at his leisure. If more than a small fraction of the strip is melted through a new one is put in and the old one thrown into the scrap pile to be sent back for remelting and rerolling. The cost of these strips is thus made nominal. The refilled recorder is then put in the pile ready to go out. A record of "miles run" and "inches melted" is kept for each man, and the clerical work is so slight that it can in most cases be done in spare moments by men already employed. While a man may have bad luck as to delays and heavy loads one day, such things will not happen to the same man all the time, and as a matter of fact it is found that there is a striking persistency in the way in which some men pile up a record until they are given a hint to reform.

In order to thoroughly test the practical working of this recorder and to determine what could actually be accomplished in the way of commercial economy by its use, arrangements were made with Superintendent W. F. Brennan of the Chicago General Railway to equip all the cars of that road. It was realized by the writer at the outset that the saving possible by the use of this device on this road was far less than on many others because it operates a comparatively small number of cars and the men are thus brought more directly under the eye of the superintendent than on large systems. Furthermore, Mr. Brennan has always been specially careful in teaching his motormen economy and care, and the men now running on the road are the "survival of the fittest" from several years of operation and a reduction in car service, and every one familiar with the road knows that its motormen are an unusually painstaking lot of employes. In fact, as REVIEW readers will remember, Mr. Brennan once, during a shortage in power, gave his motormen a course in running cars with a No. 25 copper wire for a fuse, from which they nearly all successfully graduated without being suspended during the course. It was almost a question in the writer's mind whether recorders were needed on a road so managed, but as Mr. Brennan seemed to think there was still room for improvement by the use of recorders a thorough test was prepared for by taking a series of readings at the powerhouse switchboard. A summary of this first series of tests is shown in one of the accompanying tables. These tests were all made between the hours of 8 a. m. and 6:15 p. m. and were made under conditions of track favorable to a low power consumption. Frequent light snow storms during the nights made necessary running the sweeper early in the morning on several of the days and the track was thus kept clear of dirt clean and wet. The averages shown are from 10 second readings of station ammeter and voltmeter, each test lasting about one hour. Nine tests were taken during hours of heavy, and eight during hours of medium traffic,



Cravath recorder on Chicago General Railway.

investment in feeders. A feature of this excessive current recorder that makes it specially valuable for its particular purpose is that it records according to the square of the current flowing through it, provided, of course, the current is of sufficient volume to cause it to record at all. The careless motorman thus has his record magnified in a way that may not be very satisfactory to him, but leaves no doubt in the superintendent's mind as to where improvement or "reprovement" is needed.

With hot wires all of the same diameter and material, with terminals of the same size and distance apart and with an alloy of uniform mixture and thickness it is evident that there is little chance for difference in the performance of one recorder as compared with another, and we have here a fair means of comparing men in the same class of service and a comparison is after all the main thing of practical value.

As to practical operation this recorder is ideally simple. When the motorman is called for his run he is given a locked recorder containing a fresh strip of alloy. As is seen by the illustrations, it is a strong wood box 35 inches long by 2 $\frac{3}{4}$  by 2 $\frac{1}{4}$  inches. It contains simply a weight, an alloy

This company operates two types of cars, one on double tracks with two G. E. 1200 motors and weighing 23,200 pounds complete; the other with same motor equipment but shorter and on single trucks weighing 18,600 pounds complete. A Sperry motor car is also operated at times, its weight being 16,000 pounds. Six cars are operated on the company's main line on Twenty-second street, doing a cross-town business and scheduled for 8½ miles round trip in one hour including numerous stops for railroad crossings. One transfer car is also run on the Homan avenue branch. Owing to variation in the proportion of long and short cars operating, all results are figured in power required per ton of dead weight operating, it having been determined that the power required to operate the road was proportional to the total weight of the cars without regard to whether that weight was in the shape of long or short cars.

After taking the first series of tests the six cars on the main line were equipped with recorders, one on the branch line remaining unequipped. The moral effect of having a recorder on each car of course caused all men to use more care from the first day the recorders were put in service, but it was found that still there was a marked difference between the weekly records of the various men. After about two weeks of operation with recorders a comparative record was posted showing the relative standing of each motorman as to amount of strip melted per trip. The more efficient men were thus given an incentive to try to stay at the top of the list, and those making a less favorable showing naturally felt the importance of getting nearer the top, which latter fact was made evident by the recorder readings after the record was posted.

The second series of tests (shown herewith) was made after the recorders had been in service some time. Unfortunately the rail surface was not in as good condition during the second as during the first series, owing to the fact that a great quantity of pasty mud had dried on the rails about the time the second series was begun and no rain came to wash it away during the test, but still the showing is favorable enough to leave no doubt as to the beneficial effects of the recorders. The conditions (aside from track surface as before mentioned) were as nearly alike in the two tests as was possible. The same time schedule was maintained and the same proportions of heavy and medium load tests were taken in both series.

The tests show that it took nine per cent more power to operate the road without recorders than it does now with them. Not only is the average power cut down, but the maximum power is, as might be expected decidedly reduced. If such a saving can be shown by equipping with recorders, six-sevenths of a small road where the men are already noted for careful handling of motor equipments, the readers of this article can perhaps imagine what the effect would be on the majority of roads having fifty motormen and over where close supervision is impossible.

Considered from the standpoint of the power plant alone, the employment of recorders means a fuel saving due to a reduction of the average load, but in many cases it means much more. The reduction of the maximum power needed to handle a given number of tons of rolling stock makes it possible to either run more cars with a given capacity of generating machinery or to reduce the capacity of the generating machinery that must be kept running to handle a given number of cars. In the former case the saving will not only be in fuel but in investment and it immediately

becomes a question for the engineer to consider whether it is not cheaper to buy recorders to put on the cars and keep down the power consumption rather than invest so much money in feeder and power plant capacity. In this connection it may be said that some snow storm and bad track tests made at the Chicago General plant after the recorders were in service showed the maximum and average demand for power at those times to be only about equal to the average of the entire first series of tests. The use of a smaller engine has also been made possible there during light load hours.

However, the saving in power and the investments connected therewith are by no means the only items to be considered. Electrical and mechanical repairs are nearly as important. An accurate test as to saving in repairs by the use of recorders is difficult to make, but no electric railway man needs to be told that most of the electrical and many of the mechanical repairs on motors are necessitated by the misuse of the controller, which misuse the presence of the recorder puts a stop to.

Another evil that the recorder effectually checks is that of running recklessly, at a much faster rate than called for by the schedule in order to get a long lay over at the end of the route. Men are also more careful not to get behind time for useless reasons as they know their recorder record may suffer in making it up.

In conclusion the writer wishes to acknowledge the courtesies shown him by Mr. Brennan of the Chicago General Railway and his staff in making this first practical test of an excessive current recorder for motormen, thorough and complete and especially to express appreciation of the careful attention given by Mr. Caywood, chief engineer, to making the power plant tests. Mr. Brennan has always been one of those managers who realized keenly the importance of some recording device of this nature. To him much credit is due for being the means of bringing out information that can not but benefit the entire industry.

James R. Cravath is already well and widely known as a deep student of electric railway problems, and a popular and successful writer on these subjects.



J. R. CRAVATH.

Mr. Cravath for over four years past has most acceptably served as electrical editor of the STREET RAILWAY REVIEW, which department he has conducted with marked ability. It is with genuine regret to the REVIEW that Mr. Cravath severs his connection with us in order to devote his entire time to his recorder, although he will continue to contribute to its columns from time to time. The exceptional opportunities he has had to study street railway problems has specially fitted him to undertake his new work, and we wish and predict for him the same success in his new work which has attended him as a technical journalist. The members of the Chicago Electrical Association have also recognized his strong work in that organization, and he is now serving a second term as its secretary. He will be at home to old and new friends at 825 Monadnock building, Chicago.

## FIRST SERIES OF TESTS, CHICAGO GENERAL RAILWAY (BEFORE EQUIPPING WITH RECORDERS).

Date.	Hour of day.	Condition of Track and Weather.	Temperature.	Average h. p. per ton.	Average amperes per ton.	Maximum amperes per ton.
Feb. 5,	*8:30 to 9:50 a. m.,	slight snow changing, to rain.....	32° to 35°	1.013	2.741	5.874
" 6,	9:45 to 11:10 a. m.,	rails covered with water; fair weather.	36°	1.830	2.651	4.666
" 7,	*4:15 to 5:15 p. m.,	rails damp and fairly clean; fair.....	36°	1.774	2.526	5.874
" 8,	10:15 to 11:15 a. m.,	little mud fresh frozen on rail; fair.....	26°	1.515	2.168	4.569
" 8,	4:00 to 5:00 p. m.,	little mud fresh frozen on rail; fair.....	26°	1.655	2.364	5.874
" 9,	9:30 to 10:30 a. m.,	frozen dirt pulverized on rail; fair.....	26°	1.675	2.386	5.703
" 9,	4:15 to 5:15 p. m.,	frozen dirt pulverized on rail; fair.....	26°	1.740	2.509	5.703
" 9,	*5:30 to 6:10 p. m.,	frozen dirt pulverized on rail; fair.....	26°	1.774	2.517	5.703
" 10,	4:15 to 5:15 p. m.,	rail wet with light melting snow; fair..	33°	1.802	2.593	5.720
" 10,	*5:23 to 6:08 p. m.,	rail wet with light melting snow; fair..	33°	1.881	2.683	5.383
" 12,	*4:45 to 5:45 p. m.,	rail wet with light melting snow; fair..	35°	1.859	2.673	6.011
" 13,	9:30 to 10:30 p. m.,	rail wet with light melting snow; fair..	35°	1.674	2.394	6.364
" 13,	*4:50 to 5:50 p. m.,	streets muddy; fair.....	36°	1.884	2.677	9.011
" 14,	*4:20 to 5:20 p. m.,	rail wet; fair.....	36°	1.500	2.282	5.644
" 15,	*4:55 to 5:55 p. m.,	streets flooded with melting snow; fair.	38°	1.765	2.524	6.011
" 16,	4:05 to 4:55 p. m.,	rail muddy; fair.....	40°	1.701	2.437	5.657
" 16,	*5:00 to 5:50 p. m.,	rail muddy; fair.....	40°	1.786	2.550	5.304
Average.....				1.754	2.510	

\*Made during heavy load hours; morning and evening and Sunday afternoon traffic.

## SECOND SERIES OF TESTS, CHICAGO GENERAL RAILWAY (AFTER EQUIPPING WITH RECORDERS).

Date	Hour of Day.	Condition of Track and Weather.	Temperature.	Average h. p. per ton.	Average amperes per ton.	Maximum amperes per ton.
April 2,	2:56 to 3:56 p. m.,	rail very dirty with dried mud; fair....	46°	1.548	2.187	4.316
" 3,	*8:00 to 9:00 a. m.,	rail very dirty with dried mud; fair....	48°	1.564	2.193	4.316
" 3,	11:00 to 12:10 p. m.,	rail very dirty with dried mud; fair....	48°	1.454	2.081	4.316
" 3,	*4:40 to 5:40 p. m.,	rail very dusty; fair.....	50°	1.625	2.359	5.312
" 4,	*3:40 to 4:40 p. m.,	rail very dusty; fair.....	50°	1.689	2.400	4.832
" 5,	2:07 to 3:07 p. m.,	rail very dusty; fair.....	42°	1.541	2.210	5.479
" 5,	*4:40 to 5:40 p. m.,	rail very dusty; fair.....	42°	1.608	2.284	4.794
" 6,	*4:40 to 5:40 p. m.,	rail dirty with dried mud; fair.....	36°	1.677	2.303	4.316
" 7,	*8:00 to 9:00 a. m.,	rail dirty and slightly damp; fog.....	38°	1.728	2.430	4.794
" 7,	10:35 to 11:35 a. m.,	rail very dusty; fair.....	43°	1.636	2.317	5.136
" 7,	3:47 to 4:47 p. m.,	rail very dusty; fair.....	45°	1.743	2.493	4.931
" 8,	*7:52 to 8:54 a. m.,	rail very dusty; fair.....	40°	1.598	2.269	3.983
" 8,	9:50 to 10:50 a. m.,	rail very dusty; fair.....	42°	1.577	2.248	5.312
" 8,	2:57 to 3:57 p. m.,	rail very dusty; fair.....	45°	1.557	2.231	4.666
" 8,	*4:52 to 5:52 p. m.,	rail very dusty; fair.....	43°	1.702	2.424	4.666
" 9,	*7:56 to 8:56 a. m.,	rail very dusty; fair.....	36°	1.554	2.189	4.510
" 9,	10:00 to 11:00 a. m.,	rail very dusty; fair.....	48°	1.538	2.187	4.510
Average.....				1.608	2.288	

\*Made during heavy load hours; morning and evening and Sunday afternoon traffic.

## STREET RAILWAYS TO PAY LICENSE IN WISCONSIN.

A bill for the payment of licenses by street railways and electric light and power companies, has been debated and is almost certain of passage by the Wisconsin legislature.

Street railways having gross cash receipts in excess of \$800,000 per annum constitute the first class, those having receipts less than this amount the second class. The bill provides that on the first Monday in December each company shall pay to the treasurer of the city, village or municipality in which the road is located a percentage of its gross cash receipts as follows: Railways of the first class, three per cent on the first \$800,000 and four per cent on receipts in excess of \$800,000. Railways of the second class, one and one-half per cent on the first \$250,000 and two and one-half per cent on receipts in excess of \$250,000. Six per cent of these license fees goes to the state and three per cent to the county. If the road is interurban the tax is divided in proportion to the mileage in the two or more cities except where the railway extends from a city to neighboring towns and villages, then the city is to receive three portions of such tax per mile to one portion in the neighboring towns

and villages. Where there is more than one taxing district in the municipality the fees from the railways are proportioned among them according to the number of feet of track laid in each such district. These fees are in lieu of all taxes and fees and all property, franchises and real estate used in the operation of the company's business shall be exempt from all other taxation.

## GOOD RECORD IN BIRMINGHAM.

Last year over 5,000,000 passengers were carried and 200,000 tons of freight hauled by the Birmingham (Ala.) Railway & Electric Company. Under the capable management of J. B. McClary, the roads, which were consolidated in 1890, have been united into one complete system and many improvements and extensions in the service made. The company now owns 55 miles of track, 45 motor cars, 15 locomotives, 38 passenger coaches and 6 freight cars. It is expected that the Ensley and Bessemer steam lines will be converted into an electric system by fall.

The Jenney Electric Motor Works at Indianapolis, Ind., were burned on the morning of March 12.





Isaac Bearinger, president of the Interurban Electric Railway Company, Saginaw, Mich., was married April 1, to Miss Adelia McCormick.

W. B. Bucklin, of Little Falls, N. Y., has taken up his duties as assistant superintendent of the Zanesville (O.) Street Railway and Electric Company.

Joseph Leiter, son of L. Z. Leiter, has been elected a director in the Chicago City Railway to fill the vacancy caused by the resignation of his father.

Another change has been made in the management of the Lincoln (Ill.) Electric Street Railway Company, Elmer Simonton succeeding J. A. Ferguson as superintendent.

D. J. Duncan of Carbondale, Pa., has taken up his duties as superintendent of the Schuylkill Electric Railway Company, and L. J. Wright has been appointed general manager of the same road.

On March 13, the Hood Machine Company of Birmingham entertained at its shops in honor of the first electric locomotive built in Alabama. The locomotive was built under the direction of G. F. Perin, E. E.

After several conferences with President McKinley, Henry C. Payne has decided not to accept an appointment in the diplomatic service, and has returned to Milwaukee to attend to his street railway and other business interests.

Robert Hardie, inventor of the Hardie compressed air system now being tried in New York, was a REVIEW caller. He is delighted with the demonstration thus far and is confident compressed air will yet prove to be the railway motive power.

W. F. Rudolph, superintendent of the Oakland (Cal.) Consolidated Street Railway Company met with a very painful and serious accident, being crushed between two cars, sustaining internal injuries and a lacerated leg. Fortunately the accident will not prove fatal.

E. W. Goss, superintendent of the Middletown and the Portland (Conn.) Street Railway Companies has recently been appointed superintendent of the Middletown & Portland Bridge Company. His new position does not interfere with his duties in street railway affairs.

A new field of usefulness is open to the trolley car. Recently one of the employes of the Columbus (O.) Street Railroad Company moved into a house in Olentangy park, owned by the company and his goods were transferred on a sand car and one of the construction cars.

As a token of their appreciation the employes of the Rochester Railway Company presented C. A. Williams, the retiring secretary, with a handsome solitaire diamond ring. He has been in the service of the company for seven years, but has been compelled to give up his work on account of ill health.

The Baltimore papers announce again the certainty of the oft-reported consolidation of the Baltimore Traction, the City Passenger and the City & Suburban lines. The interests, however, are difficult to adjust to the satisfaction of all, and the effort will probably fail, as preceding attempts have failed.

Frank C. Homsher, who has been assistant superintendent of the Harrisburg (Pa.) Traction Company for six years, has retired from the services of the company. C. L. Brinser, of the operating department, and J. H. Tinker of the office force have also been relieved, to curtail expenses, and the positions abolished.

R. T. McCabe, president of the New York & Queens County Railway Company will be succeeded by Mr. Sheldordine of Philadelphia. J. R. Beelan, who has been general manager of the Peoples' Traction Company of Philadelphia, will take the place of George Chambers as manager. The system has recently changed hands.

F. S. Jones, who for several years past has so acceptably managed the Chicago office of the Stillwell-Bierce & Smith Vaile Co., has had his good work recognized in a promotion of which his many friends will be glad to learn. He has gone to Dayton, and will hereafter be found in the home office as treasurer and manager of the company.

C. S. Van Wagoner, president of the Van Wagoner & Williams Hardware Company, Cleveland, and Frank X. Cicott, manager of the railway department of the Ansonia Brass & Copper Company, were callers on the REVIEW when in Chicago a few days ago. Mr. Van Wagoner, by reason of a new department in his works will now be interested in street railways, and will be found a progressive and accomplished gentleman.

## WHERE WILL YOU SPEND THE SUMMER?

It is not too early to begin to think of the best place to spend your summer vacation. Do not leave this matter until the last moment, make up your mind in a hurry and then—regret for the next six months that you did not take more time in making your decision. And while you are thinking of this matter it will pay you to investigate some of the many hundred beautiful resorts situated along the line of the New York Central & Hudson River Railroad. You cannot get a better list to choose from. If you want a gay social time, and can afford it, take the New York Central to Saratoga, Lake George, Lake Champlain, or the Thousand Islands. If you want a quiet, rustic time, you can find it in one of the many small villages scattered through the Adirondacks, the Catskills, or the Berkshire Hills. The New York Central lines will take you into the heart of these famous regions. If you want to spend your vacation in sight seeing, take this same railroad to Boston, Buffalo, Niagara Falls, Montreal, Toronto, Chicago, St. Louis or Cincinnati. In addition to simply taking you to these different places, the New York Central will take you in the best possible manner. It has the fastest and most perfect through train service in the world, with new and elegant sleeping, drawing room and dining cars made by the Wagner Palace Car Company. It has justly been said of this road that, "For the excellence of its tracks, the speed of its trains, the safety and comfort of its patrons, the loveliness and variety of its scenery, the trade and importance of its cities, and the uniformly correct character of its service, the New York Central & Hudson River Railroad is probably not surpassed by any similar institution on either side of the Atlantic."

For further information about any place along this road apply to George H. Daniels, General Passenger Agent, Grand Central Station, New York City.



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

Contracts will soon be let for a large power house costing \$500,000 to be built by the Consolidated Traction Company of Pittsburgh.

The Birmingham (Ala.) Railway & Electric Company has recently provided balloon ascensions as park attractions with great success.

The electric road between Westerly and Watch Hill, Conn., has been re-opened with R. H. Fillmore, Jr., acting as superintendent.

Geo. M. Perrin was sent to the house of correction for 90 days for stealing several fare registers from the Citizens' Street Railway Company, Detroit.

R. W. Clay, a director and one of the principal stockholders of the Citizens' Street Railroad Company, Indianapolis, died at his home in Philadelphia.

The last quarterly dividend of the Manhattan Consolidated Railroad was 1, instead of 1½ per cent, as heretofore. For the past three months the earnings were \$430,000.

The New Castle (N. J.) Traction Company has placed an order for \$3,000 worth of machine tools. These are to be used in the shops at the car barn where all the repairs will be made.

The officers and employes of the Citizens Street Railroad Company of Indianapolis presented A. L. Mason, president of the company, with a gold headed cane as evidence of their good will.

Regular day cars operated by the Consolidated Traction Company of Pittsburgh make 182 miles per day. During the last year, however, the car mileage has been irregular because of repairs on the system.

The Sheboygan Light, Power and Railway Company, of Sheboygan, Wis., is actively engaged in building extensions to its lines; a loop line through residence districts, an extension to Krezville and a line to the Wildwood and the Lutheran cemeteries, over which funeral trains will be run.

The tenth annual banquet given by the New Haven Street Railway Company to its employes was a most pleasurable occasion. As a token of good feeling to the officers, the men presented President Corey with a handsome tobacco box and fine Morris chairs to Superintendent Mather and to M. J. Donlon.

The Wilmington & New Castle Electric Railway celebrated its opening by carrying the members of the general assembly, the mayor and council of New Castle and many prominent citizens on the first trip. After these distinguished gentlemen had completed the circuit the cars began to run on schedule time.

A Council Bluffs street car was the scene of a unique marriage recently. A young man and woman were taking

a trolley ride and at a prearranged place a clergyman boarded the car, the license was produced, the nuptial knot tied, with the conductor and motorman as witnesses, the fee paid, and the wedding journey taken, all in one trip.

A conductor was recently discharged by the Consolidated Traction Company of Jersey City and prosecuted for embezzlement. Expecting only a fine he practically pleaded guilty, but Judge Hudspeth considered it no less a crime to steal from a railway company than from an individual, and sentenced the erring conductor to six months in the penitentiary.

Ex-President Harrison appeared before the supreme court at Washington in behalf of the Citizens' Railway Company of Indianapolis in the suit brought against it by the City Railway Company. The Citizens' company contends for the perpetuity of its franchise, and claims that the state could not delegate its franchise granting power to the Indianapolis city council.

A report extensively circulated by the daily press to the effect that the Reading & Southwestern Street Railway Company of Reading, Pa., had issued an order requiring car employes to be clean shaven is denied in toto by the company. This report has caused the officers considerable annoyance. The only request made of the men is that they make a tidy appearance.

Application was made by the Central Trust Company, of New York, for the appointment of a receiver for the Brooklyn Elevated Railroad Company, to foreclose a first and second mortgage. Judge Van Wyck, of the Supreme Court, Brooklyn, named Frederick Uhlmann for the position. A plan for reorganization has been formulated and \$16,000,000 first mortgage gold bonds will be issued.

The Piedmont & Mountain View Railway of Oakland, Cal., has abolished horse traction on all its lines. The main line, 6½ miles, is operated by cable, but is equipped with overhead trolley wires, and electric cars are run on Sundays and holidays. The crosstown and branch lines, 8 miles, are electric. No change has been made in the officers of the company with the exception of the appointment of W. Tiffany as superintendent.

The Oxford Lake Line of Anniston, Ala., recently lost in a damage suit, \$500 being awarded the plaintiff. This is a rather unique case, as the plaintiff did not allege that the street railway company was running its cars too fast and thereby violating a city ordinance. The facts, as admitted, were that the car had passed a long wagonette or carryall, and then the team attached to the latter turned and chased the car, finally passing it and coming to a halt on the track in front. The trainmen and passengers testified that the wagon struck the car in passing; the people in the wagon, that the latter had stopped and that the motorman deliberately ran his car into it. Apparently the company lost the case, because there was, it being the 14th of July, a canvas advertising banner 2½ ft. square fastened on the front dash board, which the court did not consider necessary to the conduct of the company's business. There was but little evidence that the horses were frightened by this. The case has been appealed. The company has had but one other accident in six years.

## VAN WAGONER & WILLIAMS HARDWARE COMPANY.

The Van Wagoner & Williams Hardware Company, of Cleveland and New York, has been favorably known for over 25 years to the general hardware trade of the United States and Canada, and in England and Germany, but until recently not as a manufacturer of electrical supplies. Entering upon the manufacture of drop-forged commutator segments for street railway motors and generators brings it into the electrical field.



C. S. VAN WAGONER.

This company, with a capital of \$750,000, has a large and thoroughly modern manufacturing plant at Cleveland, O., and is up-to-date in equipment and methods. The plant is new and embodies some remarkable features for economical manufacturing. It is situated most advantageously for the purchasing and handling of raw material, and for the delivery of goods to all important points. For many years the character of its product has been most favorably known; its goods have a high reputation. The company has long followed the principle of making a thoroughly good article and giving it a fine finish.

In taking up the manufacture of drop-forged commutator

the company, who, with Wm. H. Williams, founded the business in 1871. The mechanical and manufacturing part of the business have been particularly under Mr. Van Wagoner's care, together with all matters of general importance. Mr. Williams, until his death in 1895, had charge of the sales and financial matters. Mr. Williams was well known and valued in the hardware trade, and occupied a high position politically and socially in Brooklyn, N. Y.



DROP-FORGE BUILDING.

The Van Wagoner & Williams Hardware Company, in taking up this new article of manufacture, desires to become as popular, and as favorably known in the electrical trade, as it is in the hardware trade. The merit of this concern is a



PLANT OF VAN WAGONER & WILLIAMS HARDWARE COMPANY, CLEVELAND, O.

segments of pure lake copper, the large experience of this company in drop-forging generally has come into service. Recognizing that an unusual degree of accuracy is required in this article, and a high degree of conductivity, it has experimented in the preparation of the copper and in the methods of drop-forging, so that a bar of great excellence has been produced. It has made arrangements with one of the very largest concerns of the country to furnish special copper rods from which the bars are made. Skillful die-sinkers and hammermen are employed under the direction of an expert forgemaster of recognized ability. The result is that the commutator segments produced are superior in every way, especially in accuracy, conductivity and durability.

The illustrations accompanying this article show a general view of the plant, the exterior view of the drop-forge department, and a portrait of C. S. Van Wagoner, the president of

guarantee of a prominent standing among the users of the new line of goods.

A new catalog has just been issued by the Cincinnati Manufacturing Company which illustrates and describes the various types of ticket and conductor's punches made by this company. The design is neat and compact, so as to easily fit the hand, and there are no sharp corners to catch or tear the conductor's clothes. The improved unbreakable and interchangeable springs insure good service and long life. The movement and form of the plunger are such as to prevent wearing out the dies by abrasion. This punch is handsomely polished and nickel plated. A list of 207 die designs figures, letters and forms, single and double, are shown, which at all times are in stock. Special dies are also made to order.



### A NEW FLUX FOR CAST-WELDING.

I wish to thank Mr. King for his kind and courteous method of calling to my notice a misprint over my signature in the February Review.

He does not, however, properly locate the error, which consisted in printing 36 instead of 32, since the ratio between the conductivity of steel and cast iron observed in a sample joint was found, after letter was written, to be 2.25 to 1 instead of 2 to 1. I did not go far enough back in my corrections, but the calculations and conclusions are based on 32, and are, therefore, in no way vitiated by this substitution, which I ought to have detected, since I read the proof myself. The laugh at my expense has its compensations, nevertheless, since it has been the means of putting into my hands a flux discovered by Mr. Edison which, when properly used, will effect an almost perfect mechanical and electrical union between solid steel and molten iron poured around it. Another flux gives the same result when used between wrought and molten copper. I shall be glad to send a sample of either to any responsible firm having facilities for accurately testing the result. But I cannot permit the genial Mr. King to perform the "cuttlefish act," and escape from the point of this controversy in a meaningless cloud of his own ink.

He claims to believe in the "perfect conductivity" of a joint around steel rail ends without a flux. To justify his faith, he quotes three measurements on a single unused joint, but gives neither details nor means of verifying the same. Since these three measurements do not agree with each other, nor with results obtained from hundreds of measurements made on similar joints in service, I ventured to show up some of their inconsistencies. At the same time I suggested a perfectly fair method of settling the controversy by arbitration.

Mr. King's faith is strong enough to justify a liberal flow of ink, but it evidently goes no further. To give him a chance to prove his sincerity, I again suggest that he deposit with the editor of this paper sufficient to cover all expenses. The editor is then requested to select without measurement a "cast-weld" joint that has been in actual service with heavy current for two years in the track of some large road outside of Milwaukee or its suburbs.

Let this joint be sent to the electrical testing department of some prominent university and its resistance tested up to the full carrying capacity of the rail. I will then insert a plug of plastic alloy, and if, with similar tests, this material does not give results similar to those obtained by me at St. Louis, I will then pay all expenses of tests. But if he proves to be mistaken in his claims then his deposit is to be used to cover expenses incurred.

HAROLD P. BROWN.

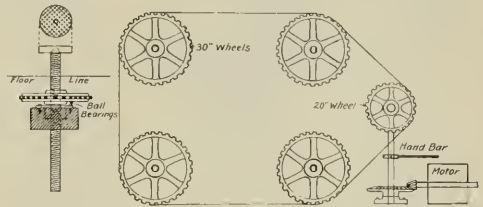
### MUSICAL ATTRACTION FOR PLEASURE RESORTS.

Managers who are operating pleasure resorts in connection with their roads—and there are scores of them now—are constantly on the alert for good attractions. Experience has already shown that nothing is more universally popular than good band music, which catches everybody, old and young. Even where local bands can be contracted for at low rates for such service, the expense grows into the hundreds very quickly, and a resort must draw big crowds to

warrant such outlay more frequently than one or two days in the week. What comes the nearest to the full brass band, and which can be operated at no expense whatever, is the new band piano, the orchestron, manufactured by August Pollmann, 70 Franklin street, New York. The instruments are operated either by hand or  $\frac{1}{2}$ -h.p. motor, and is supplied with any choice out of hundreds of pieces of popular and operatic music. New cylinders are made as fast as new music is brought out, enabling the "band" to be always up to date. The instruments are well made, do not easily get out of order, and do not have to stop for liquid refreshments on hot days. They are already doing good work in a large number of resorts, and giving decided satisfaction.

### CAR HOISTING JACK.

The cut shows diagrammatically the car hoisting jack designed by C. B. Easty, superintendent of the shop of the Cleveland City Railway. The four screws are provided with nuts in the form of 30 in. sprocket wheels. A fifth sprocket wheel 20 in. in diameter is geared to a small motor as indicated, and drives the four jacks in unison through the chain shown. A capstan head is provided on the shaft so that the jacks may be turned by hand-bars. The screws are



supported in suitable sleeves, provided with splines to prevent rotation. Ball bearings are placed between sprocket wheels and the upper faces of the screw sleeves so that the friction is no greater than with an ordinary jack. All the mechanism is below the level of the floor, only the screws projecting through, and is for the most part at the sides of the car pit. This jack lifts the car body evenly and quickly and saves both time and labor, with only a small expenditure of power.

### H. W. JOHNS COMPANY'S NEW OFFICE.

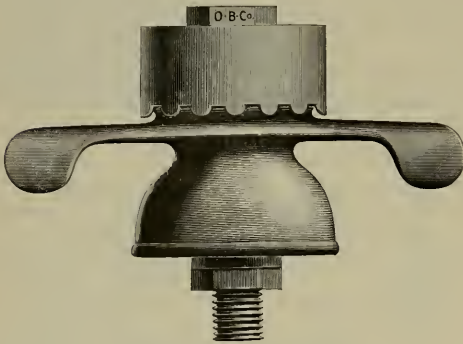
On May 1 the H. W. Johns Manufacturing Company will leave its present quarters, occupied for 25 years past, and move into the ground floor offices of the new Woodbridge building, 100 Williams street, New York, where elegant quarters have been arranged. Ten years ago, on a small scale, the company began its sale of vulcanite for electrical purposes. This well-known insulating material with its exceptional heat-proof and mechanical properties, is now generally used in almost every kind of electrical apparatus, over 1,000,000 pieces of vulcanite having been sold to manufacturers of dynamos, motors, street car controllers, arc lamps, etc. In addition to this enormous number of pieces used strictly for electrical purposes, the company has sold tons of the "steam" vulcanite, used as packing in steam, gas, water, compressed air and other apparatus. The sale

of the moulded mica trolley line insulating materials has also greatly increased. The first overhead lines constructed in the United States were insulated with moulded mica; several hundred roads are now on the list.

The "H. W. J." electric car heaters have met with good sales the past winter and is a very promising feature of the business. The company extends a cordial invitation to its friends to visit it in the new quarters.

### A GOOD TROLLEY WIRE HANGER.

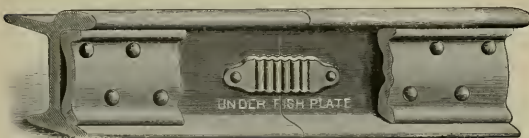
The accompanying cut represents a trolley wire hanger, designated as type D by the Ohio Brass Company of Mansfield, O. These hangers are made in all forms required for the different styles of suspensions, and ample allowance has been made in their design, so that they will support with safety the heaviest trolley wires in use. The body is of



malleable iron, and machined to fit the standard size of types D and D-W bolts. A special feature is that the hanger cap and insulated bolts are supplied with hexagonal nuts of the same diameter, and the wrench supplied is of proper size to fit easily over the nuts. Around the lower edge of the hanger cap is a series of lugs which may be riveted over and hold it securely in position. The company reports that this style of hanger is very popular, 9,000 having been ordered in the last two months.

### A DUPLEX RAIL BOND.

Realizing that a bond, of great cross-section, of minimum length, one that provides the advantages of double bonding

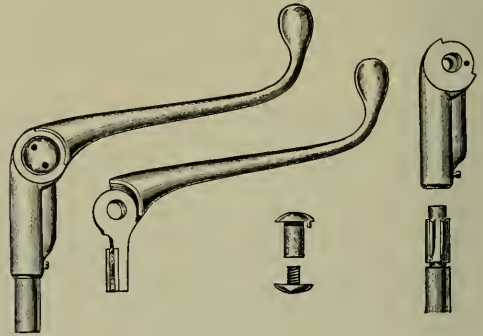


SIDE AND END VIEWS OF RAIL WITH BOND.

and can be protected by the fish plates was required, the New York Electrical Works designed, and now make a bond fulfilling these conditions. The illustrations represent the manner in which the bond is attached to the rails. The bond is made from drop forged or the new process pure cast copper, with the body of it corrugated to provide for any expansion or contraction in the rails. At either end of the bond are tubes or eyelets, as shown in the section. A hole of the same diameter is drilled in the end of each rail and the terminals inserted from both sides of the joint. A rivet is then driven through and upset as shown, thus expanding the tubular ends into the closest possible contact with the rails, and securing the bonds firmly against displacement. This operation is quite simple, and can be accomplished in a few minutes with a riveting outfit. In this way double conductivity is secured, good electrical contact assured, the fish plates protect the bond from mechanical injury and the joint is water and moisture proof.

### WALDRAN AUTOMATIC BRAKE HANDLE.

On March 20 the St. Louis & Kirkwood Street Railway made a public test of the Waldran automatic brake handle. After a trial of two months, all of the cars on this road were equipped with the new handles. As shown by the illustration the device is extremely simple, consisting of a ratchet on the upper end of the brake staff and a reliable trip. The dog is kept engaged by gravity only, no springs



being used; when it is desired to release the brake the motorman raises the handle slightly, thus releasing the dog, but need not at any time quit his hold on the brake handle. By this means both motorman and passengers who are on the front platform are protected from injury by the handle, when the brakes are released. Its few parts and positive action will commend it to street railways.

J. D. Waldran, the inventor entertained quite a large party in the special car "Rambler" when the demonstration above mentioned was given.

The Metropolitan Railroad Company, of Washington, has rewarded the faithfulness of its employes in a substantial manner. On inauguration day each man found a slip in his envelope stating that the company appreciated the energy, politeness and efficiency of the force and desired to thank each man for his efforts. One day's extra pay was in each envelope. President Harris is very popular with his men on account of his manifest interest in their welfare.



The Consolidated Car Heating Company has removed its Chicago office from room 208 to room 514 Western Union building.

C. F. Parker & Co., of New York, have received the contract to build the electric railway up Mt. Tom at Holyoke, Mass.

The Taunton Locomotive Manufacturing Company, Taunton, Mass., has recently put on the market a line of solid brass thermometer cups.

J. G. Brill & Co., of Philadelphia, have been awarded the contract by the Louisville City Railway Company to build fifty cars for August delivery.

The Garton-Daniels Electric Company, Keokuk, Ia., maker of the Garton lightning arrester reports that its business is booming and exceeds all expectations.

Partridge Carbon Company, Sandusky, Ohio, reports that business is good and improving. It has been a little behind on orders but is now in a position to fill at once.

The Pennsylvania Iron Works has been awarded the contract to build the engine for the great power station of the Consolidated Traction Company, of Pittsburg, Pa.

The White-Crosby Company, Baltimore, has been awarded the contract to convert the Blue line of the Baltimore City Passenger Railway from cable to electric.

The Schenectady Railway Company of Schenectady, N. Y., will purchase a good, large, second-hand merry-go-round. Proposals should be addressed to H. S. Cooper, superintendent.

The Chauncey Tapestry Company has purchased the manufacturing plant, merchandise, etc., of the Brussels Tapestry Company, Chauncey, N. Y., and will continue the operation of the works.

The Wells & French Company, car builder of Chicago, has established Frederick Saxelby as its eastern representative with offices in the American Surety Building, 100 Broadway, New York.

Richard Peters, Jr., has been appointed sales agent and C. L. Mahoney assistant sales agent for the Philadelphia office of the Pennsylvania Steel Company, with headquarters in the Girard building, Philadelphia.

A. D. Chandler has been appointed general western agent of the Cutter Electric & Manufacturing Company, of Philadelphia, with offices at 1114 Marquette building. Mr. Chandler expects to considerably increase the sales of the well known I. T. E. circuit breakers in the western territory.

The Jackson & Sharp Company, Wilmington, Del., has built and has now ready for painting, lettering and trimming, some standard 10-bench open cars which can be finished to suit on short notice for quick delivery.

The Sanitary Car Grip Company has been incorporated at Portland, Me., to manufacture straps for street cars. The capital stock is \$50,000, and the incorporators are Frederick B. Wentworth and Edwin W. Brown, of Boston.

The H. W. Johns Manufacturing Company, Chicago, has sent us recent catalogs describing its electrical materials, moulded mica insulators, sockets, etc., vulcabeston controller parts, electrotherms and "H. W. J." electric heaters.

The entire plant of the Laconia Car Company has been sold to Frank Jones, of Portsmouth and Edward H. Gilman, of Exeter, representing a new company with a capital of \$200,000 which will probably be increased to \$500,000.

Among the orders now going through the shops of the John Stephenson Company are 150 open cable cars for the Broadway line, New York; cars for Salt Lake City and nice orders for Ecuador and Mexico. The works are quite busy.

The J. W. Atkinson Company has been incorporated at Chicago to manufacture electric street railway and railroad supplies. The capital stock is \$20,000, and the incorporators are John M. Atkinson, Theodore H. Pletsch and George E. C. Johnson.

Fred C. Ley, of Springfield, Mass., who built the Bristol & Plainville Tramway, has been given the contract to build that part of the New Britain & Hartford line extending from the present terminus to Newington. The work is to be finished by May 15.

Col. N. H. Heft, chief electrician of the New York, New Haven & Hartford Railroad, has just purchased of the Washburn & Moen Manufacturing Company a large number of its "crown" rail bonds to be used on the new electrical equipment at Berlin, Conn.

The various improvements on tin rollers for car use that have been added by the Stewart Hartshorn Company have produced the natural effect of inducing more car lines, both steam and electric, to equip their cars with shades instead of the old fashioned wooden slat blinds.

The Brooklyn & New York Railway Supply Company, Elizabeth, N. J. reports its trade improving, and the register and bronze trimming departments quite busy. Cars are going through the shops for Plainfield, N. J., Brooklyn, Norwalk, Conn., with others to follow.

Russel & Co., Massillon, O., have recently been awarded several large contracts for their four-valve, medium speed, corliss engines, which are intended for street railway duty. Among the roads purchasing are the Pittsburg, Allegheny & Manchester, the New Paltz & Wallkin Valley, of Ulster county, N. Y.; the Detroit & River St. Clair, the Indianapolis, Greenwood & Franklin, and the Cleveland & Chagrin Falls. Future prospects are reported as very promising, particularly in the street railway line.



The Washburn & Moen Manufacturing Company has received the order from the N. Y., N. H. & H. R. R. Company for the rail bonds to be used in the new electric line from Hartford to Berlin. These are the stranded "crown" bonds of 300,000 circular mils and two to each joint.

The E. T. Burrows Company, Portland, Me., maker of the waterproof curtain material "oakette" has just issued a small pamphlet illustrating its screen factories, which are the "largest in the world." The company's large catalog, with samples, prices and testimonials, will be sent on request.

The J. G. Brill Company has just received an order for 10 new cars from the Niagara Falls & Lewiston Railroad. They are to be summer cars and supplied with every appliance for the safety and convenience of tourists. Automatic electric brakes of new design are being fitted to the cars.

The Dornier & Dutton Manufacturing Company, Cleveland, O., has recently sent to the trade a new catalog of its electrical railway appliances. Trucks for motor and trail cars, wheels, axles, sweepers, gears and pinions, heaters, roller bearings and various special machines for railway repair shops are illustrated.

In describing the equipment of the power house of the Union Traction Company, Philadelphia, which was destroyed by fire on March 3, we stated that Wetherill engines were used. There were also in the plant several 600-h. p. Westinghouse compound engines, two of which are shown in the view of the interior.

The Chase Construction Company, of Detroit, has been awarded the contract by the Lorain & Cleveland Railway Company, to put in the electrical work on the line now in course of construction between Cleveland and Lorain, O. E. P. Mann, formerly superintendent of construction for the Detroit Railway, will supervise the work.

The Paul O. Stensland Building, of Chicago, has increased its electric plant by the addition of a direct connected engine and dynamo, the engine being furnished by the Ball Engine Company, Erie, Pa., and the dynamo by the Jenney Electric Company, Indianapolis. This is the third direct connected outfit, furnished by the same companies, in this building.

The R. D. Nuttall Company reports a gratifying increase in orders, and for the past month has been compelled to work overtime to meet them. During all the months of depression the works ran full time, which, with the present report, would seem to indicate that goods of its manufacture, as well as the methods of doing business, meet with the approval of the street railway trade.

The Standard Air-Brake Company of New York reports an excellent business for March, and in addition to deliveries at home, secured several good orders from abroad, including one by cable for air-brakes for the Colonies. This company will make an extensive exhibit at the Brussels Exposition, which opens this month; the shipment made per the "Friesland" contained full working outfits for motor and trail cars, and will no doubt prove of great interest to street railway men in Europe. General Manager Wessels expects to attend the exposition in June.

The Edward P. Allis Company, of Milwaukee, Wis., has purchased the business formerly carried on by the Hercules Ice Machine Company and the Reliance Engineering Company of Aurora, Ill., and is prepared to supply repair parts on all ice and refrigerating plants erected by these companies, as well as to design new machines for refrigerating plants of from 1 to 500 tons capacity.

C. E. Loss & Co. of Chicago, have received the contract to build a street railway in Jalapa, Mexico. The road will connect the towns of Coatepec and Huatusco, near the port of Vera Cruz. A waterfall will generate power for the line, which will carry freight as well as passengers. The backers of the enterprise are J. B. Haggin of New York, and Gen. E. C. Frisbie of the City of Mexico.

The Sterling Supply & Manufacturing Company of New York has removed to the Lexington building, a fine new structure at 145 to 155 East 25th street, between Third and Fourth avenues. Here it occupies the entire third floor, the business having grown so fast that a division has become necessary of the special departments, of sand boxes, registers, brakes, fenders, and miscellaneous supplies for street railways.

The Cutter Electrical and Manufacturing Company has a printed check, with a small coupon receipt attached at one end, which saves correspondence and is very convenient. The check is made out to the creditor and signed by the president and treasurer of the Cutter company and on the detachable slip the amount paid is stated and to what account together with these words: "We send herewith our check in settlement of account as below. If found correct, the proper indorsement of the check is the only receipt required, The C. E. & Mfg. Co."

Graphite paints have received a very scientific recommendation from Professor Spennrath, Director of the Technical School at Aix-la-Chapelle. Experiments were conducted with various pigments and oils, covering a period of several years, and the results indicated that well made paints of graphite and linseed oil are the most enduring for iron work and surfaces exposed to the weather. The Joseph Dixon Crucible Company maintains that this report corroborates the claims that the silica graphite paints are superior to all others for this class of work.

The Sterling Supply & Manufacturing Company, New York, is now nicely established in its new plant, Nos. 141 to 155 East 25th street, and has a thoroughly representative establishment for the manufacture of general street railway supplies. President J. H. Carson reports business since the first of the year as very good indeed, having received a large amount of work from the Metropolitan Street Railway Company, the Nassau system of Brooklyn, the Richmond Traction Company and two or three systems in Canada. In addition to that there is considerable inquiry as well as some business from Europe. In general, the outlook is very satisfactory.

S. C. Strock, 50 Broadway, New York City, has received some large orders for poles, both for street railway and telegraph purposes. Recently, he secured the largest contract for manufactured yellow pine poles ever given. The American Telephone & Telegraph Company needed 8,000

taper poles from 25 to 55 ft. in length and this order was placed with Mr. Strock. The poles are to be of long leaf yellow pine, square cut and tapering from a large butt to one-half size at the top and creosoted throughout. Mr. Strock is well known in the electrical field, having been with the Thomson-Houston and General Electric Companies before going into the pole business.

The Ajax Metal Company, Philadelphia, is placing on the market its new patent interchangeable trolley harp, for which special claims are made as to simplicity, durability and cheapness; the new harps being sold for about 50 per cent less than the old style. They are made entirely of steel and malleable iron, and from practical experience by a trolley road in Baltimore, the average life is estimated at three years, without any cost for repairs. The company also has on the market its celebrated Ajax trolley wheels made of Ajax metal and which give exceptionally long life. A specialty is made of babbit metals for electric roads, attention being called to the uniformity of mixture and low price.

The Standard Air Brake Company of New York, through General Manager Wessels, has recently closed contracts with the Mason City & Clear Lake road, Iowa, for two special air-brake equipments for freight motor cars and seven trailers; also with the Norfolk & Ocean View road, Virginia, for equipment for freight and passenger car; also with the Richmond Railway & Electric Company, Richmond, Va., for supplying air brakes for its new cars. For the two first-named installations the "Standard" motor compressor type with automatic current controller will be used, and in the last-named the geared type compressor will be used, similar to those in service on the Akron, Bedford & Cleveland, and Washington, Alexandria & Mt. Vernon roads.

Greater attention is constantly being given to long distance transmissions and the results of high voltage on the equipment is watched with interest. The General Electric Company was gratified to receive the following letter from John J. Seymour, president of the San Joaquin, California, Electric Company: "It affords me great pleasure to write you regarding the successful operation of the Fresno long distance transmission plant installed for our company. The entire plant as furnished has been in actual, practical operation for a period of several months. The 35 miles transmission has given us no trouble whatever. Our load at present consists of 145 arc lights, 5,000 incandescent lights and 410 h. p. in motors, the latter including 180 h. p. for the Sperry Flour Mill and 75 h. p. for the city pumping plant. All of the machinery doing this work has worked with perfect success from the start."

The McGuire Manufacturing Company of this city is running all its departments full time and has on hand a very flattering number of orders for trucks and ratchet handles, and we understand has been awarded the contract for 200 trucks for the new Benton Harbor Electric Railway & Transit Company. It has finished delivery of 50 No. 26 pivotal motor trucks to McNaugle, Holcomb & Co., of this city, and is working on the following orders: Buffalo & Williamsville (N. Y.) Railway Company, People's Railway Company, Dayton, O.; Chicago City Railway Company, Frederick (Md.) & Middletown Railway Company, New Castle (Pa.) Electric Street Railway Company, Second

Avenue Railway Company, Pittsburg; Waterloo & Cedar Falls (Ia.) Rapid Transit Company. The company's foreign trade is steadily increasing and the outlook for business abroad this year is very encouraging.

The Weston Engine Company, Painted Post, N. Y., during the first week in April closed the following contracts: Masonic Temple Association of Detroit, for two 10x12 and one 6x8 Imperial engines, direct connected to Triumph generators; McCoy's Hotel, Chicago, 14x14, direct connected to Western Electric; Soldiers' and Sailors' Home, Xenia, O., one 12x12 and one 10x10, direct connected to Western Electric generator; Jacob Reed's Sons, Philadelphia, 14x14 and 10x10, direct connected to General Electric generators; Julian Scholl & Co., one 14x14, belted. Manager Hollister writes: "Business is improving with us every day, and we are securing all the work we can possibly handle with our present plant. We are running our plant from midnight Sunday night until midnight Saturday night, and working nearly 100 men in our machine department alone. We now contemplate the erection of another large building, probably 50x150 or 200 ft. to take care of our daily increasing business."

## RELIABLE SWITCHBOARD INSTRUMENTS.

The Keystone Electrical Instrument Company of Philadelphia has made some important alterations in the design of its switchboard instruments. This is the result of years of experience and careful study of the electrical principles and mechanical construction of voltmeters and ammeters.

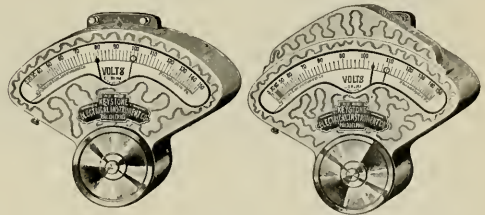


FIG. 1.

The purpose was to get an instrument that would indicate correctly both direct currents and the virtual potential and amperage of alternating currents. Fig. 1 represents the "K" type of voltmeter, with and without illuminated dial.

Fig. 2 shows a galvanometer ground detector, which is very valuable in indicating the extent and on which side of the line the ground is located. These instruments are all carefully calibrated, and the scales are so divided that readings can be quickly and readily taken. The bearings are jeweled. There is no effect from change of temperature or external magnetization.



FIG. 2.

The instrument is dead heat, and there is no heating within itself. The moving parts are inclosed in a dust proof, handsomely finished case.

## PRUSSIAN ELECTRIC STREET RAILWAY.

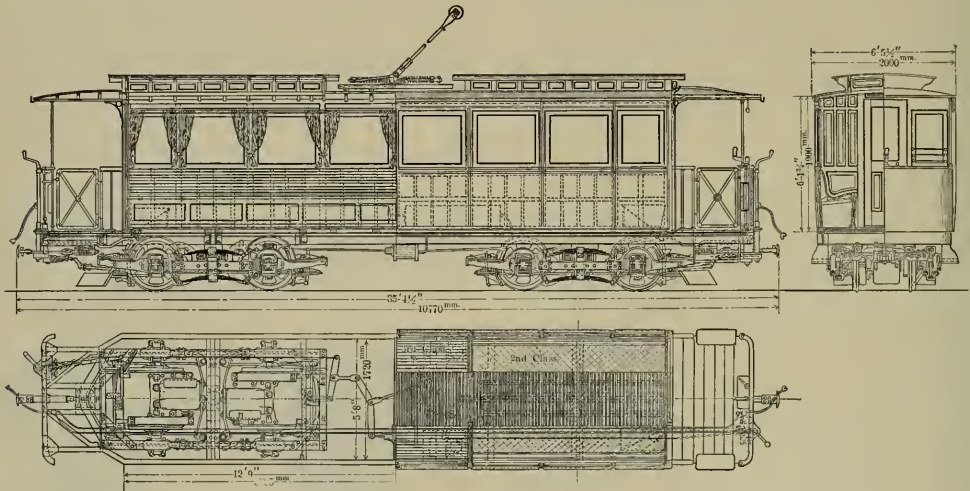
We show a cut of the type of motor car which will be used on the Oberschlesische Dampfstrassenbahn system in Prussia, a steam road which is soon to be equipped electrically. The Standard Air Brake Company, through its continental agent, the Bergische Stahl Industrie, secured the contract for equipping 30 motor cars and 50 trail cars with its brakes, this type being specified because of the satisfactory results obtained in Leipsig, where one road has some 300 of these equipments.

These 80 cars will make a very handsome appearance, and in addition to carrying first-class passengers it will be noticed that there are compartments for second and third class passengers as well.

The Oberschlesische is a narrow gage road, 30 in., and as

## WATER POWER AND HIGH VOLTAGE IN SOUTHERN CALIFORNIA.

A new enterprise has been started which promises much for the street railways in Los Angeles and cities in that vicinity. The Southern California Power Company has been incorporated with a capital stock of \$1,000,000 to develop the water power of the Santa Ana river. The water is to be taken from the junction of Bear creek with the river and carried in a stone ditch and pipe line along the hills to the head of the Bear valley canal where it will be delivered to the turbines at a head of 1,100 ft. It is estimated that 10,000 h. p. will be developed and this is to be transmitted 75 miles to Los Angeles at a voltage of 30,000. San Bernardino, Pomona, Ontario and Pasadena will also be supplied. Henry Fisher of Pittsburg and H. H. Sinclair, president of the Redlands



MOTOR CAR—OBERSCHLESISCHE STEAM STREET RAILWAY.

there is no room on the axles for the axle-driven compressors, gearless motor-driven compressors are used. The motor compressor furnished is 16 x 24 x 18 in.; its location is shown in the cut. The hand brake staff is retained. Each car is equipped with four motors, one to each axle, of a specially narrow design. The weight of a train loaded is about 50 tons. The steepest grade is about 5 per cent, and the average speed contemplated about 16 miles per hour.

General Manager Wessels, of the Standard Air-Brake Company, is pushing a vigorous campaign, not only at home but abroad, and doing a vast amount of good work in making the value of air brakes understood and appreciated.

W. T. Van Brunt, general manager of the St. Joseph (Mo.) Railway, Light, Heat & Power Company, states that the cars on his lines make a daily average of 126 miles.

The Columbia & Western Railway Company is considering the feasibility of using electricity on the lines in British Columbia. Water rights have been secured in the vicinity of the road which can be used for water power in generating electrical energy.

Electric Light & Power Company are the leading spirits in the undertaking. The surveys have been completed and the specifications asking for bids on work and material are now ready. It is proposed to deliver power to Los Angeles by January 1, 1898. As this voltage is to be the highest in practical operation, its use will be watched with much interest.

## ALLEGHENY TAXES GROSS RECEIPTS.

An ordinance was passed by the Allegheny council requiring all corporations to pay into the city treasury a certain per cent of the gross income and for street railways this was fixed at four per cent. This was protested by the railway companies as being exorbitant. After considerable negotiation, Dawson Callery, president of the Federal Street & Pleasant Valley Passenger Railway Company, and Geo. B. Hill, president of the Pittsburg, Allegheny & Manchester Traction Company made a compromise with a committee from the council. The agreement is that the companies will pay two per cent of the gross receipts, amounting to about \$35,000 annually and promptly meet the payments for street paving for which suits are now pending.



# Removal Notice.

We beg to announce that we have removed from the Betz Building, to 10 So. Tenth Street, Philadelphia, where we have established a large and commodious warehouse. We now have in stock a full line of material manufactured by the well-known Companies we represent, together with a Full and Complete Stock of Electric Railway Material and Supplies for immediate shipment. Our facilities for handling our rapidly increasing business are now strictly first-class.

MAYER & ENGLUND,  
10 South Tenth St. Philadelphia, Pa.

WRITE FOR LATEST PRICES. IMMEDIATE SHIPMENT FROM STOCK.

## Directory of Street Railway Associations.

### American Street Railway Association.

President, R. McCULLOCH, St. Louis, Mo.; First Vice-President, C. S. SEROANT, Boston, Mass.; Second Vice-President, D. B. DYER, Augusta, Ga.; Third Vice-President, C. F. HOLMES, Kansas City, Mo.; Secretary and Treasurer, T. C. PENNINGTON, Chicago, Ill. Executive Committee: H. M. LITTLE, New York; H. P. BRADFORD, Cincinnati, O.; C. H. SMITH, Troy, N. Y.; H. SCULLIN, St. Louis, Mo.; G. B. HIPPER, Des Moines, Ia.

Next meeting, Niagara, N. Y., third Tuesday in October, 1897.

### New York State Street Railway Association.

President, G. TEACY ROGERS, Binghamton; First Vice-President, W. CASYL ELY, Niagara Falls; Second Vice-President, JOHN N. BECKLEY, Rochester; Secretary and Treasurer, H. A. ROBINSON, New York. Executive Committee: H. H. VRESELAND, New York City; JOHN W. McNAMARA, Albany; H. M. WATSON, Buffalo, C. L. ROSSITER, Brooklyn.

Next meeting, Niagara Falls, first Tuesday, September, 1897.

### Ohio State Tramway Association.

President, A. A. ANDERSON, Youngstown; Vice-President, T. R. CATLIN, Canton. Secretary and Treasurer, J. B. HANNA, Cleveland; Chairman Executive Committee, W. F. KELLY, Columbus.

Next meeting, Columbus, June 15, 1897.

### Pennsylvania State Street Railway Association.

President, JOHN LLOYD, Altoona; First Vice-President, ALBERT JOHNSON, Allentown; Second Vice-President, ROBT. E. WRIGHT, Allentown; Secretary, S. P. LEIGHT, Lebanon; Treasurer, W. H. JANUS, York. Executive Committee, JOHN LLOYD, B. F. MYERS, S. P. LEIGHT, JOHN A. HIGG and E. C. FELTON.

Next meeting, Allentown, first Wednesday in September, 1897.

### Michigan Street Railway Association.

President, W. L. JENES, Port Huron; Vice-President, W. WORTH BEAN, St. Joseph; Secretary and Treasurer, B. S. HANBETT, Jr., Grand Rapids; Executive Committee, OFFICERS OF THE ASSOCIATION and CHAR. M. SWIFT, Detroit, and E. E. DOWNS, Kalamazoo.

### Massachusetts Street Railway Association.

President, PRENTISS CUMMINGS, Boston; First Vice-President, P. F. SULLIVAN, Lowell; Second Vice-President, JOHN R. GRABAM, Quincy; Secretary, CHAR. S. CLARE, Boston; Treasurer, W. F. POPE, Boston. Executive Committee: E. P. SHAW, Newburyport; E. C. FOSTER, Lynn; CHAR. B. PRATT, Worcester; G. H. CAMPBELL, Lawrence, and S. M. THOMAS, Taunton. Auditing Committee, J. N. AKARMAN, Worcester; C. S. SEROANT, Boston, and ROBERT S. GOFF, Fall River.

Meetings are held every month.

### Connecticut Street Railway Association.

President, H. HOLTON WOOD, Derby; Vice-President, HENRY S. PARMELEE, New Haven; Secretary, E. E. BRADF, New Britain; Treasurer, E. S. GOODRICH, New Britain. Executive Committee, A. L. YOUNG, Waterbury; E. I. RAEL KILBY and A. W. DODGE.

### Texas Street Railway Association.

President, CARL F. DRAKE, Abstin; Secretary and Treasurer, C. L. WAREFIELD, Dallas. Executive Committee: The OFFICERS and GEO. B. HENDRICKS, Fort Worth, and A. H. HAYWARD, Houston.

Next meeting, Austin, third Wednesday in March, 1897.

### The Maine Street Railway Association.

President, W. R. WOOD, Portland; Secretary and Treasurer, E. A. NEWMAN, Portland. Executive Committee, W. B. WOOD, Portland; H. TWITCHELL, Bath; A. F. GERRARD, Waterville; J. HYNES, Augusta; G. E. MACOMBER, Hockland; E. H. BANKS, Biddeford; E. K. DAY, —; F. N. LAUGHTON, Bangor; F. W. DANA, Lewiston.

Next meeting, February, 1897.

### The California Street Railway Association.

President, CHAR. F. CROCKER, San Francisco; Vice-President, S. B. McLENNAN, San Francisco; Secretary and Treasurer, J. E. MORRIS, Oakland. Executive Committee, E. P. VININO, San Francisco; F. W. WOOD, Los Angeles; L. WREKLER, Alameda.

Next meeting, third Tuesday in April, 1897.

# 20th CENTURY FEEDER WIRE.

WE MANUFACTURE THE BEST GRADE OF WEATHERPROOF WIRES, RUBBER WIRES, LEAD ENCASED CABLES AND ALL OTHER KINDS OF INSULATED WIRES.

NEW YORK STORE, 136 LIBERTY ST.  
D. G. SCOTT, MANAGER  
CHICAGO STORE, 19 S. CANAL ST.  
TESCHEN-MACOMBER-WHYTE CO., AGTS.

**CREFELD ELECTRICAL WORKS,**

49 FEDERAL ST., BOSTON.

BIBBER, WHITE & CO., GEN. AGTS.  
FACTORY: SAYLESVILLE, R. I.



invention is bound to fill a niche in mechanics and the most conservative manufacturer, capitalist or expert should see the model. Address

D. J. SINCLAIR, Caledonia, Livingstone Co., N. Y., U. S. A.

## DRAUGHT PERFECT.

New because radically unlike any other. Great because the same drawhead allows a flexible, rigid, direct-slack, long-link and short-link coupling, and will couple automatically with all of them, it can therefore be used in nearly all kinds of lifting, holding and drawing, and specially adapted to the use of Trolley Cars, Traction Engines and Field Artillery. A full size working model with attachments will be on exhibition the third Wednesday of each month at No. 303 Ellicott Square, Buffalo, N. Y. American, Canadian, British, French and Belgian patents on royalty or outright. This

Patentee and sole owner of these patents.

## A RAILWAY MOTOR FOR HEAVY SERVICE.

The accompanying cut represents a G. E. 51 railway motor which has been specially designed for high speed suburban and elevated railway work. It has a capacity of 80 h. p., rated according to the standard basis of a rise of 75° C. above the temperature of the surrounding air after a run



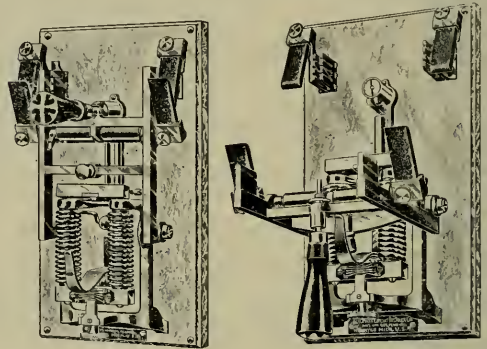
G. E. 51 RAILWAY MOTOR.

of one hour at rated load. A considerable range of speed can be attained by different gear reduction combinations. For high speed work a reduction from 1 to 1.74 can be used and two motors of this type will drive a train of 25 or 30 tons at speeds up to 45 or 50 miles an hour. For snow plows, freight locomotives and slow speed work this style of motor can be satisfactorily used with larger gear reductions. In general appearance the motor resembles the G. E. 1,000. The field frame consists of two steel castings parted, horizontally but extended back to envelop the car axle, and when closed makes the motor dust and water proof. A large opening is provided, allowing easy access to the motor for the adjustment of the brushes and the inspection of the interior. A hand hold is provided in the bottom of the frame for the removal of any refuse that may accumulate there. The axle bearings are of ample dimensions and lubricated from wool waste packed in the oil reservoir. The armature bearings are adjustable, set screws at the bottom being used to raise or lower the armature. The armature, commutator and brush holders are of the standard G. E. type.

## AUTOMATIC CIRCUIT BREAKERS.

It is now recognized that fuse wire does not furnish adequate protection against short circuits, overloads or lightning, and automatic magnetic circuit breakers are a necessity in any well designed station. The illustrations show the latest, improved circuit breakers, closed and open, made by the Automatic Circuit Breaker Company of Newaygo, Mich.

This instrument can be regulated over a considerable range of current and is guaranteed to operate within one per cent of the set capacity. When the current exceeds the pre-arranged amount a magnetic armature strikes a sharp blow,



releasing a catch. This permits a spring in the dash pot to act and by a hammer-like blow the break frame is struck and the circuit broken. The action is instantaneous and saves the machines and instruments from any serious effects of an excessive current in the circuit.

The Railway Material & Tool Exhibit Company has a new office in the Great Northern Building, Chicago, where those interested either in steam or electric railway appliances are always welcome. Material and equipments are on exhibition and catalogs are issued at intervals giving an account of the machinery and appliances. The rooms are in a convenient location, and visitors will find the manager ready at all time to show and explain the exhibits.



WINDSOR & KENFIELD PUBLISHING COMPANY,  
 OLD COLONY BUILDING, - - CHICAGO.  
 TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.

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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. MAY, 1897 NO. 5

CONNECTICUT has passed a law which compels suit, to be brought against street and steam railways, or notice of suit to be brought later, to be served on the company within four months of the date of accident or death. This is a good law, and while working no hardship on any legitimate claimant, will go a long ways toward reducing the number of fake-injury suits which are the bane of transportation companies. A company obviously stands very little show to secure witnesses who might have been on a car one or two years previous, for of course in the fake cases the conductor has put in no report. It often occurs that the conductor who was in charge of a car on a certain trip two years ago has left the company, and no one knows where he has gone. Four months will be quite bad enough in these fraud cases, but a great improvement on the several years as still in force in many states.

SECRETARY PENINGTON, of the American Street Railway Association, has already issued the official notice of the October meeting at Niagara Falls. Assignments have been made for the eight papers which will be presented, and are in the hands of very strong committees. The subjects are all good, and include such 20th century questions as municipal ownership, gas engines in power

houses, and long distance transmission. In this connection we cannot refrain from reminding our readers that companies may join the association at any time during the year, and that the membership ought to be double what it is. The arrangements for exhibits promise to be good, although at this writing the local committee at Niagara which has the space in hand, has issued no plat of ground floor, or made assignments of space to applications, some of which have been on file now nearly seven months. The size and arrangement of the building were determined on long since, and if the committee at Niagara appreciated the anxiety of exhibitors to know at the earliest date possible, the shape and location of their space, it certainly would give this matter the attention it deserves.

ON another page will be found a notice that the Cincinnati Street Railway will in the future refrain from insuring its property against fire. This was brought about by the short sighted action of the insurance companies in raising the rates, and also by the insertion of arbitrary and unjust conditions in the policies. In all probability the example of the Cincinnati company in effectively resisting these demands will be followed by the street railways in other cities where the same or similar conditions exist. Unfortunately this course is only permissible with those companies which are large enough to carry their own risks, but for the most part it is only in the large cities that these important differences between the underwriters and the insurers arise. Not long since, however, the REVIEW published an account of a small road which had been obliged to cease operations because of the arbitrary rulings of the local underwriters.

THE X-rays promise to be of great and unequalled service in a certain class of damage claims. We refer to fraud claims, fake accidents and the like, of which in many cases the claim department is certain, but heretofore found it a very difficult matter to prove. Such a case was recently worked on the City & Suburban, of Baltimore, but the company's adjuster cleverly exposed the swindle by causing the claimant to sit for an X-rays photograph of his alleged broken arm. The startling result caused a drop in estimated damages from \$2,000 to \$25 on the part of the attorney for the plaintiff, while the injured (?) party hastily left town to avoid arrest, taking his arm with him. The suggestion of possibilities to claim departments in employing this method to determine the actual facts in such cases is highly promising of good results, and will gladly be accepted by companies. An account of this interesting case is given in detail in this issue.

Too many companies, like individuals, begin at the wrong end when planning to reduce insurance charges by the employment of precautionary measures. Some go ahead and erect a building with little or no regard as to the arrangement and location of oil rooms, heating apparatus, etc. After the building is up they consider



the installation of sprinklers, extinguishers and similar devices. In many cases the advantage gained by such means, and for which allowance is made by insurance companies, does not begin to equal what would have been allowed on different and no more expensive construction without the extra expense of fire apparatus. We have in mind a case to which our attention was called a few days ago of a manufacturing plant. The owner spent several months and some hundreds of dollars dictating the layout of his new works before turning his plans over to the architects. But he so carefully studied the matter, and finally arranged his danger points in such a way, and by erecting mill construction, he secures a rate of about \$500 per annum on \$250,000, where ordinarily, and in his old works the rate was \$2,500 per annum. The amount of money saved in a long term of years is readily seen to be quite important. While our power house construction, as now practiced, is practically fire proof, and does not admit of marked improvements, there is abundant opportunity for study in car house building, and in the erection of new depots managers will do well to give this subject the most careful and thorough investigation.

THE collision of a trolley and steam train at Tampa, Florida, in which one passenger was killed, and two others seriously injured, should be a lesson to the managers of roads operating without conductors. The car was left running at a slow speed while the motorman went to the rear to collect fares. An altercation occurred over change, and while two passengers and the motorman fought it out, the car reached a steam road crossing just as a train approached, and a terrible accident resulted. Strangely enough the man killed, and the one most seriously hurt were the ones who had the motorman down on the floor. It is practical to operate some lines with only one man in charge, but cars should never be allowed to move while that man is away from his controller.

THE most serious accident of the month and the worst in some time, occurred at Portland, Oregon. A car with thirty-four passengers was descending a grade when the brake failed to work. When some distance from the accident the motorman jumped. The conductor did his best to stop the car which was now running wild but failed, and at the foot of the grade at the entrance to a sharp curve the car jumped the track, and passing on went through a bridge into a slough, resulting in the death of three and severe injury of nearly all the other passengers. The cowardly action of the motorman cannot be too deeply censured, for no man should accept a position where the lives of others are entrusted to his keeping, who is not willing to stand by his post to the last. His behavior at the critical moment of danger is in marked contrast to others who in similar positions have remained on the front platform to the last, several even at the loss of their lives, thus proving themselves as true heroes as ever fell in battle.

WE direct the special attention of intending exhibitors at the next convention of the American Street Railway Association to that portion of the secretary's announcement which refers to the appointment of a representative to superintend installation. It was through the efforts of the REVIEW exclusively that the opinions of a large number of leading exhibitors found expression in the article published last December. The executive committee has most courteously recognized those requests, and promised to recognize, subject to the committee, whoever the exhibitors may unite upon. Now let the exhibitors make their plans for a superintendent of exhibits, bureau of information, or whatever he may be termed. Of course, the principal work of installation will, as heretofore, be conducted by the exhibitors themselves, but it will be a great help and a big saving of expense for such an officer to get on the ground early, secure sufficient and competent teaming and carpenter forces, etc., and at prices which are right. The functions of such an official were fully explained in the December article referred to above. We hope to see the matter taken up at once.

#### THE HUMPHREY BILL.

The now celebrated Humphrey bill will probably be called up for its second reading in the Illinois legislature about the time this reaches our readers. No bill in years has aroused so much hostile expression in Chicago as this, and much of the work of the opposition would put to shame that of ward heelers of the most unblushing type. In the name of "reform," business men are standing shoulder to shoulder with boodle aldermen of the worst class, and using every effort to assist these parasites to gain their desired ends. The daily press has been the willing tool of these same politicians, and has fairly exhausted itself in printing columns of lies. Two illustrations will suffice; the dailies came out simultaneously with the startling discovery that the bill as framed called for a payment of percentages on "gross earnings" which they thereupon proceeded to prove was what would be left after paying all operating expenses, interest, dividends, taxes, insurance, and anything else the company might incline to do, and that the percentage would be figured on what was left; admittedly not very much. We need not comment on this. Another scheme was a great furore over an alleged case of attempted bribery, to a man said to resemble a senator and who was occupying his seat while the senator was absent on committee work. The canard was a fake of the thinnest kind, but was given columns and deceived many people. Some aldermen went so far as to print slanderous posters calling certain legislators thieves, and posted these on bill boards in the district from which the member assailed was elected. One man is already defending a libel suit for \$50,000 as a result. If one-half the anarchy now preached from public platforms and pulpits in this city by people who ought to know better, had been talked by workmen, the public would have asked for police interference and had the meetings stopped. When a prominent politician on the recent "reform" ticket addresses a meeting and urges his hearers to use a rope and the first handy lamp post because men with good reputations and understanding the bill have seen fit to favor it, little remains

to be said as to the position occupied by the frantic and misguided opposition. The bill is a good one and ought to pass, even if the value of a seat in the Chicago city council is greatly depreciated in consequence.

Ex-Governor Altgeld has frequently been accused of strong anarchistic tendencies, but even he, from a public platform in this city, at one of the "reform" meetings, gave expression to the following strong language:—

I tried to get all the light I could two years ago; tried to see if there was something I could suggest that could solve some of these great problems. The corporations, on the one hand, said: "Why are we literally eaten up at home. We have to defend ourselves every week in the year against almost every man that holds office. We want to look somewhere else for protection. We do not wish to be bled 365 1/4 days in the year. We would like at least to have rest on Sunday." And they are right. They are right.

These great interests, these great corporations, are entitled to protection on the one hand. I had almost reached a point two years ago where I would have winked at monopoly, provided I could have felt that there is a strong, powerful agency of the law standing between the public on the one hand and monopoly on the other.

The railroad people claim we have no adequate law for organizing elevated railroads; that we have no adequate protection to offer to street railway companies against the constant intermeddling of the local city council. They say it affects the value of their security; that they cannot tell from one month to another where the next attack is coming from, and they claim that they should have reasonable protection.

Let us try to follow the line of justice. Let us hear in mind that these great interests have rights. Let us also recognize the fact that they have been seriously and frequently abused, that they have been bled at almost every pore, and not for the benefit of the public either

## CAR WHEELS FOR BALLAST.

Mention has been made in the REVIEW of the dinkey motor cars or locomotives that are used on the North and West Chicago Street Railroads for hauling trailers on electric lines which branch off from cable lines. They are simply short motor car trucks, equipped with two G. E. Soo motors, and surmounted with a motorman's cab. The past winter these dinkeys have had their traction increased by the weight of six old car wheels, making in all about a ton of weight added. These wheels are put in diagonally opposite corners of the cab. As the motorman expressed it, "It makes her stick."

## TROLLEY IN CALCUTTA.

J. W. Maples, managing agent of the Calcutta Tramways Company, Limited, advises us that it is contemplating a change to electricity from the steam and horse power now in use. The general plans have been decided upon, but the details have not all been worked out as yet. The track to be changed covers 20 miles of streets, all double track except one section. The overhead trolley system will be used, the generating plant to be operated by steam. The cars at present running are 150 two-horse cars, seating 40 passengers, and 36 one-horse cars, seating 25 passengers.

The present law of Iowa prohibits street railways from having a bonded debt of more than \$16,000 per mile of track. President Polk, of the Des Moines City Railway, appealed to the senate corporation committee to make such alterations in the law that the street railway companies may bond their roads for \$25,000 a mile on paved streets and \$15,000 a mile on unpaved streets.

## COST PER CAR-MILE

vs.

## COST PER PASSENGER.

### A Symposium.

That there is abundant work for the Accountants' Association is evidenced by the diversity of opinions as shown in the following symposium. The replies are in answer to the inquiry, "Which affords the better comparison, the cost per car-mile, or the cost per passenger?" As will be apparent from reading the opinions offered, the widely varying local conditions have very much to do with determining the verdict, whether or not any given figures in either case are high or low for that road, even though in comparison with other roads a wide difference is shown.

### P. V. Burington, Secretary and Auditor, Columbus, (O.) Street Railway.

The question of computing cost of operating street railways on the basis of cost per car-mile, or cost per passenger, is in many respects a perplexing one. Allow me to present the following argument, in the hope that it may be of service in discussing this matter:

We will start out by assuming that mileage and operating expenses are the two more stationary items of account, while the number of passengers carried varies according to conditions of weather, trade or special attractions, and under these conditions may either increase or diminish to a marked degree, at the same time no more or no less cars were run or mileage made, and practically no additional expense or reduction of expense incurred. If more than the usual number of passengers were carried, we have an increased earning per car-mile; if a less than usual number, then a corresponding decrease per car-mile. In one sense this is a matter of profit and loss while the matter of expense is largely fixed by car schedules, and general operation maintained, whether few or many passengers are carried.

If we compute the cost of carrying by the passenger, instead of the car-mile, we do so with varying conditions of travel as a basis and obtain a result corresponding with these conditions; in other words, if a large number of passengers are carried, we show small cost per passenger, and if a small number, a large cost. As an instance; the month of December in a preceding year may have been a month of storms of sleet and snow and severe cold, by which business was seriously obstructed and persons used the cars only as necessity required, yet not so severe as to prevent about the usual schedule mileage. In this case we would have the usual mileage over which to distribute the increased operating expense, if any, amounting we will say to only a fraction of a cent per car-mile; whereas, by the passenger method we would have the probable increased operating expense to distribute over a decreased number of passengers, and, instead of showing only a fraction increase as in



P. V. BURINGTON.

the case of the car-mile, the difference would be many fractions.

Now, assuming that the same month of the year following to be on an open one, with large regular and holiday travel, and with no special increase in operating expense, what possible value could be placed on the passenger comparison thus obtained? Let me give assumed months and figures to illustrate:

PER CAR-MILE.		
	December 1896.	December 1895.
Miles run.....	371,400	371,400
Earnings.....	\$63,000	\$49,500
Earnings per car-mile.....	.170	.133
Operating expenses.....	\$33,000	\$35,200
Operating expenses per car-mile.....	.088	.095
Net.....	.082	.038
Decreased expense 7.4 per cent per car-mile.		
PER PASSENGER.		
	December 1896.	December 1895.
Passengers carried.....	1,400,000	1,100,000
Earnings.....	\$63,000	\$49,500
Earnings per passenger.....	.045	.045
Operating expenses.....	\$33,000	\$35,200
Operating expenses per passenger.....	.024	.032
Net.....	.021	.013
Decreased expense 25.0 per cent per passenger.		

The per cents in these two cases tell the story. In the one case the earning per passenger does not vary, the cost only being affected; while in the other case both earning and cost per car-mile are changed, relatively, as earnings and expenses are high or low.

When it is considered that the investor is constantly watching the more important question of expenses as a matter that can be more or less adjusted to meet times of varying earnings, and that he as well as we know that the number of passengers carried cannot be adjusted to our pleasure, is it not better for us and fairer to him that our comparative showings be based on the method less seriously affected by fluctuations? The number of people carried we cannot materially change, but the true operating expense we can keep from dancing about like water on a hot griddle.

#### J. M. Smith, Comptroller, the Toronto Railway Company.

In reply to your question I will say that in my opinion the best expression for comparison would be "cost of operating per mile run," for while "cost per passenger carried" would enable a comparison being made between companies (everything else being equal), it would not answer where a company is making comparisons by routes, which I think every company should do, especially so far as earnings are concerned, that they may always be in a position to tell whether or not there are more cars running on any route that the earnings of such route would warrant.

To illustrate what I mean take two routes, No. 1 route has 15 cars, while No. 2 route has 16, both earning \$500 per day, the average per passenger being the same in both cases, but owing to the difference in the mileage No. 1 route earns 25 cents per mile run, while No. 2 earns only 18 cents. This shows at once that No. 1 could stand another car better than No. 2. The same rule applies to the maintenance of tracks, pavements, overhead wires, poles, etc. No. 1 route being shorter than No. 2, will of course cost less to keep up, while if figured by the passengers carried, the routes would

appear to cost the same to maintain. I think, therefore, as it is necessary to make certain comparisons on the mileage basis, that the best term to use is "cost of operating expenses per mile run."

#### F. R. Greene, Secretary, Chicago City Railway.

Replying to your question I will say that I am of the opinion that the "cost per car-mile run" is the best expression for comparison.

One road might carry twice as many passengers as another, both having nearly the same mileage, yet the latter road might not be able to reduce its mileage, owing to certain conditions, and the comparison in this case on the basis of "cost per passenger carried" would be unfair. However, it is difficult to make a fair comparison between a small road and one doing a large business on either of the above expressions, as allowances must be made in either case for different conditions, such as long hauls vs. short hauls; heavy traffic vs. light traffic, etc.

I think the better plan would be to compare the "cost per car-mile run," together with the "receipts per car-mile."

#### F. S. Barton, Secretary, Akron, Bedford & Cleveland Railroad.

In reply to yours as to expression concerning the advisability of computing cost on car-mile run, or passenger carried, I would advise you that our people are interested in a good many lines, and they are persistent searchers after valuable statistics, and in every instance the records are kept, figuring cost on car-mile run.

Many arguments in favor of this course could be produced, but there are none more convincing than that while, on two successive days, the actual expense of operating a line may be exactly the same per car-mile, yet the weather may so affect the travel that it will cost two or three times as much per passenger. Take Saturdays and Sundays, for instance, on our suburban lines, the numbers of passengers carried are very greatly in excess of the other days in the week, and yet the expense of operation is practically the same. In other words, a cost figured on the passenger basis would be extremely variable and affected by a number of outside influences, such as weather, temperature, holidays, special parties, etc.

#### H. M. Sloan, General Manager, Calumet Electric Railway, Chicago.

You ask my opinion as to what gives the best results for comparison: "Cost per car-mile," or "Cost per passenger carried."

I will state that I believe entirely in figuring results per car-mile run. I think this way certainly gives fairer results for comparison than any other. Figuring the cost per passenger enters too largely into the question of receipts. It is true it would fairly tell whether or not the road was making money, but it would not give the results of operating so clearly as the cost per car-mile. It is a well understood fact with all railway managers that the larger roads doing a heavy business do not operate so cheaply as the smaller roads. I think this is taken into consideration when making comparisons. Take as an example any one of the large roads of Chicago. Their cost of carrying a passenger would be ridiculously low as compared to a small road, which would show a ridiculously high figure, and from neither one could you tell whether either road was operated cheaply or not.



In conclusion, I will say, that in figuring the cost per passenger there enter into the subject two separate and distinct elements which are impossible to separate except by reference to other figures, while in figuring cost per car-mile there is but one element that enters into the construction of the result.

**Both Figures Are Necessary. (Name withheld by request)**

My opinion is that both "operating cost per mile run," and "cost per passenger carried," are required in order to make an intelligent comparison between companies; and that in addition the capital per mile or per passenger carried, or both, are also required; and as to whether you should use either solely would depend upon what you wanted to prove.

To illustrate: One company may average to carry 10 persons per car-mile run and another, 7 persons per car-mile run, both operating under precisely the same expenses, yet in the case of the latter company, the cost per passenger carried would be 43 per cent more than in the case of the former company.

In the case of the former company it may be required to pay a percentage of its gross receipts to the municipality and the municipality of the latter company may say that it, too, should and could pay because its operating expenses per mile run were exactly the same as in the case of the former company.

Or the positions of the companies may be reversed, the latter company paying a percentage of its receipts to the municipality, yet it would not follow that the former could do the same. The latter company may have unpaved tracks, and may not have been called to construct bridges and bear other onerous burdens and as a result could earn as great or greater percentage on the capital invested, notwithstanding that the cost per passenger was more.

I should use all of the above elements in making comparison, and should go further with reference to rates of wages, rates of speed, cost of fuel, winter expenses, etc.

**J. C. Hutchins, Vice-President Detroit Citizens Street Railway.**

I would say, that the "operating cost per passenger carried" affords a better and fairer comparison than the "operating cost per mile run." The "operating cost per mile run," may mean nothing, for the reason that such cost may at any time be reduced by useless mileage; while the cost per revenue passenger carried, surely indicates the real cost of operating.

**Wm. R. Avery, Auditor, Cincinnati Street Railway.**

No two companies operate under the same conditions. The different divisions of the same company differ in results. The bad goes with the good. The management, familiar with these variations, may need mileage figures which only an expert can safely use. Made use of by experts in the employ of the company, they are useful in determining value of cars, motors, wheels, power plants, generators, etc., for private information of manager or engineer. To the stockholder, general public, or even officers of other companies, they are confusing and misleading.

Many "expert accountants" have used mileage comparisons as the devil fish slings ink—to obscure and cover actual conditions.

Steam railroads have a fare per passenger per mile; street railways have a fixed fare—say five cents—for any distance, be it one mile or 15 miles. What the investor or officer wants to know is, "What have you done with this nickel and how much of it have you saved to pay dividends?"

Determine also what a car-day shall be in your calculations. We say 18 hours. Have statements show earnings and expenses per car-day (or car-hour), also per cash passenger, and let them know how many transfers you had to carry, increasing cost of carrying passengers, or other information, explaining increase or decrease, leaving out all misleading and confusing mileage calculations. The interested parties will then understand your figures and quickly determine whether their investment is properly and profitably managed.

The Cincinnati Street Railway Company is owned by its stockholders, having practically extinguished its bonded debt. It must make a certain net earning per passenger to pay its dividends. As before stated they want to know what became of the nickel; the quarterly dividend checks sent our stockholders represent the net earnings.

Our officers approve my statement that the income being per passenger paying fare, the cost of carrying should be given on the same basis.

**E. D. Hibbs, Auditor, Consolidated Traction Company, New Jersey.**

You ask my views on the question which is the better basis for comparison, the operating cost per mile runs or, "the operating cost per passenger carried." I beg to say that my opinion is probably a biased one, from the fact that I have used the "per car-mile" basis for a large proportion of the comparisons furnished from my office, and in ninety-nine cases out of a hundred, special requests for information will specify the "per car-mile" as a basis. The majority of electric roads in operation to-day are in a measure regulated by provisions in their franchises which compel them to give a more or less short headway, and these limitations are made regardless of the number of passengers to be handled. These provisions compel the running of a certain number of car-miles between certain hours and as it is compulsory upon the company to perform the service, the question naturally arises, "How can the requirements be met most economically?" The pay roll expense is virtually the same whether you haul two passengers or whether you haul 20, the only difference being in the time consumed in stopping and starting, to load or unload the smaller or larger number of passengers. Assuming two different lines of cars running on the same headway, say 10 minutes, under the same conditions so far as equipment and platform expenses are concerned, covering a distance of six miles for the round trip, one of these lines handling 20 passengers, the other 60 passengers, the cost of operating these two lines would be to all purposes the same, say 72 cents, the cost of operating per car-mile would be the same for each line, about twelve cents; the cost of operating per passenger carried, however, would be vastly different, in one case 3.6 cents, in the other 1.2 cents.

The different ways of handling transferred passengers by the different lines also makes a "per passenger carried" basis a very unsatisfactory one. In some cases the transferred passengers are registered; in others they are not registered and only original passengers from whom cash fares or tickets are received are registered, and as the register is the source from which the number of passengers car-

ried is arrived at, two lines actually carrying the same number of passengers would show a very widely different result.

One other phase of this subject presents itself to me. One line equipped with 25-ft. cars, capable of seating 36 passengers is compared with a line equipped with 18-ft. cars with a seating capacity of 22. The "per passenger carried" cost of operating the smaller cars would be very much greater than the cost of operating the larger cars, while as a matter of fact the cost of operating per car-mile run is very nearly the same; the cost of maintaining the car and track and the power consumed would be slightly more in the case of the larger as compared with the smaller equipment.

These are some of the reasons why I am inclined to favor the "per car-mile" basis.

(Continued next month.)

## RIGHTS OF STREET RAILWAYS IN WISCONSIN.

For some time past a dispute has been pending between the Chicago & Northwestern Railroad and the Milwaukee, Racine & Kenosha Electric Railway in regard to the latter crossing the tracks of the former in South Milwaukee, and the matter finally reached the Supreme Court. The decision handed down by Cassody, C. J., discusses the question of whether the construction of an electric line in a street constitutes a new burden on the abutting property, and it is held that while a mere street railway for the transportation of passengers only does not necessarily impose a new burden, a railway carrying freight does, and must make compensation to or obtain the consents of abutting owners. The mere difference in motive power is not sufficient to relieve the street road from the obligations imposed upon a steam road under similar circumstances.

In part the court says:

"A mere street railway for carrying passengers only as the statute prescribed under which the Harbart case was decided would greatly relieve the streets of a city or village from travel and hence would to that extent facilitate travel on foot or by carriage. Such street railways, under the decision in that case do not necessarily constitute an additional servitude or burden for which abutting property owners are entitled to compensation. The same would to some extent be true as to the suburbs of the cities and villages. But the principle has no application to the country towns between Kenosha and Milwaukee. The several amendments to the revised statutes purposely omitted the word 'only' and added 'freight,' and also added the words 'other power' as well as horse power. In other words, the manifest purpose of the amendments was to authorize the construction and operation of commercial railways upon such streets and highways without consent of or compensation to abutting owners.

"The charter of the defendant company contemplates the construction and operation of such commercial railways between Milwaukee and Kenosha, which, of course, on the same theory, might be extended to Chicago. That such commercial railway upon public streets and highways, engaged in the carriage and transportation of merchandise, personal baggage, mail and express matter, as well as passengers, would tend to obstruct and interfere with the ordinary uses of a street or highway would seem to be quite

manifest. Such use of streets and highways constitute, in our judgment, an additional servitude or burden on the lands of abutting owners, for which they are entitled to compensation."

This will not affect the Milwaukee, Racine & Kenosha line as it has the consents of all the abutting owners except the Chicago & Northwestern and the dispute with this company has been settled amicably and a subway will be built at South Milwaukee at a cost of \$25,000. Probably the most far-reaching effect of the decision will be that of the holding that a street railway may do a freight and express business upon obtaining the consents of the abutting owners.

This, together with the act of the Wisconsin legislature, approved April 2, puts the two classes of roads on the same footing. The act is as follows:

Section 1. Any street railroad corporation, or any electric railroad corporation may, by purchase, grant or condemnation, acquire such real estate and other property as may be necessary for the construction, maintenance and operation of its railroad and of the stations, depot grounds and other accommodation reasonably necessary to accomplish the objects of its incorporation; to hold and use the same. Nothing in this act shall be construed as conferring on such street or electric railway company the right to lay or construct its track or tracks over or across the track or tracks of any steam railway company other than such as may now exist at law.

Section 2. All the provisions of the revised statutes and of the act or acts amendatory thereof relative to acquiring land by right of eminent domain by railroads, shall apply to all street railroad companies and electric railroad companies incorporated under the laws of this state; provided, that the provisions of this act shall not apply to any streets, alleys, viaducts, parks or boulevards in any incorporated city in this state.

Section 3. This act shall be in force from and after its passage and publication.

## GET READY FOR THE OCTOBER CONVENTION.

Secretary T. C. Penington, Chicago, of the American Street Railway Association, has started in early and has already issued official circulars outlining the plans for the October meeting at Niagara Falls. He has also sent out to supply men printed application blanks for space and as will be noted in the circular, the association proposes to give the exhibitors all possible assistance.

The opinions of exhibitors published exclusively in the REVIEW for December, 1896, are recognized by the association and for the first time a chance is offered the exhibitors to help themselves. The executive committee will allow the exhibitors to select some one to represent them, and if so chosen he will be so recognized by the association. This is exactly what has been asked for and now the executive committee has kindly granted the request, exhibitors should lose no time in accepting. Just how the selection is to be made is the question.

### CIRCULAR TO EXHIBITORS.

The American Street Railway Association will hold its Sixteenth Annual Convention at Niagara Falls on Tuesday, October 19th, 1897, continuing in session four days.

The exhibits and displays of the supplymen are so important a part of our conventions that the Executive Committee, in making arrangements for the meeting, has been as mindful of our wide-awake allies, and as zealous in providing for their convenience and accommodation as for any other feature of the gathering.

We have held an Executive Session at Niagara Falls and give you in this circular the substance of the arrangements we have made in your interests.

A commodious exhibit hall, 120 x 151 feet, is now being erected in the centre of the city and very near all the hotels. The steam railroad tracks are now within two hundred feet of the building, and we secured an agreement to have these tracks extended directly to the building, thus saving to the exhibitors all charges for cartage. A side-track will be laid in front of the hall for cars, sweepers, etc.

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 entire hall is to be lighted and heated during the entire presence of the exhibits. Written agreements have been secured that all the hotels will be kept open and that their rates will not exceed the following:

Hotel.	Rooms.	Rates per day.
International Hotel.....	350 to 450 people.....	\$3.50 to \$4.50
Cataract House.....	350 to 450 ".....	3.50 to 4.50
Imperial.....	110 rooms.....	2.50 to 4.00
Tower Hotel.....	35 ".....	2.00 to 3.00
Columbia.....	50 ".....	2.00 to 2.50
Niagara Falls House.....	25 ".....	2.00
Salt's New Hotel.....	30 ".....	2.00
Temperance House.....	50 ".....	1.50 to 2.00
Atlantique.....	22 ".....	2.00
Kallenbod.....	30 ".....	3.00
Prospect House.....	40 ".....	3.00 to 4.50

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 ten cents per square foot, and ruled that no space of less than one hundred 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 Mr. T. C. Penington, Secretary and treasurer of the American Street Railway Association, 2020 State street, Chicago, Illinois, on or before October 1st, 1897. Application for space should be made to Mr. H. W. Beardsley, Chairman Committee on Exhibits, Niagara Falls, New York. We hope to have you with us with an extensive display.

Space must be applied for by September 1st. 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, October 18th, which is the evening prior to the opening of the Convention. Possession of the hall can be had on Monday, October 11th, thus giving ample time for preparation. Watchmen will be in charge of the premises so that exhibits will be safe.

If the supply-men so desire, and will designate one of their own number who will be willing to go to Niagara Falls at some short time previous to the meeting, and whose necessary expenses they will defray, the Executive Committee will invest him with the requisite authority to supervise the reception and placing of displays. He can arrange with local carpenters, lumbermen, etc., to the effect that there may be no unfair charges for services or material that may be necessary in arranging exhibits.

The Executive Committee found the Niagara Falls and Buffalo brethren so enthusiastic as to the coming meeting, and so hospitable and seductive in their greetings that success is assured, the location being central and accessible, and the natural attractions wonderful beyond description, and the inquiries and information already received being so encouraging, an unusually large attendance seems guaranteed.

The annual dinner will be held at the International Hotel, Thursday, October 21st, at eight o'clock p. m. Tickets will be sold at the actual cost to the Association.

The railroads will sell tickets on the certificate plan. Be sure and leave your certificate with the clerk the first day of the Convention; it will be signed, vised and ready for you on Thursday, October 21st, 1897.

Please make your arrangements and applications as above noted as promptly as possible.

With kindly greetings and wishes for the health and prosperity of all, and with confidence in meeting you in October,

We are yours to command,

T. C. PENINGTON, SECRETARY-TREASURER. ROBERT McCULLOCH, PRESIDENT.

The business sessions of the association will all be held in the convention hall, located in the second story of the exhibit building. Papers on the following subjects will be read:

- "Municipal Ownership of Street Railways."
- "Modern Electric Railways; their Construction, Operation and Disadvantages."
- "Application of Electricity to Railroads now Operated by Steam Power."
- "The Best Method of Settling Damage Cases, and the Prevention of Accidents by the Use of Fenders and Otherwise."
- "Producer Gas for Use in Street Railway Power Houses and Gas Engines."
- "Storage Batteries for Street Railways."
- "Discipline of Employees."
- "Long Distance Transmission and the Use of Multiphase Current for Ordinary Street Railways."

The meeting will last from October 19 to 22 inclusive.

### LONDON TUNNEL RAILWAYS.

A committee of the House of Commons has been considering plans for some system of tunnel railways to relieve the congested traffic in a number of the principal streets of London. Of the schemes suggested one has met with approval and that is to build a double tunnel from Piccadilly Circus to Brompton road. The line is to be 3,476 yds. long, and its construction is to be similar to that of the Central London line. Each tunnel will be 11 ft. 3 in. in diameter, and from 55 ft. to 75 ft. beneath the surface. The estimated cost is \$3,750,000. The power house will be located at Chelsea Creek, about 1½ miles from the line. This location was selected by Prof. A. B. W. Kennedy on account of an abundant supply of water for condensation and easy access to coal. The capacity of the power house will be about 1,200 h. p. Concentric cables will conduct the current to the tunnels at a voltage of 1,200 which will be reduced to 600 for the trolley lines.

### REPORT OF THE GENERAL ELECTRIC.

The fifth annual report of the General Electric Company, dated April 27, shows the gross receipts for the year to have been \$12,820,000; expenses \$11,207,000; after the deduction of fixed charges, depreciation, etc., the reduction of the deficit of previous years was \$960,000. A considerable shrinkage of orders received occurred in the latter part of the year, but the result of this was made apparent in the decreased amount of work in progress rather than in a material falling off in shipments. The volume of business secured during the first three months of the present year is slightly in excess of that for the same period of last year.

### CINCINNATI STREET RAILWAY CARRIES NO INSURANCE.

The Cincinnati Street Railway Company has decided by resolution of its board of directors not to renew the insurance now carried when the present policies expire, and in the future to "carry its own insurance," as the popular phrase puts it. For the purpose of protecting itself a sinking fund has been provided, which is known as the Insurance and Security Guarantee Fund, and placed in the care of a trustee for proper investment, through which all fire losses will be cared for.



## STILLWATER STIRRED UP.

Several years ago when hopeful railway builders imagined a street railway could be built anywhere, an electric line was put in at Stillwater, Minn. The people never appreciated the enterprise and the city council made its corporate life a burden in many ways. It shortly went into a receiver's hands and later was shut down. Finally the court ordered a sale, but the price bid was afterwards declared too low. A second sale took place and the road was bought by another party who bid less than the first. This deal also was declared off and recently a third sale was held and the property knocked down for \$4,700 to Flint & Scott—the

## LONG DISTANCE TRANSMISSION AT BAKERSFIELD, CAL.

The plant which the Power Development Company, of San Francisco, has recently completed for utilizing the power of Kern river, the third stream in California, is in point of size, in all probability, except for Niagara, without a peer in the perfection of its transmission and equipment. The generating plant is located at the mouth of the Kern river cañon, on the edge of the Sierra Nevada mountains, 16 miles to the northeast of Bakersfield, Cal., by wagon road, and 14 miles in a straight line. Here the river after its course of nearly 100 miles through rugged cañons from



THE FLUME GRADE AT WATER LEVEL.  
SAW MILL.

INTERIOR OF FLUME.  
PIPE LINE CONSTRUCTION.

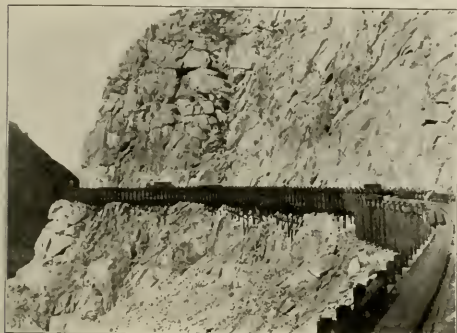
lowest sale of all. At this time deep snow was upon the face of the earth. When the snow melted and the pig came out of his poke, the buyers concluded their best way to success was to pull up the iron and sell it for scrap. This they proceeded to do, but the city secured an injunction; and there they are. This would be an excellent place for municipal ownership and a 3-cent fare.

The friends of W. W. Bean, president of the lines at St. Joseph, Mich., who some time since was forced to defend his property by force of arms will understand the following from a neighboring Michigan paper, which says: "It is said that because W. W. Bean, president of the street railway company does not like Gov. Pingree, he wanted the Pingree Rifles of St. Joseph, to change their name. One of them suggested that they call themselves 'Bean Shooters.'"

Mt. Whitney, breaks into a number of cataracts and rapids before finally settling down to a peaceful flow through the valley. There is an abundance of water flowing at all times to insure 7,000 h. p. at the power house, and the water needed is diverted from the river at a point nearly two miles up the cañon, by merely tapping it, no dam or reservoir being needed.

From the point where the river is tapped, the water is carried along the north side of the canon for a distance of 8,575 ft. in a wooden flume, to secure a bed for which it was necessary to blast out a roadway in the solid rock for the entire distance. The flume is built of redwood, 8 ft. wide, and 6 ft. deep, with a grade of 5.28 ft. per mile, making the capacity 14,400 cu. ft. of water per minute. The flume is laid out on tangents and curves, sharp turns being avoided, and is covered the entire distance. A tramway is laid on

the cover. At one point there is a break in the cañon side and the flume is carried on a bridge of 87 ft. span, the arches of which are built up of 16, 1 x 6 in. planks sprung into place. One of the illustrations shows the false work for this bridge and another the bridge as completed.



THE FLUME AT GIBRALTER AND THE PALISADES.

flume progressed a track was laid along the bottom and the material delivered at the far end by pony power.

At the terminus of the flume it is 102 ft. above the power house and the water is conducted to the latter through a steel



THE GENERATING STATION.

Lumber for the flume was all hauled by team a distance of 16 miles to the south side of the stream, a bridge thrown across, and a tramway 325 ft. long, with a grade of 30 per cent, constructed up the steep hill to the point where the flume was to end. A steam saw-mill was then set up at the foot of the tramway and after the timber was cut to size it was loaded onto cars and hauled up the grade. As the

pipe 66 in. in diameter and 540 ft. long. The pressure at the lower end is about 80 lbs. per sq. in.

In the generating station are four water wheels of the Girard type direct connected (two wheels to each) to two 450-k. w. 28-pole General Electric alternating generators operating at 257 r. p. m., making 7,200 alternations per minute. The current is generated at 550 volts, stepped up by



INTERIOR OF THE GENERATING STATION—POWER DEVELOPMENT COMPANY, BAKERSFIELD, CAL.





1—Looking up the river—the grade completed. 2—Panoramic view of power station. 3—Cañon before any work was done. 4—The safety gate. 5—Making the flume grade—just after a blast. 6—Carrying dynamite. 7—Making flume grade—in heavy stone.



# Street Railway Review

transformers to 11,000 volts, and transmitted to the sub-station in Bakersfield with a line loss of 7.5 per cent. The town distributing systems carry current at 2,680 volts, and the systems for distributing current in the agricultural districts, where it is used for pumping purposes, at 10,000 volts.

The wheels are regulated and water hammer in the pipe prevented by special governing devices designed by the Girard Water Wheel Company of San Francisco, which give excellent results.

In the panoramic view of the station the flume, main waste gate, forebay, pipe line, power house, employes' quarters and superintendent's residence are shown. The safety gate is located about midway along the flume and is shown in another view.

The current is conveyed from the generating station to the sub-station in Bakersfield over six No. 4, B. & S., copper wires. We show two views of this sub-station, which also contains the offices. As will be seen from the interior of the transformer and switchboard room, the high potential board is inclosed in a glass case.

All the material and work entering into this plant have been first class in every respect. Dr. Cary T. Hutchison of New York designed and had charge of the electrical work and machinery, while the mechanical and hydraulic engineering has been handled by Messrs. Cobb and Hesselmeyer of San Francisco. W. R. Macmurdo, of Bakersfield, was the civil engineer in charge of construction and Walter James of the same place, consulting engineer. The direction of the work from its inception has been in complete charge of C. N. Beal, secretary and treasurer of the Power Development Company. The other officers of the company are Charles Webb Howard, president, and W. F. Goad, vice-president.

We are indebted to Mr. Beal for the photographs from which our illustrations were made, and which show the engineering problems encountered. Records thus far taken give evidence of results which are in no way second to those at Niagara, except quantity.

The illustrations grouped on the opposite page give a good idea of the picturesque scenery in Kern cañon, and also of the difficulties of construction. In the view looking up the river is seen a reminder of a former enterprise of

considerable magnitude which did not prove successful; the grade on the right of the picture was constructed by an irrigation company and then abandoned. One of many places where danger was wont to lurk is shown in No. 6



SUB-STATION IN BAKERSFIELD—INTERIOR OF TRANSFORMER AND SWITCH BOARD ROOM.

the eight men are carrying dynamite up the pathless mountain side, 50 lbs. to the man, where a mis-step of one meant instant and terrible death to them all.

The cylinder head of one of the engines at the Muskegon Street Railway Company's power plant blew out but no serious results followed. The load was transferred to the other engines and operations did not cease while repairs were being made.



FALSE WORK FOR ARCHES.



ARCHES COMPLETED.

## THE INDIANAPOLIS 3-CENT FARE LAW.

Exciting Scenes Mark the Attempt to Enforce the Law—Company Refuses to Accept 3-Cents—Passengers Are Ejected—Company's Officers Arrested—Judge Showalter Grants Injunction in Favor of the Company—City Takes Case to State Supreme Court—President Mason Resigns.

Incidents in the history making of the now celebrated 3-cent fare case at Indianapolis have crowded fast one after another since our previous issue. In April we printed the full text of the legislative bill, which provided that in cities of more than 100,000 inhabitants by the census of 1890, the street car fare should not exceed 3 cents, including transfer. The bill was also specially vindictive since it was so worded as to make it easily possible for a dishonest employe to work a forfeiture of company's franchise. We branded the bill as unconstitutional because it was distinctly worded so as to apply only to Indianapolis, and Judge Showalter of the United States Circuit Court, has since so ruled. A short review of the exciting events pending his decision is interesting.

The bill became a law when signed by Governor Mount, on the evening of April 14, and was published by proclamation early on the morning of April 15. The company, meanwhile, through its bondholders, the Central Trust Company of New York, had filed its petition for an injunction in the United States Court, which, however, did not make its ruling for two weeks. Interested parties started out early on the 15th to test the law, and boarded the cars tendering 3 cents, and refusing to pay more. Many were ejected, some were carried free rather than accept three cents; some paid 5 cents rather than have trouble, and in a few hours the condition was chaotic. The excitement increased all day, frequent blockades occurring through conductors refusing to start their cars until full fare was paid. On the morning of the 16th the situation was at fever heat, and before noon the police were obliged to take a hand. A special session of the grand jury was convened and indictments promptly returned against the resident officers of the company and several conductors. Arrests were made at once, but bail in the amount of \$200 each, promptly given and accepted. That afternoon a truce was effected between the mayor and President Mason, and for two days following either 3 or 5 cents was accepted as fare, the conductors so far as possible securing the names of those who refused to pay full fare, and notice given that the company would reserve the right to prosecute such person under the statute which prescribes a \$50 fine for refusing to pay fare on street cars.

On April 19th, the United States Supreme Court handed down a decision in the case that had been before it for some time, in favor of the company and against the city, confirming the company's right to the streets until 1901.

On April 23rd, Judge Showalter, of the United States Circuit Court, ruled on the petition for injunction, holding that the law was unconstitutional because special legislation, and issued the order restraining the city and state officers from enforcing the law, and the company from obeying it. One of the most interesting features of the controversy is the manner in which the case was brought before the Indiana Supreme Court without putting all parties concerned in contempt of the Federal Court. The company

proceeded under the statute which imposes a fine of \$50 for refusing to pay street car fare, and a party so refusing to pay was fined in the police court, appealed to the Circuit Court of Marion county, and upon that court sustaining the fine and ruling in accordance with Judge Showalter's decision, a further appeal was taken to the Supreme Court of Indiana, where a hearing is expected on May 19.

The annual report of president Mason, of the Citizens Company, at its annual meeting, May 5, 1897, reviews the situation fully, and is such an interesting document we publish in full

### PRESIDENT MASON'S REPORT.

As the writer is about to retire from the presidency and board of directors of the Citizens' Street Railroad Company, a brief outline of the events of the past four years in the affairs of the company is herewith submitted:

On March 15, 1893, there was a change in the ownership of the stock of this company, and on that day a new board of directors was chosen, consisting of H. Sellers McKee and M. A. Verner, of Pittsburgh; R. W. Clay, of Philadelphia, and W. L. Elder, Henry Jameson, W. J. Holliday and A. L. Mason, of Indianapolis. The board organized by electing the writer as president.

At that time the company had but four of its lines operated by electricity; the remainder, and by far the larger part of the property, was operated by mule power, the company having more than one thousand mules. No electric car had at that time ever been seen on the south side of the city, nor on the west side, embracing two-thirds of the population. Crown Hill cemetery, the Fair Ground and Irvington were reached by electric cars, but the Insane Hospital and Stock Yards, Haughville and Brightwood, Garfield Park and West Indianapolis, were all reached only with small mule cars, containing fare boxes, having no conductors and traveling slowly over inferior track.

The new board electric entered at once upon the work of giving Indianapolis first-class electric street railroad service. A new power station was built on the banks of White river, supplied with powerful condensing engines; single track roads were rebuilt in large part into first-class, double track lines. Important extensions were made on Prospect, Shelby, Union, South Meridian, East and West Washington, and Blake streets, and Columbia and Clifford avenues. Within two and one-half years the entire system was electrified and supplied with modern vestibule motor cars. The old and unsatisfactory electrical car equipment, previously owned by the company, was abandoned and replaced with new and powerful motors, and the service throughout the city brought to a point of efficiency which, while not claimed to be perfect, nevertheless compares favorably with the street railway facilities of any city the size of Indianapolis.

Another important change was made in the transfer system. Previously passengers had been permitted to transfer between many of the lines without charge by passing into a small transfer car located in the middle of Washington street. The transfer car was abolished and instead there was adopted a free transfer ticket, which permitted transfers between all lines at every junction point in the city without extra charge. As this increased the transfer points from one to nearly thirty, there was, of course, a corresponding increase in the number of free transfers. Besides this, the transfer privilege was enlarged so as to include even the suburban lines, with the exception only of the Fair Ground, and Fairview Park line on Sundays.

It is not too much to say that during this period of construction an enormous work was developed upon the management of the company. The laying out of every new line, the planning of every piece of special work, the designing of cars, location of power station, construction of feeder lines, strengthening bridges, in short, the whole work of reconstruction received the constant and unremitting attention in all its details, not only of the writer, but largely of the executive committee from the board of directors. At the same time economy of operation has by no means been lost sight of. Mr. McKee, chairman of the executive committee, for years received a copy of the pay-roll each week and personally checked off the names and suggested constantly most important economies. The writer failed not to consider the most minute details of the expense account. Even within the last year, during the most successful superintendency of Miller Elliott, there have been introduced many improve-



ments and economies. Such matters as substituting pressed steel for bronze pinions, cut steel gears in the place of malleable and cast iron gears, malleable gear casings instead of cast iron, hammered iron axles in the place of steel, the best system and materials for car painting and varnishing, the best and cheapest engine oils and motor greases, economy in boiler repairs, the improvement of track joints and a thousand similar things have been carefully studied by skillful employes and passed upon, after thorough investigation, by the president.

Under Mr. Elliott's superintendency of the last year there has been a continued improvement in the character and efficiency and loyalty of the men in the company's employ. The accident list, which is so serious a question with all electric roads, has undergone an enormous reduction, owing partly to increased care on the part of the people, but largely to the improvement, skill and discipline of the car service men. It is not too much to say that the working organization of the company at present is the most compact, efficient and economical one in its history. Mr. Milholland, secretary and treasurer, has charge of the office, having been in the employ of the company for many years, and reached his present position by well deserved promotions. Besides the superintendent, of whom mention has been made, I take pleasure in mentioning W. T. Lewis, assistant superintendent, who has been in the employ of the company for twenty years, Mr. McCreary, who has been in the electrical department from its beginning and now, as electrician, has charge of the two power stations, the overhead lines, repair shops and rolling stock of the company. The roadmaster, C. S. Butts, was first employed about four years ago, and has shown himself to be a skillful surveyor as well as roadmaster. In mentioning these faithful servants of the company, there is, however, no disposition to exclude from honorable mention the office employes and barn foremen, the road officers and others on whose successful efforts the efficient service rendered by the company so largely depends.

#### FRANCHISE MATTERS.

While the company has thus gone steadily forward in the improvement of its property, its organization, its service to the public and its economies, it has, nevertheless passed through most trying ordeals in its relations to the municipal government of the city of Indianapolis.

Previous to March 15, 1863, there had been much public criticism of the company on account of its inferior service and failure to give the entire city rapid transit. There were, no doubt, other sources of criticism, but of these the chief one was the fact that the company did not pave between its tracks. At the time the original ordinance was passed in 1864, under which the company operates, it required the company to pave between its tracks, but a few years later an ordinance was passed, prepared by the city attorney and not opposed by a single paper in the city, relieving the company from the burden of paving, and substituting only the requirement that the company keep the space between its tracks in repair. As Indianapolis has, in the last few years, been passing through a period of extensive street improvements, including the use of asphalt, brick and block pavements, the question of the company paving between its tracks assumed much greater importance than at the time the amending ordinance had been passed in the year 1878.

Feeling the dissatisfaction of the public and desiring to discharge their whole duty to the city of Indianapolis, the new board of directors, on March 16, 1893, made it their first task to appear before the board of public works and state that the company was willing to enter into any fair, reasonable and just arrangement by which it should comply with the demands of the city of Indianapolis and at the same time have proper security for the necessary investment. To this proffer, the board of public works, under advice of the city attorney, answered that they would have no negotiations with the company whatever as to terms of settlement of existing controversies. On the contrary, the board declared that the company's rights in the streets would expire in the following January, after which it would be treated as a trespasser. The board of public works then proceeded, a few days later, to advertise and sell a so-called franchise to the highest bidder, commencing immediately and running for a period of 30 years. This alleged franchise was purchased by the City Railway company, a new organization, consisting of a number of influential local capitalists. The new company immediately laid claim to all the streets and parts of streets occupied by the Citizens' Company. An injunction suit was thereupon brought by the Citizens' Company

against the City Company in the Federal Court, to enjoin the defendant from interfering with the occupying company and to quiet the title of the latter to the use of the streets. This suit resulted in a victory for the Citizens' Company in November, 1894. There was a difference of opinion between the two judges as to the time of the expiration of the rights of the Citizens' Company. The original city ordinance, under which the company operates, ran until January, 1894. A so-called extension ordinance was passed in 1880, making the time of expiration 100 years. Both judges agreed that the extension ordinance assumed to be invalid. Both judges agreed that the extension ordinance was valid, and that the City Railway Company should be enjoined. But Judge Woods, presiding, held that the city had no power, by ordinance, to fix a time limit for the use of the streets for street railway purposes, and that the Citizens' Company, being a corporation in perpetuity, had a continuing right to use the streets, subject only to the reserved power of the legislature to alter, amend or repeal the charter of the company itself. The City Railway Company appealed this case immediately to the Supreme Court of the United States.

Pending this appeal, the Citizens' Company renewed its efforts to obtain a settlement with the city of Indianapolis, being ready at all times to make just and reasonable arrangements with the city. These efforts, however, were met from the beginning with the statement on the part of the city government, that the new company now had acquired, by the so-called franchise of 1893, certain contract rights with the city, or claimed to have acquired them, and therefore the city was morally, if not legally, bound to refuse to make any negotiations or settlement with the Citizens' Company, unless the City Railway Company should consent to surrender its rights. By this ingenious opposition on the part of the city government, the Citizens' Street Railroad Company was put in a false position before the people, most of whom supposed that the company was stubbornly refusing to pave between its tracks or to make any other proper return for the privileges it was enjoying. In the summer of 1895 a negotiation was undertaken for the settlement, which was to include not only the city government but also the City Railway Company, it being intended to procure that company to surrender its so-called rights. The writer was not a member of the committee which conducted the negotiation and did not personally participate in the matter. However, at one time there was, as I believe, good reason for believing that this settlement would go through, notwithstanding the extraordinary concessions which were required by the City Railway Company in order to induce it to surrender its supposed rights. So far as the city was concerned, its special counsel, the late Hon. John M. Butler, in a long letter to the mayor, outlined substantially the terms of settlement which he advised the city to make with the Citizens' Street Railway Company. The directors of this company were then and continued to be entirely willing to settle on the basis proposed by the city's own attorney, Mr. Butler. Meanwhile, an injunction suit was brought by a citizen of Indianapolis to enjoin the proposed settlement, and the city government began to raise its demands from day to day, until, in the course of two or three months, the plan of settlement advised by its attorney, Mr. Butler, was declared to be utterly impossible and not to be thought of. The terms of settlement proposed by the city were impossible and impracticable for this company, taking into view the enormous sacrifice necessary to secure the retirement of the City Railway Company from the field. In the fall of 1895, it became apparent that the proposed settlement was a failure, and in October the mayor and council went out of office and a new administration came into office.

So far as the Citizens' Street Railroad Company was concerned, the change in administration did not improve the chances of a settlement. The demand of the City Railway Company, as the price for its retirement from the field, was larger than it had previously been, and the new mayor was equally as firm as his predecessor in the position that the city of Indianapolis would consider no settlement unless the City Railway Company were gotten out of the way. Our board of directors found it impossible to comply with the double requirements thus imposed by the city government of Indianapolis and by the City Railway Company.

In this situation the Legislature of 1897 met, and there was immediately introduced Senate Bill No. 61, which provided that the rights of street railway companies in the streets of cities should absolutely terminate at the time fixed for the same in any ordinance under which such companies were operated, and that the occupying company should remove its tracks from the streets unless it elected to sell the same to its successor at an appraised value. This appraisal was



to be made by a board of three members, one to be appointed by the company which was quitting business, one by the new company, both subject to the mayor's confirmation, and one by the mayor. The new company was not required, however to buy the property, even after the appraisement had been made. After a hearing before the committee, this bill was amended by the consent of its author so as to place the appointment of appraisers in the hands of the Circuit Court, and the law was limited to cities now having 100,000 population. A severe contest ensued in the Senate over this bill. It was pointed out that this bill at once extinguished the rights of the Citizens' Company in 1901 and confirmed the rights of the City Company for the next thirty years, and placed the property of the occupying company actually at the mercy of the new company, because the latter was still not compelled to buy the plant, even at the appraised value. Senator Hogate introduced an amendment which was designed not to lengthen the life of the Citizens' Company, but to avoid confirming the rights of the City Railway Company. It provided that when the rights of the occupying company expired, the city should open the field to free competition and sell the street rights for thirty years to the best bidder. If the occupying company was not successful, the successful bidder was strictly bound to buy the property at an appraisement to be fixed by the Circuit Court, and pay for the same in cash. The Hogate amendment was bitterly fought by the friends of the original bill, but the amendment was adopted, and the bill passed the Legislature without further opposition. It was supposed that this would end the legislative attack on the company. However, the moment the Hogate amendment had passed the Senate, a bill was introduced prescribing street railway fares in Indianapolis at three cents for each cash fare, and requiring free transfers between all lines.

This extraordinary measure, which had never been suggested until the passage of the Hogate amendment, was, if valid, a substantial confiscation of the Citizens' Street Railroad plant. The law went into effect about the middle of April of the present year. In the meantime, the Central Trust Company of New York, trustee of the consolidated mortgage bonds of this company, brought an injunction suit in the Federal Court against the city of Indianapolis, the prosecuting attorney and the Citizens' Street Railroad Company to enjoin the enforcement of this law and compliance with it by the company. The case was argued at great length in behalf of the Central Trust Company, by Gen. Benjamin Harrison, Ferdinand Winter and W. H. H. Miller, before Judge Showalter of the United States Circuit Court of Appeals. Judge Showalter promptly delivered a careful opinion declaring the three-cent fare law to be unconstitutional and void for the reason that it was local and special legislation. Since that decision was rendered, a case has been taken to the Supreme Court of the State of Indiana, which is now set for argument in that court May 19. It is hoped by the city government that the State Supreme Court may render a different opinion from that of the United States Circuit Court, or, at least, this is supposed to be the object of this new proceeding.

In the meantime, while Judge Showalter had the three-cent fare law under consideration, the Supreme Court of the United States decided the appeal of the City Railway Company adversely to that company and favorably to us. It was held that the rights of the Citizens' Company were at least good until 1901, and, therefore, the court considered that it was unnecessary to decide the question of our rights beyond that time. The court expressly declined to give any opinion upon the question of our company's rights after the expiration of the extension ordinance, but it confirmed the decree enjoining the City Railway Company from in any wise interfering with the occupying company.

This is the present status of one of the most notable legal struggles that has ever taken place in the courts of this country. It began, practically, the day after the writer became president in March, 1893, and has continued without cessation until the present time. In every instance, however, the company has been victorious in the maintenance of its legal rights. One of the later phases of this struggle has been the indictment and arrest of the officers and many of the employes of this company for alleged violation of the three-cent fare law. Under the injunction, however, entered by Judge Showalter, the company is collecting five-cent fares for each passenger, with privilege of free transfer.

It is to be hoped that the fresh support and strength which will be brought to the company by its new board of directors and new officers will enable it, now that the legal battle has been fought out and

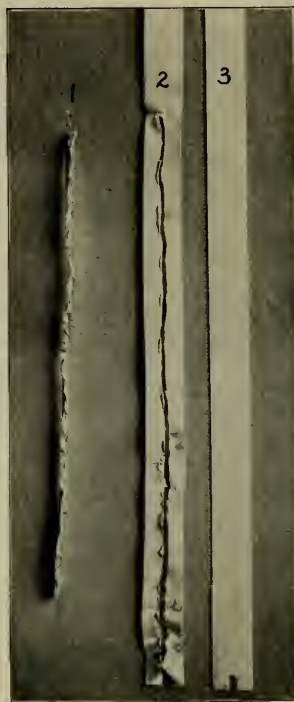
won in the courts, to speedily reach a satisfactory adjustment of this most intricate problem.

Respectfully submitted,

AUGUSTUS L. MASON,  
President.

## RECORDS FROM THE CRAVATH RECORDER.

The accompanying engraving shows some of the alloy strips used in the Cravath recorder as they appear before and after use. It will be remembered from the description that appeared in our last issue that the record is made by a hot wire in the main motor circuit, melting a path through an alloy strip—the alloy being a mixture of lead and tin



CRAVATH RECORDER RECORDS.

which melts at a low temperature. The metal does not drip, but simply flows back from the wire, leaving the strip as shown in numbers 1 and 2. Number 3 shows a new strip. A rather curious phenomenon is that at each point the strip pauses in its descent a notch-like place is left by the hot wire. The distance between notches is usually very short with the best motorman and becomes longer as the men are more careless.

R. T. McDonald, president of the Ft. Wayne Electric Company, has been sued for \$50,000 by S. J. Hart of New Orleans, on account of an interview in which Mr. McDonald was alleged to have spoken in a derogatory manner of Mr. Hart's character.

**THE LEWISTON & YOUNGSTOWN FRONTIER RAILWAY.**

The Lewiston & Youngstown Frontier Electric Railway connects the villages of Lewiston and Youngstown, Niagara County, N. Y. The company was organized by a number of local capitalists in the summer of 1895, and after a number of surveys the road was finally located through private property between these villages, about one-quarter



FORT NIAGARA.

of a mile easterly from the River Road, so called, with the object of avoiding the destruction of property along the banks of the lower Niagara River, or occupying the highway.

The contract for the construction of the roadbed, ballasting, overhead work and fencing was let April 12, 1896, to Craige & Tench, Buffalo, N. Y., for the sum of \$63,500.

The road starts from the New York Central depot at

The right of way is 30 ft. in width and fenced throughout its entire length between the villages. There are no structures whatever on the line, with the exception of a few wooden box culverts and one trestle 48 ft. long and about 9 ft. high.

The road is single track of standard gage and has five turnouts in the course of the line with end switches at each end. In the two villages the track is laid with girder rails, 2 1/4 miles of 67-lb. and 1/2 mile of 87-lb. and in the country with 56-lb. T-rails, 4 1/2 miles. The Johnson Company furnished the rails and track fastenings and all the rails except the 87-lb. girders which were rolled by the Pennsylvania Steel Company. The ties are of cedar, 6 x 8 in. x 8 ft., spaced 2 ft. between centers. The line is ballasted with broken stone which is 6 in. deep under the ties.

R. W. Oliver furnished the overhead work at a cost of \$9,750. In the villages span work is used and in the country side pole bracket work. The trolley wire is No. 00 and there are nearly 24,000 ft. of No. 0000 stranded triple covered feed wire starting from Lewiston and reaching nearly to Youngstown. All poles and fence posts are painted olive green.

No power plant was constructed by this company, power being obtained from the plant of the Niagara Falls & Power Company, which is situated 7.17 miles distant from Lewiston. It is generated by one of the 1,000-h. p. generators situated in the new power house at the foot of the cliff, at a voltage of 550 volts. This is raised to 750 volts by being passed through a booster, and is conveyed to Lewiston over a 500,000 circular mil stranded copper wire, triple covered. This wire is strung on the poles of the "Gorge"



SCENES ON THE LEWISTON & YOUNGSTOWN FRONTIER RAILWAY.

Lewiston and runs up Center street to 5th street, thence northerly through 5th street to the village limits, thence through private lands to 3rd street, Youngstown, thence through Church street to Main street and to the United States Military Reservation, at the mouth of the Niagara River. There is also a branch in Lewiston from 5th street through Onondaga street to the New York Central freight station and a branch in Youngstown to the docks. The road is 7 1/4 miles long in all.

The country through which this road runs is extremely level and is in the heart of the Niagara fruit district, being largely devoted to the culture of apples, peaches and grapes.

Railway, located in the Niagara Gorge, and thus brought to Lewiston where it is connected with the trolley and feed wire above mentioned.

The equipment consists of four, eight bench open motor cars and two closed combination baggage and passenger cars seating 16 people, made by the J. G. Brill Company, Philadelphia. The combination cars have a vestibule on the passenger end, and the baggage compartment, which is 8 feet long, has sliding doors on each side and three drop sash in the front end allowing the motorman to occupy the baggage compartment when running that end forward, but there is no vestibule. All these cars are equipped with Brill eureka

maximum traction trucks, with 33-in. and 20-in. wheels. Each truck is equipped with one G. E. 1,000 motor, thus giving each car 2,000 lbs. horizontal tractive pull. The total cost of roadway, equipment, transmission line, land damages, etc., amounted to very nearly \$100,000.

After a number of delays, owing to the non-arrival of material, etc., the road was informally opened the latter part of August, 1896, and has been running ever since. The company contemplates a freight as well as a passenger service, and it is at present handling about 10 cars of freight per day, beside package freight. A steady passenger traffic is maintained between the points mentioned, which will undoubtedly increase during the summer.

The officers of the company are: L. D. Rumsey, president; H. C. Howard, vice-president and treasurer; F. R. March, attorney; Karl Evans, general passenger and freight agent, and R. B. Goodman, superintendent, all of Buffalo, New York.

The engineering work was in charge of Paul Voorhes, of Buffalo, who has constructed several other roads in the last four years, among them Buffalo & Williamsville Electric Railway and the Buffalo, Gardenville & Ebenezer Railway. During the thirteen years since his graduation at the Rensselaer Polytechnic, Mr. Voorhes has also been connected with several steam roads, notably with the New York Central as assistant.

#### OWNERSHIP OF UNCLAIMED ARTICLES

Some discussion has been aroused in New Jersey over the ownership of unclaimed articles lost in street cars. Nearly all of the street railway companies make some provision for holding the packages, umbrellas, etc., at some particular place so that the owners may come and claim them. This is nearly always done but when no owner can be found the question is to whom does the lost article belong? The custom is to return it to the conductor who turned it in. In New Jersey the state settles this question in the following manner. The law provides that the lost article may be sold after being held for three months and advertised. If, at the end of two years, no one has made claim to the ownership the money, less charges for storage, advertising and selling, shall be turned over to the state treasurer. Needless to say, New Jersey has not grown rich from these proceeds.

#### A REPAIR SHOP THAT PAYS.

About a year ago the Urbana & Champaign Electric Street Railway Company fitted up a repair shop with a drill press, a large lathe, a Q. & C. steel hack saw, emery wheels, grindstones, a circular saw and a forge with blower. President B. F. Harris, Jr., says that he considers the repair shop as one of the very best investments the company has ever made, and that the work can be done better and cheaper than elsewhere. With the tools at hand to do the work repairs were made in the earliest stages of deterioration instead of waiting until the parts fall to pieces. The cars are also painted and lettered in the shop. Lately, the plan has been adopted of transferring the letters, figures and ornaments instead of using the gold leaf in the usual way, thus getting a much handsomer effect at less expense than by the old method of hand lettering.

#### THE NEW ELYRIA & OBERLIN LINE.

The Cleveland, Beria & Elyria Railway is to be extended seven miles to Oberlin, but the extension is incorporated separately and will be known as the Elyria & Oberlin Electric Railway Company. F. T. Pomeroy, general manager of the new company, writes that franchises have been granted by both Oberlin and Elyria councils, and by the commissioners of Lorain county. The tracks will be laid on the principal streets of each town, and outside the corporate limits a private right of way has been secured. Within the city limits a deep T or girder rail will be laid and outside a 56 or 60-lb. rail will be used. What bonds are to be used has not yet been determined; in fact, the problem is still troubling the engineers. The new power house is to be built in Elyria, and with sufficient capacity to furnish current for the extension and for the western portion of the present lines. This will shorten the running time between Cleveland and Elyria about 15 minutes. The extension will make a total of 40 miles of track in the whole system. Some of the contracts have been let, and the work will be completed early in the fall.

#### THE ACCOUNTANTS' ASSOCIATION.

Secretary Brockway has mailed 900 copies of the constitution and by-laws, with application blanks, etc., to street railways in this country, Mexico and Canada, and already the returns are coming in. A very considerable addition to the initial membership is promised.

All members of the association and all interested persons are urged to send the secretary an expression as to what time of the year is best suited for future meetings. As reported in the April REVIEW this subject was fully discussed at the March meeting and while it was decided to hold the next meeting in October at the same date and place as the convention of the American Street Railway Association, it was understood and agreed that the matter would come up for settlement then. Many who voted for holding the next meeting in October are opposed to that date as the permanent one, believing it will be far better to meet in the spring and not at the same time and place as the American. Hence it is urged that a full expression be made to Secretary W. B. Brockway, Toledo, O., to whom inquiries for any information relating to the association may be addressed.

The committees appointed at Cleveland have already begun their work and the report will mark a big step in advance toward the work of standardizing accounts. Subjects for papers and assignments are being made, and the program will well repay every accountant in street railway work, for the time and expense to attend the meeting.

#### ATLANTA WILL CONTEST COMPULSORY TRANSFER.

Joel Hurt, president of the Atlanta Consolidated lines, has done as he said he would in case the transfer ordinance was passed by the city, and has taken the case to the United States court at New Orleans, where a restraining order against the city and the road was granted, preventing the putting into effect the ordinance until the court rules on the case. The company hopes to have the injunction made permanent.





# Street Railway Review

## WAGE STATISTICS FOR STREET RAILWAYS IN NEW YORK OPERATED BY MECHANICAL TRACTION. From Report of New York Railroad Commissioners—1896.

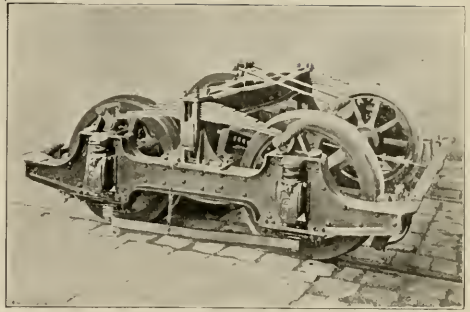
Name of Road.	Passengers Carried.	Miles of Track Operated.	Annual Tonnage.	Motormen or Drivers.		Starters.		Watchmen.		Switchmen.		Roadmen.		Hostlers.		Linersmen.		Engineers.		Firemen.		Electricians.		Machinists and Mechanics.			
				Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.		Hrs.	
				Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage	Wage
Albany.....	8,511,556	498	2,229,977	10.34	10	1.55	10	1.65	10	1.65	10	1.60	10	1.65	10	1.85	10	1.75	8	2.00	8	2.00	10	2.50	10	2.50	
Amtsterdam.....	666,802	34	182,291	4.95	13	1.50	12	1.40	10	1.50	10	1.50	10	1.50	10	1.50	10	1.50	12	1.50	10	2.00	10	2.50	10	2.50	
Atlantic Ave.....	14,473,770	959	3,375,482	23.75	2000	2.00	2000	2.00	2000	2.00	1.75	1.25	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Albany City.....	977,577	407	881,298	19.54	11	1.50	11	1.60	11	1.71	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Binghamton.....	3,281,653	128	829,246	26.40	12	2.00	12	2.15	12	2.15	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
Brooklyn City & Newtown.....	15,455,776	270	2,338,556	18.75	10	1.75	12	2.25	12	2.25	2.00	1.50	1.50	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75		
Brooklyn Heights.....	106,686,306	5,039	21,504,715	205.62	10	2.50	10	2.50	10	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50		
Brooklyn, Queen's County & Suburban.....	15,446,760	570	3,789,461	44.94	10	2.00	10	2.00	10	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
Buffalo.....	30,871,829	1,341	6,302,590	67.20	10	1.80	10	1.80	12	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Buffalo, Hellens & Lancaster.....	47,413	49	388,548	16.03	10	1.83	10	1.83	10	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83		
Buffalo, Garden City & Suburban.....	80,835	10	22,483	4.60	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Buffalo, Kensington & Tonawanda Electric.....	193,626	12	112,609	7.15	13	1.50	13	1.50	13	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Buffalo, North Main St. & Tonawanda.....	692,445	100	626,522	36.00	10	1.80	10	1.80	10	2.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Buffalo, Williamsville & Tonawanda.....	100,246	12	130,000	7.00	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Buffalo, Williamsville & Tonawanda.....	185,861	10	79,100	4.6	13	1.92	13	1.92	13	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92		
Canastota, E. & R. R. Co.....	24,841	10	11,500	14	11	1.50	11	1.50	11	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Canastota Street.....	189,465	20	375,150	3.28	11	1.56	11	1.56	11	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56		
Cohoes City.....	341,667	28	100,000	18	10	1.65	10	1.65	10	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65		
Colonial City.....	511,255	10	175	10	1.75	10	1.75	10	1.75	10	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75		
Colonial City Traction.....	111,255	42	48	1.38	10	1.75	10	1.75	10	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75		
Connetquot & Brookline.....	6,889,165	226	8,066,044	26.01	10	2.00	10	2.00	10	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
Corning & Painted Post.....	412,868	33	77,681	5.9	13	1.87	13	1.87	13	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87		
Cortland & Honor Traction.....	716,831	32	378,121	10.37	10	1.25	10	1.25	10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
Cosconongue.....	10,732,461	592	2,747,028	79.92	10	1.80	10	1.80	10	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80		
Dunkirk & Fredonia.....	223,498	11	72,142	3.70	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Elmira & Horseheads.....	1,366,663	70	505,899	11.14	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Fishing & College Point.....	484,262	30	216,268	4.23	10	1.75	10	1.75	10	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75		
Genesee, W. R. F. & C. L. Traction.....	1,242,514	60	417,064	17.25	10	1.35	10	1.35	10	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35		
Glens Falls, S. H. & F. Edward.....	1,039,710	54	9,025	1.50	12	1.30	12	1.33	12	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Herkimer, M. I. & F.....	872,176	10	10	1.50	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
Herkimer, M. I. & F.....	315,832	10	91,680	3.33	12	1.57	12	1.57	12	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57		
Herkimer, M. I. & F.....	304,260	10	177,025	2.66	11	1.35	11	1.35	11	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35		
Hudson Electric.....	312,994	11	24	1.30	12	1.30	12	1.30	12	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30		
Ithaca Street.....	1,344,517	45	399,701	7	10	1.25	10	1.25	10	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25		
Jamestown.....	3,472,914	65	697,781	18.67	11	1.95	11	1.95	11	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95		
Kingston City.....	1,029,633	49	197,609	2.85	13	1.73	13	1.73	13	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73	1.73		
Lock City Electric.....	270,028	10	146,795	5.11	11	2.25	11	2.25	11	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25		
Metropolitan.....	17,416,947	4,230	4,573,397	17.87	10	1.75	10	1.75	10	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75		
Middletown-Goshen Traction.....	1,235,087	50	414,420	12.47	10	1.30	10	1.30	10	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30		
Nassau Electric.....	14,902,463	3,900	4,694,148	121.89	10	2.00	10	2.00	10	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
Newburgh Electric.....	1,648,090	50	605,971	16.21	10	1.50	10	1.50	10	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50		
New York, E. & White Plains.....	184,225	29	134,000	5.25	10	2.00	10	2.00	10	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00		
Niagara Falls & R. Bridge.....	1,470,091	40	441,628	18.41	10	1.67	10	1.67	10	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67		
North & South Electric.....	938,779	9	27,091	4.02	12																						

**BUDAPEST UNDERGROUND ELECTRIC RAILWAY.**

We are indebted to the Railway World of London for the illustrations which we publish of the Underground Electric Railway in Budapest. This road extends from near the Danube river to the Park, 2.29 miles, and is laid in a tunnel under the Boulevard Waitzner and Andrassy street. Tunnel construction was necessary because the city absolutely refused to permit Andrassy street to be defaced by a street railway. The street was already inconveniently crowded by carriage traffic and foot passengers, and a surface railway could not



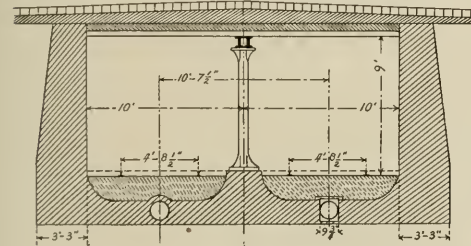
MOTOR CAR—BUDAPEST UNDERGROUND RAILWAY.



BOGIE TRUCK WITH 4-POLE MOTOR.

be added without rendering the blockade dangerous. The plans were prepared by Adolph Worner, technical director of the Electric Stadtbahn Company, and the work carried out under the direction of Messrs. Siemens & Halske.

Work was begun August 1894, and the line publicly opened May 26, 1896. The franchise is granted for 90 years, but the city reserves the right to buy the concession in 1940, when the surface line franchises expire, on announcing its intention two years in advance. The minimum rate of fare has been fixed at 5 cents for the entire distance, but



after 15 years the city may require a certain reduction to be made. After 20 years the city will receive from the company 1 per cent of the gross receipts for 10 years, 2 per cent for the next 10 years, 3 per cent for the next 10, 4 per cent for the next 10, and 5 per cent for the last 30 years of the concession. During the first 25 years the city is forbidden to grant any other transportation concessions of any kind between the center of the city and the Park.

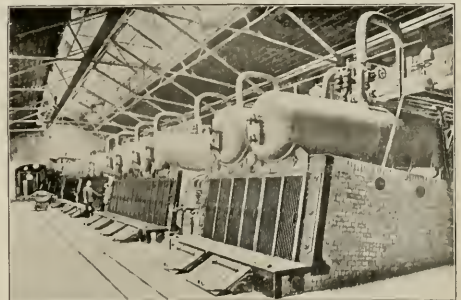
The total depth which could be given to the tunnel and its foundations was limited to 16 ft. because of a large sewer which crosses the street at that depth. The thickness of the roof was fixed by the size of the girders necessary to sup-

port the surface roadway and the thickness of the pavement, and varies from 2 ft. 7 in. to 3 ft. 3 in. The foundation, though varying slightly, is also about 3 ft. 3 in. in depth, including the roadbed and rails, leaving 9 ft. 6 in. for interior depth. The inside width is 20 ft. The two tracks are of standard gage, 4 ft. 8 1/2 in. and 10 ft. 7 1/2 in. between centers. Columns are spaced 13 ft. 5 in. between centers, and carry twin longitudinal l-beam girders 12 1/2 in. deep under wood and 13.7 in. deep under stone paving. l-beams running transversely for the support of the pavement are spaced 3 ft. 3 in. apart, and vary in depth from 9 to 17 in. The transverse girders are covered by a bed of cement, which is 3 in. thick in the center of the street, and this latter is covered with several layers of felt smeared with hot asphalt, making the tunnel practically impervious to moisture. But to make sure, concrete conduits have been laid between each pair of rails, which will conduct any water that may leak in to cisterns, from which it can be pumped out.

The rails are of the Vignolles system. They are 4 1/2 in. high, weighing 50 lbs. per yard, and are in 30-ft. lengths. They are secured to iron cross ties by special clips and are inclined inward so as to bring the pressure of the tapered wheel tread in line with the rail web, as is the common practice on European steam roads.

The power station is near the park terminus of the road. It is equipped with two Siemens units, each supplying 11,000 amperes at 300 volts.

The cars are 36 ft. 4 in. long, 7 ft. 6 in. wide, 8 ft. 9 in. high and weigh 15 tons. The clearance between the car



BOILER ROOM—BUDAPEST UNDERGROUND RAILWAY.



and the ceiling is but 6 in., and between the curved girders which support the car body and the rail but 4 in.; at the sides it is 7.9 in. between the car and the outer wall and 3 ft. 1 in. between the two cars when passing.

The passenger compartment, that portion of the car body between the trucks, is divided into three parts, the two at the ends seat seven persons each and the middle one 40 persons. The end compartments for ladies and non-smokers are entered only through the middle one.

The stations are similar to the underground stations of London and Glasgow, and are very commodious. At the largest there is standing room for 1,000 persons. There are 11 stations, and only one car is permitted in the block between any two stations. The signal apparatus is entirely automatic and operated by the cars.

The service is performed by 20 cars, of which 14 are always in motion, giving a headway of 2 minutes. Trains run regularly from 6 a. m. to 11 p. m. at intervals of 3 minutes. From November 1, 1896, to January 15, 1897, 572,000 passengers were carried and 106,764 car-miles run.

### EXPERIMENTAL TRACK OF THE GENERAL ELECTRIC.

The encroachment of electric traction upon the field heretofore exclusively occupied by the steam locomotive has caused the General Electric Company to provide a special track to facilitate electric traction experiments. The track is laid along the Erie canal at Schenectady and comprises 6,700 ft. of the standard New York Central construction with 85-lb. T-rails. The first section of the line is a tangent of 2,415 ft., the second a series of short tangents and curves, and the third a tangent 2,730 ft. There are two 30-lb. conductor rails set on 8-in. treated ash blocks, running beside the track on the far side from the canal. The two conductor rails were installed for the purpose of experimenting



EXPERIMENTAL TRACK AT SCHENECTADY.

with alternating multiphase currents; for direct current experiments the two rails are connected in multiple. Both track and conductor rails are bonded with No. 0000 copper bonds. The feeder is a 500,000 c. m. insulated cable running along the track for 5,300 ft. The line is divided into three working sections, each controlled by its own switch and semaphore. When this switch is closed its section of conductor is made alive, and the movement of the switch handle sets the semaphore.

The experiments made so far have been carried on for the purpose of developing motors and systems of operation for elevated and surface steam roads. For the locomotive a

special 8-wheeled car is used which weighs 30 tons empty. It resembles a regular passenger coach and is so constructed as to give an unobstructed access to the two motor trucks. It is divided into three sections, a driving and testing compartment in front, a passenger division in the center, and a rear compartment for the air pump, tools, etc. The forward compartment is equipped with all the apparatus necessary to obtain a complete record of the performance under test. The resistances are suspended under the central compartment. The contact shoe is suspended by the two loose links from an iron casting on the end of an oak beam which projects from beneath the bolster of each truck.

During the test, when the photograph from which our illustration was reproduced was taken, the locomotive was equipped with four G. E. 2,000 motors rated at 125 h. p. each, one to each axle. A K16 series parallel controller was used. The first test made with the motor equipment was hauling four freight cars, loaded with pig iron, making a load of 121 tons. Later the locomotive was coupled to four passenger coaches which, with the motor car made a train of 130 tons. The total draw-bar pull was about 15,000 pounds. The tests have so far been attended with success and many interesting results will be derived from them.

### A LEVEL HEADED MAYOR.

One mayor has been discovered who has the courage of his convictions, and who is not afraid to express them. The Chicago Tribune recently published replies to questions it asked the mayors of several cities regarding their opinion of the Illinois Humphrey bill, then pending. Mayor H. P. Ford, of Pittsburg, said:

"Not knowing anything about the Humphrey bills I would not care to put my signature to an article on the subject. Generally speaking, I am opposed to the city and state supervision of street railways. The conditions in Chicago, where the ground is level, are different from what they are in Pittsburg, where the land is hills and hollows. I do not think the city should have the power to grant, extend, or annul franchises. When capitalists put their money in a road they do not know whether it will be a success. They have to risk their capital and take the responsibility. If the road proves a success the city shares in the benefit by getting improved transportation facilities and securing an increased taxable value on real estate.

"The city should not have the power to annul a franchise because a railway might be operated for ten years and not pay. Just about the time the stockholders began getting their money back it would not be right for the city to step in and annul their franchise. The men responsible for the creation of the road would quit heavy losers if this were done. The city should not be given a chance to build and operate street railways unless it has the money to do the work. The municipality might project a railroad that would lose money in its operation instead of making it. The taxpayers would have to foot the losses. Then, again, to build new lines the city would have to levy sufficient taxation to cover the cost and operation. This might be disastrous to the taxpayers and plunge some of them into bankruptcy. With private capital taking all the risks the city should give every encouragement in the way of franchises. If a road is not a success the city will not lose anything, as it would if it built the line."

## STREET RAILWAY LAW.

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

*Damages for Death of Minor.*

A girl, three years and eleven months old, having been left at home by her parents, in charge of an older sister, went upon the street and was killed by appellant's car; held that whether the parents were guilty of contributory negligence is a question of fact for the jury.

Under the circumstances of this case where the parents were working people and the child would probably have been a wage earner, the actual pecuniary loss could not exceed two thousand dollars.

In the opinion of the court, Shepard, P. J. said in part; "The appellee's intestate was a girl three years and eleven months old, in good health, and was run over and killed by a horse car, operated upon West Chicago avenue, by appellant. \* \* \* While it must be conceded that the witnesses for appellee did not agree, in some particulars, with one another, and sometimes on cross-examination did not adhere to an entirely consistent account of every detail testified to on direct examination, yet as to the main facts there can not, in fairness, be said to be an uncertainty, and from the whole evidence, the jury was justified in finding that the horse car driver was negligent. C. W. D. Ry. Co. v. Ryan, 31 Ill. App. 621, and 131 Ill. 474. Even though a child of such tender years goes upon the street and plays in the absence of her parents, having been left at home by her parents in the charge of an older sister, ten years of age, the law does not say that the parents are guilty of such contributory negligence as shall prevent a recovery for an accident to her from the negligence of another.

Whether the parents under such circumstances be guilty of contributory negligence, is a question of fact for the jury under proper instructions by the court. \* \* \* The objections urged against the instruction are that it omits the element of care due by the parents; that it is mandatory as amounting to coercion upon the jury upon using "must;" and that it omits to give to the jury any rule governing their assessment of damages. The instruction was had in every particular, except perhaps as to its mandatory form. T. W. & W. Ry. Co. v. Grable, 88 Ill. 441; City of Chicago v. Meyer, 18 Ill. 349; L. S. & M. S. Ry. Co. v. Pandey, 37 Ill. App. 203; C. E. & L. S. Ry. Co. v. Adamick, 33 Ill. App. 412; Garlan v. C. & N. W. R. R. Co., 82 Ill. App. 571 and the judgment would have to be reversed if that instruction were the only one in the case. But the appellant by instructions asked and given in its behalf, most amply cured all the defects in the one complained of.

Considering all the objections, the whole law of the case was sufficiently given to the jury. The verdict and judgment were for \$3,500, if we were permitted to consider anything more than the bare pecuniary loss to the next of kin, we could not say the verdict was for too much.

The parents were working people and worked away from home; the eldest sister was fifteen and was "living out;" the presumption is strong that if deceased had lived to a working age she would have joined the ranks of the wage earner, and if so, her parents would have been entitled to her earnings during her minority, such facts should be considered and when it be given its full weight, the result shows that the amount awarded is too large.

When the deceased is a minor and leaves parents entitled to his or her earnings, the law presumes a pecuniary loss, for which compensation may be given under the statute,

though, without the statute, no recovery whatever could be had. It was said in City of Chicago v. Scholten, 75 Ill. 468, and quoted approvingly in R. R. I. & St. L. R. R. Co. v. Delany, 82 Ill. 198, in such cases, the pecuniary loss may be estimated, for the fact proved common observation. The child was not old enough to apply any other of the elements there referred to, by applying what we have quoted to the case at bar, the death of a little girl almost four years old, the child of working people, and herself, presumably, as soon as her years would permit, we can not, by any calculation, conclude that the actual pecuniary loss exceeded \$2,000.

If, therefore, the appellee shall, within ten days, remit from the judgment recovered, all in excess of \$2,000, we will affirm the judgment for that sum, but otherwise the judgment will have to be reversed, and the cause remanded, and in both events, at the cost of appellee. Affirmed, if remittitur be made down to \$2,000, otherwise reversed and remanded.

(Appellate Court of Illinois, West Chicago Street Railroad Co. v. Scanlan Administrator, etc., 29 Chicago Legal News 224.)

[NOTE.—In the similar case of Calumet Electric Street Railway Co. v. Lewis Administrator, 29 Chicago Legal News 223, a girl two years and five months old running across the street to her father's house was run over and killed by an electric car when the car had gone less than its own length from the place of starting. The motorman did not see the child until she was in front of, almost under the car. The court found that from the time he did see her he was guilty of no negligence, but that he might have seen her sooner. In affirming a verdict against the company, the Appellate Court cites with approval the case of Chicago West Division Railway Co. v. Ryan, 31 Ill. App. 621, and 131 Ill. 474 on the questions of absence or negligence by the company and of care by the parents of the child.—ED.]

*Riding Between the Rails of Electric Railway on Bicycle—Duty of Motorman and Rider.*

A person riding between the rails of an electric railway upon a bicycle is held to be chargeable with the duty of looking out for and endeavoring to avoid danger from the electric cars; and the motorman seeing him is held entitled to assume up to the last moment that the rider will turn out of the way by increasing his speed or turning aside to avoid the danger.

(Supreme Court of California, Everett v. Los Angeles Consolidated Electric Railway Co., 34 Lawyers Reports Annotated 350.)

*Driving Upon Track in Front of Electric Car—Collision with Vehicle—Negligence of Motorman.*

In an action against a street railway company for injuries received in a collision with an electric car, it appeared that plaintiff, in order to pass a vehicle, drove upon the track of the defendant company and in a line with an approaching car some hundred feet in his rear, after going about thirty-five feet on the track he turned off and his wagon was struck by the approaching car, and it is held, that the plaintiff was not guilty of negligence in driving upon the track when the car was approaching at the rate of six miles per hour.

It appearing that the motorman had his car under control when within a wagon's length of the plaintiff, at which

time he increased the speed of the car so as to pass, he was guilty of negligence and an instruction that he recklessly ran into the wagon was not error.

(Supreme Court of Michigan, *Blakeslee v. Consolidated Street Railway Company*, 29 Chicago Legal News, 257.)

*Injury Caused by Several Wrong Doers—Liability of Each.*

The question with appellee is not which of the two railroad companies was most at fault, but is, did the appellant contribute to the injury she received. She sued both companies together, but at the trial dismissed her suit as to the city company, and took her verdict and judgment against appellant alone. Her right to do so is not questioned. The degree of fault, if there were any fault attachable to appellant, is immaterial so far as she is concerned. There was no evidence that tended to show that in a considerable degree at least, appellant was negligent in that its driver failed to see the cable train as he should have done, and he did not wait for it to pass, and appellee had her right of action against both or either of the wrong doers. Either one was responsible to her for the whole injury, and the degree of blame as between them was immaterial.

"When contributory action of all, accomplishes a particular result, it is unimportant to the party injured that one contributed much to the injury, and the other little; the one least guilty is liable for all because he aided in accomplishing all." *Cooley on Torts* (Sec. Ed.) 155. In the case of *St. Louis Bridge Co. v. Miller*, 138 Ill. 465, the court says: "Where several tort feasers have co-operated to the same end, either may be held for the entire tort. The fact that the injury could not have happened without the wrongful act of one is not a test of the non-responsibility of the other. A tort may be of such character as to require for its perpetration the concurrent action of several, so that if either one fail in part, the tort is not committed. In such case it may properly be said that but for the wrongful act of either of the tort feasers, the wrong could not have been committed. But the fact can not be argued in exoneration of the others."

(Appellate Court of Illinois, *West Chicago Street Railway Company v. Feldstein*, 29 Chicago Legal News, 216.)

*Action for Death of Child—Care to be Exercised Toward Minor—What may Excuse Heedlessness of Child.*

The duty of the appellant to exercise ordinary care, "That degree of care which, it is to be presumed, an ordinary careful and prudent person would exercise under the same relation and under the same circumstances," to avoid injuring a child upon the street, cannot be denied.

Her tender years and sex are to be taken into account in calculating the probable influence upon her fears in the loud ringing of the gong while the car was constantly coming nearer, and the way so obstructed.

Negligence and care are questions of fact for a jury. That she was a young girl running as fast as she could from the car, which was coming toward her, and that her path would soon be so narrowed that she might well be afraid to enter it, were obvious facts. While the duty of the appellant was not increased toward the child, her heedlessness in leaving a path of safety and going into danger may be excused by them.

The jury was justified in finding, in effect, that the car should not have been driven to pass her, as was the apparent purpose of the motorman, and that more respect should have

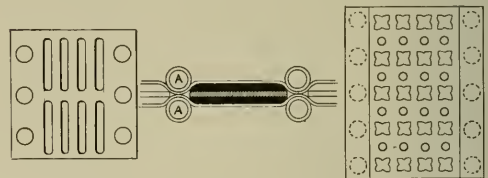
been had to the uncertainty of what such a child would rashly do under the surrounding circumstances.

The court is of the opinion that the question of the amount of damages is not before it for review.

(Appellate Court of Illinois. *Calumet Electric Railway Company v. Van Pelt*, 29 Chicago Legal News 197.)

## THE RIBBE STORAGE BATTERY.

Germany is the home of the practical storage battery and many efforts have been put forth to construct a battery suitable for street railway purposes. The latest product is a storage battery designed by Paul Ribbe, of Berlin, for which the inventor makes many claims of merit. The illustrations, which are from the London Electrical Engineer, represent the construction of the battery. The cell has a pasted plate for both positive and negative with celluloid separators. The lead frame work is shown to the left in cut and consists of a lead sheet, 0.35 in. thick with slots punched through it to hold the paste. In center of cut is shown the finished plate and cross section of the plate is represented on the right. The paste is applied only to those parts containing vertical slots and a thin sheet of celluloid is placed on either side of the



plates. The tubes of celluloid, A A, form vertical separating ribs between adjacent plates. The plate consists of a continuous lead core, a thin layer of active material on each side and a cover of celluloid, cemented at intervals through the grid. A car has been built for the London, Deptford & Greenwich Tramway Company and these batteries used. There are 140 cells to a car which gives a voltage of 280 and an ampere-hour capacity of 288. The weight of the batteries is about 6,150 lbs. and the inventor says that the storage capacity is 81 kilowatt-hours or enough to run the car for 20 hours.

Like other forms of storage batteries, good laboratory tests have been recorded but it has not yet proved itself durable enough for the severe service necessary for electric traction.

## FARE RESTORED TO FIVE CENTS AT SAVANNAH.

The Savannah (Ga.) Traction Company has given notice to its patrons that hereafter five cents will be the regular fare instead of three cents. This company, formerly called the Electric Railway Company, carried on a rate war with the City & Suburban Railroad Company and fares went as low as one-half cent, but through the intervention of the courts this was raised to three cents in 1895.

As both companies suffered greatly in their finances and neither gained any decisive victory by the war, each will be content to accept its share of patronage at the regular rate of fare.



## FIRE PROTECTION FOR STREET RAILWAYS.

The subject of fire protection falls naturally into three divisions, watchmen, apparatus and organization, and to these are to be added inspection and drill.

The most effective protection against fire is an efficient watchman, because if he properly attends to his duty, a fire, except as the result of an accident, such as an explosion, cannot get under sufficient headway to do serious damage. In conversation with a REVIEW representative, Fire Marshal Swenie of the Chicago fire department, in discussing watchmen, said that the mistake is often made of expecting too much of the men, and relying upon clocks or other time checks to see that the duty is properly attended to. For a man to watch all night and keep his senses alert is deemed impossible, and therefore the watchman should be relieved at the end of three or four hours. This, of course, would necessitate at least two men in the smallest plant. While the foregoing is true, it does not apply with the same force to street railway property, except the shops, because at barns, car houses and power stations there is always a regular force of men on duty until midnight or later and in some cases, where there are many cars to be cared for, all night.

The fire apparatus is usually installed at the instance of the fire underwriters, and the number of hydrants and extinguishers is regulated by an insurance inspector, and they are located in accordance with his recommendation.

The most important duty in connection with fire apparatus is to see that it is in good order and fit for use in the case of emergency. Too often the inspections of it, if made at all, are entirely perfunctory, and consist largely in observing that the particular thing inspected has not been carried off. As a rule, the city fire department makes inspections of all large buildings at regular intervals. In Chicago the captain and the lieutenant of each district make inspection of all buildings, other than dwelling houses, in the district at least once each year, the visits of the two officers being so timed as to be about six months apart. On these occasions notes of changes are made, and all valves hose, fire extinguishers, etc., carefully examined.

Lastly, there remains the organization among employes to be considered. The importance of having men skilled in the work required of them is nowhere greater than in this particular, because the best of apparatus is useless if the men do not know how to handle it. Any organization in general will have two objects—extinguishing the fire and rescuing the property in danger if the first is impracticable.

When requested to outline a fine organization among street railway employes which could be depended upon to render efficient aid to the regular department Chief Swenie said that because of the different conditions obtaining in each building a concrete scheme could scarcely be outlined. In general he laid down these rules: There must be a leader, one who will not be liable to get the "fire scare" and can be depended upon to hunt the fire and not lead in the retreat. The fire brigade should comprise only the employes who are regularly employed about the barn or car house, as they will be familiar with the premises and at hand when required. A set of signals agreed upon so that the location of the fire may be known when an alarm is turned into the office or other central point; a man at this point whose par-

ticular business it is to turn in an alarm to the city department. When an alarm is sounded the men should report to the barn foreman, or the person in charge at the barn, for directions. Frequent drills, which shall familiarize the men with the operation of the apparatus provided; at drills the apparatus as well as the men should be exercised.

Chief Bonner of the New York Fire Department advises as follows:

"In the large stables here, where a large number of horses are used and housed, there is a form of organization amongst the employes; upon a given signal, they are required to proceed to that point and render all necessary assistance in extinguishing the fire.

"The building is generally equipped with pails of water, fire extinguishers, or in other cases hogsheads, with pails submerged and ready for immediate use. This, in connection with a watch system and time detectors, is found to be very efficient when properly looked after. Of course the first duty of a watchman or others on discovering a fire in those great stables, is to send out a regular alarm for the city fire department; a special box for this purpose should be within the building, or within the immediate vicinity of the stables.

"Our officers make frequent inspections of these and other large buildings, such as hotels, music halls, theaters and large places of assemblage, or buildings covering large areas, with the view of becoming familiar with the building and its means of entrance, exits, stairways, etc., and see that all laws and regulations required by the department are strictly enforced, and to report from time to time any additional safeguards that may be required for the protection of life or property.

"The best plan of organizing a fire brigade for the protection of property would be to obtain the services of a thoroughly practical fireman and give him entire control of the men whom it is desired to use for this purpose, allow him to make the necessary inspections of the building, and assign such implements, extinguishers, etc., and posts for watch purposes as he may deem necessary. If he is the right caliber of a man he will report a plan of organization, commencing with a thorough system of watching, the supplying of implements, extinguishers, etc., and the assignment of the men under his charge, on a given assignment to any point within the building, let it be day or night. The system of watch duty ought to be supervised and provided with time detectors which should be located in the office where each tour of duty could be reported upon the card board and examined by the company upon the following day. This and other safeguards, such as may be suggested by the officer in charge of the department, I think would insure great safety, and possibly be the means of allowing a very large rebate on the amount of insurance."

Fire Marshal J. A. Archibald, of Cincinnati, writes as follows:

"It is customary in our department that the members and officers acquaint themselves with all buildings in their respective districts.

"We do not rely upon the employes of any company for any assistance, but these are at times of great assistance in locating the fire and assisting around the building.

"It would be an excellent idea to have an organized fire brigade at any plant of that kind. I would have plenty of water and good hose distributed in locations where it could be used to the best advantage, and would have picked men

from the employes and put them through a practical drill once a week. In a case of that kind they would not only be a great help to the fire department, but the chances would be they would put out the fires themselves without calling on their fire department."

When fire occurs the first duty is that of notifying the city department, and the second that of rescuing the property threatened, usually horses or cars. For handling cars, especially where the motive power is electricity, one or more cars used as switch engines may often be employed to advantage in hauling cars out of the barns, and one road has outlined such a scheme. In some places such an arrangement may be impossible, as in Indianapolis. There, when a fire occurs in any department of the street railway, the city fire department notifies the company to cut off the current from all lines in order to protect firemen from possible accidents with live wires.

The following replies to letters of inquiry to some of the largest street railway companies will indicate the precautions taken by them.

The Toledo Traction Company has no fire organization but employs regular watchmen with call boxes to American District Central Station. A scheme is outlined for switching cars out of barns in case of fire.

On the National Railway lines of St. Louis there is no organization among employes in the nature of a fire brigade and no drill. The buildings are all well supplied with lines of hose connected with water pipes, water tanks, buckets, etc. Daily inspections are made by the company, and also frequent inspections by the fire underwriters. The men are instructed to turn in an alarm and then use water buckets and hose and utilize all available men for running cars into the street.

One manager in writing of the matter concludes: "We have never had a fire, and being just like other mortals, our long immunity has, perhaps, made us careless in this regard."

The Market Street Railway of San Francisco up to the present has taken no precaution other than providing numerous hydrants and suitable hose. The red-wood used in building is much less inflammable than pine. This company contemplates a more thorough system however.

The Consolidated Tramway Company of Denver has no organization, but has its car houses protected by the Grinnell automatic sprinkler system, and in addition has stand pipes and fire plugs and Miller extinguishers.

The Lindell Railway Company, St. Louis, provides Babcock extinguishers, but has no drill. When an alarm is sounded on the fire bell the men report to the foreman, each taking the nearest extinguisher with him. Switching, etc., is at the discretion of the foreman.

J. E. Rugg, general superintendent of the West End Street Railway of Boston, replies to inquiries as follows:

"Our large car houses are equipped with stand pipes and roof nozzles, with fire underwriters standard hose and nozzles, also with fire buckets, axes, etc. A fire gong is connected with switchboards, by which an alarm can be sounded from different parts of the house.

"The car house men are organized into a fire brigade in charge of the foreman of mechanical department, each man being detailed for a particular duty.

"The men are not drilled regularly but are called out without previous notice.

"There is no special scheme outlined for running out cars in case of fire.

"At the sound of alarm the men respond instantly, assembling at a given point, and take their orders from the foreman.

"The fire equipment is inspected daily, being in charge of the foreman, and he is held responsible for it being in good working order."

The Union Traction Company, Philadelphia, has all of its stations thoroughly equipped with fire buckets filled with water, and fire hose attached to plugs and on reels ready for immediate use, but has no fire brigade or drill among employes. A fire inspector is employed whose duty it is constantly to visit the various stations to see that the apparatus is in good condition. The company carries no insurance except on leased property, and then not unless required by the terms of the lease.

The Twin City Rapid Transit Company has no fire organization and relies upon the service of watchmen, who are employed in all the stations.

The North and West Chicago Street Railroads employ watchmen and provide fire pails and buckets of sand for use in case of small fires, but have no fire organization among employes. The instructions are that a city alarm is to be turned in as soon as a fire is discovered, and every effort is made to have the alarm boxes placed near the principal buildings of the companies; in many cases they are placed on the walls of the barns or power houses.

The Montreal Street Railway Company has no regular fire organization. The superintendent, Mr. McDonald, says in regard to fire appliances: "In our main car shop and repair building, which is a three-story structure, we have a 3-in. water main running to the roof of the building and 300 ft. of hose attached to this, to reach any part of the roof in case of fire. Apart from this all parts of our shops are provided with sand and water pails that can be used at a moment's notice. In one of our stations, where we have several car sheds spread over a large area, we have a small hand reel that carries 500 ft. of hose, and we occasionally give our men who are waiting around the station a false alarm to accustom them to act quickly with this reel in case of fire."

The Chicago City Railway has a fire organization among the employes of each of its seven barns and also at the shops. Lindgren & Mahan stationary chemical machines, and Miller and Babcock extinguishers are placed according to the recommendations of the city fire department and the insurance inspectors, the number and location depending on the arrangements of the particular building. Fire hydrants are provided in all buildings; in the new Cottage Grove avenue car house they are spaced 50 ft. apart in one direction and 30 ft. in the other. Buckets of water are also placed at convenient intervals.

The fire brigade comprises all the men regularly employed in the barn, at the new barn there are about 20 men all the time both day and night, trainmen not being relied upon except as auxiliaries. Special watchmen are employed where there is no night force.

The barn foreman is the leader and is held responsible for the condition of extinguishers, etc., and for the men being acquainted with their respective duties. Each month the inspector visits all barns, opens and cleans all valves, inspects hose, tries the extinguishers, and in general satisfies himself by trial that all is in order. Notes are made of the condition of apparatus as found and a written report submitted to the electrical engineer by whom it is transmitted to the general manager.

Electric push buttons are placed in different parts of the barn. When fire is discovered the man's first duty is to push the nearest button, as directed, which signals the barn office as to the location of the fire; he then runs to a gong centrally located and sounds it. The men report for duty at once and are direct where to go, taking fire buckets and hose with them. When the alarm in the office is sounded the man on duty there turns in a city alarm at the nearest box.

This company organized its fire service in 1892, since which time seven fires have been extinguished without aid from the city department.

To illustrate the workings of this department, General Manager Bowen gave a REVIEW editor an order to turn in an alarm at the Cottage Grove car house. Presenting it to the barn foreman, he went quietly along until a point somewhat remote in the building was reached and then turning in an alarm waited to see if anything turned up. As the gong rang out its warning the score or more of workmen scattered through the building dropped their tools and in a moment he was surrounded with a phalanx armed with buckets, extinguishers and hose. When the boys discovered the cause of this excitement they looked as if they would like to turn the hose on somebody, but a "fire out" was sounded and the brigade returned to the more peaceful occupation of cleaning cars.

It appears that but little attempt has been made by the fire departments to have the railways cooperate with them, and what has been done in the way of fire service among employes has been at the instance of the companies themselves.

#### COPPER NEEDS NO PROTECTION.

The proposition to place a duty of one cent per pound on copper, as is proposed in the Dingley bill, is meeting with opposition from the Copper Producers' Association. The only copper that is imported comes to the smelting works to be refined or for separation of the precious metals contained in it. The United States has the greatest production of copper in the world, last year the output being 424,402,735 lbs. Of this about 252,000,000 lbs., valued at \$30,216,194, were exported. There are at present three copper producing districts in the United States, namely; Montana, from which 208,939,323 lbs. were mined; Lake Superior, 144,797,153 lbs., and Arizona, 70,666,259 lbs. It is noticed that the lake region no longer governs the supply. The Anaconda Copper Mining Company alone, produced 121,549,878 lbs., and the capacity of the Montana mines is being rapidly increased by the introduction of additional and improved machinery. The Arizona mines have been rapidly developed of late. It would seem that this profitable business is on a firm basis and can no longer be accounted an "infant industry."

The Consolidated, Pittsburg, recently took the wind out of a foolish suit, by going into court and confessing judgment for the five cents sued for by a passenger, whose transfer ticket was refused.

The Market street road, San Francisco, has caused the arrest and will prosecute under the anti-spitting law, a wealthy Californian, W. B. Bradbury, who persisted in expectorating in a street car after having been warned by the conductor to desist.

#### CONTINUOUS RAILS IN UNPAVED STREETS.

We all know of what great advantage the continuous rail has been to the street railways which have adopted it, and the low joint, the bete noire of the street railway manager, is no longer feared because it need no longer exist. By removing the hollows every 30 or 60 ft. into which each wheel fell, to be pulled out at the expense of the coal pile, the cost of power has been reduced, and also the cost of maintenance. The rail, the tie, the wheel, the truck and the passenger are all saved wear and tear. When it is suggested that the continuous rail would be of equal value in saving both the track and the rolling stock on steam roads, the answer is that on such roads the rail is above ground and exposed to all sudden changes of temperature; that it would contract and pull apart in winter and expand and buckle in summer; that on the street railways using the continuous rails, they are so buried in paved streets that less than 30 per cent of the surface is exposed and are laterally supported by the paving which prevents buckling. On



83-LB. RAILS IN 47TH STREET.

suburban roads also, where the tracks are laid in unpaved streets there has been considerable hesitancy about welding the rails, one company going so far as to consider the design of an expansion joint which could be laid at rather long intervals and thus provide for the expansion and contraction that it was presumed would occur.

We reproduce here photographs showing a piece of double track laid by the Chicago City Railway on 47th street between Western avenue and Kedzie avenue in July, 1896. This track is of standard street railway construction; 7-in. 83-lb. girder rails; oak ties spaced 28-in. between centers; wrought iron tie-rods every 7½ ft.; joints cast-welded by the Falk process. Tie plates with a brace which supports the rail on the outer side are used; there are four spikes at each end of each tie, the two on the inner side are driven through holes in the plate and grip the lower flange of the rail, those on the outer side are smaller and hold the tie plate only. This track is laid in an unpaved street on an embankment but little wider than the tracks. The space between the two tracks and between the rails is for the most part filled with loose dirt, in wet weather it is soft mud, into which the horses driven over the street sink clear down to



the ties, but the sides of the rails are in many places exposed for more than half their depth. This piece of track is one mile in length and has passed through the summer without a kink and the winter without a break.

The co-efficient of expansion of steel may be taken at .000066 per degree Fahrenheit, and the extreme range of temperature as 120 degrees, or the co-efficient for the total range as .0008. In a mile this amounts to over 4 ft. As the cars operating over this track did not find any such chasms it is fair to presume that the rails did not contract.

Assuming the joints to have been welded at the maximum temperature attained in summer, the rails would tend to contract .0008 of their length for a fall of temperature of 120°. The force necessary to prevent this is .0008 times the modulus of elasticity, which latter may most easily be defined as the stress necessary to stretch a bar of unit cross section to twice its original length, in the case of steel about 30,000,000 lbs. per sq. in. Thus the force necessary to prevent contraction is 24,000 lbs. per sq. in. or, since an 83-lb. rail has a sectional area of about  $8\frac{2}{3}$  sq. in., the total force is 208,000 lbs. This stress of 24,000 lbs. is well within the elastic limits for rails. Inasmuch as the modulus of elasticity is the ratio of unit stress to unit strain, the force necessary to prevent contraction is no more for a mile than for a foot; but this resisting force may be distributed, and applied uniformly throughout the length of the rail. The ties are 28 in. apart or 2,263 per mile, so that if at each tie the motion of the rail is resisted by a force of 92 lbs. no movement will result. Of course the track must be anchored at the ends in some manner or other, in this case it is so anchored by being connected to more track at the Western avenue end and to a piece of track in Kedzie avenue. The longer the rail the less is the resisting force per tie required to prevent motion and for 10 miles of track it would be only 9 lbs.

It is generally admitted that the buckling is more difficult to prevent than the contraction, and as the proper way of doing this Mr. Bowen suggests the rails should be welded at a comparatively high temperature so that nearly all the stresses to which the rails are subjected shall be those producing tension. This experience of the Chicago City Rail-

Oakland avenue, Milwaukee, laid with 60-lb. T-rails. The photograph was taken after four days exposure in June, 1896, the joints having been cast at night. This track is



SIX INCH 60-LB. T RAIL, OAKLAND AVENUE, MILWAUKEE.

covered by dirt to the heads of the rails; no joints have broken on this track.

### CARRYING BICYCLES.

Street railway managers are waking up to the fact that in many cities the carrying of bicycles on street cars is not only a possible source of revenue, but an accommodation which the public is beginning to demand. We have realized this trend from numerous letters, asking what is being done in other cities.

There are evidently cities where such accommodations are not much needed, but in others where the parks or other desirable riding streets can only be reached by passing over long stretches of bad riding, a good business can be carried. In San Francisco, as already illustrated in these pages, a device is attached to the front of each car which will carry two wheels. For these one regular fare is collected. All familiar with the topography of that city, and Butte, Montana, where wheels are carried, will realize the popularity of the scheme. But in other cities, not hilly, there are lines where bicycles can be hauled, not only in case of accident to the wheel, but where riders become tired, or are caught in rain and glad to return under cover. In New York city the elevated roads have put in operation several bicycle cars, converted from regular cars by taking out the seats and substituting a rack along one entire side; side seats extend along the other side. In these cars no one is allowed without a wheel, and no checks are given—each rider must watch



TRACK IN 47TH STREET, CHICAGO.

way will no doubt be of interest to those interurban roads which are seeking a solution of the low joint problem.

The third illustration is a view of a piece of track in

his own machine. On Sundays and specified holidays special bicycle cars are attached to trains running every twenty minutes between 155th and Rector streets, via the 9th avenue line, from 6:30 to 8:50 a. m. and from 4:30 to 6 p. m. This service was inaugurated Sunday, April 11, and promises to be very popular. A sign is carried reading "Bicycle Train."

Where street railways desire to inaugurate this traffic it would not be difficult to convert an old horse-car to the purpose, putting in racks with locks, using keys that cannot be removed when the rack is empty, and transporting the passengers in the regular car ahead. For good weather a flat-car can easily be constructed in the home shop of good length, and without any roof if desired.

### THE VARIED DUTIES OF MANAGING A SMALL ROAD.

We have always had a great deal of sympathy for the manager of the small road, and feel that frequently he out-generals, in his smaller operations, many a time, his brothers of the larger systems. It is obviously no easy task with small earnings, where every dollar must be made to count to give the service which he wants to give, but which the receipts do not warrant. In addition to this he must be practically the whole thing, and fill all the executive offices at once.

A bright young electrician who has had considerable experience on a large eastern road has been for the past year in charge of a small road in the west, and writing us of his experiences, says:

"When I come to think of the worry and care that have been mine during the past two years, I count my experience very valuable to me. I dare say it would have taken many years to have acquired the same ins and outs on a metropolitan road. The large street railways are divided into departments, and each department is under a separate head, but here a manager must act as superintendent, claim and purchasing agent, chief engineer, and sometimes a relief or extra on the cars; or, at other times must deal out comfort or charity to an afflicted widow whose husband your cars have killed; attend council meetings, secure legislation, and bear up proudly under the adverse criticism of a thankless public, which does not appreciate the efforts of its best friend. With the watchword, "Pay expenses or shut down," the past two years have found us heroically struggling to keep our heads above water. It has made me sick at heart at times to know that we ought to string more feeder wire, to find that the ground return was in bad shape, and re-bonding was necessary; hangers need replacing; air-brakes should be purchased (grades 1 per cent); that cars need repainting; whether to pay damage claims or stand suit; and buy a new engine for the power-house; repair faulty bridges—and only "chicken feed" in the till and a dwarfed bank account. Such are a few of the interesting problems I have had to face and work out, and I know you will rejoice with me that I have succeeded in paying expenses and made quite a number of improvements as well."

Such is the every day experience of many of our readers, and we offer these trials of our friend for the consolation of those in the same boat, on the ground that misery loves company. Let the manager of the many small roads which are working under conditions most adverse and unpromising take heart, and keep trying; there are doubtless others worse off.

### A NEW TIDE MOTOR.

Experiments are being continued in California to improve the old and unsuccessful types of wave motors so as to get a practical mechanism. A motor has been designed and is being built at the Union Iron Works, San Francisco, which the inventor, Mr. Schomberg of Los Gatos, believes will fulfill the requirements. In the model the force of a wave is transmitted to a piston which compresses the air in the cylinder into a large reservoir from which it can be used for driving any compressed air machinery. The apparatus is designed for a period of greatest calm and least swell as an ingenious system of pawls and ratchets with an automatic trip relieves the motor from any excessive strain due to very heavy swells. A wharf will be erected near Santa Cruz or Capitola this summer to test the new motor. Although no one has yet succeeded in working out the problem, it is such an inviting field and so full of possibilities, that it is to be hoped practical progress will soon be made.

### ELECTRIC MUTUAL CASUALTY ASSOCIATION.

At the annual meeting of the members of the Electric Mutual Casualty Association of Philadelphia, Pa., officers were elected as follows: President, W. B. Rockwell, Staten Island Midland Railway; vice-president and general attorney, Thomas B. Harned; treasurer, W. H. Clark, Bergen Traction Company and cashier of the Quaker City National Bank; secretary, William W. Wharton. In addition to the foregoing, the directors elected were N. Sumner Myrick, president Warren, Brookfield & Spencer Street Railway Company, Brookfield, Mass.; C. H. Stoll, president Belt Electric Line Company, Lexington, Ky.; Dr. H. B. Rockwell, medical director; W. S. Grant, Jr., president Geneva, Water-



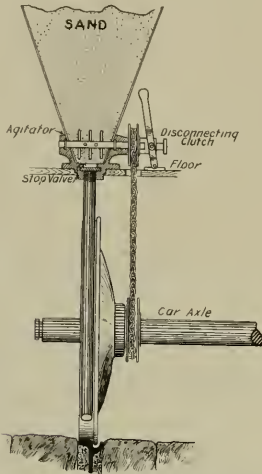
W. W. WHARTON.

loo, Seneca Falls & Cayuga Lake Traction Company, Seneca Falls, N. Y. The association had a very successful experience in 1896 in avoiding accidents and adjusting claims, and commences the present year with every prospect for a successful career and rendering itself more necessary to its members than ever. The membership now comprises 40 of the most completely equipped suburban and interurban roads in the country, and a high standing is necessary for admission. The secretary, W. W. Wharton, who was elected at the last meeting of the association, was in December last appointed to that position, succeeding Newton Jackson. Mr. Wharton has long been identified with the insurance world, and is well qualified for the position.

An ice dam was formed beneath the falls at St. Cloud, Minn., recently, and caused the water in the Mississippi to back up in the canal leading to the power house of the City Street Car Company. This interfered with the turbines, and the plant was forced to shut down for a time.

## AN IMPROVEMENT FOR SAND CARS.

The Third Avenue Railroad Company, of New York, has two sand cars used exclusively for sanding and sweeping the tracks in wet weather. Four hoppers are on the car, and from these sand is deposited at the rear of the revolving brushes on a clean track. Some trouble was experienced in keeping the sand from packing in the neck of the hopper when it became damp. George H. Robertson, the twelve



year old son of Superintendent J. H. Robertson, designed a device by which this trouble is eradicated. As shown in the cut, a toothed wheel is revolved in the bottom of the hopper by a chain which is rotated by a collar on the wheel axle. This agitates the sand and prevents lumps from forming. A disconnecting clutch throws the mechanism in or out of gear. By this simple device but four men instead of eight are required on each car.

## EMERGENCY TELEPHONE SYSTEM.

The Simplex Interior Telephone Company of Cincinnati, has recently perfected an emergency street railway telephone system that may be installed at small cost. In its simplest form it comprises a metallic circuit from the power house or central station along the car route. The pole boxes are of iron, a trifle larger than the ordinary messenger call box, and the interior construction is such that the introduction of the conductor's transmitter automatically puts the same in circuit; there is also a ringing key for signaling central station. The conductor's instrument mounted in hard rubber, is small and easy to carry. The receiving station instrument comprises a relay, local alarm bell, and telephone instrument. Six cells of a good open circuit battery in the central station are sufficient to operate a line 10 miles long.

The wheelmen of Charleston, S. C., add insult to injury when they insist that the street railway provide a cinder path between its tracks, so bicyclists can ride out to the country. A liberal use of oyster shells would perhaps be better for the railway business.

## STREET RAILWAY PROBLEMS IN EUROPE.

Our readers will no doubt be interested in the questions proposed for discussion at the Tenth General Assembly of the Permanent International Tramway Union of Europe, which is to be held in Geneva in 1898. They are as follows:

## DIMENSIONS OF CARS.

What is the best relation, in tram cars, between the dimensions of the car body and of the platforms?

What type of car do you recommend for electric traction: 1. For underground or overhead trolley lines; 2. For storage battery lines?

## TRUCKS.

What are the advantages and disadvantages of using cars with bogie trucks for local traffic lines?

May not, by other arrangements, the reduction in dead weight be effected, in increasing the capacity of the rolling stock?

What is your experience with radial trucks?

## BRAKES.

What brakes do you recommend for the different systems of traction; 1. Animal; 2. Electric: (a) with motor car only; (b) with motor car and trailers; 3. Steam, compressed air, and gas motors.

## POWER HOUSES.

What, in general, is the proper choice of boilers and engines for a central station?

## BONDS.

What is the best electrical connection for the rails: 1. When laid flush with the pavement; 2. When projecting above the surface?

## SWITCHES.

What are the types of switches you use?

Do you consider that, for mechanical traction, switches with two moving points are preferable to those with one moving point?

## ACCUMULATORS.

What progress has been made with storage batteries for street railway traction?

1. As regards the construction, the capacity, and the reduction of the dead weight of the accumulators.

2. As regards the durability and the cost of maintenance.

3. As regards their practical and economical application to tramway traction.

## GENERAL.

What are the present actual advantages and disadvantages of the different systems of electric traction?

Have you new communications regarding mechanical motors for tramways?

## CARS HAVE RIGHT OF WAY AGAINST CYCLISTS.

In a suit brought against the Los Angeles Consolidated Electric Railway Company by one Everett, who was injured while riding a bicycle on the car track, the court held that it is a wheelman's duty to look out for and endeavor to avoid danger from the electric cars. The motorman has a right to assume up to the last moment that a rider who is between the rails will increase his speed or turn aside to avoid a collision.



### MAIL BOXES ON DES MOINES CARS.

The post office department has decided to test the use of street letter boxes on the cars of two lines of the Des Moines City Railway. The test will cover six months, and if at the end of that time proves satisfactory will be extended to all the lines, and to other cities where conditions are suitable. The Des Moines road affords an excellent test, as every car on the entire system passes the post office, and the boxes can be emptied each trip. The scheme was tried about 10 years ago on the Mt. Adams road in Cincinnati, and in one or two other cities but under the old horse car system was not as successful as it should be now with the quick trips made by electric cars. General Manager Hippe is to be congratulated on having his road selected.

Leading business men of St. Louis are urging the same service there.

### FRAUD CLAIM EXPOSED BY X-RAYS.

As the result of a collision of one of its cars with a car of another company, the City & Suburban Railway of Baltimore has recently had a suit entered against it for damages, by a passenger who claims to have had his arm broken, and in connection with which X-rays photographs will prove important evidence, if they have not already knocked out the case.

Although the collision was reported to be of a minor nature, the claim agent with due consideration of the consequences of such accidents, started at once to investigate. Early in his search he came to the business address of one of the passengers (a Jew) where he learned from his journeyman that the employer had met with an accident that morning and had gone to consult a doctor. In questioning these men, without revealing his business, the claim agent became suspicious, and started at once to track the party. He did not then succeed in locating the physician, but stumbled across a lawyer at whose office the claimant had already applied. From him was gained some valuable information. Two days later the claim was made by letter through another attorney. A meeting was arranged and the claimant appeared with his arm in plaster of paris splints, complaining of great suffering, and armed with a doctor's certificate which stated he was treating him for a broken ulna. The claim agent seemed credulous, and only to be anxious for a reasonable settlement, but made no offer. The claimant asked for \$2,000. When the company's surgeon examined the case he was met with the difficulty of the splints in his way, but he felt well satisfied from other indications that the arm had not been recently broken. How then to meet the contrary statements of the claimant's doctors became the question, in the event of a court trial. If claimant could be induced to submit to an X-rays examination the matter would be determined. To the claim agent's and doctor's plea of only wanting to be satisfied, the man consented to undergo the test, apparently in good confidence that he would escape detection. Appointment was then made with Professor Hamel, of the State Normal School laboratory and an outside surgeon of standing.

The first experiment, owing to movement of the patient while sitting, did not make a good court exhibit, although it satisfied the doctors that the arm was not broken. With much difficulty the claimant was induced to undergo a second trial. This resulted in a clearly defined reproduction

of the bones of hand and arm in normal condition; also showing in varying shadows the clothing, buttons and some trinkets placed in the field by the subject. As a result of the test one of the lawyers (for by this time there were three), dropped from his last offer of \$750.00 to \$25.00, but the company decided it would give nothing, and the claimant has since left Baltimore. It was afterwards learned that he had applied an acid to his arm to give it an inflamed appearance. An account of the exposure appeared in the daily papers, and the claim department has since heard that it has had a good effect upon a certain class of railway claimants.

### A CAR IN COVENTRY.

The illustration herewith is reproduced from a photograph showing one of the double-decked cars of the Coventry Electric Tramways Company, Coventry, England. Being a double-decker the trolley-stand must be of the form shown in order that the trolley may not interfere with the passen-



ELECTRIC TRAM CAR, COVENTRY, ENGLAND.

gers outside, and that the steps to the roof may be clear, the controllers must be set well back from the dash. These two features make the car look strange to American eyes, but the truck is quite familiar, as it should be, being one of the Peckham "extra long."

### TIME LIMIT IN DAMAGE AND DEATH CLAIMS.

The general assembly of Connecticut has passed a bill providing that no action for damages either by death or accident may be brought against any electric, horse, cable or steam railway company, unless written notice stating claims be given such company within four months of the time of the accident. The notice may be served on the secretary or any executive officer of the road.

The bursting of a steam pipe at the Depot street station near the foot of Price Hill, Cincinnati, caused a shut down of the engines and blocked the cars around Government square. Steam was soon up on another battery of boilers and the engines and generators started after an hour's delay.

### AN ABANDONED TROLLEY LINE.

There are some localities which cannot support electric roads, and when, regardless of conditions, tracks are laid and cars run with few patrons, the stockholders and investors are sure to come to grief. Such an ill-advised line was the Northern Electric Railway which made connections with the Cicero & Proviso electric road and Hanson Park, a suburb of Chicago. The Chicago, Milwaukee & St. Paul handled the suburban traffic in these sparsely settled suburbs. It was thought by some that an electric line connecting with the elevated or trolley roads to the center of the city would be profitable. In the spring of 1895 the track was laid for a part of the Northern Electric, but at the intersection of the C., M. & St. P. the railroad owned a strip of land 500 ft. wide. Upon this were laid 54 tracks



extending a short distance on each side of the street upon which the electric line ran.

To build a crossing over all these tracks was deemed too expensive for this small road, and tracks were laid to each side of the railroad crossing. Five cars were put in operation, the power being supplied from a dynamo in the Garden City Foundry. The receipts of the road amounted to about \$2 a day and the expenses \$24. When the cold weather came the system was frozen up and went into hibernation for the winter. The following spring the cars were run for a time, but financial prospects were no brighter than the previous season, and the service was abandoned. The illustration from the Chicago Chronicle shows the dilapidated condition of all that remains of the system. Small boys and junk men soon had the trolley wire down and the cars dismantled. The rest of the ruin was wrought by the elements. The remains stand as a monument to injudicious plans and blasted hopes, and a warning to those who think a fortune is made when a trolley line is built.

### AMERICAN TRADE IN EUROPE.

Albert Herbert, of Boston, in addressing the National Association of Manufacturers, recently said:

We have had some experience with foreign trade. In the last few years one-third of our entire force of 1,200 men has been working on foreign trade, nearly all European, and in England we did it in this way.

First, we found that the circumstances over there are very similar to what they are here. Those people have the same

tongue, and American advertising reached them, and they responded just as quickly to advertising as in this country. In addition to that, we sent over first-class American salesmen and established offices in the principal cities on the other side. We found those people were just as quick as we are—and I believe a little quicker—to take hold of a first-class American article over there.

In other words, the way to reach that trade over there is to advertise the same thing that we advertise here, first-class advertising when it is required, and back it up by first-class salesmen, sent from this side to start the thing over there. I think that in two years from this time most of our business will be done in Europe.

### RECENT DECISIONS IN CONNECTICUT.

The supreme court of Connecticut has recently decided the question of whether a street railway constitutes an additional burden in the street in the negative. Unfortunately the court was divided in its opinion so that a change of one in the judges may result in a reversal of the rule in similar suits which will certainly be brought in the event of such a change occurring. The only similar case that has ever been before the court was decided in 1857, the road being a steam railroad, and it was held that an additional servitude was created. A few years later a lower court held that no new servitude was imposed by a street railway, and the case was not appealed. Being thus able to approach the question unhampered by a mass of precedents the decision was on different lines from what it would have been had the law been well settled.

The majority opinion was written by Judge S. E. Baldwin and concurred in by two of the other four judges. The court says, in part:

"It is the prevailing doctrine in the United States, and was settled, as respects this case, in the case of *Imlay vs. Union Branch Railway Company*, 26 Conn., 249, that the location of an ordinary steam railroad upon a highway imposes an additional burden upon the soil, for which the owner of the fee is entitled to demand the compensation. \* \* \* The essence of the decision was that the grant of a railway franchise by the legislature, authorizing the occupation of land subject to a highway in such a manner as substantially to interfere with the proper uses of a highway, or substantially to change them by introducing another, not practically identical with the original ones, was the bestowal of a power, the exercise of which charged the land with a new servitude."

This opinion cites the preamble of one of the early statutes of the state which declares the fit maintenance of highways in a "fit posture" for passage "according to the several occasions that occurred," is necessary for man and beast and a profit and advantage for the people. The court holds that this statement of principles requires that the public easements for highway purposes must have "originally contemplated all such improvements in structure and grade as occasions occurring in consequence of the advance and growth of the country, and particularly of populous and growing cities shall make necessary."

Continuing, the Judge says:

"Whoever holds property subject to a public trust holds it subject to the same extent to public control. The owner of the fee in a highway holds his estate subject to a public right, which is equally, and for similar reasons, subject to public control so far as may be necessary to protect the public in the full enjoyment of whatever belongs to them. This power of control resides primarily in the general assembly. It is their judgment that street railroads furnish a proper means of accommodating public travel on highways; and the judicial depart-

ment of the government will not pronounce charters granted for their construction to be invalid because they make no provision for additional compensation to the owners of the soil, unless forced to the conclusion that to give them effect would necessarily sanction the invasion of private right.

"But as yet there is a substantial identity in many particulars between the use of a highway by an electric car and that by an ordinary vehicle, both moving upon the same grade. \* \* \* New York is the only state in which the courts have accepted the position that a railroad, designed for the transportation of passengers, or passengers and property, and not operated by steam, imposes a new servitude on the soil of a city or village street; and this conclusion is there rested on the ground that the railway company has a right of an exclusive character to the use of its tracks, which is, to a certain extent, paramount to the general public right to travel. \* \* \* No grant of any power of eminent domain is to be found in the charter of the Newington Tramway Company. If, therefore, the franchise to construct a street railway, which it assumes to grant, cannot be exercised in case of objection on the part of any of the abutting land owners, without the aid of compulsory proceedings, it must fail of effect, and fail because the charter is in conflict with the constitution, in that it purports to allow the taking of private property for public use without just compensation."

While thus holding that there is not of necessity an increased servitude because of a street railway being laid in the street, it is also plainly pointed out that speed, construction and operation may be abused and thus special servitudes arise.

The opinion of the minority is by Judge Hamersly, the youngest on the bench in point of time, and concurred in by Chief Justice Andrews, the oldest. The argument by them is that at common law the rights of the abutting owner in the highway are subject only to well defined easements of a public character, and that the street railway is in the nature of an illegal private occupancy, or a trespass which sounds in damages.

Another case of interest is that decided by Judge Wheeler of the Superior Court in regard to a trolley line from Shelton to Stratford, which in connection with other trolley roads would have joined Bridgeport with Ansonia and Derby, and closely paralleled a division of the New York, New Haven & Hartford. When such a parallel is proposed, it is necessary to have a ruling from a judge of the Superior Court that the line is of public necessity, and Judge Wheeler in deciding this point, rules that there can be no public necessity for "speculative" roads. He says:

"If it should appear that the applicant is bankrupt and that the road will exist on paper, that its promoters were but speculators intending to hawk the franchise about the state, no public interest could be conserved by such a road, and I don't think that the public convenience and necessity would require such a road. Under the statutes the intentions to build such a road must be proven."

If this decision is sustained in the Supreme Court it will inure to the advantage of all legitimate street railway enterprises, protecting them from a very common species of blackmail.

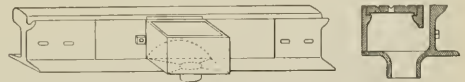
## ELECTRICAL REPAIRS ON CITY VS. SUBURBAN ROADS.

A rather peculiar fact which is hard to account for has been observed by the manager of a large system which has some lines reaching into the heart of a great city and others which do simply a suburban business. On the suburban lines straight runs of half a mile or more at full speed are common, while on the city lines the traffic is as heavy as any place in the world. The power station records show, as would be expected, that the city lines take from 25 to 30 per

cent more current per car-mile than do the suburban because of the power used in accelerating cars. However, in the matter of repairs, the proportion of expense is almost exactly the reverse; that is, the armature repairs are higher per car-mile on the suburban than on the city lines. The rolling stock is the same in the two classes of service. It would naturally be thought that the armature repairs would be greatest on those lines which used the most current per car-mile. However it would hardly be good logic or common sense to reason that the more current a car uses the less will be its electrical repairs; nor does it follow that a reduction in the amount of power used by the city lines would not be accompanied by a reduction in repairs on the city lines. There is, evidently, some special destructive force at work on the suburban lines that is not felt on the city lines. The fact is hard to account for, and the REVIEW would be pleased to learn of the experiences of any roads similarly situated, in order that further light may be thrown on the matter. The high speed lines would naturally be expected to cause more mechanical wear on the motors than slower speed, and it has been suggested that perhaps the mechanical strains on the armature windings are at the bottom of the electrical repairs. The fact that the motors are in parallel a greater proportion of the time on the suburban lines, and are, therefore, both subjected to the full potential a greater proportion of the time has also been offered as an explanation.

## FOR DRAINING GROOVE RAILS.

Our illustrations shows a perspective view and a section of a rail patented in England by W. H. S. Dawson, and manufactured by Askham Bros. & Wilson, of Sheffield, designed to drain groove rails on tramways. The drain rail is of crucible cast steel and is usually 8 ft., 6 in. long, though made in shorter lengths and also in curved sections. Except at the drain box it is of the same section as the grooved girder rails and is fished to the latter at the ends when laid.



A slot 12 in. long is cast in the groove of the rail casting through which the water flows to the sewer, a drain of 4-in. earthenware tiles being laid. Adjacent to this slot and covering the drain, a box with removable lid is provided so that the drain may be easily cleaned, though this is seldom necessary. The rail is in use on tramways in Bradford, Leeds, Huddersfield and Wigan, where considerable difficulty has been experienced from water flowing along the rails and eventually getting into the joints and under the bottom flanges causing more rapid deterioration.

## NO DAMAGES FOR DOGS.

George F. Frances brought suit for \$5,000 against the North Chicago Street Railroad Company on account of his large St. Bernard dog being killed by a cable car. The jury decided for the company.

The Nassau Benevolent Association has been organized by the employees of the Nassau lines, Brooklyn.



## ONE REMEDY FOR BROKEN WHEELS.

Managers that are searching for the mysterious cause of numerous broken wheels and who are on the point of blaming the wheel maker or adopting a heavier wheel for future use may find something to interest them in the experience of a small city road, which recently by a heroic method of treatment succeeded in solving the broken wheel problem. The road was one nearly free from curves but abounding in crossings. The wheels being on maximum traction trucks under long heavy cars, were subjected to heavy stress at special work. Finally after much search for the cause of the difficulty and much argument with the wheel maker, the motormen were notified that men turning in broken wheels would be expected to pay for them. That was the end of the broken wheel difficulty on that road. It is unnecessary to state that the motormen now run over rough special work more carefully than formerly.

## OWNERSHIP OF THE CALUMET ELECTRIC RAILWAY, CHICAGO.

On April 19, Judge Showalter, of the United States Circuit Court, approved an agreement between J. C. McKeon, receiver for the National Bank of Illinois, and Farson, Leach & Co., who financed the Calumet road, by which title to \$183,800 of the \$500,000 capital stock, and to \$2,846,000 of the \$3,000,000 outstanding bonds is transferred to the bank in satisfaction of sundry doubtful promissory notes, assets of the bank. The bank also expects to secure some of the remaining stocks and bonds, and perhaps all of it. Farson, Leach & Co. release all claims on the road; but in the event of its sale prior to April 1, 1900, are to receive one-twelfth of the net proceeds. The receiver for the bank will advance the necessary funds to operate the road and keep the property in first-class condition. No changes in the management or policy are contemplated. As a result of the approval of this agreement, the case in equity of the National Bank of Illinois against the creditors, for debts secured by the Calumet stock and bonds is dismissed.

## ACCIDENTS IN MASSACHUSETTS, NEW YORK AND PENNSYLVANIA.

The table taken from the annual report of the Board of Railroad Commissioners of Massachusetts, is intended to exhibit as fully as may be the actual as well as the comparative risk of injury in connection with street railway operation. The years 1896 and 1895 are compared with the year 1888, which is the last year in which the operation was wholly by horse-power, in order to show, so far as the data furnished by the companies will permit, the relative dangers attending the use of horse and electric power. The report continues:

"The comparison thus made will be the more satisfactory as regards fatal injuries, since it must be presumed that these have always been fully reported. Without going into particulars, it may be said that the proportion of passengers and employes killed during the last two years of electric operation appears by the table to have been on the whole about the same as with the use of horse power in 1888, while the ratio of persons killed on the street to total mileage

operated, round trips and car-miles run, has not been materially larger.

"The ratio of non-fatal accidents or injuries appears by the table to have been considerably greater the last two years than in 1888. To just what extent this is due, to the fuller reports of slight accidents which have been made in the later years, as before mentioned, it is impossible to say. The greater speed of the electric service undoubtedly contributes to accidents of this class, especially to the large proportion of accidents, most of them slight, which result from attempting to take or leave a car, or from falling or being thrown from a car, while the car is in motion. In all kinds of locomotion speed is attained with some sacrifice of safety, and nowhere more so than on the street railway. Any high degree of railway speed is absolutely incompatible with the safety of other street travel.

"The record of the last two years indicates, however, that on the street railway lines of this state only one out of 32,500,000 passengers is likely to meet with fatal casualty, and but one out of 275,000 passengers will receive any injury, however slight; and that cars are run on an average about 30,000 miles without mishap of any sort to passenger, employe, traveler on the street, or other person."

## ACCIDENTS IN MASSACHUSETTS.

PASSENGERS CARRIED, ETC.	1888.*	1895.	1896.
Passengers carried, . . . . .	134,475,319	259,794,308	292,308,943
Employes (total), . . . . .	5,531	8,048	8,190
Miles of main track, . . . . .	333,353	1,087,118	1,291,094
Round trips run, . . . . .	3,220,578	5,179,294	6,004,809
Car miles run, . . . . .	23,244,767	43,655,560	53,613,685
<i>Passengers Killed,</i> . . . . .	<b>4</b>	<b>7</b>	<b>10</b>
Ratio to all passengers, . . . . .	1 to 33,619,866	1 to 37,113,473	1 to 29,235,934
Ratio to miles of track, . . . . .	1 to 133.49	1 to 155.31	1 to 129.10
Ratio to round trips, . . . . .	1 to 805,145	1 to 739,891	1 to 600,481
Ratio to car miles, . . . . .	1 to 5,811,192	1 to 6,236,309	1 to 5,361,369
<i>Passengers Injured,</i> . . . . .	<b>140</b>	<b>891</b>	<b>1,114</b>
Ratio to all passengers, . . . . .	1 to 960,559	1 to 291,676	1 to 262,441
Ratio to miles of track, . . . . .	1 to 5.31	1 to 1.22	1 to 1.18
Ratio to round trips, . . . . .	1 to 23,064	1 to 5,813	1 to 6,390
Ratio to car miles, . . . . .	1 to 166,034	1 to 48,996	1 to 48,127
<i>Employes Killed,</i> . . . . .	<b>1</b>	<b>0</b>	<b>1</b>
Ratio to all employes, . . . . .	1 to 5,531	-	1 to 8,190
Ratio to miles of track, . . . . .	1 to 333,353	-	1 to 1,291.04
Ratio to round trips, . . . . .	1 to 3,220,578	-	1 to 6,004,809
Ratio to car miles, . . . . .	1 to 23,244,767	-	1 to 53,613,685
<i>Employes Injured,</i> . . . . .	<b>11</b>	<b>45</b>	<b>50</b>
Ratio to all employes, . . . . .	1 to 503	1 to 179	1 to 163
Ratio to miles of track, . . . . .	1 to 48.51	1 to 24.16	1 to 23.05
Ratio to round trips, . . . . .	1 to 292,750	1 to 115,094	1 to 107,229
Ratio to car miles, . . . . .	1 to 2,113,161	1 to 970,124	1 to 957,387
<i>Other Persons Killed,</i> . . . . .	<b>6</b>	<b>18</b>	<b>15</b>
Ratio to miles of track, . . . . .	1 to 55.59	1 to 60.40	1 to 86.07
Ratio to round trips, . . . . .	1 to 536,763	1 to 287,735	1 to 400,321
Ratio to car miles, . . . . .	1 to 3,874,128	1 to 2,425,309	1 to 3,074,246
<i>Other Persons Injured,</i> . . . . .	<b>76</b>	<b>546</b>	<b>570</b>
Ratio to miles of track, . . . . .	1 to 7.92	1 to 1.92	1 to 2.26
Ratio to round trips, . . . . .	1 to 42,375	1 to 9,846	1 to 10,534
Ratio to car miles, . . . . .	1 to 305,852	1 to 79,995	1 to 94,059
<i>Total Killed,</i> . . . . .	<b>11</b>	<b>25</b>	<b>26</b>
Ratio to miles of track, . . . . .	1 to 48.51	1 to 45.49	1 to 49.66
Ratio to round trips, . . . . .	1 to 926,780	1 to 297,169	1 to 230,554
Ratio to car miles, . . . . .	1 to 2,113,161	1 to 1,746,222	1 to 2,062,065
<i>Total Injured,</i> . . . . .	<b>227</b>	<b>1,482</b>	<b>1,740</b>
Ratio to miles of track, . . . . .	1 to 2.35	1 to .73	1 to .74
Ratio to round trips, . . . . .	1 to 14,188	1 to 3,495	1 to 3,451
Ratio to car miles, . . . . .	1 to 102,400	1 to 29,457	1 to 30,812
<i>Total Killed and Injured,</i> . . . . .	<b>238</b>	<b>1,507</b>	<b>1,766</b>
Ratio to miles of track, . . . . .	1 to 2.24	1 to .72	1 to .73
Ratio to round trips, . . . . .	1 to 13,332	1 to 3,437	1 to 3,400
Ratio to car miles, . . . . .	1 to 97,667	1 to 28,969	1 to 30,259

\* Operation wholly by horse power.

The detailed report of accidents in Massachusetts showed that the West End road of Boston, with about one-half the passengers and one-half the car-miles run in the state, had

about the same proportion of accidents to passengers and to employes, but nearly three-quarters of the accidents to "other persons;" it had one-half the fatal accidents and three-quarters of those not fatal.

From the report of the New York Railroad Commissioners for 1896 the second table has been compiled, showing the accidents on mechanical traction lines in New York in 1896, and the ratio of the persons killed, injured, etc., to the passengers carried, miles of track, and car-miles.

### ACCIDENTS IN NEW YORK, 1896.

Passengers carried.....	569,680,943
Average number of employes (including officials).....	21,782
Miles of single track.....	1,485.17
Car-miles run.....	111,403,286

	Killed.	Injured.
<b>Passengers</b> .....	<b>13</b>	<b>192</b>
Ratio to all passengers.....	1 to 43,129,308	1 to 2,920,109
Ratio to miles of track.....	1 to 114.24	1 to 7.73
Ratio to car-miles.....	1 to 8,569,484	1 to 580,225
<b>Employes</b> .....	<b>4</b>	<b>40</b>
Ratio to all employes.....	1 to 3,639	1 to 545
Ratio to miles of track.....	1 to 247.53	1 to 37.13
Ratio to car-miles.....	1 to 18,567,214	1 to 2,785,082
<b>Other persons</b> .....	<b>56</b>	<b>169</b>
Ratio to miles of track.....	1 to 26.52	1 to 8.78
Ratio to car-miles.....	1 to 1,988,987	1 to 659,191
<b>Total</b> .....	<b>75</b>	<b>401</b>
Ratio to miles of track.....	1 to 19.80	1 to 3.79
Ratio to car-miles.....	1 to 1,485,377	1 to 277,814

The third table is from the report of the Secretary of Internal Affairs of Pennsylvania. This report does not give the car-miles run, so that the ratios of killed and injured to the car-miles can not be computed.

### ACCIDENTS IN PENNSYLVANIA IN 1896.

Passengers carried.....	376,502,551
Total number of employes.....	8,394
Miles of single track operated.....	1,561.89

	Killed.	Injured.
<b>Passengers</b> .....	<b>32</b>	<b>532</b>
Ratio to all passengers.....	1 to 11,765,705	1 to 1,053,912
Ratio to miles of track.....	1 to 48.81	1 to 2.94
<b>Employes</b> .....	<b>10</b>	<b>67</b>
Ratio to all employes.....	1 to 839	1 to 125
Ratio to miles of track.....	1 to 156.89	1 to 23.31
<b>Other Persons</b> .....	<b>76</b>	<b>394</b>
Ratio to miles of track.....	1 to 20.55	1 to 3.66
<b>Total</b> .....	<b>118</b>	<b>993</b>
Ratio to miles of track.....	1 to 13.24	1 to 1.57

The Massachusetts table is particularly valuable as showing the decreased liability of accident with mechanical traction.

It is evident that there must be considerable difference as to what accidents are reported in these three states; in Massachusetts the ratio of passengers injured to passengers killed is 111, while in New York it is 12, and in Pennsylvania 17. This indicates that the reported injuries in the latter states were much more serious than the average injury reported in Massachusetts.

The ratios for the number of persons killed indicate that it is about four times as dangerous for a passenger to ride on street cars in Pennsylvania as in New York, and three times as dangerous as in Massachusetts. For "other

persons" the fatal liability is about as 1 in Massachusetts to 3 1/3 in New York and 4 1/3 in Pennsylvania.

On the steam railroads in these states the number of passengers killed and injured were as follows:

	Mass.	N. Y.	Pa.
Passengers carried.....	111,620,051	179,315,449	128,334,166
Passengers killed.....	10	18	37
Passengers injured.....	79	196	834
Ratio of killed to total carried.....	1 to 11,162,005	1 to 9,963,081	1 to 3,468,499
Ratio of injured to total carried.....	1 to 1,413,037	1 to 914,874	1 to 141,887

It is apparent that in proportion to the passengers carried, there are on an average for these three states but 2/3 as many passengers killed on the street railways as on the steam roads. As the danger to passengers on steam roads is known to be slight, and considering that the street railways operate in streets, the showing of fatal accidents to passengers on them is very favorable indeed.

In Massachusetts there were relatively 5 times as many passengers injured on the street roads as on the steam roads, which is further ground for believing that in this state many trivial injuries on the street railways are reported. In New York the steam roads injured relatively 3.2 times as many passengers, and in Pennsylvania 7.4 times as many, as did the street roads. The average for the three states is the same as the average killed—2/3 as many, relatively, on the street roads as on the steam roads.

## SNOW PLOW FOR THE SOUTHWESTERN MISSOURI.

The illustration shows a snow plow of novel design built for the Southwestern Missouri Electric Railway Company by the Freeman Foundry & Machine Works of Joplin, Mo. It consists of a share of heavy steel boiler plate mounted on



SNOW PLOW—SOUTHWESTERN MISSOURI ELECTRIC RAILWAY.

a 1-wheel truck, which is coupled to and pushed ahead of the car. The plow is fitted with a lever for raising and lowering the share. During the last winter this plow was used over the entire system of the company and proved to be very servicable.

Contrary to newspaper report the Oakland (Cal.) Consolidated has not made a 1-cent fare, but has put on sale a commutation book of 25 rides for a dollar, which is primarily designed for use by students at the state university.

## ALUMINUM CONDUCTORS.

The recent reduction in the price of aluminum has caused electrical engineers to do some figuring as to the relative cost and conductivity of the metal in comparison with copper. It can be seen that aluminum gives promise of coming into commercial use as a conductor of electricity. The production of copper seems to be inadequate to the present demand. In fact the visible supply is barely equal to three months' consumption. This is due to the extensive application of electricity in every branch of industry. Especially is the demand a growing one in England and on the Continent, because of the development there of electric traction. The price of Lake copper, with a gradually rising market, is 12 cents per pound. Careful tests have been made recently with aluminum of 99.66 per cent purity, and a conductivity of 63.1 per cent was found as compared with copper. The specific gravity of rolled aluminum is 2.63 and that of copper is 8.93. With this conductivity and specific gravity, weight for weight, aluminum will conduct 2.14 times as much current as copper. At present quotations for copper, aluminum will be a competitor whenever the price is reduced to 25.68 cents per pound. In view of the fact that aluminum sold for \$12.00 a pound 10 years ago, and can be purchased for 32 cents per pound in England today, and with the ever increasing facilities for cheap production in large quantities, it seems reasonable that the metal can soon be purchased for 25 or even 20 cents per pound.

At first aluminum was produced by the sodium process, but this chemical method was quite tedious and expensive on account of the great stability of the compounds. Chemical methods were abandoned, the separation of the metal by electrolysis being the only commercial process. At the works of the Pittsburg Reduction Company at Niagara Falls, the Hall process is used, which consists of dissolving alumina in a molten bath composed of the fluoride of aluminum and the fluoride of some metal more electro-positive than aluminum. Bauxite, an oxide found in extensive deposits in Georgia and Alabama, is best suited for the reduction. It is composed of the following elements: Alumina, 59 per cent; water, 32 per cent; titanic acid, 4 per cent; silica, 3 per cent, and oxide of iron, 2 per cent. This is obtained cheaply, and is delivered to the works direct from the deposits in the South. The crude ore is crushed and washed. With cryolite added as a solvent it is placed in pots which are arranged in series with a low potential circuit of great current carrying capacity. The resistance of the metal mass is such as to give a very high temperature. In each pot is a carbon cylinder which is the positive electrode or anode and the lining of the pot, with the metal deposited, is the other electrode. The aluminum is deposited in the bottom of the vessel by this electrolytic action in a molten mass, and is then drawn off and a new supply of material added.

Cryolite has nearly the same specific gravity as molten aluminum, and for this reason is not an ideal solvent, but its high heat of formation protects it from being decomposed in the electrolytic process, and its solvent powers are greater than any other substance that has been tried. These pots are in constant operation, and as there is little depreciation they seldom need renewal. Noxious gases are prevented by the use of special chemical solvents which are used in dissolving the alumina with a certain strength of current.

Direct currents must be used in this process which necessitates the use of rotary transformers to convert the two-phase alternating current into a direct current of 160 volts. After the aluminum has been drawn off in iron ladles the ingots are sent to the company's works at New Kensington, Pa., where the metal is cast, rolled or hammered into commercial forms.

Since 1886 no less than 16 plants have been started for the manufacture of aluminum and of these only five remain, the rest succumbing to adverse litigation. These firms are the Pittsburg Reduction Company in the United States, the British Aluminum Company in England, the Aluminum Industrie Actiengesellschaft in Switzerland, the Société Electro-Metallurgique and the Société Industrielle d'Aluminium in France. In 1895 these factories turned out 2,528,960 lbs. of aluminum, whereas 10 years previously less than 7,000 lbs. were consumed. The capacity has increased with great rapidity, the Pittsburg Reduction Works alone with its new plant having an output of 3,500,000 lbs. annually.

At the works of this company aluminum has been used for conductors both to the upper and the lower plants. At the upper works, currents of from 8,000 to 10,000 amperes at 160 volts are carried over bars one half to one inch in thickness and 12 in. wide, bolted together with aluminum rivets. Mr. Hunt, president of the company, says that there is less corrosion at the joints and that the present lines give better service than the copper bars which have been used and are still employed in part of the line. At the lower works, in conducting the current from the power station to the pot room on the upper bank of the Niagara river, aluminum rods are used which are 350 ft. in length and  $\frac{3}{8}$  in. in diameter. The rods are connected to the bus bars at one end, running from the generators, and at the other end to the large bars carrying current to the pot-room line by having the ends of these  $\frac{3}{8}$ -in. rods upset into a large aluminum plate which is designed to make the connection between the rods which are the conductors up the bank and the pot room line. About 500 of these rods are used in this way, and are bare.

There are some objections to the use of aluminum in line work, the most fertile source of trouble being with the joints. Joints are difficult to solder though it is stated that the use of a solution of ammonia will greatly facilitate the operation. Galvanic action is liable to take place between the solder and the conductor, but these defects can doubtless be remedied in practice. The greater bulk of the aluminum conductors would make them more difficult to handle than copper, the cost of insulation will be increased and the insulation resistance diminished. However, for trolley wire the greater size with equal weight will facilitate suspension, give greater strength to the line, better contact to the trolley and a less per cent of depreciation. Aluminum has a tensile strength of 25,000 lbs. per sq. in. which is about the same as copper. It likewise has nearly the same temperature coefficient but is not so easily corroded. Some of the alloys of aluminum are of commercial value, though they do not possess the low specific gravity that is such a desirable feature of the pure metal. Many novelties and small utensils are made of aluminum and its use is constantly finding broader application. Should it become available as a conductor of electricity, the effect will be far reaching for in many cases it would be preferable to copper.



## TO THE PYRAMIDS BY ELECTRICITY.

(From Our Own Correspondent, Cairo, Egypt.)

Cairo, if not a city of magnificent distances, is at least a city of magnificent contrasts. There, in striking juxtaposition, are squalor and luxury rubbing shoulder with one another, whilst savagery and barbarism are check by jowl with an advanced form of civilization. Along the streets of Masr-el-Kahira pass all types of vehicles, the well-appointed broughams of wealthy pashas, humble bullock wagons laden with burdens of veiled village women; stately camels with Beduin riders fresh from the desert, bicycles steered by dames in the regulation wheeling costume, donkey boys in blue galabeyahs, bestriding their animals and flourishing their sticks over their heads, and hacks and carriages, called in the vernacular "ariboyahs," with red tarboushed drivers. Motley as the throng is to those multifarious conveyances was added last summer another kind of conveyance, which has to a large extent revolutionized the street traffic of Cairo. Electric tram lines, operated from an over-head trolley, intersect the principal thoroughfares of the capital of Egypt. From the building devoted to the mixed tribunals run the trim, well-kept electric cars, conveying passengers to Abasiyeh, the site of the English cavalry barracks; to Boulak; to Masr-el-Atiqua or Old Cairo; to Bab-el-Luk, and to the Citadel where the famous—or rather infamous—massacre of the Mamelukes took place. Their success is partly evidenced by the rise in the price of the shares of the Societé Anonyme des Tramways du Cairo, from the nominal value of \$100 to \$150.

Curiously enough, none of the shares are held by the native population of Egypt, and on the organization of the company some little dissatisfaction was thereby caused, since many of the wealthier Egyptians desired to invest capital in a local enterprise. Nevertheless, the general public has taken kindly to the new means of transit, and the cars are daily crowded with the turbaned



KASER-EL-NIL BRIDGE.

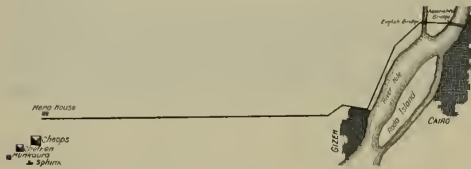
Arabs, and the black, shapeless bundles whose kernel is an Egyptian woman. Of course, at first a few Arabs were killed by the trams, because an Arab takes some time to grasp the fact that the ting-ting of the bell is an imperative injunction for him to get out of the way. Only 20 have, however, been killed, which is a notable fact to the credit of the native motormen. The success of the trams is further attested by the fact that last year the number of licenses applied for by ostahs or the drivers of hack carriages has been decreased by one-third, and that the donkey boys have decreased in like proportion—in some respects a regrettable fact. There is a further evidence of the popularity of the electric trams in the projected tramway to the Pyramids, for which a concession has been granted by the Egyptian government to the above named company.

The tramway will be commenced in May, and it is anticipated that the cars will be running during the early part of the next year. It will be about seven miles long, and will start from the Kaser-el-Nil bridge, whose poodle-like



ROAD TO THE PYRAMIDS, WHICH THE TRAMWAY WILL FOLLOW.

lions wear an expression of idiotic complacency, and will terminate at Mena House, the famous hotel near the Pyramids. The estimated cost of the undertaking is \$300,000. One of the little difficulties in the way of the undertaking is the narrowness of the bridge called the English bridge, in contradistinction to the Kaser-el-Nil bridge, which was built by the French. The company is required to build on the side of the existing bridges for the tram line and to construct a small foot-way on the other side of the bridge for foot-passengers. The undertaking, however, presents no great difficulty, as the arm of the Nile crossed by the bridge is of



no great width. There is a further requirement, this being that the trams shall not interfere with the avenue of acacia trees which line the road to the Pyramids.

As is the case with the other lines in Cairo, the projected line will be operated on the overhead trolley system, and the power will be derived from Boulak. As the Kaser-el-Nil bridge, or rather one portion of the bridge, is open at a stated time of the day in order to admit of the passage of the dahabeyahs, the cable is carried under the Nile at this point and thence over the bridge. The system is that of the so-called Union Electricaets Gesellschaft of Berlin, which is the same as that of the General Electric Company.



PALM GROVE AT GIZEH.

The poles supporting the trolley wire were in the case of existing lines made in the United States, but as to the forthcoming line they are at present being made in France. The cars are to be made in Belgium; open cars will be used in summer and closed cars in winter. Each car will contain six garden seats, while there will be a compartment set apart for the harem. The wheels are to be made, as for the other cars of the company, by Miller & Co. of Edinburgh. The service will be an hourly one, and there is no doubt whatever that from a financial point of view the success of the scheme is assured. All the material for the line is already in Cairo, and the work is not likely to be stopped by any hitch. There is to be in the first instance a single line, which will no doubt accommodate the traffic, at all events for some time. There will, however, be no difficulty in constructing a double line if needful in a very short time.

Of course, from an engineering point of view, there is no special interest in the line to the Pyramids. The road is perfectly flat and there are no difficulties to be overcome which cannot be readily surmounted. On the other hand, from a picturesque point of view, the road along which the trams will pass is eminently interesting. The contrast between the avenue of trees, with its passing throng of quaintly attired, bronzed Arabs in bright blue robes, or in yellow, purple or striped garments, and the arid desolation of the desert glaringly yellow in its sterility, is great indeed. But this is not the attraction of the traveler. Attention is always fixed on the huge masses of stone which loom up in the distance, seeming to be very near, but which are apparently no nearer after three miles of the road have been traversed than at the outset.

It is, artistically speaking, a huge mistake to destroy the old world aspect and the orientalism of the road to the Pyramids by anything so shockingly modern as the electric tram, which must inevitably jar the aesthetic sensibilities of the cultured traveler.

Still the tram will be by no means a bad thing from a practical point of view, and as usual in this prosaic age aestheticism must give way to utility.

#### TROLLEY WIRES AND POLES IN ST. LOUIS.

The annual report of A. J. O'Reilly, supervisor of the city lighting department, of St. Louis, for the fiscal year ending April 13, 1896, shows:

The miles of streets on which electric cars are operated are 187, on which are laid 332 miles of track. The miles of trolley wires are 344, and the number of poles in public streets, used for railway work is 13,630; poles in parks 123. Only three cases of electrolysis were reported during the year and these were quite insignificant. Electric light wires caused the death of four persons and three horses; five cases of fire were reported from electric wires; and three persons were killed from gas explosions, while two more were asphyxiated.

There were 267 reports of electric light wires "down" and 100 reports of span, trolley and guard wires repaired.

New York's rapid transit act has been declared constitutional by the Court of Appeals, in the suit brought by the Sun newspaper to enjoin the city officials from paying out funds for the enterprise.

## REPAINTING OLD CARS.

BY CHARLES KOONS.

## PART I.

The subject of repainting old cars is quite a broad one, and the systems in vogue are still broader, and often varied in ways and methods. Every painter likes to be original and says his way is the best, and even after he does settle down upon a regular system he is never satisfied, but keeps continually changing, from the fact that here and there some one will be found who has improved this and that way of doing things. It is a progressive trade in any way one wishes to look at it. New colors demand certain treatment to make them show up and wear; varnishes, shellacs, fillers and stains need constant attention and study also.

The numerous new substitutes for this paint and that paint that are constantly being brought forward have to be tested by the practical painter before he feels justified in using them. It is not the wise painter that takes anyone's word for anything in the painting business. If he did there would be chaos in his work, and there would be nothing but trouble from start to finish in all that he did. He must know his oils, japans and varnishes thoroughly, their working qualities and their natures, and be well posted on the strength and drying of his paint mixtures.

The labeled three and four day paint coat and varnish is out of the race just now and has to be used in the one and two day limit, and sometimes sooner. It takes some thought.

The modes of a few years back will not answer for the rush of the present; instead of two weeks, now it is days, and then one cannot do the work soon enough for some people.

The question of service is not considered so much now as formerly, but how soon can it be put through, the quicker the better for some of the hustlers of street railways. With many of them the least attention is paid to this part of the work, hence the rush and hurry that is continually being urged with the painting, which ought to have plenty of time. It has been too often the case that street railway managers look upon the repainting of street cars as needed only when other work is necessary, and not before, and then only a short time is given the painter to jump at his work and throw it on almost any way; if he don't get sufficient paint on to do the work right it has to go anyway, and he has to do the best he can.

This makes it very bad and disagreeable for the painter, as he wants to do good work always, but is often hindered by this kind of treatment. It also keeps him from using the proper material, and as a result he cannot do the work satisfactorily to himself or to his employer. The work, as a rule, in such cases is run out, looking bad and only half finished, and, of course, will not give the service that it should, or would give if better done.

There is no other department that is so hurried in its work and handicapped by the want of proper time. The blacksmith may take all the time he cares to, the woodworker is never through with a job until he has patched up every hole in the car, and even the electrician goes about his work as if he had all summer to do it in, but lo the poor painter has to hedge in on somebody's time in order to get half a show. And he is asked before he has hardly commenced, when he will finish the job. But there are some managers that have

due respect for well painted and fresh looking cars, and have arranged things accordingly, and more, they give the master painter all the freedom he requires in repainting; and as the rolling stock never receives too much paint it is the proper thing to do.

If all of the car painters could use their own judgment in the matter there would not be so many dilapidated cars on our public streets, and instead of the heavy expense per car, for painting every two or three years, caused by the paint and varnish being allowed to perish entirely before giving attention, there would be a thorough going over every year, with a touch of color here and there, and a re-varnishing of the car throughout, in this way there would be no need of repainting a properly painted car except every three or four years. A re-touch and varnish every year saves the expense of repainting every two years. A car that is painted properly will do, if re-touched and varnished once every twelve months for at least three years, and with some colors longer. There is economy in this kind of management because it saves painting one time in three.

Cars that run two years without either painting or varnishing become so cracked up that the only thing that can be done with them is to burn off the paint and re-paint them from the bottom up. Whereas, if the car were re-touched and varnished every year the paint would be preserved and kept intact for at least three or four years, and then repainting would not require nearly as much work as to burn off the paint clear down to the wood.

The varnish preserves the paint and the paint protects and keeps the wood and iron from decay; now if there is no renewing of the varnish every year the paint is exposed and it must give way, and then there is nothing left to keep the car from rotting. The life of the very best varnish made is not over one year, and if not refreshed in that time it is bound to crack. When varnish once cracks it opens up and allows the elements to go still farther, and it is only a question of a short time when the paint will also begin to crack, and then it is a quick process of destruction for everything, varnish, paint and the outside wood and iron exposed.

There is another feature about re-touching and varnishing a car every year. It gives a chance to remedy other defects, for instance one of the worst things to start decay in a street car is the opening of the joints at the corners, and the loosening of screws and nails in every part. This necessarily lets in the rain and dampness, and as a consequence decay soon starts in these places. When this destroyer once has a foot hold there is nothing to prevent it eating its way into more vital parts, thus causing the car to become weakened just through a little matter of neglect.

About once a year these things need attention, when the car is brought in to re-touch and varnish the car builder needs to look over the car and carefully examine every joint and tighten every loose screw or, which is better, replace every loose one with a larger size. The painter in his re-touching always touches and thoroughly goes over these parts, putting and filling up and painting them well and then when the coat of new varnish is put on over this it is ready for another year's run. It is the old story that a stitch in time saves nine, which will be thoroughly proved to any manager if he will give the method a trial.

This, however, is only a prelude to my subject, but is a necessary preparation for the hints and pointers that may follow. In repainting a car the first thing necessary for a painter is to find out how badly the old varnish surface has



cracked. If it has not gone too long and the under paint coating is not affected, it is not necessary to burn it off, but only to wash it down clean with water then take the finishing coat of varnish off with ammonia, using it just strong enough to soften the outside coat, and no more, as the under coat or rubbing varnish that is used in colors must not be softened unless the cracks run clear through all of the varnish, which is unusual unless it is caused by improper painting or bad material. If the cracks are deeper than the varnish and color, the surface must be rubbed down with block pumice stone; after all the varnish is taken off with ammonia, if the cracks are still deeper and run down clear through the under coatings to the priming then there is only one thing to do, that is to burn the old paint off. After which sand and clean down smooth, and free the surface from any of the old paint; unless this is done the repainting will crack again wherever there is any of the old paint left on. This is lifeless stuff after it has gone this far, and the only thing to be done is to get rid of it at any cost. It is often the case that old cracks have not gone any deeper than the color coat, and if this is the case a careful rubbing with block pumice stone will be sufficient to bring out the cracks and level it down to start again with a coat of lead, or a guide coat as we call it. It is nothing more than lead colored up something near the color to be used.

After this coat of lead is thoroughly dry the surface is ready for the putty and plaster of which there will be quite a lot, for the reason that all the former holes, low places and cracks, through the use of ammonia, have been softened and brought down below the regular surface, and these must be all gone over again and filled up level. After the putty becomes dry the whole car is ready for a thoroughly close sanding with No. 1 sand paper. When this is done properly the car is ready for the color coats. Another system which is a very good one, is to give on top of the putty a coat of rough stuff, and rub down with block pumice stone to a level surface. One is about as cheap as the other although the former is the quicker, saving one day's time. In the matter of the painter's health the latter system is preferred on account of doing away with the dust arising from sand papering the lead and putty, which is very injurious.

Another very good way of removing old paint is to use an eradicator, of which there are quite a number on the market. Great care should be taken in using these strong preparations; they should be used by experts who know all about working them, as the tendency is to leave them on too long in certain parts and then there is trouble, as they are made up with solutions of lye, strong soda and most anything in that line that will destroy the paint.

When some parts of the old paint stick a little closer than the rest, and will not come off by using the eradicator, a putty knife or coarse sand paper should be brought into use as a continual coating of the eradicator over the same spot, has a tendency to calcine the wood, as it were, and make the surface so that nothing will stick to it; this is one result of its use and it should be handled with the greatest of care to save trouble and the usual paint and varnish deviltries.

The matter of using color is brought down to the painters judgment; he has had experience in the use of everyone's brand of this and that color, and through that knowledge he surely knows which is best adapted for his use.

There is quite a difference in the various japan colors that are on the market; no two can be alike unless they are ground in the same japan, and then the chances are that one

will be a little different from the other in fineness, and it often happens that the shade from the same pigment is different through the grinding.

Some colors should not be ground in japan, as that medium has a tendency to darken the tint and cause it to turn and fade quicker than it would if ground in varnish. In dark colors it doesn't matter, but in light delicate tints the lighter the medium in color, the cleaner and brighter will the color be when finished. The style in color for painting the modern street car runs in sectional tastes, as every city has a peculiar fad of its own for street car painting, in some dark reds seem to be the only colors used, while other cities go to the other extreme and use the light yellows and whites. In others the tendency is to follow the steam car style and paint all over one color, this makes a very heavy looking street car, especially when the color is dark, although a more economical style could not be devised.

The usual custom is to paint the main panels and letter board with the top ends and dashboard the main color of the car, and then the window framing and the concaves a lighter shade, this adds a little more life and variety to the car, as well as making it appear lighter than it would if painted one color all over.

There is quite a difference in the degree and quality of the colors that may be used in either the dark or light color, and it is poor economy to use cheap colors. The cheap dark colors having a tendency to turn and spot while the lighter shades either turn dark or dim away to no color. Another point against using cheap material in the way of colors is that they will not allow re-touching and varnishing every year, but if the car is to be made to look anything like a fresh painted car the cheap colored paint will have to be cut down and re-coated, while the substantial color will stand re-touching and varnishing two or three times before it needs repainting. This is a saving of one in three in the matter of labor and material, and in the continued expense of keeping the cars looking fresh and clean.

In re-touching good color the tendency is not so much for constant changing. When the color has taken on its old look it generally stays at one point, if it is protected, and can be easily matched anytime afterward. This is not the case with the cheap colors, as they are the ones that are so easily affected by the elements, which cause them to turn and fade, sunlight being their worst enemy.

This can be easily proved by coating panels two or three days apart and exposing each coat to the sun; each day will show a different cast of color with the cheap colors but with good reliable material the changes are not perceptible but come after long wear and exposure if at all.

In another issue we shall take up the permanency of colors used for street car work.

## FIRE DEPARTMENT HAS RIGHT OF WAY.

It has been decided in the case before Justice Dickey of the Supreme Court of New York that fire engines have the right of way over trolley cars as well as other conveyances.

The suit was brought by a fireman against the Atlantic Avenue Railroad Company of Brooklyn, on account of injuries sustained from a collision between a trolley car and a fire engine. It was previously decided that a trolley repair wagon has no right of way, the only vehicles with such a privilege being an ambulance and the fire department engines and wagons.

# 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.

Two students of the senior class of the Case School of Applied Science, Cleveland, are now conducting experiments under the direction of Professor Benjamin on the bursting of small fly-wheels. The wheels are driven by a steam turbine, the speed being determined by observing the tone. The first wheel tested was 15 $\frac{1}{8}$  in. in diameter, and burst at a speed of 6,250 r. p. m. A timber bomb-proof surrounding the wheel was demolished.

\* \* \*

The reason why the best is the cheapest in cylinder oils, as in other things, is well brought out by Albert A. Cary in the Engineering Magazine. When oil is fed into the steam much of it enters the cylinder mechanically suspended in the steam in the form of minute globules, and the remainder as vapor. As of course only the unvaporized oil is available for lubrication, the greater the portion vaporized the greater the quantity that must be fed to the cylinder to secure the necessary lubrication. The cheaper grades of cylinder oils are generally composed of a mixture of mineral oil (which has not been sufficiently deprived of its most volatile constituents) with some animal or vegetable oil, added to increase the viscosity. These last named oils vaporise at comparatively low temperatures, and are not therefore fitted for use in cylinders with high pressure steam.

\* \* \*

### Test of a 300-H. P. Steam Turbine.

The illustration, for which we are indebted to the Scientific American, shows a 300-h. p. De Laval steam turbine, now in successful operation in the 12th street station of the Edison Electric Illuminating Company, New York City.

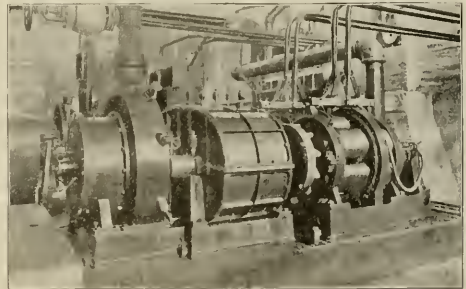
In this type of motor steam is conducted from the initial pressure through nozzles to a lower final pressure with consequent increase in volume and velocity; the nozzles are made divergent at the ends so that considering the increasing velocity of the steam, the cross section of the tube is such as to just provide for the increasing volume. The turbine shown has eight such nozzles; when it is desired to reduce the power developed some of them may be closed. The wheel case is near the left end looking at the picture, with the stems of the valves controlling the nozzle openings projecting from it.

The turbine wheel is 29.5 in. in diameter, and runs at 9,000 r. p. m., the speed of the buckets being 1,160 ft. per second. The blades are ranged around the periphery and are milled out of the solid steel spokes of which the wheel is built up. The blades forming the buckets are curved in cross section and made very thin at the edges; a steel band surrounds the periphery and prevents the steam jet from escaping over the front edge of the buckets. At the left of the wheel case is the exhaust chamber which is connected to a surface condenser; at the right is the gearing box. In

the gearing box are a pinion and two gears of such proportion as to reduce the speed from 9,000 to 750 r. p. m. The shafts of the two gears extend through the box and operate two 100-k. w. Desrozier dynamos working on the three wire system. The teeth on the pinion and gears are double helicoidal, inclined both ways from the center at an angle of 45° so that there is no end thrust on the shaft.

As in all De Laval turbines the shaft of the turbine wheel is sufficiently flexible to bend and permit the wheel to revolve about its center of gravity. A centrifugal governor driven from one of the dynamo gear shafts regulates the speed by varying the supply of steam admitted to the steam chest, through a balanced valve in the top.

The following are the published results of the tests for which we are indebted to J. W. Lieb, Jr., general manager of the Edison Electric Illuminating Company. The results of



300-H. P. DE LAVAL STEAM TURBINE.

four tests of one hour each are tabulated below; in these the steam entered the turbine chamber at a pressure of about 147 lbs.:

No. of jets in use.	Average load.		Average watts.		Per cent of full load.	Vacuum ins.	Steam per e. h. p. per hour. Lbs.
	+ Amp.	Amp.	+	-			
2	153.78	147.15	18,707	18,283	18.50	27.00	27.35
4	433.60	455.80	54,156	57,886	56.02	26.43	20.22
6	700.85	718.65	87,746	91,268	89.51	26.07	19.75
7	771.94	787.33	97,418	100,856	99.14	25.70	19.95

A six-hour test made with a steam pressure of 155 lbs. gave results as follows: Dynamo output 127.25 volts and 692.45 amperes and 128.26 volts and 709.18 amperes. Total water from air pump, 27,763 lbs. Average water per electrical horse-power-hour, 19,275 lbs. Average water per brake horse-power-hour (allowing an efficiency of .90 for the dynamos), 17,348 lbs.

Tests on the Parsons compound turbine, recently made at Newcastle, England, are said to have shown water consumptions of 17.28, 20.00 and 22.01 lbs. per electrical horse-power-hour, the steam pressure being 70 lbs. and the speed 9,400 r. p. m.

If these very surprising figures on water consumption, (equal to or better than the compound engine) can be duplicated elsewhere, the steam engine has found a rival indeed. Such a low economy as this was scarcely to be expected, as the experiments on a 10-h. p. De Laval turbine at Purdue University, the results of which were published some time since by Professor Goss, showed a water rate of 46.6 lbs. per brake h. p. per hour when the turbine was developing 10.3 h. p., the initial steam pressure being 126.3 lbs. per sq. in.

\* \* \*

### The Wellington Series Engine.

On April 8 the Engineering News published a description of the Wellington series engine, involving an "absolutely new process in thermodynamics," and believed to be "entitled to rank among the greatest of original creations in the field of the transformation of heat into mechanical energy."

The diagram, Fig. 1, illustrating the arrangement is reproduced from the Engineering News, after adding the temperatures of the several boilers and condensers. The series engine as indicated, consists of five engines, each having its separate tubular boiler and surface condenser. At one end of the series is a "heater," and at the other a "cooler." A "circulating fluid" is caused to flow from the heater through the boilers of the several engines, through the cooler, and back to the heater through the several condensers, by a suitable pump not shown in the diagram. The "circulating fluid" imparts heat to the "boilers" and abstracts it from the condensers. Each of the five engines draws steam from its own boiler and exhausts into its own condenser.

In the original description it was assumed that the circulating fluid leaves each boiler with its temperature reduced 56°F. below its temperature when entering; that the engines

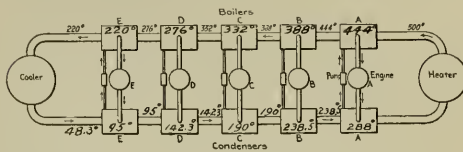


FIGURE 1.

all use steam for the working fluid; and that in passing through each condenser the temperature of the circulating fluid is raised 47.6° F. It was further supposed that the steam pressure in each boiler is that due a temperature 10° less than that of the circulating fluid at its exit from that boiler, and that the same difference exists in each condenser between the temperature of its contents and the temperature of the circulating fluid leaving it. It was assumed, however, that the temperature of the contents of the condenser was 10° less than that of the circulating fluid instead of 10° greater, but this was probably only a blunder of the editor, since not even a Wellington condenser can be expected to transmit heat from a lower to a higher temperature.

In the discussion which follows we propose to show, that waiving all questions as to the series engine being a mechanical monstrosity, that practically the use of a circulating fluid is absurd, that the same heat applied to a single multi-cylinder engine will give 50 per cent more work, and that it is cheaper to throw away the heat abstracted from the exhaust steam by the condenser than to save it by the means adopted in the series engine.

The thermodynamic efficiency of the Wellington series engine depends solely upon the temperature at which the circulating fluid leaves the "heater," and upon that at which it enters the cooler. Leaving the heater at 500° and entering the cooler at 220° the series engine shown in Fig. 1 has the thermodynamic efficiency,  $(500-220) \div (500+461.2) = .2913$ .

But this efficiency can only be realized on the assumption that there are an infinite number of engines in the series, and

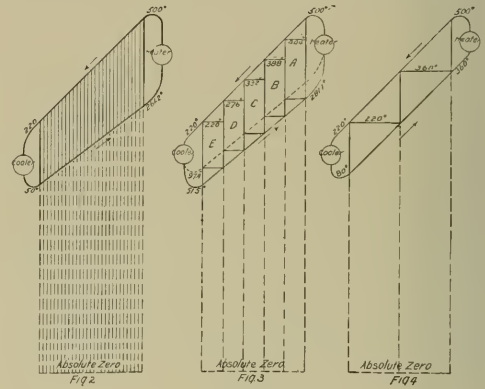


FIGURE 2.

that each works in a Carnot cycle, receiving heat from the circulating fluid as it passes along one side and restoring a portion of the heat as it returns on the other. Fig. 2 will serve to indicate a perfect series engine.

Since there are an infinite number of engines the heat that each receives from the circulating fluid will lower the temperature of the latter by an infinitesimal amount, so that each of the small engines will receive all its heat at the maximum temperature and reject it at the minimum. The efficiency of each small engine is the same and equals  $(220-50) \div (220+461.2)$ ; but as all the heat not appearing as work is returned to the circulating fluid by the small engines their range of working is unimportant.

All the heat given to the small engines by the circulating fluid is transformed into work or is returned to it, so that the efficiency of the latter is the ratio of what it gives the small engines to what it might give, i. e.,  $(500-220) \div (500+461.2) = .2913$ , as before stated.

A single engine working in a Carnot cycle would give the same result.

The temperature at which the heat is rejected is limited to 32° when water is the working fluid; but it may be assumed that 50° is as low as the temperature of the working fluid may be reduced.

Since it is impossible to have an infinite number of engines in the series let us reduce the number to say five, and let those



five each work in a Carnot cycle. Also let the specific heat of the circulating fluid be unity. Fig. 3 will represent such an engine.

Each small engine will receive heat at say the temperature of the circulating fluid as it leaves the boiler of that engine. Let the efficiency of each engine be .18. Then the lower limit for the engine E is  $.82x(220 + 461.2) = 558.6^\circ$  or  $97.4^\circ$  F. The engine E rejects  $.82x(276 - 220) = 45.9$  thermal units. Hence the temperature of the circulating fluid must be  $97.4^\circ - 45.9^\circ = 51.5^\circ$  when it leaves the cooler, in order not to become hotter than  $97.4^\circ$  when leaving condenser E, and thus reduce the working range and the efficiency. The temperature when entering the heater will be  $51.5^\circ + .82x(500 - 220) = 281.1^\circ$ .

The heat transformed into work by the five engines is  $280x.18 = 50.4$  thermal units, but  $50.4 \div (500 - 281.1) = .2302$ , while the thermodynamic efficiency is .2913. The difference is the loss due to the necessity of cooling the circulating fluid below the temperature of the condenser E, that is, with an infinite series the temperature at which the circulating fluid returned to the heater would be  $45.9^\circ$  higher. The full line in Fig. 3 shows the actual temperature of the circulating fluid and the dotted line the higher temperature that we would get in the infinite series engine.

Thus it is apparent that if we have a series engine composed of five perfect engines working in Carnot cycles between the temperatures  $500^\circ$  and  $220^\circ$  we shall get but  $\frac{2}{3}$  as much work from it as from a non-series engine working in a Carnot cycle.

Fig. 4 shows what will happen if we continue to reduce the number of cylinders in series. For two in series with the heater heating the circulating fluid to  $500^\circ$ , and the cooler cooling it to  $80^\circ$  there would be absolutely no heat transformed into work.

Now, in order to compare the performance of the "series" and the "non-series" engines: Let each engine receive dry and saturated steam at the higher temperature indicated; let the steam be expanded adiabatically in a non-conducting cylinder until the condenser temperature is reached and then exhausted into the latter; no clearance, compression, cylinder condensation or radiation losses are, for the present, considered. The circulating fluid is a matter of indifference but let it be water. In the description it was stated that it might be a gas; but we submit that the efficiency of the Wellington boiler is then no greater than that of any other boiler of the of the same material and dimensions. Let there be no gap between the boiler and engine nor between the engine and condenser temperatures. In other words, we substitute engines working steam in non-conducting cylinders for the Carnot cycle engines of Fig. 3. Fig. 1 shows the temperature limits of this engine.

Under the foregoing conditions each engine will receive heat equal to that given out by the circulating fluid in falling  $56^\circ$  in temperature, which will be slightly different for the different engines, because of the varying specific heat of the "circulating fluid," water.

Peabody's and Thurston's steam tables were used and the results, considering one pound of the "circulating fluid" for the five engines, and for a non-series engines N working between the temperatures  $500^\circ$  and  $200^\circ$  are given below:

Engine.	Heat to each engine. B. T. U.	Transformed into work. B. T. U.	Range of temperature Degrees.	Ratio of expansion.	Efficiency of steam. Per cent.
A	50.3	9.37	156	5.7	.1580
B	38.4	9.56	149.5	6.8	.1637
C	57.8	9.67	142	8.5	.1673
D	57.3	9.77	133.7	11.1	.1766
E	56.4	9.79	125	15.2	.1736
Total	220.7	48.16			.2182
N	220.7	56.70	380	26.4	.2569

The total heat for the series engine is not the total of the heat supplied to the several engines by the circulating fluid but the heat supplied to one pound of the latter by the heater, and is, of course, the same for the series and the non-series engines.

Other calculations show that if a drop of  $10^\circ$  be allowed between each boiler and engine and between each engine and condenser, other assumptions remaining unchanged, the work from 220.7 B. T. U. given to the circulating fluid will be 43.01 instead of 48.16 B. T. U.

Now we observe that the engine N has a temperature range of  $280^\circ$  and 26.4 expansions, so that it might be a compound engine with a temperature range of  $140^\circ$  in each cylinder. Suppose that the 18 per cent more work given out by the non-series engine is all lost because of the drop in the receiver pressure when the engine is compounded. We then have theoretically, the same amount of work for both engines, but the series engine comprises five cylinders, with an average temperature range of  $141^\circ$  in each, and six pumps, while the non-series engine comprises two cylinders with temperature ranges of  $140^\circ$ , and at most two pumps.

It is thus apparent that the losses due to compression, clearance, radiation and cylinder condensation will be, in actual engines, much greater in the series than in the non-series engine.

However, the series engine requires a "cooler" which shall cool the circulating fluid to  $48.3^\circ$ , and it is but fair to supply the non-series engine with a similar cooler. Cold water is abundant, and we may safely assume that in the non-series engine the lower limit of temperature is  $140^\circ$ .

This engine working steam in a non-conducting cylinder would give us, with an expenditure of 220.7 B. T. U., 77.4 B. T. U. transformed into work. The temperature range is  $360^\circ$ , the number of expansion 137, the efficiency of steam .3234.

Working over this range in a quadruple expansion engines we have a temperature range of  $90^\circ$  in each cylinder, as against  $141^\circ$  in the series engine, and one less cylinder.

Also since in the example we have allowed no temperature drop between boilers and engines and between engines and condensers in the series engine which would further reduce the work from it by more than 10 per cent., we may safely take the losses from all causes as being no greater in the quadruple expansion than in the series engines.

Hence, the efficiency of steam in the series engine may be taken as .218, as against .323 in the non-series, that is, the latter has 50 per cent greater efficiency.

Referring to the editorial comments of the Engineering News under the caption "The Story of a Great Invention," there are a few points that may be mentioned:

It was stated that "Mr. Wellington perceived that its practical success would depend on the invention of an entirely new form of heat transferring apparatus." We presume

that this refers to the boiler, but as the "heater" in the series engine has all the functions of the boiler in the ordinary plant and must itself have a source of heat, it is not apparent why the "heater" should not transfer heat to steam instead of to hot water. In any event that which heats the heater must leave it at a temperature in excess of the latter, with consequent loss.

The same applies to a Wellington series engine receiving its heat from the jacket of a gas engine, why not generate vapor and work it to better advantage in a "non-series" engine? The use of liquids with a low boiling point is not new, (see Rankine's Steam Engine, p. 444) but if we expand much below the lower limit of engine E it would soon be necessary to erect a refrigerating plant (driven by a steam engine) to condense the volatile gas.

The prediction was made that, if a practical success, the Wellington engine promises the highest economy in the conversion of heat into work of any heat engine ever made. Having shown that the maximum efficiency of this engine to be about two-thirds that of a non-series engine working between the same limits, we do not have any faith in the prediction, and think that our contemporary should have given the "discovery of this absolutely novel process in thermodynamics" to the world on April 1, or else permitted it to quietly rest in the "wild-cat cage."

## THE OPERATION OF A HIGH PRESSURE MULTIPLE EXPANSION STEAM PLANT.

BY FREDERICK L. RAY.

In building a steam plant where the latest and best machinery of all kinds is used, it is expected that the most economical results will follow the installation. These expectations are not always realized, but the experience will cause no backward movement in improved appliances, but rather an energetic effect to better the appliances and make the plant as it should be, a money making investment.

Vertical engines with three or four expansions are to be found on land as well as on sea, and why should they not be, for if they are a paying investment on the sea, with proper consideration as to their importance, they should be on land. Multiple expansion engines, as a rule, are run condensing, but may, with profit, be run non-condensing in connection with an exhaust steam heating system where coal is costly and a good price can be obtained for steam heating. When the steam heating is installed in connection with the plant, the double system of piping is needed in order that no more engines than necessary shall exhaust into the heating system. Especially does this apply in the fall and spring when there is very little heating to be done. There should be two exhaust mains of the same size, which are connected across on top with gate valves on vertical pipe over each main. This enables the operator to throw steam to the atmosphere or the heating system, and effects a saving by running the engines without back pressure when the exhaust is not needed for heating. A condensing system can be operated in connection with a steam heating system if water for that purpose is convenient and cheap. With a condensing system and a heating system in connection with a lighting plant, where the right conditions prevail, there is no reason why the highest economy should not be obtained. A plant of this kind would depend upon the conditions under

which it must operate. To make the heating system pay, the plant must be close to the center of distribution of heating, and for a condensing plant to be highly successful it must be close to a large supply of water. With these conditions prevailing, there is no reason why a plant of this kind should not be a financial success. It is desirable, if possible, to return all water of condensation from the steam heating mains to the boilers, especially so if hard water is used, as a little water of condensation will go a great ways towards improving bad water for boilers.

There are several systems of exhaust steam heating. In some of these the water of condensation is returned to the boilers, where it is used over again. In others, all water is drawn off at the heating service pipe main, where it is trapped to the sewer, after passing through what is known as a cooling coil, and goes to waste after having given up the most of its heat. To the careful engineer it would appear that if it be practicable to return this water to the boiler, it should be done. Almost without exception it will be found that the exhaust system feed water heater is used in connection with steam plants. Now, if heating and condensing apparatus be installed in the plant, an exhaust steam heater is useless, because all the engines which are not on the heating system will be run condensing. The exhaust steam heater would be replaced by a fuel economizer, with which a much higher temperature of feed water can be obtained, and still use a product that is continually going to waste. With an economizer of an ample size for the work, it is no trouble to get feed water at a temperature of 250° to 527° F. This is not exceptionally high when the steam pressure is 200 pounds, but can be attained in every day actual practice. Where the steam pressure is lower it would not be possible to get so high a temperature in the economizer. It is generally considered that with such a high temperature in the economizer, where bad water is in use, that it would be but a short time until the pipes would be scaled so badly that no heat could be transmitted through them. Such is not the case, as with very bad water the writer has had no trouble along this line. There is precipitation, of course, but it fails to the bottom, and while in a soft state can be blown out to the sewer. When the conditions are such that no other water can be had for the boilers but that which is highly impregnated with scale forming salts, devices must be used that will purify the water before it enters boiler. These devices are usually settling tanks, exhaust steam heaters, economizers, and live steam purifiers. Where space is valuable, settling tanks are out of the question. Where the plant is running condensing the exhaust steam heater is of no value, but there is no time when the economizer and the live steam purifier cannot be brought into effective service. The economizer uses nothing but the heat which otherwise would go to waste, and if properly constructed there need be no loss in draft. The purifier will cause no loss but by radiation, and there need be but very little of this if the purifier is properly covered by a good non-conductor. All devices for use under 200 pounds per square inch must be made extra heavy, or especially for that service. A good common wrought iron pipe will work satisfactorily under this pressure, but no cast iron fittings of any kind should be used, unless they are extra heavy, as they will leak, and at all times be a source of danger.

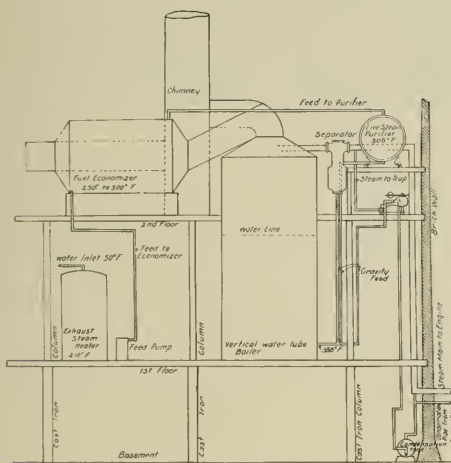
Let all flanges be faced and have plenty of bolts. All valves and fittings above three inches should be flanged, as it adds greatly to the convenience of the making up and

taking down of pipe and fittings. A good steam joint is one that will not leak, and if it does leak, there should be no chance for enough steam or water to blow out to cause any damage, or obstruct the working of the plant. Such a joint would be made of some soft rubber and lead composition, such as Jenkins, or Usudurian sheet packing, which when hot, will soften so that the joint can be screwed up almost iron to iron. This joint may leak just a little when it is cold, or when it is warming up, but when it is hot it will be tight. It is often the practice to use some thick gasket, or rubber composition, or asbestos. This will not do under high steam pressure, as there would be danger of a piece blowing out, and if it did, it would mean the shutting down of a part of the machinery, or perhaps all the plant, depending on where it was located. The ideal joint for high pressure is that in which the metal comes up iron to iron, or nearly so. More allowance must be made for the expansion and contraction of piping under high pressure, because of the higher temperature. All flanges for pipe should be beveled slightly on the inside; the pipe screwed hard into the flange and through it a short distance; then it

to give them strength. The disadvantage of steel in comparison with brass is that it will rust, but with proper application of graphite, there need be no trouble from this source. A rising spindle is to be preferred over others that are stationary, for the rising spindle always indicates whether the valve is open or shut. A good valve will be made so that the stem can be packed regardless of whether the valve is open or shut. This is an important consideration in an electric lighting plant, as it is a serious matter to be compelled to shut down a part of the plant to pack the valve stem.

Composition discs of soft metal or rubber, will not answer for high pressure valves, as they are not to be relied on, and, almost without exception, it will be found impossible to shut steam off some time when it is necessary to do so. Nothing can serve the purpose better than a good bronze seat and disc. If they leak they can be repaired and made as good as new. Brass body valves of large sizes are not satisfactory for high pressures as made, for, on account of the expensive character of the metal, these are made of light weight. This is their great fault, and they twist and bend and expand so that they leak at the disc, and at the thread on the pipe. Of course if they were made heavier, there could be no objection to them, but this would prohibit their manufacture in competition with cast iron body valves. One of the most important valves around a steam plant is the blow-off valve. If it leaks, one can soon blow tons of coal into the sewer, so to speak, and to keep it tight under high pressure has always been an interesting problem. Thanks to the inventive genius of an American mechanic, we have today a blow-off valve made for any pressure, which, when it leaks, can be repaired.

All water of condensation should be returned to the boiler automatically, and this can be done by the return trap as shown in the illustration. The separators on the engines and all steam mains are connected to a receiver in the basement, from which the water is returned to the boiler as fast as it comes to the receiver. Where separators are placed on the pipe close to the boilers, as shown in the cut, the condensation and entrained water will return to the boiler automatically. The condensation pipe should be connected below the water line in the boiler, and should have a vertical check in the pipe close to the separator, to prevent the water coming from the boiler to the separator, if from any cause it should attempt to rise. The separator should be placed between the main stop valve and the boiler, so that when the boiler is off this separator will be off also. All pipes and fittings should be covered with the best non-conductor of heat to be had, for steam at 200 pounds pressure will soon radiate a great amount of heat. Covering pipes also makes them safer, as it prevents to a great extent the sudden expansion and contraction that occurs where it is exposed to all the various changes of temperature. Live steam purifiers should be covered. If they are not, there will be trouble from leaks at the rivets, and especially at horizontal seams. In putting on the purifier, great care should be exercised in regard to heating all parts gradually. The method of doing this is to turn steam on very slowly, and finally get boiler pressure. While heating it in this manner there will be considerable water form in bottom. This must be drained off through the blow-off, which should be opened a little when steam is first turned on. If this water is allowed to accumulate in the bottom, there will be an unequal expansion that will require the services of a boiler maker at once. The bottom should be kept dry while putting purifier on. When



is cut off and riveted. This will make a joint that will last as long as any other part of the plant, but if at any time one of these joints should leak, no attempt should be made to caulk it, as it is impossible to make a caulked wrought and cast iron joint hold under 200 pounds steam pressure. There is nothing around a steam plant more satisfactory than plenty of good pure graphite. A little of this mixed with oil will prevent pipe joints from sticking, and bolts from rusting, and it is useful in a thousand ways. There are no valves made today, extra heavy or otherwise, that can be opened under 200 pounds steam pressure, without injury to themselves, except they be a by-pass to first equalize the pressure. A good gate valve for high pressure will have removable seats that are not screwed, but are driven in, so that they can be removed for repairs. A globe valve also, should have a driven seat. Globe valves can be reset without taking the seat from the valve, or the valve from the pipe, with a portable valve reseating machine, a number of which are in the market. Valves should have steel spindles



thoroughly heated, the gravity valve opened and the water turned in, the purifier is ready for work.

To keep a water gauge glass intact under 200 pounds pressure is one of the present impossibilities. They will last for, say from one moment to sometimes as much as a week or two, but no reliance can be placed in them. Nothing but a very short glass, such as are used in automatic lubricators, will stand this pressure. A glass of any length is soon destroyed, either by an explosion or by a white coating, which renders it unfit for use. All shapes and makes of glass fail under this pressure, when they experience so many extreme changes of temperature. A good chain pull self-closing gauge cock is the best practice possible at present, but let us hope that in the near future there will be improvements that will be satisfactory, for to know where the water is in some kinds of boilers, will soon wear out the best of gauge cocks, and a fireman's will.

Coal should be handled as much as possible by machinery. Ashes should be handled by machinery also. Ashes should be lifted and carried to their destination, and under no circumstances should dragging them be tried, for it has not been successfully accomplished. Mechanical stokers should be used because they are a smoke preventative, and more than that, at least 25 per cent more work may be had from the same boiler than with hand firing. There will be better results from the economizer, for there will not be so much smoke, and necessarily not so much soot, and certainly a higher temperature for the gases in the economizer. There can be of course, a great many arrangements for handling coal and ashes at a modern steam plant, all of which should be as simple as possible, for all devices soon wear out, and if very complicated, there will soon be a great deal of trouble and expense. A rule to build on in this case would read something like this: Fill car with coal from bin in basement; elevate car to top of bin, dump and repeat the operation. Coal to leave bin through a spout to place on the floor, if hand fired, and to hopper, if mechanical stoker is used. Handle ashes in the same manner by a car, when they can be drawn from the bin and carted away.

So far, this paper has been dealing with boiler appliances, but now we shall, for a little while at least, treat of the engine.

Triple expansion engines run just the same as any other, and require the same good care to get good results. A vertical triple expansion engine may, and usually does, have more pieces in it than a Corliss engine, but it is no more complicated to the intelligent engineer. To secure good results, one must have high steam pressure and dry steam at all times, or the first result noticed will be that the work is not done. This means loss all around, uneconomical engines and poor service to consumers.

Belt transmission is slowly but surely being displaced by direct connected engines and dynamos. This is as it should be in a triple expansion plant, for why should one go to the expense of saving at the engine, while still losing on the belted machinery. If a triple expansion engine have dry steam at high pressure and be direct connected to the work, it will deliver the work to the line with as little expenditure of coal as it is possible for it to be done. In handling high steam pressures special care must be given to all piston packing, as there is always a tendency to leak at any pressure, and once fairly started, great damage is soon done.

As is generally supposed, cylinder oil must stand a very high fire test for use in cylinders under high pressure, but

there is no trouble in getting an oil to do the work nicely. A vertical engine from the very nature of its design requires very little oil as compared with others, which have heavy pistons and unbalanced valves. Direct connected engines and dynamos for arc lighting and street railway work, must be perfectly insulated one from the other. This point is not so important in alternating current machines. In the arc lighting stations of today, where it is the practice to use from 4,000 to 6,000-volt machines, the greatest precaution is necessary to prevent loss to life. The machines are carefully insulated from the earth. The floor is such that if the frame of machine should be grounded, there would be no harm come to the attendant if he should touch it, and as an extra precaution, rubber mats are spread about the machinery on the floor. All terminal boards are covered with glass or fibre. The insulating couplings between engines and dynamos are sometimes made of wood, fibre or raw hide. Veneered wood has served as well as anything. It should be soft and tough and thoroughly seasoned. Fibre is good, but is objectionable because of its tendency to warp out of shape and also because so very hard. Raw hide is a good flexible coupling, but it is not nearly so good as wood or fibre. Either one of these must be kept tight, and no lost motion permitted, or the coupling will soon be destroyed.

In conclusion, it may be said, that the high pressure multiple expansion steam plants of today are features of modern engineering, and they have come to stay. They are advances along the line of practical engineering, wherein it has been demonstrated that the higher the pressure and the more expansions, the higher the economy will be. We are told that 200 pounds steam pressure is the limit of practical engineering today. Perhaps it is, but who can tell us what the morrow will bring forth. The 20th century may bring us a practice of steam engineering, of which we cannot dream now. If it be in the line of present developments, the advance will be towards higher pressures and more expansions. What will this mean? Why, greater engines, stronger material, and appliances; greater knowledge of how to apply and safely handle this machinery under these conditions. Such may be our future, and why not help to make it.

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#### SAFETY GATE DAMAGE CASE.

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The cars in St. Paul and Minneapolis have been equipped for several months with safety gates operated by the motor-man, who does not open them until the car has come to a full stop and who closes them before starting. The effect on the accident list has been most marked, and the management are confident of saving many thousands yearly.

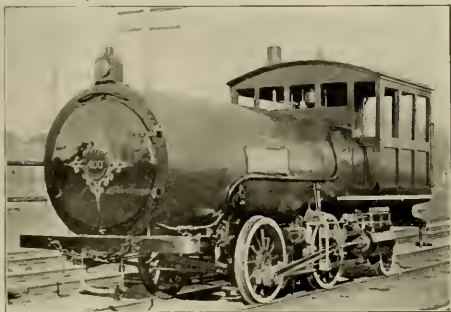
Suit was recently brought by a woman passenger, who claimed injuries caused by the gate closing as she was boarding the car. The company made its defense largely on a demonstration of the gate, a full sized model of which was installed in the court room and operated before the jury. The result was so evident and convincing that the sudden closing of the gates could not inflict any great physical injury that the jury found for the defendant within 30 minutes.

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The footboards, on the summer cars of the Metropolitan Street Railway of Kansas City, are to be removed to prevent passengers from jumping on and off the cars while in motion.

**HARDIE COMPRESSED AIR LOCOMOTIVE.**

In the REVIEW for April were given the data obtained with the two motor cars on the Hardie compressed air system which have been operating on the 125th street line in New York City for several months past. The illustration herewith, for which we are indebted to the Railway Age, shows the locomotive which is to have a trial on the Manhattan Elevated. In general appearance this machine much resembles the ordinary steam locomotive. The space usually occupied by the boiler, however, is taken up by the storage tanks for the air and by the reheater. On this locomotive



HARDIE COMPRESSED AIR LOCOMOTIVE.

the air is stored in 36 tubes of Mannesmann rolled steel, they are 9 in. in diameter and of varying lengths, from 13½ to 21 ft. The charging pressure is 2,000 lbs. per sq. in. The air is led from these tanks through the reheater, in which water is stored at an initial temperature of 350°F., and after passing through three reducing valves is admitted to the cylinders at a pressure of 150 lbs. The working cylinders are 13½x20 in. The American Air Power Company, which controls the Hardie patents has erected a compressing plant for charging at 100 Greenwich street. It is expected that this locomotive will haul 5 cars and make a run of 13 miles between charges.

**THE ECONOMY OF CONTRACTING FOR REPAIRS.**

M. R. McAdoo, the general manager of the road at Paterson, N. J., is the author of several original ideas which he has put into successful operation. For the last two years he has specially watched and studied the question of repairs, and has concluded that many of the usual repairs about a street railway can be more cheaply secured by contract work than in the good old way of the company's men on yearly pay roll. Thus far he has carried it out on track work and the repainting of open cars.

Formerly the best he was able to get out of 12 men and 1 foreman, on raising joints, was 5 miles for an entire summer's work. This was accomplished at an expense of \$18 per day, the foreman receiving \$3 and the men \$1.25 each. Last year Mr. McAdoo tried the contract plan on the following basis: For 35 cents per joint, the contractor was to expose a rail joint, remove three ties if necessary, replace, fill and tamp; remove bond wires if necessary, raise joint,

tighten fish plates; all to the satisfaction of the company's inspector. The company replaces the paving. It would not seem that much of a job could be done on a pair of joints for 70 cents, and Mr. McAdoo says it can't, or is not, with men working for the company direct. The contractor, on the other hand, divides the work out frequently as piece-work, and the result is the men are practically working for themselves—with the usual result. In this way the entire system of 35 miles was gone over last summer, at an expense no greater than the company had previously been paying for 5 miles. The scheme is well worth study.

Another line of contract work was repainting his open cars this spring. There is little fancy work, and this was left to the company's master painter to do with his own men. But the roofs and floors and running boards were let out. The contract called for one coat on the roof, three on the floor and foot-boards, the work and material to be furnished at a price of \$2 per car; and performed in a manner satisfactory to the master painter. The question most naturally arising is that the paint must have been mighty poor stuff; but the explanation is the labor was done by a cheaper grade of painters than the regulation \$3-a-day man, and yet was good enough for the purpose. The cars were from 23 to 35 ft. in length. The fact that outsiders can come in and make contract, and fulfill the same, at the prices named, is sufficient to warrant some careful thinking.

**SAN MATEO TROLLEY ROAD TO BE IMPROVED.**

About a year ago the San Francisco & San Mateo Railway was purchased at a sheriff's sale for \$300,000 by J. A. Buck, Nicholas Ohlandt and the Spreckels brothers. The road cost nearly three times that sum, but its sale was forced by a foreclosure suit. The mortgagors failed to redeem, and, having secured the property, the present company expects to greatly improve the system. The 13 miles of track will be relaid with 84-lb. rails, new cars will be purchased, the feeder lines enlarged and an outlet to Market street secured. The new officers are: A. B. Spreckels, president; J. A. Buck, vice-president; Walter Gibson, treasurer, and W. Clayton, secretary. J. D. Spreckels is the fifth director.

**RE-TURNING TROLLEY WHEELS.**

Charles E. Moore, master mechanic of the Chicago City Railway, has quite recently devised a method for re-turning trolley wheels on a milling machine instead of a lathe, with the result that only four minutes are needed to do the work that formerly required 20 minutes. A small sprocket wheel is fixed on the shaft that ordinarily is used only for giving a vertical feed to the table, and a similar sprocket also attached to the head of the milling machine, these two being connected by a chain when turning trolley wheels. A special 10-tooth cutter with a suitable form of tooth is mounted on the cutting arbor, the wheel to be turned mounted on the head, the latter placed in position, and a single revolution of the head suffices to true up the wheel. The speed of revolution of the cutter is about 160 times that of the head.

Atlanta (Ga.) city council passed an ordinance requiring the company to issue transfers on one fare.

## THE USE OF BED PLATES IN CONCRETE TRENCH CONSTRUCTION.

The president of a western road writes us as follows:

Referring to the STREET RAILWAY REVIEW, I notice the article on new track construction at Kansas City, page 140, March issue, and also the article on concrete work in track construction, page 73, February issue.

In the latter article, reference is made to the REVIEW for January, in which F. A. Little presented figures on concrete foundations, based on the construction of nearly 50 miles of track in Detroit. Our company has eight blocks of double track road, which was laid on wooden stringers, they in turn being laid on wooden cross ties. The work was imperfectly done before the road came under the present management, and since we have ascertained that the wooden stringers, as well as the ties, have become badly decayed, and that the track is spreading, there being practically nothing but the granite blocks to hold it in position. As the street has been paved with concrete and asphaltum, we wish to reconstruct the same by taking out the granite blocks, and the old rails, throwing out the wooden stringers, cutting off the old ties, and practically doing that kind of trench work referred to in the above issues of your journal. We think of using the Johnson rail, Section 83, No. 275, weighing 83 lbs. to the yard, and laying the same on a bed of cement concrete, to be laid in the bottom of the trench. We expect to use cross tie-rods, say every 10 feet, and bed the rails in cement, the construction being similar to that shown in Fig. 1, page 73 of your February issue. We may use granite blocks on both sides of the rail, instead of one side, as shown in said illustration.

We would like to know if it would be desirable to use bed plates under the ends of the rails, where they join, and if so, what size and thickness. We believe the Detroit company laid its rails on concrete foundations, omitting the wooden cross ties, as shown in Fig 2, to be used in new track construction at Kansas City.

We would like to know what its experience has been, as to whether the rail resting on the concrete made too rigid and solid a foundation or not. Unless the rails should settle at the ends, breaking the concrete, would there be any advantage in using a bed plate? How thick should the concrete be underneath the base of the rail? The soil underneath the tracks referred to is principally sand, having been filled into a depth of some eight or ten feet above the natural surface of the soil.

If there is any information on this subject, in addition to that already published in the numbers of the STREET RAILWAY REVIEW above referred to, you would confer a favor by informing us of the same.

Reply by F. A. Little, C. E., Detroit.

Your communication relative to "trench" work at hand. In reply we will say that we think, under the conditions stated in the letter, that trench work as has been previously described in the REVIEW, will give them the best of results.

We consider it necessary to use bed plates under the joints, to avoid the possibility of the breaking of the concrete. In the Detroit work we used  $5\frac{1}{2} \times 24 \times \frac{3}{8}$ -in. plates and channel iron of the same dimensions with 1-in. flanges, the base of the rail resting in the channel. Either one answers the purpose, channel iron being the easier to place in position.

We believe that a beam of concrete 8 in. deep and 12 in.

wide is sufficient under the base of the rail, provided the soil upon which it rests is firm, but if the soil is soft, and of a yielding nature, it needs a wider base, tapering towards the base of the rail, so that the trench through the asphalt shall be no wider than the convenient placing of the track in place requires.

In the February issue of the REVIEW, Fig. 1, page 73, the rail is shown as resting directly upon the concrete beam. While not wishing to criticise any method of construction, but judging from our own experience, we would say, better construction can be obtained by laying a 6-in. course of concrete, or so as to be 2 in. below the base of the rail, and let that "set" for four or five days before beginning track laying. In this way we have 2 in. of space between the base of rail and the concrete, which allows for the placing of the rail to the exact grade irrespective of any irregularities in the laying of the concrete, and also leaving room to work the grouting under the rail. We used oak "shims" for blocking the rail to grade.

It is true that concrete makes a very rigid and solid foundation, but we do not consider this an objection, when the slight additional rumbling sound made by the cars running over it is greatly overbalanced by the smoothness of its riding qualities, and not only this, but it is a satisfaction to railway companies to know that they have a track, laid at a moderate cost (compared with tie construction under the same conditions), that is going to last as long as the rail, which we believe possible with concrete properly laid.

In conclusion we can say that the track laid by the Detroit Railway in trenches, using a concrete beam 6 in. in depth and 12 in. in width, and grouting around the rail and 2 in. beneath it, using tie-rods every 10 ft., and bed plates under the joints, after withstanding the frosts of two winters, and a traffic of cars from two to four minutes apart, 18 hours per day, for two years, is in a condition at least 25 per cent better than the tracks laid with oak ties on a 6-in. concrete foundation, but using no tie-rods and extra support for the joints.

## SPLICING SMALL CARS.

BY W. H. PELTON.

While the writer was in charge of the railway shops of a well-known company the management became imbued with the long car idea, and there was some work done which may be of interest to readers of the REVIEW. The equipment consisted at that time of short, panel-body cars, as shown in Fig. 1, each car equipped with two 30-h. p. motors; and while it was imperative that the old equipment be not scrapped, it was equally imperative that we have double-truck cars. As a result it was decided to form one 32-ft. car from two 16-footers, and to operate it with the four 30-h. p. motors taken from the short cars.

The two bodies were set on horses in the shop, the back end was removed from one and the front end from the other, and the corner posts and end sills ripped in half. Then the two bodies were butted together and fastened with  $\frac{5}{8}$ -in. carriage bolts, placed so as to be out of sight. A few heavy wood screws were used under the window strips, and the sills were reinforced with  $\frac{1}{2}$ -in. iron plates extending  $\frac{1}{4}$  ft. each way from the splice. While this work was in progress the old panels and water rails had been removed so



that it was possible to set a piece of southern pine,  $4\frac{1}{2} \times 12$  in.  $\times 32$  ft. on each side of the car, flush with the bottoms of the sills, and to bolt through the sills at intervals of about



FIG. 1.

22 in., using  $5\frac{3}{8}$ -in. bolts, with cast washers on the pine side. The old sills were of oak. On each side of the splice two rods of  $3\frac{1}{4}$ -in. round iron went clear through the car body. The  $4\frac{1}{2} \times 12$ -in. was framed at the top to fit the curvature

to hold it there. The  $2 \times 8$ -in. pieces are 14 in. from the roof at center of car.

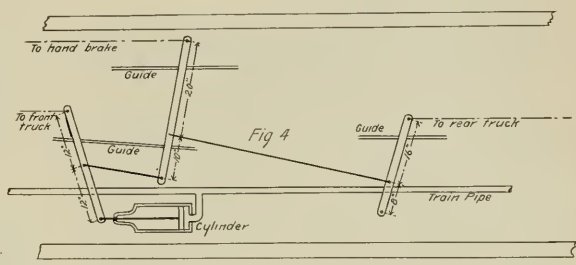
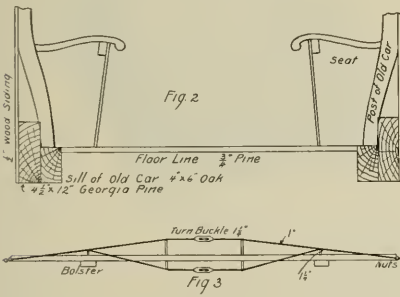
The four motors are operated with an ordinary controller, wired so that on the series notches the motors are working two in series and two in parallel, and on the multiple notches, four in parallel. Whenever it is necessary for the wiring to go below the floor it is placed in an iron-armored "interior conduit."

The Hunt air-brake is used, and the arrangement of the brake levers on the car body is such as to give extreme flexibility (see Fig. 4.) The brake is worked from an independent electric compressor.

The steps were formed by cutting risers from  $1\frac{1}{8}$ -in. iron and riveting two of the old single steps in position to form one double step.

The trucks were set well apart, so as to avoid an extreme overhang on curves. This threw the front truck so far forward that the sand-rigging was placed in front of the back truck; the sand valves from the two small cars being connected by a rocker shaft so as to sand both rails.

In writing this article it was not the purpose to describe an ideal car. But this makeshift may, for a very little money, furnish some other road with a few good-looking, durable, easy-riding cars, capable of handling a very heavy traffic.



of the posts. A section through a post is shown in Fig. 2. After putting in the truss rods the car was sided with round-corner white wood,  $1\frac{1}{2} \times 1\frac{3}{4}$  in.

The form-trussing used is shown in Fig. 3. This form of double truss effectually prevents the sagging of any part of the car body, no matter how loaded. The under truss was placed just inside the car sills, and covered by the seats. The over truss was let into the  $4\frac{1}{2} \times 12$ -in., and held close to the siding, in order to have the necessary rise and not prevent the lowering of the windows near the center of the car. The under truss was so placed as to secure a good bearing on the old car as well as the new car sills.

In closing the roof, finishing the sign-board, water-rail, etc., care was used to break joints wherever possible, but even then, owing to the lightness of the frame and carlines, the roof would barely support its own weight, not to mention a heavy trolley stand, and the hob-nail shoes of a 190-pound "inspector." The form of truss adopted may be seen in Fig. 5. Two pieces of Southern pine, each  $2 \times 8$  in., extend the length of the roof and into an angle of  $\frac{1}{2}$ -in. iron at each end. Two rods,  $3\frac{1}{4}$  in.  $\times 32$  ft. 5 in., pass through these angles with double nuts on each end. With this device it is possible to give the roof any desired camber and

Some may object to side seats in a car of this style. They are not pretty, but please to remember that the seating capacity is just about the same as with cross seats in a car of the same size, while the standing room is vastly greater,



FIG. 5.

and a car of this sort can be loaded or unloaded at a rate that would be utterly impossible with any of the cross-seat cars known to the writer. One of these cars, 32 ft. long by

7 ft. wide over all, will seat comfortably 44 to 48 persons, and will handle without undue crowding loads of 100 to 110.

These are the exact dimensions of the car shown in Fig. 5, and the writer has seen a load of 134 persons on that car, exclusive of children and dead-heads; probably 156 or 158 in all. That time it was crowded.

The four motors may lead to some extra work and some expense. But they render every pound in the entire car available for traction and on a slipping rail, or on an upgrade, a car will come up to speed in from one-half to one-third the time that it can with a two-motor double truck equipment. The difference is more than noticeable on a clear level rail.

It was also shown by ammeter readings that a car in going around the loop referred to above would use for a given speed 36 to 38 amperes with four motors; 88 to 92 amperes with two motors in one truck or 54 to 56 amperes with one motor in each truck. The same would undoubtedly be found in any one of the curves on the line, the ratios depending on the radius of the curve, and would be more clearly shown in starting from a dead stop in a curve. And every extra horse power spent in this way means not only a loss of power but it means the destruction of the car wheels, of the special work, and to a smaller extent of the trucks and car body. In double truck work four motors have their advantages. I shall be pleased to answer any enquiries addressed in care of the REVIEW.

#### DISTRIBUTION OF RESISTANCE BETWEEN CONTROLLER POINTS.

When series-parallel control first came into use but little subdivision of resistance between controller points was made, the usual arrangement being to divide the resistance into two parts, half of which was to cut out on the second point of the controller, and all was out on the third point. But very little resistance was used when the motors were thrown in parallel. The tendency more recently has been to subdivide the resistance more, so as to prevent the tendency to jerk when the controller is turned from one point to another. Theoretically, when the resistance on a certain type of motor equipment has been once properly fixed by the manufacturer, there should be no further trouble. But practically it is often the case that the resistance in circuit on some points of the controller does not seem to be properly proportioned to the work to be done. On numerous equipments which have come under the writer's notice but very little effect in the way of acceleration seems to be obtained on some of the controller points, while on the next points above those spoken of the car gives a jerk, showing that the resistance was too much on the point below. For example, on a certain type of car the first point is often hardly sufficient to make the car move, and when the controller is put on the second point there is almost invariably a jerk, no matter how long and patiently the motorman waits on the first point. The effect of having such an arrangement is practically to induce the motorman never to wait for acceleration on the first point. If the first point gave a good acceleration there would be less temptation to leave it too soon. On other equipments the opposite fault is found, that of having in circuit so little resistance on the first point that it is hard to start a car without slipping the wheels. The obvious remedy for all such defects is to pay more attention

to the subdivision of the starting resistance when a set of cars is first equipped.

#### KEYSTONE PORTABLE VOLTMETERS.

The illustration shows a portable voltmeter recently placed on the market by the Keystone Electrical Company of Philadelphia, which is recommended as more fully meeting the requirements of practical use. In the construction nothing is incorporated that is subject to deterioration, and being calibrated, they may be relied upon to maintain their accuracy. The system is such that there is no magnetic lag



and no error due to self-induction, therefore they are independent of frequency variations of the alternating current. The instruments are dead-beat without the use of a mechanical brake, and each is provided with a reversing switch for use with direct currents; these two features will be appreciated by busy users. These voltmeters are listed in ranges from 12 to 700 volts, single and double scales, so that all classes of work are provided for. They are mounted in mahogany cases in which separate compartments are provided for the pair of flexible leads included with each instrument.

#### REDUCED FARES CONSIDERED BY THE INTERSTATE COMMERCE COMMISSION.

The stockholders of the Chevy Chase & Kensington Electric Railroad Company are also the stockholders of the Chevy Chase Land Company. The latter company sold railroad tickets at half the regular fare to those who purchased land from it or who were patrons at the company's hotel. Complaints were made to the interstate commerce commission and a decision was rendered. The commission holds that the two companies are distinct and that no discrimination was practised by the railroad company and the common ownership was not a means of evading legal obligations. The discrimination of the land company in the sale of tickets for the benefit of its business is not a subject for correction by the commission.

**BICYCLES REDUCE WAGES IN ROCHESTER**

The lines in Rochester, N. Y., are paying the penalty for the large amount of excellent paving done there in the past few years. The constantly increasing use of bicycles during eight months in the year has made very appreciable inroads upon the earnings of the company, which has been forced, though the action has been deferred as long as possible, to order a cut of 10 per cent in wages.

**HE STOLE LIGHT.**

An enterprising inhabitant of Gloucester, Mass., who knew too much about electricity for his own good, tapped one of the feeder lines of the Gloucester street railway and lighted his house from it. After enjoying the privilege of free and brilliant illumination for about a month the company discovered the leak in its line and put a stop to it without ceremony. The wire was cut, attached to the company's wagon and pulled out of the man's house.

**GOOD CHANCE TO TRY MUNICIPAL OWNERSHIP.**

It is not often that a street railway system, with all the appliances, may be had for the asking, but such is the case with the little city of Woodland, Cal. Dr. T. Ross, president of the Woodland Street Railway Company, offers to give to the city the entire service, with tracks, cars, horses and car house, providing the city will maintain and operate the system for at least five years. The board of trustees hesitate about accepting the gift until some expression is made by the citizens of Woodland.

**MEASURING TRACK WITH A BICYCLE.**

The manager of a small road recently remarked to C. L. Wight, secretary of the Toledo Traction Company, that he was bothered in getting some track measurements, and did not want to go to the expense of having it chained. That's easy, replied Mr. Wight, if you do not need the measurement down to a few inches all you have to do is to run a bicycle over the route, riding in the middle of the track, and note the starting and finishing figures of the cyclometer on the wheel. To make doubly sure let two riders go over the route, or the same one two or three times, and take the average distance recorded. It can be quickly done, will not cost anything, and will give results sufficiently accurate for many purposes.

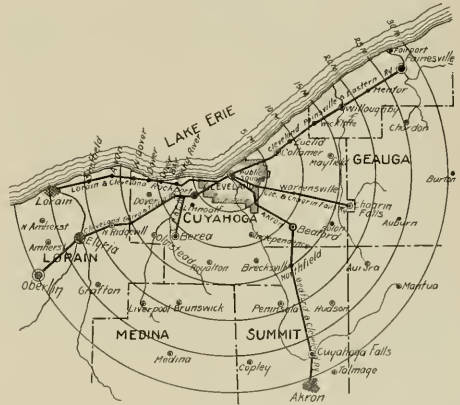
**CITY GUIDE BOOK FOR ATLANTA.**

The Atlanta (Ga.) Consolidated Railway Company has recently published a very attractive pamphlet, giving a condensed time table, describing some of the most pleasant places around Atlanta to visit and containing a fund of general information. The 18 miles of lines extend to the suburban towns of Decatur, Pittsburg, Edgewood, Kirkwood and Inman Park. Fort McPherson, the government post and reservation, Grant Park, Lakewood Park and Brisbane Park are all pleasant places for a trip on the trolley cars. A few hints are given to the patrons of the company

in reference to getting on and off the cars and in dealing with the conductor. The good will of the railway company to its patrons is manifest by this request: "Suggestions from patrons or friends of the road as to the betterment of its service, or on any other points, will be gladly received, and where possible such suggestions will be adopted, provided they prove to be in the interest of the public and the company." Advertising on two pages of the circular paid for its publication.

**CLEVELAND SUBURBAN SYSTEMS.**

The accompanying map shows the electric suburban or interurban railways which connect Cleveland with a score of the towns and villages lying within a radius of 30 miles of the city. Even at the present time the electric suburban transportation facilities enjoyed by Cleveland are more complete than can be found elsewhere, and a glance at the number of towns in the vicinity not so served makes it evident that there is ample opportunity for the construction of



feeders for and extensions to the existing lines. The electric lines all terminate at the public square in Cleveland, and by thus being of more convenient access to the public are able to compete with the steam roads even in the matter of time. The fares to Painesville and Akron are 80 cents and \$1.00, as against \$1.15 and \$1.90 charged by the steam roads. The lines now in operation serve 16 towns with an aggregate population of 66,000; the Lorain & Cleveland line and the extension to Oberlin, now building, will increase this figure to nearly 100,000. During the month of March the Akron, Bedford & Cleveland carried 31,200; the Cleveland, Painesville & Eastern 36,400, and the Cleveland, Berea & Elyria 23,500 passengers.

Foreclosure proceedings against the Columbus (Ohio) Central Railway Company have been instituted by the trustee of the bond mortgage. This action will likely prevent the establishment of the freight service contemplated. The company has always done a certain amount of hauling between Columbus and Westerville, charging at the rate of \$4.00 per car and allowing one hour for loading and unloading at each end of the run. An extension of this service was planned but will hardly be carried out.





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

Springfield, Mass., will do its street sprinkling with electric car sprinklers.

The Lindell Railway Company of St. Louis has purchased the Midland Street Railway and the Clayton & Delmar Railroad.

In Milwaukee a judgment of \$11,981 has been paid a 6-year-old boy who lost an arm and a leg by being run over three years ago.

The Rochester, N. Y., railway has been ordered to discontinue the hanging of signs from span wires, whether for charitable or other purposes.

Owing to the sudden death of R. M. Fernal, the principal owner and president of the Eureka (Cal.) Street Railway Company, the cars have stopped running and as the road is in a bad financial condition, there is little prospect of operation being resumed.

A Chicago justice refused to fine a man arrested for spitting in a street car, on the grounds that the law under which the arrest was made was unconstitutional; but stated he would have imposed a fine had the offender been booked on a charge of "disorderly conduct."

B. F. Harris, Jr., the successful young president of the railway, electric lighting, gas and water works properties, at Champaign and Urbana, Ill., has consolidated them all into one company called the Urbana & Champaign Railway, Gas & Electric Company. Mr. Harris is president of the new company.

The city council of Los Angeles, Cal., passed a resolution to prevent the erection of poles or the stringing of wires in the business section of the city. It further required that all poles and wires in the "conduit district" must be removed within a year. An exception was made in favor of electric railway poles and wires.

A loan of \$100,000 was made by the Union Trust Company of San Francisco, to the San Diego Electric Railway Company for 40 years at five per cent interest. A mortgage has been given on all the property, real and personal, including franchises, power houses, cars, railroads, and all that may be built within the next 40 years.

A terrific explosion occurred in the tunnel of the London Underground Railway, severely injuring 10 persons and wrecking a passenger car. It was supposed that the accident resulted from an explosion of accumulated gas or else it was due to the placing of a bomb in the tunnel by some one wishing to destroy the station near by.

An ordinance was introduced to forbid the aldermen from receiving passes over the Superior (Wis.) Rapid Transit Railway. Several of the members stated that they had enjoyed the privilege of free rides for the past two years

and did not care to be deprived of it now. The bill was laid on the table for the new council to consider.

An alderman of Port Angeles not long since was greatly exercised over a paving problem and vigorously championed wood in a speech, closing as follows: "Gentlemen, I consider it our bounden duty to degrade and pave these streets. By putting our heads together we can at least construct a wooden pavement. By so doing our posteriors will forever bless us."

The reports of the Brooklyn Heights and the Brooklyn, Queens County & Suburban Railroad Companies, of the Brooklyn Rapid Transit system for the quarter ending March 31, 1897, show earnings of \$959,703; operating expenses, \$644,947; fixed charges and taxes, \$449,343. Exclusive of taxes operating cost 67.20 per cent of earnings. The deficit is \$75,161 against \$128,981 for same period in 1896.

Calumet Electric Railway stockholders, May 4, elected John Farson, president; Charles R. Corwith, vice-president, and H. B. White, secretary and treasurer. During the year ending April 30 the road earned all operating expenses and a surplus of \$10,000. A short extension of the company's Lake avenue line will be made by Receiver John C. McKeon.

The Baltimore & Ohio Railroad Company has extended the electric equipment of its Belt Line at Baltimore a distance of two miles, to Waverly. Hereafter freight trains will be drawn to that point by the powerful electric locomotives. The object of the extension is to do away with the smoke nuisance, and to enable rapid transit over the heavy grades.

More trouble has been experienced on the Brooklyn bridge from broken axles on the electric cars. Although the axles are of the best make on the market and are the same size as are used on many of the steam roads, yet the company has decided to get new axles one-half-inch larger in diameter. It is thought that not enough allowance has been made at the curves in the width of the gauge and that the trouble will not cease until this defect is remedied.

G. A. Wheeler, general manager of the Love Electric Traction Company, states that this company has purchased the franchise rights of the General Electric Railway of Chicago, and will proceed to build the road as soon as it is possible to complete the preliminary arrangements. The offices of the two companies are at 955 Old Colony building, Chicago, but there are no signs of the preparation visible there. Mr. Wheeler declines to make any statements as to when contracts will be let.

Conductor H. E. Miller, of the Frederick & Middletown Electric Railway, lost his life and wrecked a freight car through his disobedience of the company's orders. On the Catocitic mountain line the motor car sometimes leaves a freight car at the top of the mountain to be loaded and proceeds on to Middletown. Conductor Miller was in charge of such a car and decided to run it down the mountain by gravity. He soon lost control of it and at the crossing at the foot of the mountain it jumped the track, shattered a trolley pole and stopped in a newly plowed field, the conductor being impaled on a post.

The Mahoning Valley lines at Youngstown, O., have been equipped with the Buffalo fender.

A "Tramway Technical Exhibition" is to be held in Hamburg, Germany, August 5 to 9, with a general meeting on the 6th and 7th.

The first car over the extension of the street railway to the Soldiers' Home four miles north of LaFayette, Ind., is scheduled to run on May 16.

On May 1 the employes of the Akron, Bedford & Cleveland were notified that the rate of wages would thereafter be 20 cents instead of 17 cents per hour.

Wages on the Duryea line of the Pittsburg Traction Company were, on May 15, reduced from \$1.70 to \$1.50 per day. It is not expected that other lines will be affected.

The Consolidated and North Side roads of Pittsburg have modified their recent orders so as not to discriminate against workmen carrying tools so long as the burden is a reasonable one.

J. T. Windrim was chosen president of the Holmesburg, (Pa.) Tacony & Frankfort Electric Railway Company, F. F. Bell, vice-president, and James Pollock a member of the board of directors.

Charles A. Bien, superintendent of the Akron & Cuyahoga Falls Rapid Transit Company, was struck by a trolley pole while working on the top of a disabled car. His injuries were quite serious.

An electrical stamp canceling machine has been placed on the street railway postal car running on the Mission street line in San Francisco. Power is furnished by a small motor taking current from the line.

The transfer office of the Capitol Traction Company in front of the Treasury, Washington, D. C., was set on fire by the explosion of a coal oil stove. Two printing outfits for transfers were burned together with other property making a loss of \$1,000.

Martin Lane of Philadelphia, was chosen president of the Portsmouth (Va.) Street Railway in place of Gen. J. K. Siegfried, deceased; C. W. Wilson of Pottsville, Pa., was elected secretary. The other officers and directors were re-elected. The board decided to change the lines to a trolley system.

Another "revolution in street railway propulsion" is threatened, this time by the Atmospheric Railway & Power Company of Baltimore. The cars are to be propelled by atmospheric pressure, a more or less perfect vacuum being formed by steam power behind the piston which is connected to the car axle.

The Consolidated Road at Butte, Montana, has received from the city a new franchise which permits it to continue the operation of its cable lines or a change to trolley at such time as desired within three years. The proposed change would be made with a view of having one power station do the work now performed by two.

Suit to recover \$10,000 deposited as security to guarantee the construction of its electric road according to terms of the franchise was brought by the Peekskill, State Camp & Mohegan Railroad at Peekskill, N. Y. Judge Dykman has just decided that as the railroad company failed to keep its agreement its deposit was forfeited.

F. L. Wanklyn, general manager of the Toronto Street Railway Company, has gone to Montreal to assume charge of the Montreal road during the absence of James Ross, vice-president, and Granville Cunningham, general manager, who sailed for England May 8 to superintend the construction of the new electric line in Birmingham.

The annual meeting of the stockholders of the Winona (Minn.) Street Railway & Electric Light Company, was held in Boston and the following officers chosen: A. Perry, president; R. T. Payne, vice-president; A. Burr, secretary and treasurer, and S. B. Livermore, general manager. Except Mr. Livermore the officers are all Boston men.

The following officers have been chosen for the Lafayette (Ind.) Street Railway Company; W. G. Griffith of Philadelphia, president; Paul M. Elsasser of Philadelphia, vice-president; J. T. Henderson, secretary and treasurer, and E. B. Gunn, general manager. The new board of directors consists of W. G. Griffith, P. M. Elsasser, J. L. Jones, J. M. Kennedy, T. J. Levering, H. W. Moore and J. L. Caldwell.

The Harrisburg, (Pa.) Traction Company has been selling tickets 25 for \$1.00, but has been compelled to stop it on account of the misuse made of such tickets by the merchants of the city. The store-keepers offered tickets as a premium for each bill of goods purchased and this practice became so general that the four cent fare became the basis instead of five cents. The traffic did not justify such a reduction and the tickets have been withdrawn.

E. C. McCloy, who is a member of the American Tribune Soldiers Colony, at Fitzgerald, Ga., writes that it is desired to interest someone in the promotion of a street railway in that city, which in two years has grown to 6,000 population, and the founders expect will reach 20,000 in 5 years. Two steam roads, with three more in sight, and a navigable river furnish excellent transportation and a rich country and facilities for manufacture promise a bright future.

The Southwest Missouri Electric Railway has passed out of the hands of the Harrisburg, Pa., stockholders and is now controlled by local capitalists of Carthage, Mo. Robert Moore, Wm. McMillen, W. E. Hall and Isaac Perkins are the new directors; D. R. Goucher was chosen president; C. F. McElroy, secretary, and F. H. Fitch, superintendent. This is an interurban, 32 miles in length, and runs through Carthage, Cartersville, Webb City, Joplin and Galena, Kan.

What promised to be a serious fire in the car barn of the Consolidated Street Railway Company of Grand Rapids, Mich., was narrowly averted. It is supposed that a live coal from a stove in one of the cars dropped on the floor and set fire to it. The fire rapidly spread, but as soon as the heat was great enough to act on the automatic fire extinguishers, eight of them began to spray water on the flames and materially assisted the fire department in confining the damage to one car.

## POWER STATION CONTROVERSEY IN CHICAGO.

Engineers, like doctors and lawyers, often disagree, but it is astonishing in these days to find men who term themselves engineers saying that in properly designed boilers plants, economizers are no good, that simple cylinder engines are more economical and better adapted to street railway work than compound condensing engines; that dynamos driven by means of rope transmission, are more desirable, reliable and economical than direct driven units, and so on; such however, is the case according to an article which appears in the May issue of the Street Railway Journal.

In the first place economizers are a valuable adjunct to any boiler plant, whether well designed or not, and is it not a fact that 99 per cent of the engineers in the old country and in this are firm believers in them. In some instances they give better results than in others, according to the class of boiler and method of setting. For example, in the case of a battery of Galloway or similar boilers where the gases from the furnaces are kept in contact with the boiler by means of flues 100 ft. long, before they enter the main flue leading to the stack you will find the gases at a lower temperature than in the case of return tubular or water tube boilers. However, in such a case, the gases by being passed through an economizer, would raise the temperature of the feed water from 100 deg. to 120 deg. Fahr., as shown by the reports of the chief engineer of the Manchester Steam Users' Association, England, abstracts of which have been given from time to time in the engineering papers. Wherever they have been installed in connection with electric or other plants in this country, they have been found economical, and although the first cost may seem a trifle heavy, yet in a short time they will prove by results given in actual work, that it is a profitable investment. As a large number of plants which have been equipped with economizers have been designed by engineers of high standing and good reputation, and are generally considered very good from a mechanical standpoint, I would ask Mr. Pierce and his colleagues if these have been properly designed and installed, and if they can suggest any improvements in them. Such information would be beneficial to the engineering fraternity at large.

Coming to the question of engines, Mr. Hill tells us that simple non-condensing engines for street railway work are the most economical for his company, but why this particular company more than any other engaged in the same class of work. It is an acknowledged fact, not from 24 hour test results, but from continuous working in large stations from one end of the year to the other, that compound condensing and non-condensing engines are more economical than single cylinder condensing and non-condensing engines respectively. As a practical proof of this statement, compare the coal bills of plants having the different classes of engines; also look at the number of plants where extensions and alterations have been made, and you will find the simple engine has given place to the compound, either with or without condensers, and further look at the number of boilers installed in one case as compared with those in the other. From a theoretical point any engineer having a thorough knowledge of heat and the expansive properties of steam, combined with the principles of engine design, can verify the above statement.

One objection against direct coupling is the want of elas-

ticity, which in case of sudden and heavy overloading might cause a breakdown, but why cannot engines for street railway work be designed on the same lines regarding strength as those in the mercantile marine service, which are subject to far heavier shocks and loads, especially in very rough weather, and seldom give out. If possible in one case it can surely be done in the other, especially when one type of engine is controlled by a governor and the other is not.

Regarding generators, Mr. Hill lays great stress on the accidents caused where direct coupled units have been used. Have not accidents without number been caused by the bursting of fly-wheels in belted plants, not only demolishing the engines and building, but killing several persons outright and damaging property far beyond their own walls? Again, fires have been caused by short circuits in belted plants with no crane or direct coupled unit in sight, the cause of the fire often being located a mile or more from the central station. Mention is made of a plant with compound condensing engines and direct coupled units having lost two armatures whilst a third was being repaired, tying up the road. It strikes me forcibly that the plant in question may have been too small for its work, and as one armature had become disabled the load was too great for the other two, and by overloading they gave out. Such cases as this have occurred in other plants, and have often been due to insufficient capacity, neglect and shortsightedness by not keeping the machinery in proper repair and working order. As to the Western avenue plant in Chicago there must be something radically wrong with the design of the machines to necessitate this continued tinkering, otherwise why have not the same troubles occurred in other plants belonging to the same company?

I fail to see how it is necessary to disconnect the generators to repair the engines in a direct coupled plant except in case of a fractured shaft, for as a rule the shaft and its bearings are the only parts immediately connected with the generators, and you could remove the rest of the engine without disturbing these. In case of re-babbiting the boxes, as engines are now designed, it is necessary in any case to lift the shaft slightly so as to remove the box.

Mr. Hill says the frictional load is from two to four per cent less. Does he refer to the main bearings alone, or the frictional load the engine has to overcome as a whole, including the rope driving gear and its adjuncts? Furthermore, does he refer to the friction when the engine is running the dynamos with no load or when running with a full load?

A good return tubular boiler will give results as good as many of the water tube class, but can you raise steam as rapidly with them; are they as safe as the water tube class; don't they take up more room for an equal horse power, and when one of a battery explodes three or four others follow suit from some unknown cause; and how often we read of these accidents with loss of life and property, whilst an occasional tube only may need replacing in the other. In case of emergency and having to feed with cold water, how many shell boilers have cracked and leaked on their lower surfaces, whilst a water tube has done its work irrespective of hot or cold water. The New Haven Railroad may have used the return tube boilers, but at the same time it installed direct driven units as being better and more economical than any other.

Under the head of "Operation" Mr. Hill says that the Edison Electrical Company of Paterson, is using rope



drives for its arc machines, and that it has the most economical plant in America. But he does not mention that it has four cross-compound condensing engines with direct coupled units for the electric railway work, and two similar engines and dynamos for the three wire incandescent system, whilst it has two cross-compound condensing engines for driving the arc lighting machinery, and furthermore, all the boilers are of the water tube type. These are the elements which make it such an economical plant.

English engineers are also quoted in connection with this matter, but electric traction is little known in England, and in the matter of lighting they are away behind their American cousins. The Englishman, although a pioneer in steam railroading and navigation, has allowed other nations to go ahead in the development of electricity. There are many reasons for this, one of which is they are subject to very severe and exacting laws and not allowed to put up poles, string wires and lay down tracks when and where they please; again, they do not rush into new enterprises without due consideration and deliberation, and expect a fair return for the money they invest. What they have done in electrical work has been well carried out and in a substantial manner; but large direct connected units are almost unknown to them, perhaps the only example of this class of work being that done by Ferranti, at Deptford, near London. However, they like to have a plant symmetrical in all respects and do not care to mix up different styles in the same station, and this may have had something to do with the Liverpool plant. In lighting plants they have adopted small direct driven units very extensively and are still moving in the same direction.

In conclusion Mr. Hill gives a table of building and power costs of certain plants in Chicago and makes a comparison between them and his own. Putting first cost aside, for the cheapest plant is not always the best and most economical, I should think the best thing he could do so as to make a comparison is to measure all the water supplied to his boilers, weigh all the coal carefully, and have a recording wattmeter on his switchboard, then only can he tell what his plant is doing; but as done at present, by taking half hourly readings, no man on earth can tell what the actual output is, nor can he tell what the boilers are doing relatively to fuel consumption and evaporation. When this is done he can find out the cost of fuel per kilowatt-hour, which is the factor all practical men consider today in judging whether a plant is economical or not.

A case has recently been brought to the writer's attention in Mr. Hill's own city, where a comparatively small railway plant installed a direct coupled unit and thereby dispensed with the running of three single corliss condensing engines with a saving of some seven to ten tons of coal in the twenty-four hours. There are other plants all over the country which show results in the same direction.

I think enough has been written on this matter to convince any practical man which of the two systems is the best.

A PRACTICAL ENGINEER.

The many friends of W. B. Allen, for a long time general sales agent of the Brownell Car Company, will be pleased to learn of his appointment to the very desirable position of secretary to the president of the board of public improvements, St. Louis. The appointment is for four years at a good salary.

## CALIFORNIA STATE ASSOCIATION.

The Street Railway Association of California held its second annual meeting at the California Hotel, San Francisco, May 6. A discussion of railway matters occupied the day, vice-president S. B. McLenegan presiding, and in the evening a banquet was served.

Among those present were: S. B. McLenegan, E. P. Vining, M. B. Stein, H. H. Lynch, E. M. Van Frank, Ira Bishop, E. P. Vandercook, C. Gustafson, J. W. Harris, A. W. Barran, J. C. Skinner, S. L. Foster, H. A. Iddings, G. H. Fairchild, W. Clayton, G. A. Loring, J. P. Burk of San Jose, F. W. Ely of Santa Cruz, George T. Smith, C. P. Gilbert of Sacramento, Fred C. White, F. A. Ross of Sacramento, F. W. Woodward and J. F. Burke of Los Angeles and L. A. Lighthipe.

## ELECTRICITY FOR CALIFORNIA STEAM ROAD.

No little interest will attach to the announcement of President Huntington of the Southern Pacific, that his company has under consideration the conversion of its steam line between San Francisco and San Jose, a distance of 50 miles, from steam to electricity. There is a large passenger travel between the city and the Santa Clara valley, and a growing necessity for frequent train service, and the plans contemplate half hourly trains. The change will not be made before next year, but will in all probability be put under way then.

## WRECK IN PORTLAND, ORE.

A very serious accident occurred at Portland, Ore., on the morning of April 27, which it is claimed was primarily caused by running down grade at an excessive speed. A car on the Mount Tabor line was approaching Span's slough, which is at the bottom of a long grade, at a high speed and in passing a jog in the track the front axle was broken, causing the car to leave the track. At the slough the car broke through the bridge railing and plunged into the water. There were 34 persons on the car, three of whom were killed and several injured, some of them seriously.

## MASON AT INDIANAPOLIS RESIGNS.

A. L. Mason, for the past four years president of the Citizens' Street Railway, Indianapolis, resigned on May 8, going to Philadelphia in person to tender his resignation, which was accepted.

Shickle, Harrison & Howard iron works, St. Louis, have a constantly increasing demand for motor gears, and in addition to old customers are steadily adding new ones. One of the orders being filled this month is for 500 steel gears for the Chicago City Railway.

The E. T. Burrows Company, Portland, Me., announces two new styles of curtain fixtures for street cars, making four styles now manufactured for this trade, and which gives a selection which meets every possible requirements. The Burrows shades are rapidly becoming the standard for street railways, thousands of them being in use on the best roads in all parts of the country.

## NEW PUBLICATIONS.

We acknowledge the receipt of the catalog of the Scoville Place School, Oak Park, Ill., of which W. J. Cooke, vice-president of the McGuire Manufacturing Company, is president.

Thomas G. Grier has just published a revised edition of his "Note Book of Wiring Tables," which treats in a very thorough manner the systems of calculating the sizes and the methods of wiring.

The April 29 issue of *Lighting*, of London, was a special "fittings" number with an extended article on electric lighting in house decoration, which is handsomely illustrated and will be found very interesting.

The W. J. Johnston Company has sent out a new catalog of electrical books published by this firm and some pamphlets giving an outline of the contents of the *Electrical World* during the past year. The excellence and variety of the Johnston publications are well known.

The yearly catalog of Worcester Polytechnic Institute has just been issued giving an outline of the five courses of study, three of which are in engineering. In the electrical engineering department attention is given to the design and testing of street railway apparatus and lectures, illustrated by stereoptican views, are delivered by Prof. H. B. Smith.

The last catalog of Purdue University, Lafayette, Ind., has been received. The technical courses are especially strong in electrical and railroad engineering. The electrical laboratory is equipped for the study of different kinds of apparatus and machines in commercial use. Several street car motors are mounted with series parallel controllers and prony brakes to absorb the power. Prof. W. E. Goldsborough gives a course on the design of street railway apparatus.

Catalog No. 28, issued by the Murray Iron Works Company of Burlington, Ia., is an illustrated book of 72 pages descriptive of its Sioux corliss engines, formerly known as the Sioux City, and as such receiving an award for excellent workmanship at the World's Fair. It is apparent from the list of the users of the Sioux engines that they are very well adapted to street railway and electric lighting service, reference being made to 50 such companies. A catalog will be sent to those interested on application.

The W. J. Johnson Company has just published two books of much value to electrical engineers. "Theory and Calculation of Alternating Current Phenomena" is the title of an exhaustive treatise on that subject by C. P. Steinmetz, assisted by Ernst J. Berg. It is a book of 425 pages written in a terse and mathematical style, with many formulæ and curves. A knowledge of the fundamentals of the theory of alternating currents and electrical terminology is presupposed and Mr. Steinmetz ably discusses the phenomena of resistance, inductance, capacity, reactance, admittance, conductance, susceptance, etc., with reference to alternating current apparatus. Price, \$2.50.

Dr. Louis Bell is the author of "Electric Power Transmission, a Practical Treatise for Practical Men" and it is as its

name indicates, a book full of suggestions and an accumulation of facts from operating plants. It is not mathematical and clearly states the elemental principles of electricity, so that it does not take an engineer to follow the author in his treatment of the subject. Transmission by alternating and direct currents, current reorganizers, prime movers, both steam and hydraulic, the construction and operation of lines and power house, and lastly the commercial aspect are all topics handled in a lucid and pleasing manner. The book is profusely illustrated. Price, \$2.50.

We have received from Monsieur Guyer-Zeller, of Zurich, the chairman of the Jungfrau Railway Syndicate, a portfolio of information regarding the "Jungfraubahn," the electric railway which is to bring the summit of this incomparable mountain within three and one-half hours of the Little Scheidegg. After a thorough consideration of the engineering problems involved and of the sanitary and æsthetic objections urged against the enterprise, a concession was granted M. Guyer-Zeller in December, 1894. Subscriptions to the \$1,200,000 of bonds and the \$800,000 of stock are now being received; it is the desire of the Syndicate to interest American and English capital to the extent of one-quarter of the total.

A new edition of the "Pocket Handbook" of useful information, relating to lead covered electric cables and insulated wires, has been published by the Standard Underground Cable Company. It is a book of 182 pages containing many rules, diagrams and tables which will be of value to electrical engineers. The question of electrolysis is discussed and results of laboratory and commercial practice given. Directions are furnished for conduit and cable laying and jointing, the application of protective devices, location of faults, and solutions of many problems, troublesome to electricians. The book is in a neat and convenient form with a handy index. It is a souvenir worthy of the company and makes a valuable addition to a technical library.

"Materials of Construction" by J. B. Johnson is probably the most comprehensive treatise which has been published on this subject. Professor Johnson has for many years been an earnest student of engineering subjects and in this work has culled the most valuable developments from a vast number of sources, and his position as director of the testing laboratory of Washington University, St. Louis has afforded opportunity for special work. The four parts of the book comprise a synopsis of the principles of mechanics underlying the laws of the strength of materials, the manufacture and general properties, the methods of testing, and the mechanical properties as determined by tests. The care taken to incorporate the latest data available makes the work particularly valuable to the practising engineer who has not the time to make his own researches. Published by John Wiley & Sons, New York; large octavo, 800 pages; price \$6.00, postpaid.

An arrangement has been made by the surface and elevated roads with the board of trustees of the New York & Brooklyn bridge for bridge charges. The companies are to pay five cents a round trip for each car operated across the structure and for each passenger such a sum as will be determined later by the directors.

## WATER POWER FOR SANTA CRUZ.

Coal is very expensive in California, some of it being shipped all the way from Australia, so that when a water power is developed near where power is needed it is more valuable than in the eastern states. The Big Creek transmission is the latest project of this kind to be completed. Big Creek is a stream of considerable magnitude, having its source in the Coast Range and emptying into the Pacific ocean. The fall available for power is 926 ft. and the volume of water is sufficient to give a minimum capacity of 500 h. p., but this will be increased to 1,000 h. p. by building a reservoir. By constructing a flume 18 x 30 in. and 11,000 ft. in length a pressure of 400 pounds at the turbine is secured.

A 250-h. p. Pelton water-wheel, 42 in. in diameter, runs a 150-k. w. Westinghouse, two-phase generator. Perhaps no other one thing has been a greater source of trouble in a water-power plant, with a fluctuating load such as is required for a small street-railway system, than the governing



BIG CREEK POWER HOUSE.

apparatus for the water wheels. This problem has been solved by the installation of a Replogle electric governor. The speed regulation is as good as could be desired, as there is very little change from no load to full load. The cut, from a photograph furnished by F. W. Swanton, the principal promoter of the system, shows the power house, which is a wooden structure. The entire plant was completed in 58 working days, about the quickest time ever made on this kind of work.

The current is conducted to two 75-k. w. transformers at 1,100 volts, and the pressure is raised to 11,000 volts for transmission, and at the same time is converted into a three phase current by the Scott system. Two lines extend 18 miles to Santa Cruz, one of three No. 8, B. & S., wires for the street railway circuit, and three No. 5, B. & S., for lighting service. The line consists of redwood poles, 30 ft. long, and set approximately 30 to the mile. Each pole carries two cross arms for the two power circuits and a bracket for a telephone line. The wires for the power circuits are transposed at every pole to avoid self-induction, and the telephone line at every fifth pole, and no difficulty is experienced in carrying on a conversation between the power house and Santa Cruz, 18 miles distant.

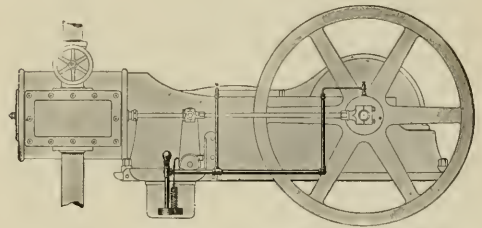
At the Santa Cruz sub-station the voltage is transformed down to 1,100 for lighting and street railway purposes. The street railway lines were run by horses from 1882 to 1893,

when electric traction was installed. The current was supplied from one 80-h. p. and one 90-h. p. generator of the General Electric multipolar type. These same machines are used, but the engines have been replaced by a Tesla motor, made by the Westinghouse Company. The motor was started April 9 and has been running with satisfaction since, even under the most exacting service that the road demands.

## AUTOMATIC LUBRICATION.

A liberal supply of oil fed automatically to the working parts of an engine, contributes wonderfully to smooth, quiet running, and relieves the engineer from the drudgery of watching and re-filling a lot of oil cups. The cut illustrates the system applied to the American Ball engines now building at Bound Brook, N. J.

The characteristic features of this system include a positive circulation of oil from an external storage tank into which the oil is strained on its return from the engine frame, and an entire separation of the water from the oil, by means of a tight bulkhead near the cylinder end of engine frame.



SIDE VIEW OF ENGINE.

A simple pump placed in the storage tank, and actuated from the rock shaft, circulates the oil through suitable pipes and discharge nozzles, to the stationary working surfaces, from where it flows by gravity or centrifugal force to the crank pin and cross head pins through oil holes and channels, provided for that purpose, and thence by gravity back to the storage tank, on entering which it passes through a fine gauze strainer located in the tank.

To insure an abundant supply of oil at the discharge nozzles, the pumping capacity is made to exceed the maximum requirement, and the surplus oil escaping through a relief valve falls back into the storage tank. To provide against possible derangement of the pump, a gravity receptacle is arranged to be instantly attached to the system, as an emergency supply.

The reports of the receiver for the Metropolitan Elevated Railroad, Chicago, show that from January 20 to February 28, the number of passengers carried was 1,732,949, or 44,434 per day; and for March 1,482,161, or 17,812 per day. It is probable that this increase is due to Sunday traffic.

The Cayuga Lake Electric Road suffered the loss of a mile and half of copper ground wire last January. The thieves were caught, brought to Seneca Falls and upon pleading guilty, were sent to the county jail for three months. The wire was recovered, but was cut up into very short lengths.



## FOREIGN FACTS.

The Board of Trade has permitted the running speed between Dublin and Dalkey to be reduced 10 minutes and the eight miles is now made in 70 minutes.

The lines of the Dublin & Lucan Tramways Company are to be changed to a single track trolley system. A power house is to be erected and rolling stock purchased.

The Leeds tramway lines are being improved and additional equipment added. An order for 10 new trailer cars has been placed and these are to be mounted on Brill trucks.

The damage to the sea-going car of the Brighton & Rottingdean line from the storm last winter was not so serious as was anticipated. It has been repaired and is again in operation.

The Taunton, England, Town Council is considering an application from the Taunton & West Somerset Electric Railways & Tramways Company which wishes to construct a trolley line in the borough.

The Halifax tramway committee has recommended the adoption of the overhead trolley system and is at work on the details. It was recommended that electric lights on the trolley poles be substituted for the present lighting system.

J. H. Madden, U. S. consul at Smyrna, Turkey, writes that there are but two street railways in that province and these are both in the city of Smyrna. These lines are of small importance as the Turks feel little need of rapid locomotion.

The Bury, Rochdale & Oldham Tramway Company has decided to equip the Rochdale branch of the company's lines with electricity and arrangements to that effect have been made with the borough authorities. The trolley system is to be adopted.

The Belgian Government has decided to make a trial of electric locomotives on the state railroad running from Brussels to Tervueren, a distance of nine miles. The speed is to be 31 miles an hour on the level and 18 going up the steep grades. Storage batteries are to be tried at first.

The Highways Committee of the London County Council has reported favorably on the application of the London, Deptford & Greenwich Tramways Company, to operate for one year Ribbe's electric accumulator street cars on the Rotherhithe New road, between Raymouth road and the canal bridge, Old Kent road.

Information is received from the Imperial & Royal Land Bank, of Vienna, that the horse tramway of Linz is to be changed to an electric line and an extension is to be made up a neighboring mountain, the continual ascent being 10.5 per cent. The single track mileage will be 5.75 miles long. There will be 17 motor and 15 trailer cars on the line and the power house capacity is to be about 1,500 h. p.

A London syndicate has been formed for the purpose of building a system of light railways on the island of Angelsey to carry both freight and passengers. The local authorities have been favorably disposed towards the project

and permission has been granted to run the lines along the main roads, with single tracks and turn-outs at suitable intervals. The company will be capitalized at £140,000.

The Tramway Committee in Glasgow after a report by the chairman that the expense of working was from 2 to 4 cents per car-mile for electricity as against 16 cents per car-mile for horses, adopted the following resolution: "That an overhead electric system of tramway traction be applied to the Springburn route, (three miles) and that the co-operation of the Watching and Lighting Departments be secured to have the route lit by electricity from the same source."

The Imperial Tramways Company, Bristol, England, desiring to find a remunerative re-investment for the proceeds of some Dublin shares recently sold, has made provisional arrangements to acquire 4,000 £10 preference, and 4,000 £10 ordinary shares of the London United Tramways. This latter company, of which J. Clifton Robinson, London, is managing director, owns and operates about nine miles of track in the west end of London, and has in the last two years paid 6 per cent on preference and 8 per cent on ordinary shares.

The Public Works Committee, of Birmingham, after visiting Bristol, Blackpool, Paris, Rouen, Brussels, Vienna, Budapest, Dresden, Berlin, Hamburg and Bremen, has returned and made a report to the council. It recommends the electric conduit system in preference to any other on account of its insulated return and greater safety. Prices quoted to the committee in Berlin for a mile of conduit were but 25 per cent higher than for the trolley. The tramways company, in anticipation of a favorable report for the trolley lines, had placed some orders for trolley equipment which will have to be withdrawn if the decision of the committee stands.

In a recently published report the directors of the Hanover tramway system advocated the extension of the storage battery system in preference to the trolley and gave figures to substantiate their judgment. Storage battery cars are run in the center of the city and trolley lines extend into the suburbs. The cost of maintenance has been accurately determined and found to be about two cents per car-mile for storage battery over the trolley but the directors think that the battery cars have advantages which more than compensate for this difference. As soon as the necessary arrangements can be made the whole system will be equipped with the battery cars.

Another street tramway committee is to make an extended tour of inspection. After considerable discussion with the city council of Douglas, Isle of Man, the Douglas Southern Company offered to pay the expenses of the traction committee, the town clerk and the borough surveyor in a trip to London, Paris, Frankfurt, Dresden, Berlin, Hamburg, Cologne, Brussels, Liege, Rouen, Bristol and Prescot. It would seem that, as this field has been pretty well covered by the tramway committees of other English cities and all of them have recommended some form of trolley traction, this long jaunt is unnecessary. However the report of this committee will be awaited with interest. The tramways company is improving its roadbed and making some extensions to its lines in anticipation of a heavy summer's traffic.

## NEW TYPES OF LIGHTNING ARRESTERS.

To be effective in conducting away high potential discharges generated in overhead lines by atmospheric disturbances, the lightning arresters must have a less resistance across the spark gaps than has the insulation of the appara-

For higher voltage the number of gaps is increased, exhaustive tests showing that for an 11,000-volt, 5,000-h. p. line there should be 14 gap spaces.

The cuts show the connections for these two types.

## DAMAGE SUIT FOR FAILURE TO DELIVER COPPER.

In the supreme court of New York, a case was disposed of last week which has been in litigation some time; the settlement being reached by a discontinuance of the suit of the Okonite Company against Holmes, Booth & Haydens.

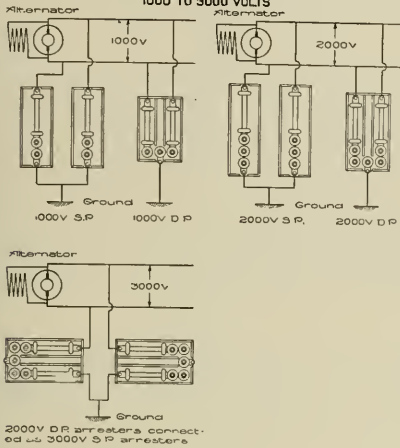
The complaint showed that in June 1895, Holmes, Booth & Haydens sold to the Okonite Company 300,000 lbs. copper at 12½ cents, and after delivering 50,509 lbs. stopped further delivery. The Okonite Company then in September 1895 purchased elsewhere the balance of the copper at 14 cents, and sued Holmes, Booth & Haydens for the difference, about \$4,500. Holmes, Booth & Haydens denied the contract. An order discontinuing the suit was entered in the clerk's office on April 21, and on inquiry it is understood that Holmes, Booth & Haydens paid the Okonite Company about \$2,800 for a settlement.

## J. G. WHITE & COMPANY.

A new corporation, the J. G. White & Company, has been organized under the laws of the state of New York, with a fully paid capital of \$100,000. It succeeds to the business of the White-Crosby Company, of 29 Broadway, New York, and of Baltimore. When the White-Crosby Company was organized it was intended that Oscar T. Crosby, who had just severed his connection with the General Electric Company, would engage actively in the business, but his health was in a precarious condition from overwork. A trip to Europe was taken for rest and recuperation. Upon his return, Mr. Crosby became largely interested in a street railway in Washington, and later organized a light and power company, which has grown into a large and flourishing institution. This and other local interests absorbing all his time, it was deemed best to reorganize the White-Crosby Company. The new company was organized under the laws of New York instead of those of West Virginia, and it was decided to adopt the name by which the company had previously been known, although the "company" was merely nominal.

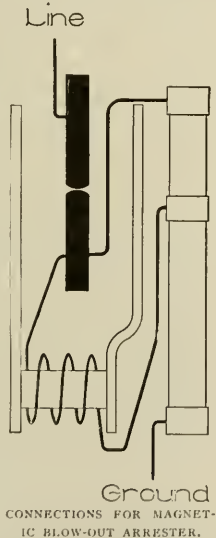
J. G. White was graduated at the State Pennsylvania College in 1882, and obtained the degree of Ph. D. at Cornell in 1885. For two years Mr. White taught physics in the University of Nebraska, and at the end of that time formed the Western Engineering Company, with headquarters at Lincoln, Neb. In this enterprise he was joined by D. C. Jackson, now professor of electrical engineering at the University of Wisconsin, and H. J. Ryan, professor of electrical engineering at Cornell University. This company was sold to the United Edison Manufacturing Company in the spring of 1890. Mr. White made an agreement with the Edison Company to become its exclusive agent, on a commission basis, for the United States, in making contracts for the construction of and equipment of electrical railways. Later in the year he formed the J. G. White Company, and conducted the business alone until the formation of the White-Crosby Company in May, 1894.

CONNECTIONS OF WIRT ALTERNATING CURRENT SHORT GAP LIGHTNING ARRESTERS 1000 TO 3000 VOLTS



tus to be protected, which in railway armatures is usually sufficient to withstand a voltage of 3,000. The perfected arrester for use with 500-volt continuous currents adopted by the General Electric Company is known as type M-D and has a spark gap of  $\frac{1}{2}$  in., which a 2,000 volt current will bridge. The gap is in a strong magnetic field so that the arc is at once blown out. To limit the current a low non-inductive resistance is placed in circuit.

The Wirt alternating current short gap arresters, made by this company, have been especially designed to operate effectively with very small gap spaces. For 1,000 volt circuits there is a single  $\frac{1}{2}$ -in. spark gap between two metal cylinders 2 in. in diameter and 2 in. long. One cylinder is connected to the overhead line and the other to the ground and a low non-inductive graphite resistance placed in circuit. The combined action of the metal cylinders and non-inductive resistance prevents the heating of the cylinders when the lightning discharge passes and the formation of gas which would enable the alternator to maintain an arc. The arc itself is extinguished by the reversal of the alternating current.



This firm, under the various titles above mentioned, has equipped electric railways in Spokane, Wash.; Salt Lake City, Utah; Sherman, Texas, and in many other cities and towns. During the past five years the contract work in Baltimore alone amounted to \$3,000,000. The transmission line for the Cataract Construction Company, between Niagara Falls and Buffalo, and a large part of the work on the Buffalo & Niagara Falls Electric Railway has been completed by this company. It has at the present time contracts for the complete construction and equipment of the street railways of Charleston, S. C., including all buildings, power plant, track, overhead equipment, and other details; the changing of the "Blue Line" of the Baltimore City Passenger Railway Company from cable to trolley; the electrical engineering for a large transmission plant to be located near Helena, Mont., power for which is to be obtained from the Missouri river; the building of extensions for the Norwalk Tramway Company, Norwalk, Conn., as well as other similar work.

Mr. White is one of the pioneers in the electric railway construction business, and the new corporation will have the full benefit of his long and varied experience.

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### PERSONAL.

J. J. Boudreau has been made general roadmaster of the Hartford street Railway.

Howard Abel succeeds Robert Laughlin as a director of the Lake Street Elevated of Chicago.

Charles W. Stevens resigned as superintendent of the Chester & Derry (Mass.) and accepted a position with the Lowell, Lawrence & Haverhill road.

W. D. Ray, manager of the railway at Everett, Wash., is anything but an ex-Ray, but has recently made some very interesting experiments with X-ray apparatus.

Russell B. Harrison, president of the Terre Haute Electric Railway Company, attended the Grant monument dedication parade in New York and acted as aid to Gen. Dodge.

Pierre Jay has been elected president of the Second Avenue Railroad Company in place of John D. Crimmins, who has held the office since the Metropolitan interests acquired control.

President Beckley, of the Rochester (N. Y.) street railway, has voluntarily reduced his own salary from \$6,000 to \$1,000, and raised that of Manager Nichol from \$4,000 to \$6,000.

C. E. Flynn, formerly of Peoria, Ill., and now general manager of the Carbondale (Pa.) Traction Company, visited Chicago friends and the REVIEW on his recent western trip.

E. J. Martyn, a member of the firm, and P. D. Armour's confidential man, died suddenly in this city. He was a director in the Metropolitan road, Kansas City, a man of fine executive ability and very popular.

W. D. Calder, superintendent of the Seattle & Rainier Beach line, was out on reconstruction work for two days and nights without rest, and fainting from exhaustion fell and badly cut his head on the iron work.

Capt. T. T. Johnson, of Fort Wayne, Ind., succeeds Col. J. R. Cook as superintendent of the street railway at Ironton, O. Capt. Johnson is a man of wide experience in street railway matters, and is well qualified to fill his new position.

H. J. Quigg, general manager of the Staten Island Electric Railroad, has resigned that position to go with the Erie Railroad, with which he was connected from 1891 to 1893. Mr. Quigg has suffered from ill health the past year and hopes to be benefitted by the change.

Robert Chappell resigned the presidency of the Galesburg (Ill.) Electric Motor & Power Company, and Fred Seacord was chosen by the board of directors as his successor. H. F. Arnold also handed in his resignation as secretary, but no action was taken to fill the vacancy.

At the annual meeting of the Peckham Motor Truck & Wheel Company, the Hon. C. H. Duell, of Syracuse, N. Y., was elected vice-president in place of H. C. Loap, of Kingston. Mr. Duell has the reputation of being one of the best patent lawyers in the United States, and his experience will be of great value to the company.

John N. Beckley, who for several years past has been president of the Rochester (N. Y.) Railway, and who has served with marked ability both his own company and the American Street Railway Association, has resigned in order to devote his whole time to other and, to him, more important interests. He will continue on the board.

John I. Beggs, who has long been identified with electric work and who was manager of the Chicago office of the Edison Company up to the time of consolidation, and recently general manager of the Cincinnati Edison Electric Company, has been appointed general manager of the Milwaukee Electric Railway & Lighting Company, and has entered on his new duties.

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### OBITUARY.

We announce with regret the very sudden death on April 22, of apoplexy, of Edward F. Bradford, of the Bradford Belting Company, Cincinnati.

Wm. W. Cross, formerly president of the Brockton, Mass., Street Railway Company, died recently of heart trouble. He was a prominent business man and interested in several lines of industry in Brockton which has always been his home.

Gustav Sutro, who has been a prominent business man of San Francisco and one largely interested in street railways, died in that city. He purchased the Omnibus Railroad Company and connected it with the Cliff House and Ferris system. In this he was associated with his cousin, ex-Mayor Adolph Sutro as well as in many other business enterprises.

The Massachusetts committee on street railways has voted to report a bill providing that after 1898 cars shall be vestibuled in winter.

The Halberstaedt (Germany) Street Railway, a horse line, earned a 3½ per cent dividend on the capital stock of \$52,000 in the year 1895-6.





**Alabama.**

MONTGOMERY, ALA.—Right to build, operate and maintain a branch line on McDonough street has been granted the Montgomery Street Railroad Company.

**California.**

SANTA ANA, CAL.—The Santa Ana & Orange Motor Company's bid of \$10 for the street railway franchise has been accepted.

MONTEREY, CAL.—The Pajaro Extension Railway Company has been incorporated to construct an electric railway in Monterey county. Capital stock, \$100,000; incorporators, Claus Spreckels, W. C. Waters and John L. Koster.

PASADENA, CAL.—Action on the Terminal Railway Company's application for a franchise has been postponed until May 17. The judiciary committee has agreed upon the conditions to be imposed, but opines that it would be inexpedient to advertise the franchise for sale until the new law relating thereto should go into effect, as it will, May 12.

**Canada**

WINDSOR, ONT.—The council of Sandwich West has granted a franchise to the Windsor, Amherstburg & Lake Erie Railway Company for an electric line through the town requiring construction to begin immediately. The company has given a \$10,000 bond to comply with the conditions.

MONTREAL, QUE.—The Montreal and Southern Counties Railway Company is being organized to construct 150 miles of electric railway to connect Montreal and the south shore with the counties of Chambly, Vercheres, Ronville, St. Hyacinthe, Laprairie, Brown, Shefford, Stanstead, and Sherbrooke. A. F. Corriveau is promoting the scheme with the assistance, it is said, of New York capitalists. The capital of the company is placed at \$2,000,000.

**Chicago.**

CHICAGO.—The Calumet, Blue Island & Harvey Street Railroad Company has petitioned the county commissioners for a 20-year franchise to construct a single or double track road over certain streets in the towns of Bremen and Thornton. The company will carry passengers, mail, express and baggage. Consents have been obtained from the required frontage.

CHICAGO.—Charles S. Leeds, promoter of the Suburban Electric Railroad, has filed a bill for an accounting from the directors of the company and Naugle, Holcomb & Co., also for a receiver for the railroad, and the Suburban Construction Company, and an injunction to restrain Naugle, Holcomb & Co., from disposing of any of the stock and bonds in their possession, alleging that if not restrained they would deprive him of all interest in the enterprise.

CHICAGO, ILL.—Receiver McKeon, of the National Bank of Illinois, has taken possession of the Calumet Electric Railway. Farson, Leach & Co., are released from all obligations. In exchange for 4,835 shares of stock and 2,843 bonds, the receiver returns to Farson, Leach & Co., the note for \$3,000,000, bearing their indorsement. The receiver is to furnish all the money needed to keep the road in operation and to develop and keep the roadway in repair, and to charge 6 per cent interest thereon.

**Connecticut.**

BETHANY, CONN.—Talcott H. Russell and E. P. Arvine are interested in the Woodbridge & Bethany Electric Railroad Company, which has applied to the railroad commissioners for a franchise.

HARTFORD, CONN.—The bill to charter the New Haven & East Haven River Railroad Company has passed the senate. This com-

pany will extend the New Haven Street Railway from its present terminus in East Haven to Cosy Beach and Mansfield Grove. A bill has also passed to incorporate the Branford Electric Railway Company.

**Delaware.**

REHOBOTH, DEL.—W. B. Welling, of New York, asks the assembly to grant a charter to the Delaware Central Railroad, which desires to build a trolley line from Seaford to Rehoboth, a distance of 30 miles.

DOVER, DEL.—P. A. B. Widener, William L. Elkins, John Edward Addicks, Peter L. Cooper and Richard Colchens are the incorporators of a new electric railway company which is to build a road from Chester via Claymont, through the city of Wilmington and connect with the New Castle Electric Railway.

**Florida.**

PENSACOLA, FLA.—Captain W. H. Northup, receiver of the Pensacola Terminal Company, states that at a recent meeting of security holders at Baltimore it was decided to equip with electricity, "the experiments with compressed air not having been satisfactory." To perfect title the property will be sold under the former order of Judge Swayne of the United States court. As soon as the sale is made the work on the extension will be pushed to completion.

**Georgia.**

ATHENS, GA.—The Athens Street Railway Company has purchased the electric lighting plant of the Athens Manufacturing Company and now controls all the commercial lighting of Athens.

ATLANTA, GA.—The Atlanta & Douglasville Railway Company has been formed to build 25 miles of electric railway. The capital is placed at \$375,000, and among those interested are Charles G. Wetter, president Builder's Exchange, Philadelphia, and L. Galloway, of Decatur, Ga.

**Illinois.**

GALESBURG, ILL.—Citizens of Knoxville have subscribed \$8,000 and Galesburg will probably give \$2,000 to make the \$10,000 bonus asked by Fred Seacord and Robert Chapel for their proposed electric railroad to connect Galesburg and Knoxville.

AURORA, ILL.—Manager Belden, of the Aurora & Geneva Railway, has begun condemnation proceedings for right of way along the river south of Geneva. Mr. Belden says: "From the present outlook, cars will run over our Geneva branch by June 1, and there is no immediate prospect of any delay in the work, which is now so well under way."

AURORA, ILL.—At a meeting, April 28, of the recently incorporated Aurora, Yorkville & Morris Electric Railway Company, at the office of Aldrich, Winslow & Worcester, the following officers were elected: President, Vine A. Watkins, of Chicago; vice-president, U. P. Hord, of Aurora; secretary, F. D. Winslow, of Aurora; and treasurer, F. B. Watson, of Aurora. The remaining director is H. L. Tracy, of Columbus, O. Several eastern capitalists, members of the syndicate, were in attendance at the meeting and expressed the belief that the work of construction would begin early this summer. Nearly all the right of way has been secured along the country route following the west river road. The road will probably enter Aurora on both sides of the river, the main line branching at Montgomery.

**Indiana.**

LAFAYETTE, IND.—Superintendent Guhn of the Lafayette Street Railway, is estimating the cost of an extension, which may be made if satisfactory to the eastern stockholders.

**Iowa.**

FT. DODGE, IA.—The electric railway company has been granted an extension of time until November 1, 1898, in which to have the road built and running.

CEDAR FALLS, IA.—Having been granted a franchise for a street railway to be operated by compressed air, gas, or electricity, C. W. McElyea is visiting eastern cities to investigate those systems of traction.

BURLINGTON, IA.—A syndicate of Boston capitalists including Edwin G. Innis and E. J. K. Noyes, has purchased the Burlington Electric Railway at sheriff's sale. The new owners intend to expend \$100,000 at once on new tracks, cars and improvements. An extension 3 miles in length will be built to West Burlington.

**Kansas.**

LEAVENWORTH, KAN.—City Treasurer Amos A. Fenn and E. A. Kelly are organizing a company to procure a franchise and construct and operate an electric railway in opposition to the Leavenworth Electric Street Railway.

**Kentucky.**

FRANKFORT, KY.—No bids were received on April 22, when the Capital Street Railway was offered for sale by United States Commissioner T. N. Lindsey.

COVINGTON, KY.—A street railway to be operated by gasoline motors is proposed by city engineer Weaver of Ludlow. The contemplated line would be ten miles in length, connecting Erlanger with the Cincinnati, Newport & Covington Electric Railway at Ludlow.

LOUISVILLE, KY.—The Metropolitan Railway Company, which was recently incorporated, offers \$75,000 a year for the street car privileges of Louisville. The fare is to be 4 cents, with 8 tickets for 25 cents. The charter of the Louisville Railway Company, which operates all the lines expires September 28, of this year.

**Maine.**

PORTLAND, ME.—The Portland & Cape Elizabeth Electric Railway Company will soon extend its double track through Broadway to Pickett street, in readiness for summer excursion traffic to Willard Casino.

**Maryland.**

BALTIMORE, MD.—The Central Railway has petitioned the council for right to lay tracks on Milton avenue and Canton avenue.

NORTH EAST, MD.—The North East Electric Railway Company, which was incorporated some time ago to build a line from Rising Sun through North East to the Elk River, held a meeting at North East, April 17, and elected the following officers: James Mallen, of Conshohocken, Pa., president; George W. Cosden, of North East, secretary and treasurer; J. C. Carhart, of Zion, Md., corresponding secretary.

BALTIMORE, MD.—The ordinance extending the time for completing the Edmondson Avenue, Catonsville & Ellicott City Electric Railway has been signed by Mayor Hooper. The company recently elected the following officers. President, George Yakel; vice-president, John Hubner; treasurer, Louis Yakel; secretary, William L. Layfield, general manager; W. Kesley Schoepf; directors—John Hubner, David M. Newbold, Bernard N. Baker, W. K. Schoepf, Louis Yakel, N. L. Layfield and George Yakel. It is stated that work on the road will be resumed in a few weeks.

**Massachusetts.**

HOLYOKE, MASS.—The Holyoke Street Railway Company has accepted the franchises recently granted for various extensions.

BOSTON, MASS.—A site for a power house costing \$400,000 has been purchased at Boylston street by the West End Street Railway Company.

NEWBURYPORT, MASS.—The Plum Island Electric Street Railway Company has been incorporated to build four miles of road. Incorporators, Charles Odell of Salem, and C. Fred Dennis of Newburyport.

AMHERST, MASS.—The Amherst-Sunderland Street Railway Company has selected a site for its power station. The steam plant will be supplied and erected by the H. M. Holt Boiler & Engine Company of Boston.

WORCESTER, MASS.—Matthew J. Whittall and Alfred Thompson, of Worcester, on April 23 purchased the Blackstone Valley Electric Railroad for \$31,000 at receiver's sale. The purchasers have not yet decided what to do with the property.

ATTLEBORO, MASS.—The Norton & Attleboro Street Railway Company has been incorporated to construct 5.5 miles of electric road. Capital stock, \$40,000; incorporators, D. E. Saunders, Salem, Mass.; L. C. Powers, Somerville, Mass.; and Albert A. Babb, Malden, Mass.

NEWBURYPORT, MASS.—Stockholders of the People's Electric Railway, which is soon to be built from Newburyport to West Newbury, recently elected Charles Odell, of Salem, president; Rufus H. Brown, of Peabody; Thomas H. Johnson, of Salem; C. C. G. Thornton, of Boston; Chas. H. Odell, of Salem; Thomas Smith, A. R. Smith, of West Newbury, directors.

PITTSFIELD, MASS.—Directors of the Pittsfield Electric Street Railway have appointed a committee to look into the matter of building their own power plant. The Pittsfield Electric Company, which now supplies current, finds its capacity overtaxed, but declines to install additional engines and generators, unless given a contract for a series of years. It is estimated that a new plant will cost \$20,000 or more.

**Michigan.**

PONTIAC, MICH.—The Oakland Electric Railway Company, by Secretary Strathearn Hendrie, will apply for a franchise to operate in Pontiac.

ALGONAC, MICH.—Citizens have voted to give the Detroit & St. Clair River Electric Railroad Company right of way over the principal street.

MONROE, MICH.—The Johnson & Jacobson Company, of Detroit has accepted their franchise and will begin work at once on the electric road in Monroe.

HOLLAND, MICH.—Work will begin at once on the new road of the Holland & Saugatuck Electric Railway Company. It is expected cars will be running by August 1.

BENTON HARBOR, MICH.—Forrester & Westcott, it is said, will take the contract to build the electric road to Eastman Springs, for which Seely McCord was recently granted a franchise.

ST. JOSEPH, MICH.—James Brooks has been appointed receiver of the St. Joseph & Lake Shore Street Railway upon application of the Royal Trust Company, Chicago, which holds a \$30,000 mortgage.

DETROIT, MICH.—Construction of the Oakland Railway extension from Birmingham to Pontiac has begun under the supervision of John Busbee, superintendent of the Wyandotte & Detroit River Electric Railway. It is expected cars will be running by June 15.

BAY CITY, MICH.—Two combination summer and winter cars will be purchased by the Consolidated Street Railway Company. The beach cars will be equipped with Westinghouse in place of Sprague motors. After completing the relaying of the Center avenue line work will be begun on the Essexville line and be completed by August 1 at the latest.

**Minnesota.**

DULUTH, MINN.—The Minnesota Point Street Railway Company made a voluntary assignment April 15, to Paul Sharvy. The immediate cause of the assignment was the inability of the company to pay a note for \$6,700 held by Charles Pettengill, and which is past due.

**Missouri.**

ST. LOUIS, MO.—The Missouri Railroad Company's 3 lines have been bought by the owners of the Lindell system.

ST. LOUIS, MO.—A bill has been introduced in the house of delegates granting franchises to the Central Street Railway Company. The St. Louis & Suburban asks leave to abandon its branch line to Forest Park and run a line in the opposite direction.

ST. LOUIS, MO.—The Hamilton syndicate power-house was damaged by fire on the night of April 16. The machinery suffered no damage, beyond that caused by water, one of the generators having its insulation somewhat weakened. It is estimated the loss will not exceed \$3,000.

### New Hampshire.

EXETER, N. H.—Directors of the Exeter Street Railway Company have been authorized to contract for the construction of their road to Hampton.

### New Jersey.

CAMDEN, N. J.—The ordinance granting the Camden & Suburban Railway Company permission to lay 1.5 miles of track in Haddonfield will be passed May 12.

HADDONFIELD, N. J.—The West Jersey Traction ordinance, which has hung fire for over two years, has been passed by the newly elected borough commissioners.

NEWARK, N. J.—A map showing seven miles of proposed extensions has been filed with the secretary of state by the Passaic & Newark Electric Railway company.

LONG BRANCH, N. J.—The Long Branch Electric Railway Company, has been incorporated to operate 1.75 miles of road in Long Branch. Capital stock, \$150,000; incorporators, Frank P. Killen, Bernard Mahon, Jacob Lorsch, James J. McInerney, C. E. Patterson, Harry W. Green and Chas. Morris.

BRIDGETON, N. J.—The Bridgeton & Millville Traction Company, which recently acquired the South Jersey Traction property at master's sale, at its first meeting, May 3, elected the following directors: C. Hartman Kuhn, president; Stephen Greene, vice-president; Walter H. Bacon, secretary and treasurer; Aaron Fries, Bloomfield H. Minch, Lawrence Johnson, and Frank S. Lewis.

### New York.

BUFFALO, N. Y.—The Crosstown Street Railway Company, May 3, filed its acceptance of the franchise recently granted to lay its tracks on six streets and avenues.

OLEAN, N. Y.—Superintendent Pierce, of the Olean, Rock City & Bradford Electric Railway, has purchased 4 high pressure boilers of 600-h. p. for the proposed new line.

ALBANY, N. Y.—The trustees of Greenbush Village have passed an ordinance granting a franchise to the Albany Railway to construct and operate an electric railway in Greenbush.

HUDSON, N. Y.—The reorganized Hudson Electric Railway Company has elected William A. Harder, Jr., president; R. W. Evans, vice-president, and Augustus McKinstry, secretary and treasurer.

MAYVILLE, N. Y.—C. C. Minton, of the Mayville State Bank, has been elected treasurer of the Westfield, Mayville Electric Railroad Company. He believes the road will be built inside of two months.

PENN YAN, N. Y.—The state railroad commission, April 14, granted the Penn Yan, Keuka Park & Branchport Electric Railroad Company permission to build its line between Penn Yan and Branchport

ORISKANY, N. Y.—Ties and rails have been distributed over the route of the Suburban Railway Company between Whitesboro and Summit Park, Oriskany. The electric road is expected to be open for travel on Memorial Day.

BROOKLYN, N. Y.—Citizens of Flushing met recently and resolved that necessary permission for building a trolley line through Bayside in accordance to the route decided upon at this meeting be granted the New York & North Shore Railway Company.

RIVERHEAD, N. Y.—Consents have been obtained for the electric road which Riverhead, Quogue & Southampton Railroad Company proposes to build through Flanders to Quogue and the Ocean beach. The capital is on hand and construction is soon to begin.

BUFFALO, N. Y.—Permission to build and operate a surface road over various streets is asked by the Tonawanda Electric Railway Company. George P. Smith asks that he be allowed to lease the franchise of the Tonawanda Street Railroad to the same company.

NEW YORK, N. Y.—Plans for a 3-story brick car and power house have been filed by the Metropolitan Street Railway Company. The plant, costing \$200,000, will be erected on Lenox avenue, to care for the increasing traffic in Harlem and to relieve the Lexington avenue power station.

ALBANY, N. Y.—The Hudson Electric Railway Company has been incorporated to operate the reorganized Hudson Electric Railway. Capital, \$50,000; directors, William H. Lamb, R. Rainey, P. S. Johnson, R. W. Evans, W. A. Harder, S. Thompson, W. M. Brownell, C. S. Rogers and J. E. Gillette.

PORT JERVIS, N. Y.—A trolley road is to be built by the Port Jervis Electric Street Railway Company, which has recently been incorporated with \$70,000 capital stock. The directors are Lafe Pence and George McKibben, of New York, and S. D. Lake, A. C. Haines, George A. Elston, J. E. Wickham, J. E. March, and Theodore Shay, of Port Jervis.

SYRACUSE, N. Y.—A franchise will be asked of the Salina town board to permit the construction of an electric railway through the town. The line would connect with the Lakeside Electric Railway and extend to Liverpool. Among those interested are Valentine Bond, George Shaver, George Riechberg and Thomas Holleran, of Liverpool, and John Kaufman, of Syracuse.

NEW YORK, N. Y.—The Rapid Transit Underground Railroad Company has been incorporated with the object of obtaining the contract to build the underground road for the city and subsequently operating it under lease. The incorporators are Carlton H. Reeve, Cornelius V. Sidell, John Bogart, John Acker, David L. Hough, John F. O'Rourke, Thomas Allen and Robert H. Sherwood of this city, and Nelson S. Eastman of Summit, N. J.

FAR ROCKAWAY, N. Y.—The Ocean Electric Railway Company has been incorporated to build five miles of electric railway over two routes. Headquarters will be at Far Rockaway. Capital stock, \$50,000; directors, Daniel F. Lewis, Louis E. Robert and Henry A. Van Keuren, of Brooklyn, and Samuel B. Lawrence, John B. Summerfield, William H. Chesebrough, Jr., Henry M. Haviland, Francis P. Lowrey and Armitage Mathews, of New York.

HAMBURG, N. Y.—The Hamburg Railway Company has ordered 600 tons of steel rails to complete the trolley line between Blasdell and Hamburg. The Buffalo, Hamburg & Orchard Park Railway Company has elected the following officers: Directors, W. W. Wheatley, Arthur W. Hickman, John A. Donaldson, Ernest Wende, Lester J. Chase, Willis J. Gregory, U. L. Upson, Frank W. Everett, George R. Vaughn, William J. Wright and Dr. Loren F. Bliss. Mr. Upson says work will begin in July.

WESTFIELD, N. Y.—The Westfield, Mayville & Chautauqua Motor Railway Company has been incorporated to build the electric line already reported in the DAILY BULLETIN. The charter provides for 15 miles of road, to be operated by any power other than steam. Capital stock, \$150,000; directors, John C. Minton, of Burlington, Ia.; James V. Minton, Waldo L. Minton, Harry S. Minton, Harlow W. Gibbs, Willis U. Baldwin, and William L. Minton, of Westfield; Charles C. Minton and Clarence R. Cipperly, of Mayville.

CORNING, N. Y.—J. D. Nares, of Corning, writes us that the Savona Valley & Lake Keuka Railway to connect with the Rochester division of the Erie Railway at Savona, and run through the towns of Savona, Bradford, Tyrone, Weston and Wayne, terminating at Keuka, the summer resort of Lake Keuka, a distance of 18 miles, then connecting with a ferry system crossing Lake Keuka to Gibson and Pulteney, a distance of two miles. The road is to be standard gage, and run all classes of passenger and freight cars, and to be run by electric power. The power house will be located at Bradford, N.



Y., about middle distance of the road. The power plant will be heavy, as the freight service will be heavy. Also the passenger service is expected to very large in the summer and fall season. The Chenango Engineering Company, of Binghamton, N. Y., is now at work on surveys and maps. Work will be let about May 15, 1897.

**BUFFALO, N. Y.**—The Buffalo, Niagara River & Grand Island Railway Company has been incorporated with a capital stock of \$30,000, to operate a street surface electric road from the city of Buffalo to the dock of the Buffalo & Grand Island ferry on the Niagara river in the town of Tonawanda. The directors are: Donoto A. Crage, William E. Tench, George A. Ricker, J. M. Metcalf, Herbert P. Bissell, George C. Riley, James Murphy, Charles W. Ricker and Frank W. Carr, all of Buffalo. The projector of the road is William E. Tench, of the firm of Crage & Tench, of this city, the builders of the Gorge road.

**BUFFALO, N. Y.**—The Buffalo & Depew Railway Company was incorporated May 1 to build an air line connecting the villages of Depew and Lancaster with Buffalo. The road will be built for rapid transit; cars are expected to cover the 7.25 miles distance in 15 minutes. The right of way is private, and was surveyed four years ago by George A. Ricker. The enterprise has no connection with the Buffalo Railway or Traction Company. Capital stock, \$100,000; directors, William B. Cutter, Augustin Smith, George A. Ricker, John H. Baker, Herbert P. Bissell, J. Henry Metcalf, George C. Riley, James Murphy and Frederick M. Turner, all of Buffalo.

**LIBERTY, N. Y.**—The Liberty & Jeffersonville Electric Railroad Company will be organized to build a line between the two towns. Citizens have subscribed \$20,000 in aid of the enterprise. Frank Lober has subscribed for \$34,600 of the 36,000 capital stock, Thomas Loomis, of New York, Charles W. Wilfert, Conrad Metzger and Charles Homer, of Jeffersonville, having taken one share apiece. Right of way has been donated, and poles have been purchased. Rails will be purchased of the O. & W. Railroad. The power house will be located at Youngsville and equipped with a 150-h. p. engine. The construction of the road will be supervised by the Pierce & Miller Engineering Company, of New York.

### Ohio.

**EAST LIVERPOOL, O.**—The East Liverpool Railway Company has been incorporated with \$300,000 capital stock.

**CINCINNATI, O.**—The Cincinnati Consolidated Street Railway Company is considering a new line to Norwood.

**CINCINNATI, O.**—A new franchise was granted May 1, by the county commissioners, to the Cincinnati & Miami Valley Traction Company.

**OBERLIN, O.**—The city council has granted a franchise for the extension of the Cleveland & Elyria Electric Railway. Work is to begin at once.

**HAMILTON, O.**—J. C. Hooven, president of the Cincinnati & Hamilton Electric Railway Company, has applied for right of way over Hamilton streets.

**ST. MARYS, O.**—The Lima & Piqua Electric Street Railroad Company, of St. Marys, has changed its name and location to Lima & Piqua Railroad Company, of Sidney.

**PAINESVILLE, O.**—Charles H. Moody, of Painesville, has been granted a franchise by the Lake county commissioners to build and operate an electric road between Painesville and Fairport.

**ELYRIA, O.**—Lorain County Commissioners have granted the Cleveland & Elyria Electric Road Company a franchise to build their road to Oberlin, eight miles from Elyria. If they are granted a franchise by the Oberlin council the work of construction will begin at once.

**BUCYRUS, O.**—W. E. Haycox, president of the Buckeye Traction Company, on May 1 filed with the county commissioners a bond of \$3,000, binding the company to begin the construction of the Bucyrus & Galion Electric Railway by June 1. It is hoped to have trains running by September 1.

**NEWARK, O.**—The Equitable Trust Company, of Chicago, filed a cross petition in the United States court April 13, in the suit of Reinhart Scheidler vs. the Newark & Granville Electric Railway Company, setting up the fact that they hold mortgages on the property to its full value, and asking for a receiver.

**CLEVELAND, O.**—The Osborne Engineering Company is making a final survey of the proposed electric road from Akron to Cleveland. The line will run through Brighton, Parma, Royalton, West Richfield, Bath, Ghent, Montrose and Fairmont. It is said contracts for construction will be let within six weeks.

**ALLIANCE, O.**—The Stark Electric Railway Company has been incorporated to build and operate a line between Alliance and Waynesburg, via Canton; also a branch between Alliance and Salem. Capital stock, \$10,000; incorporators, J. B. G. Roberts, Clement R. Jones, C. B. Gibson, R. R. Jacob and T. F. Williams. Headquarters will be at Waynesburg.

**DAYTON, O.**—Stockholders of the Dayton, Spring Valley & Wilmington Transit Company, met at Spring Valley and elected the following officers for the ensuing year. President and general manager, J. M. Wilson; secretary, J. H. Racer; treasurer, John R. Barrett; vice-president, Wallace Berryhill; superintendent, F. H. Talbot; directors, F. H. Talbot, J. B. Pence, J. M. Wilson and J. Fremont Stump.

**CLEVELAND, O.**—Stockholders of the Cleveland, Canton & Southern Railroad are figuring upon the substitution of electric for steam power. The cost of the change and the result have been closely determined. At present the company is insolvent, but it is said to be on the eve of reorganization. Their contemplated adoption of electricity is being hastened by the approaching completion of the Cleveland & Chagrin Falls Electric Railway, which expects to make passenger rates that will capture all the Chagrin Falls travel to Cleveland, thus depriving the Canton & Southern, the only steam road reaching Chagrin Falls, of considerable business.

### Oregon.

**SALEM, ORE.**—The Salem & Suburban Railway Company has been incorporated to operate the Salem Motor Railway purchased by F. R. Anson. Capital stock, \$5,000; incorporators, E. P. McCormack, F. R. Anson, F. H. Page and D. S. Tutbill.

**ASTORIA, ORE.**—The Astoria & Suburban Railway Company has been incorporated to build a road from mouth of Walluski river to the head of tide water on John Days river, and from Astoria to the ocean beach, via Warrenton and Flavel. Capital stock, \$30,000; incorporators, J. W. Conn, F. W. Newell and W. A. Sherman.

### Pennsylvania.

**MCKEESPORT, PA.**—The Corry Avenue Street Railway Company has been incorporated to construct 1.5 miles of electric railway. Capital stock, \$10,000.

**CONNELLSVILLE, PA.**—A branch line to Vanderbilt, three miles in length, will be built by the Conneltsville, New Haven & Leisenring Street Railway Company.

**PITTSBURG, PA.**—The West Newton & Northern and the Second Avenue Electric Railway Companies are rival applicants for right of way through West Newton.

**PITTSBURG, PA.**—Belleverson has at last granted a franchise to the Second Avenue Traction Company of Pittsburg for a line connecting with Charleroi, Monongahela and Belleverson.

**UNIONTOWN, PA.**—The Uniontown Street Railway Company has been thrown into the hands of the sheriff on the suit of William G. Freeman, of Cadiz, O., who holds a claim for \$5,000.

**DOYLESTOWN, PA.**—A six month's extension of time to build has been granted the Bucks County Railway Company. The ordinance of the East Penn Traction Company has passed its second reading.

**PHILADELPHIA, PA.**—The New Philadelphia & Bristol Electric Railway has gone into operation. The completed portion is 7 miles in length. Owing to the opposition of the Pennsylvania Railroad there is a gap in the line at Crocyden.

**COLUMBIA, PA.**—William B. Given, receiver of the Pennsylvania Traction Company, will buy one mile of track material, 4.5 miles of feeder wire, eight cars with 50-h. p. equipment, 300-h. p. engine, two 350-h. p. boilers, and a 260-k. w. generator.

**PITTSBURG, PA.**—The Beechwood Street Railway Company has been incorporated to build 2.5 miles of road in Pittsburgh. Capital stock, \$15,000; incorporators, Peter Shields, Frank McCann, Daniel R. Deely, Charles Donnelly and John F. Steel.

**TITUSVILLE, PA.**—A bill granting a franchise to the Titusville Electric Traction Company, on April 15, was passed second and third readings by the Hydetown council. The company's surveyors have about completed their labors under the direction of Secretary M. B. Dunham.

**PITTSBURG, PA.**—Residents of Squirrel Hill are collecting a bonus of \$50,000 to induce the Consolidated Traction Company to extend its lines to their section. The property owners have obtained a charter for a road which they will turn over to the company together with the bonus.

**MONONGAHELA, PA.**—J. J. Rankin, secretary of the Valley Electric Street Railway Company, writes us: "We expect to be in the market very soon for an entire equipment, and the construction of 18 miles of road. Would like to have addresses of parties in the construction and supply business."

**SOUTH BETHLEHEM, PA.**—President Hugh E. Crilley, of Allentown, reports that the Hellertown town council has finally granted the South Bethlehem & Hellertown Electric Railway Company right of way in that borough. After obtaining right of way between the two places application will be made for a franchise in South Bethlehem.

**PITTSBURG, PA.**—Stockholders of the Troy Hill & Reserve Township Street Railway Company, it is said, will hand over their project to any company that will undertake to build a line into Reserve township. Right of way has been obtained and other preliminary work valued at \$30,000 has been done. It is expected that the North Side Traction Company or the Allegheny & Millvale Company will accept the offer.

**MCDONALD, PA.**—Citizens held an enthusiastic meeting at McDonald recently, in favor of the Carnegie & Cannonsburg Electric Railway. It was agreed to form a company with \$250,000 capital. A committee of three men each from McDonald, Noblestown, Oakdale, Venice and Cannonsburg was appointed to obtain right of way and solicit subscriptions. Edward McDonald, banker, of McDonald, is at the head of the committee.

**TAMAQUA, PA.**—The street railway project, noticed from time to time in the DAILY BULLETIN, has been finally organized at Lehigh as the Lansford & Tamaqua Street Railway Company, with the following directors: President, Frank P. Spiese, of Tamaqua; secretary and treasurer, James McGready, of Summit Hill; superintendent and manager, W. D. Zehner, of Lansford; Daniel Shepp, of Tamaqua, and L. A. Riley, of Philadelphia.

**PITTSBURG, PA.**—President James Callery of the Second Avenue Company announces that the Pleasant Valley line will undergo extensive improvements this summer. Three hundred thousand dollars is to be expended for a new power house to replace the Taggart steel structure and for the relaying of steel girder tracks. The road will also be equipped with new cars. Calhoun Park is to be improved by the adding of new features, and Oak Park, on the line of the West End line, will be beautified.

## Rhode Island.

**WOONSOCKET, R. I.**—President Ray, of the Woonsocket Street Railway has been appointed a committee of one to arrange for the extension of the road.

**PROVIDENCE, R. I.**—The Providence & Taunton Electric Railroad Company will petition the cities of Taunton, Rehoboth, Dighton and Seekonk for right of way.

## South Carolina.

**ORANGEBURG, S. C.**—J. E. Bull writes us that the Orangeburg City Horse Railway is offered for sale.

**CHARLESTON, S. C.**—The Charleston City Railway Company has notified the secretary of state of its intention to increase its capital stock from \$100,000 to \$850,000. The extension of its charter for 50 years will also be petitioned for.

**CHARLESTON, S. C.**—The Summerville Street Railway Company has been incorporated to construct and operate a horse car line in Summerville. Capital stock, \$50,000; incorporators, J. S. Lawrence, of Baltimore, and Philip H. Gadsden, of Charleston.

**GREENVILLE, S. C.**—J. S. Lawrence and others of Charleston, have been granted a 37-year franchise on condition that they build within 12 months four miles of electric railway in Greenville. Work is to begin in about two months. Mr. Lawrence and his friends have just completed an electric road in Charleston.

## Tennessee.

**KNOXVILLE, TENN.**—Bondholders ask the appointment of a receiver for the Johnson City & Carnegie Street Railway Company.

## Texas.

**SHERMAN, TEX.**—Operation of the College Hills & Park Lines electric, has permanently ceased.

**GALVESTON, TEX.**—The Galveston & Houston Electric Railway Company has been incorporated with \$150,000 capital stock.

**SHERMAN, TEX.**—Extensions to Fairview and west are proposed by the street railway company. The company also proposes to go into the business of supplying power, light and heat.

## Virginia.

**PORTSMOUTH, VA.**—The Portsmouth Street Railway Company has contracted for the electrical equipment of 6 miles of its line. Later extensions will be made to Gilmerston and the Norfolk & Western Railroad. The North Portsmouth Electric Railway Company has applied for right of way over certain streets, having deposited \$1,000 to guarantee performance of contract.

**NORFOLK, VA.**—The application of the Port Norfolk Railway for the use of additional streets in order to reach South Portsmouth has been granted by the city council. The company agrees to pay \$20 per year for the use of each street, \$40 tax for each car, lay 7-in. girder rail on paved streets and put up a \$5,000 indemnity bond. Work is to begin in 30 days and be completed in 6 months.

## West Virginia.

**WHEELING, W. VA.**—The Suburban Electric Railway Company has been incorporated with \$500 capital by N. E. Whittaker, George W. Woods and Charles M. Fissel, of Wheeling.

## Wisconsin.

**OSHKOSH, WIS.**—A mortgage for \$200,000 has been given by the new Citizens' Traction Company to the Security & Trust Company, of New York.

**MILWAUKEE, WIS.**—C. R. Gether asks the village board of Whitefish Bay to grant a franchise for a street railway to connect with the northern terminus of the dummy line.

**MADISON, WIS.**—The Wisconsin Inland Lakes & Chicago Electric Railway Company has been incorporated in Wisconsin. This company has been undergoing promotion for a year past. Capital stock, \$5,000,000; directors, Bayard Taylor, William J. Marks, Jesse B. Barton and George E. C. Johnson, all of Chicago, and F. K. Bryant, of Princeton, Ill.

**WAUKESHA, WIS.**—Stockholders of the North Greenfield & Waukesha Electric Railway met in Milwaukee recently to decide upon arrangements for beginning construction. While the exact route in Waukesha has not been fixed, the company will in about two weeks apply to the Waukesha council for a franchise. S. I. Henderson, of North Greenfield is the chief promoter.



The Bradford Belting Company being incorporated, the death of Mr. Bradford will not interfere with the business continuing as heretofore.

Frank J. Sprague of New York has been awarded the contract to furnish controllers for the cars of the South Side Elevated Railroad Company, Chicago.

Erbeck Brothers of Homestead, Pa., have received the contract to construct 4 miles of electric road for the Brad-dock & Homestead Street Railway Company.

Abendroth & Root, of New York, manufacturers of the well known Root improved water tube boiler, have removed their western office from 1422 to 1539 Monadnock building, Chicago.

Hildreth & Co., of New York, have received the contract to build the extension of the Hartford, Manchester & Rockville Tramway to Rockville, Conn., including a bridge at Talcottville.

Dixon's traction belt dressing is recommended by electrical experts as a means of preventing the belt from slipping and thus generating electricity with a consequent loss of power and danger of fire.

The New Haven Car Register Company, New Haven, Conn., is in receipt of a remarkably large number of orders for its 1897 model register, which contains a number of valuable improvements.

Harold P. Brown's elastic copper amalgam rail bond has been adopted by the Hamilton Street Railway Company, of Hamilton, Ont., where it is proving a decided success. It is used in streets paved with asphalt.

The Griffin Wheel Company, of Chicago, reports a very busy state of affairs in its street car department. The company's new foundries at Tacoma, Wash., are now in full running order and turning out street car wheels.

The Edward P. Allis Company, Milwaukee, is building a 1,200-h. p. cross compound condensing engine for the Citizens road, Memphis, and another of the same size and type for the New York & Staten Island Electric Company.

A. O. Schoonmaker, of New York and Chicago, has gotten out some new mica segments for G. E. 800 motors. These segments have greater breath, giving greater wearing capacity. They are the Billings & Spencer type of form 6.

Garton-Daniels Electric Company, Keokuk, Ia., reports total sales for March as far in excess of the same month last year, and that orders are coming in even beyond its expectations. The improved arresters are making fine records.

The Brownell Car Company, of St. Louis, Mo., is building three convertible cars for the Janesville Street Railway Company, Janesville, Wis. A portion of the equipment required for the new power plant will be furnished by the General Electric Company.

The Partridge Carbon Company, of Sandusky, O., is running its factory to its full capacity to meet the demand for brushes for motors and generators. Foreign trade is being developed by this company with promise of its attaining considerable proportions.

The New York Electrical Works, 161 Washington street, New York, manufacturers of trolley fittings have issued an illustrated catalog showing different types of section insulators, crossings, suspensions, span wire fittings, strain insulators, ears, splicers, etc., made by them.

The Citizens Traction Company of Oshkosh, Wis., has awarded the contract for the construction of its new electric road to the Electrical Installation Company of Chicago. The contract for the special work has been given to the Falk Manufacturing Company of Milwaukee.

A big contract was recently captured by the American Electrical Works, of Providence R. I. It will furnish \$350,000 worth of electric railway feeders and other supplies to the Consolidated Street Railway Company, of Cincinnati, O., to be used in converting the cable lines into electric roads.

The American Electric Traction Company has been incorporated under the laws of New Jersey, with headquarters in New York. The company will acquire control of and manufacture the John McCleod electric railway patents. Of the \$500,000 authorized capital \$1,000 has been paid in.

W. R. Brixey, of New York and Chicago, has opened an office at suite 1507 Marquette building, Chicago, under the management of J. B. Wallace, where he is prepared to meet his old trade. A full line of Day's Kerite, feeder wire, etc., will also be carried in stock at the storeroom, 141 South Clinton street.

The Forest City Electric Works, at Cleveland, were damaged by fire on the night of April 12. Fortunately the machines received no injury, the destruction being confined to the belting, pulleys, etc. The debris has been removed, and the company is filling promptly all orders for roll-drop commutator bars.

Eugene Munsell & Co., of New York and Chicago, report considerable improvement in their business. Their western trade especially is rapidly increasing, which would indicate that their customers appreciate the establishment of a western branch carrying a full stock of Indian amber mica for insulation purposes.

The Ball Engine Company, Erie, Pa., has lately installed engines for the electric lighting plants of the Wauwatosa County Insane Asylum, Wisconsin, and the Chicago Public Library. This latter plant comprises 5 direct connected units aggregating 900 h. p.; the Chicago Edison Company furnished the dynamos.



The Central Electric Company, of Chicago, has designed new material for overhead construction which is well worthy examination. The company is preparing to place on the market at a very low price a full line of high grade railway motor bearings. Trolley wheels are now sold in large quantities to railway companies which use no other wheel.

The Buckeye Engine Company, of Salem, O., has opened an office in Manufacturers Record building, Baltimore, which will be under the management of J. W. Taylor, who is well known in the machinery line in the east. The territory, covered by this agency will be Maryland, Virginia, the Carolinas, East Tennessee, Georgia and Florida.

The Forest City Electric Company of Cleveland, O., has issued a very neat little pamphlet on "Rail Bonding" which is profusely illustrated. The evolution of bonding is briefly described and some pointers on the methods to be used are given. The merits of the flexible, protected rail bonds made by this company are set forth in a convincing manner.

The Swarts Metal Refining Company has moved to No. 20 North Desplaines street, corner of Eagle, where it will have greatly improved facilities. This company, a few years ago almost unknown, has built up a successful business both at home and abroad by fair dealing with its customers, and fortunate purchases which make low quotations possible.

Edward Smith & Co., 45 Broadway, New York, manufacturers of preservative compounds for various building materials, have recently reprinted a paper on the subject of "Preservative Coatings for Iron Work," read before the New England Railroad Club by A. H. Sabin. The pamphlet will prove very interesting to those who have to deal with the problems discussed.

The extensive engine works of McIntosh, Seymour & Co., at Auburn, N. Y., are very busy and business has increased to such an extent as to necessitate an addition to the already large plant. The new building under construction is 80 x 160 ft. and is being pushed to completion as rapidly as possible. In addition to orders already on the books a very gratifying amount of new work is in prospect.

The Providence fender has been adopted by the city council of Syracuse, N. Y., for use on the cars of the Rapid Transit Company. A special committee of the council traveled extensively to inspect the life-saving appliances employed in different cities. It was only after viewing 40 other fenders that the committee selected the "Providence," made by the Consolidated Car Fender Company of Providence, R. I.

The Standard Underground Cable Company, of Pittsburgh, Pa., has issued a handbook giving full information and complete price lists of materials used in underground cable construction. The book, which was compiled by Joseph W. Marsh, is well illustrated, with diagrams as well as rules for making all kinds of cable connections. For the convenience of customers the telegraphic code of the Standard Company is added.

The Milwaukee Electric Railway & Light Company advises us that it has just closed a contract with the Park Manufacturing Company for welding 7,000 joints, and that

the number will probably be increased to 10,000 or 12,000. A large number of these joints will be used on new track to be laid in unpaved streets, as the results on the Oakland avenue line proved so satisfactory. The greater part, however, are for raising old joints.

The Columbia Incandescent Lamp Company, St. Louis, makes a specialty of lamps for street railway service and furnishes for headlights and decorative car lighting round bulb lamps which are carefully made to consume the same amount of energy as the ordinary lamps used in the car, and so may be burned in series with them. These lamps may be had with frosted, or superficially colored globes, or with genuine colored ruby or opal glass.

The general sales office of the Walker Company, formerly at 253 Broadway, is now located in the new building on the northwest corner of Wall & Nassau streets, New York city. The Walker Company has taken an entire floor in this new building. Increased business has necessitated these large and more centrally located quarters. The Walker Company is to be congratulated for its enterprise which is indicated by this change of location.

Alfred G. Hathaway, of Cleveland, O., is enjoying a good demand for the Murrey brake in his own city, and its fame is spreading. Among recent orders he has equipped all the cars of the new Cleveland & Chagrin Falls Electric Railway. Soon he will place his brake on the Cleveland & Elyria Electric Railway. A contract has just been closed with the Detroit & St. Clair River Electric Railway Company for 14 sets of brakes. Companies operating double truck cars are especially well pleased with the Murrey brake.

Two large orders received within the past week, one from Japan and the other from Mexico, for Walker cars, evidences the fact that the fame of this car as a support for trolley wires has extended beyond the bounds of the United States, where its reputation is already widespread. The Ohio Brass Company, sole manufacturer of this article, has recently brought out several modified forms of the car used on straight line suspension which are adapted for feeder, strain and splicing purposes, so that the trolley wire can be equipped with Walker cars throughout. These several new designs will be illustrated in the new supplemental catalog soon to be issued.

Warren Hill & Co. call the attention of the trade to their improved ticket punches, which have been on the market for four years and give the best of satisfaction. These were designed upon a new principle with the idea of securing a punch adapted to all tickets in use and at the same time not imitate other punches. The die is carefully protected by a stripper and the steel joint piece is of large size and accurately fitted, so that the die can not get dulled. The  $\frac{5}{16}$  punch has a reach of  $1\frac{1}{8}$  in., and the  $\frac{3}{16}$  punch has a reach as great as  $2\frac{1}{2}$  in.; any die is made to order and over 300 are kept in stock. Communications should be addressed to the manager, John B. Holaday, 171 Pearl street, Hartford, Conn.

The Northern Pacific railroad annual, "Wonderland," has been issued by Charles S. Fee, general passenger agent, and is in every way up to the high standard of previous years. Beautifully illustrated with ever interesting views of the

mountain lands of the far West, and a text full of historic and instructive explanation, the brochure will be a welcome addition to the library table everywhere. The front cover displays a view of the great falls of the Yellowstone, in colors. A copy will be sent to any address on receipt of 6 cents in stamps, which is the amount of postage required to mail it. Many a guide book sold for one dollar is less interesting and attractive. Requests may be sent to C. S. Fee, G. P. Agent, St. Paul.

The American Engine Company, of Bound Brook, N. J., has just begun the shipment of its new direct-connected generating plants, in which the American-Ball engine is combined with the new line of 6-pole generators. The company is now installing a 75-k. w. plant at No. 7 East 17th street, New York, in the building of Deitch Brothers, and a 35-k. w. plant in the building of the Evening Wisconsin, of Milwaukee. In addition to this it has orders from the Philadelphia Inquirer for a 100-k. w. plant; the Buffalo Evening News, a 35-k. w. plant; the Phelps Publishing Company, of Springfield, Mass., two 35-k. w. plants; the New York Tribune, a 75-k. w. plant, and the World's Dispensary Medical Association, of Buffalo, a 25-k. w. plant.

The engineering staff of the Standard Air-Brake Company has been increased by the addition of Edward H. Dewson, Jr. with whom General Manager Wessels lately closed a contract for a term of years. Mr. Dewson brings to the company a ripe experience. He entered upon his new field on April 26th. Mr. Dewson has been long and favorably known in connection with his work while with the General Electric Company in its engineering department, and in connection with locomotive practice and the superintendency of one of the western lines. He has for some time filled the position of master mechanic of the Pratt & Letchworth Company, Buffalo, and is thoroughly posted on the mechanical arts and will find full scope for his ability in his new field.

At the annual meeting of the stockholders of the Standard Air-Brake Company, New York, the following directors were elected: Henry Seligman, Edward J. Wessels, Albert Strauss, Leopold Wallach, Theodore Seligman and D. F. Meyer. The company has closed contracts with the Dighton, Somerset & Swansea Street Railway Company of Taunton, Mass., the Commonwealth Avenue Street Railway Company of Boston, and through its foreign agents, for air-brakes for the Continent. Advices have been received as to the successful opening of an extension at Sydney, N. S. W., on which heavier motor cars equipped with the Standard brakes are used. The company is also supplying a complete working outfit to the Pennsylvania State College for its experimental line.

The Mica Insulator Company, 218 Water street, New York, has lately added to its already extensive plant at Schenectady, some new machines of special construction which mill micaite plates to very exact thickness. The special plates for commutator segments are gaining a stronger hold than ever. They are guaranteed not to ooze cement whatever temperature a commutator may reach in practice. Considering the mechanical difficulties contended with, to reach the present high state of perfection, high compliments are due the company. The improvement in business reported

is very encouraging, because the mica business is one of the best barometers, and without a doubt this company has during the past year of depression placed itself in a position to reap the full benefits of the business improvement which is just dawning.

As a result of recent experiments with compressed air motors on the Eckington & Soldiers Home Railroad at Washington, D. C., it has been decided to equip the road with these cars. Fifteen of them will be placed on the line to Brookland as soon as they can be constructed. Receiver Schoepf says the tests have been entirely satisfactory. The car now in operation has carried eighty-seven passengers one way and thirty the other, making 107 on the round trip, with 25 per cent of reserve force in the reservoirs, or 500 pounds out of the 2,000 pounds with which the reservoirs were charged with starting. "The car has already run over 1,000 miles on the Eckington tracks," said Mr. Schoepf, in conclusion, "and has hauled over 4,500 passengers, and not yet has a dollar been spent on it for maintenance or renewals. I consider this a fine showing."

The Vilter Manufacturing Company of Milwaukee, Wis., has recently closed contracts for supplying refrigerating machinery and Corliss engines as follows: Maumee Brewing Company, Toledo, O., one 25-ton refrigerating machine; Indiana Brewing Association, Marion, Ind., one double 100-ton refrigerating plant; Theodore Hamm Brewing Company, St. Paul, one 100-ton machine; Centennial Brewing Company, Butte, Mont., one 35-ton plant; Estrell a de Oro, City of Mexico, one 10-ton plant and brewery outfit; Schwartzschild & Sulzberger Company, Kansas City, one 200-ton machine; Ouemmi & Siebert Refrigerating Machine Company, St. Louis, one 50-ton and one 5-ton machine; Christ, Abtau, Germantown, Pa., one 5-ton machine; H. Piper, Chicago, one 2-ton machine; A. Trostel & Sons, Milwaukee, one 2 1/2 x 42-in. engine; William Larsen & Company, Green Bay, Wis., one 12 x 30-in. engine.

Boody & Wheeler of Philadelphia have been awarded the contract to construct 25 miles of electric railway between Trenton, N. J., and Doylestown, Pa., for the East Penn Traction Company. The line will pass through Morrisville, Yardley, Newtown, Writestown, Pineville, Buckingham and Mechanics Valley. The contract provides for a stone-ballasted roadbed, equipped with the latest improved cars and motors and power-house machinery, including boilers, engines, generators, ample car-barns, and everything complete to operate the road. Double-truck, 8-wheel 34-ft. cars with two 30-h. p. motors to each car, will be used. Work will begin immediately at Morrisville, opposite Trenton, and at Doylestown and be carried on in both directions. The road will be along the side of the public highway and there are no physical difficulties to be encountered. The grades are light and there are no important bridges except at Morrisville. It is expected to have the road built and in operation between Morrisville and Yardley within a few months, and to Doylestown inside of one year.

The consolidation of the Oakland, California, lines which was well under way a few months ago, at which time it looked as though an English syndicate would purchase them all, has fallen through and the deal is entirely off.

# Removal Notice.

We beg to announce that we have removed from the Betz Building, to 10 So. Tenth Street, Philadelphia, where we have established a large and commodious warehouse. We now have in stock a full line of material manufactured by the well-known Companies we represent, together with a Full and Complete Stock of Electric Railway Material and Supplies for immediate shipment. Our facilities for handling our rapidly increasing business are now strictly first-class.

MAYER & ENGLUND,

10 South Tenth St.

Philadelphia, Pa.

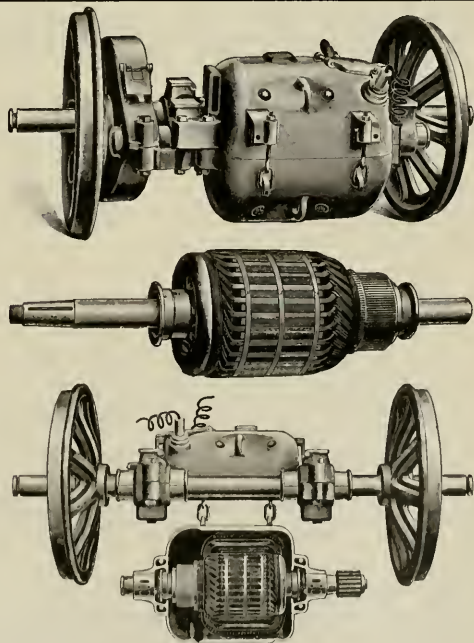
WRITE FOR LATEST PRICES. IMMEDIATE SHIPMENT FROM STOCK.

## THE NEW STEEL MOTOR.

Street railway motors, entirely enclosed and constructed of steel, were first designed and built by the Steel Motor Company, of Johnstown, Pa. On account of the strength, lightness and durability of these motors they met with much favor. This company has lately constructed and tested a new motor, known as No. 22, which combines the best features desired in a railway motor. As shown in the cut, the motor is cylindrical in form and enclosed in a water and dust proof case. The whole construction is of steel, and is so compact in design that it is claimed to be lighter for a given output than any heretofore produced.

There are four poles, each having an individual field coil which is interchangeable with the others. They are wound on special forms and are insulated with special material of such a character that deterioration in ordinary service is prevented. The poles are of laminated wrought iron with serrated face, this for giving great mechanical strength and a high efficiency. The illustration shows the lower half of the field frame dropped down with the armature retained in it. However, the armature may be kept in the upper half if desired, thus permitting easy access to all parts.

The armature is of the ordinary drum type, and is very simple in its construction. It contains a smaller number of slots than any armature manufactured, and into which are inserted machine-wound coils which are thoroughly insulated with special material and are waterproof. The armature is well ventilated. The design is such that a very short time



NEW STEEL MOTOR.



is required to rewind the armature, and this feature will be especially appreciated when quick repairs are required. The armature core is hollowed to prevent sparking at excessive loads and to provide means for a rapid circulation of air.

The commutator is of the undercut bar type, and is simplified by the number of bars used. The armature leads and commutator bars are tinned for electrical connection and the use of solder is avoided. The brush holders are identical and interchangeable, and are independent of each other and their position on the commutator is fixed. No adjustment is necessary, and they may be removed or replaced without opening the motor. The motors are arranged for nose, yoke and side bar suspension. The armature bearings are interchangeable. They project outside the motor frame, providing a ready means for slinging the armature. Oil wipers are provided which prevent grease from getting into the motor.

These motors are made in sizes from 25 h. p. up to 100 h. p., and are suitable for urban, interurban and elevated railway service. The parts are all interchangeable and as few and simple as can be designed.

### WHERE WILL YOU SPEND THE SUMMER?

It is not too early to begin to think of the best place to spend your summer vacation. Do not leave this matter until the last moment, make up your mind in a hurry and then—regret for the next six months that you did not take more time in making your decision. And while you are thinking of this matter it will pay you to investigate some of the many hundred beautiful resorts situated along the line of the New York Central & Hudson River Railroad. You cannot get a better list to choose from. If you want a gay social time, and can afford it, take the New York Central to Saratoga, Lake

George, Lake Champlain, or the Thousand Islands. If you want a quiet, rustic time, you can find it in one of the many small villages scattered through the Adirondacks, the Catskills, or the Berkshire Hills. The New York Central lines will take you into the heart of these famous regions. If you want to spend your vacation in sight seeing, take this same railroad to Boston, Buffalo, Niagara Falls, Montreal, Toronto, Chicago, St. Louis or Cincinnati. In addition to simply taking you to these different places, the New York Central will take you in the best possible manner. It has the fastest and most perfect through train service in the world, with new and elegant sleeping, drawing room and dining cars made by the Wagner Palace Car Company. It has justly been said of this road that, "For the excellence of its tracks, the speed of its trains, the safety and comfort of its patrons, the loveliness and variety of its scenery, the trade and importance of its cities, and the uniformly correct character of its service, the New York Central & Hudson River Railroad is probably not surpassed by any similar institution on either side of the Atlantic."

For further information about any place along this road apply to George H. Daniels, General Passenger Agent, Grand Central Station, New York City.

### A SHORT DESCRIPTION.

A short description of the Lake Shore & Michigan Southern Railway will not be uninteresting to any one who is thinking of taking a business or pleasure trip from New York, Boston or Buffalo to Chicago.

This railroad is the only double track line between Buffalo and Chicago, and in connection with the New York Central and the Boston & Albany railroads, forms the only double track route between Chicago, New York City and Boston. It is the most interesting route between the East and West, traversing the richest and finest portion of the Middle States. In the opinion of those experienced in travel, it has no superior in perfectness of roadbed, punctuality and elegant service and the comfort and care of its patrons.

Leaving Buffalo the line traverses the picturesque south shore of Lake Erie through the Western Reserve, passing on its way a large

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BUFFALO, N. Y., 8, Erie Co. Bank Bldg.

PITTSBURGH, Westinghouse Building.

TACOMA, WASH., 102 S. Tenth Street.

Charlotte, N. C., 36-38 College Street.

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WINDSOR & KENFIELD PUBLISHING COMPANY,  
 OLD COLONY BUILDING, - - CHICAGO.  
 TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

Address all Communications and Remittances to Windsor & Kenfield Publish-  
 ing Company, Old Colony Building, Chicago.

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 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 deal-  
 ers 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. JUNE 15, 1897. NO. 6

POSTAL car service on street railways has proved even  
 better than anticipated and has certainly come to stay. The  
 service is being increased as rapidly as appropriations will  
 permit. Baltimore is the latest, with four cars serving the  
 city and near by suburbs.

THE decision of the Indiana Supreme Court on the 3-cent  
 fare law was handed down on June 11. The law is pro-  
 nounced constitutional, the court holding that the legislature  
 may do anything with street railways except confiscate them  
 or prescribe unreasonable rates of fare, and no claim was  
 made that a 3-cent fare is unreasonable (!) An appeal to  
 the Federal Supreme Court will be taken.

MOTOR cars, which at one time were heralded as the com-  
 ing competitor of the street car, do not appear to be keep-  
 ing up their pace. A few are running in the larger cities,  
 but even the wealthy have not invested to any discoverable  
 extent in this novel type of transportation. In England it  
 is stated they are much less numerous on the streets and  
 highways than six months or even a year ago.

THE attention of our readers is particularly directed to  
 the circular letter issued by the committee of the Street Rail-  
 way Accountant's Association published on another page.  
 Accountants are greatly interested in the subject as is evi-  
 denced by the symposium on "Cost per Car-Mile vs. Cost

per Passenger" and we trust that the railways will give all  
 the assistance possible to the committee in its endeavors to  
 collect the information desired by it.

NO SMALL interest and curiosity has been awakened as to  
 the future of gas engines for stationary power of consider-  
 able quantity, and whether they are destined to become desira-  
 ble for railway work on small lines. Some of the promises of  
 the gas engine men are quite attractive, even outside the gas  
 belt, where of course, the system would operate to greatest  
 advantage. It can hardly be recognized as a competitor  
 with the steam engine; but rather, like water power, as  
 coming in to share in a part of the natural increase and  
 growth in power production.

BICYCLES, not motor cars, are cutting a large figure in  
 street railway earnings. The effect last year was distinctly  
 noticeable, and the wheel season opens with greatly aug-  
 mented numbers. The wheel as a means of daily trans-  
 portation between home and office or shop is daily increas-  
 ing, and to all appearances is destined to increase. As the  
 number of riders grows larger the demand for smooth pay-  
 ing on arterial lines will gather strength, and it really looks  
 as though wheelers were likely to get about all they ask.  
 The effect of bicycles on pleasure riding in all our large  
 cities is startling, and we may well ask, where is it going  
 to end?

THE most important application of electricity to steam  
 roads is the installation on the New York, New Haven &  
 Hartford, which has been inaugurated during the past  
 month between Hartford and New Britain, Conn., the  
 steam service being unchanged, however. A long estab-  
 lished steam locomotive passenger service is thus placed in  
 direct competition with its new rival. To what extent the  
 substitution of the latter for the former will be ultimately  
 carried is not at present a certainty, but enough has been  
 demonstrated to clearly determine that for suburban work,  
 the motor and not the mogul will be selected. Just now the  
 transformation seems to be gaining, though slowly, but is  
 nevertheless making sure and definite progress, and very  
 soon the steam roads will be racing each other in the effort  
 to get their electricity first.

THE Allen bill, successor to the recently defeated Hum-  
 phrey bill, passed the Illinois House on June 4, and was  
 signed by the governor on June 9; it takes effect on July 1,  
 1897. From a street railway standpoint it is in some  
 respects a much more favorable law than the Humphrey,  
 which was so blindly opposed by alleged reformers, assisted  
 by Chicago aldermen. By the Humphrey bill the legis-  
 lature would have extended existing franchises 50 years upon  
 the payment to the city of \$2,000 per mile of single track,  
 and a percentage of gross earnings, which in counties hav-  
 ing a population of more than 200,000 increased from three  
 per cent for the first 15 years to seven per cent for the last  
 15 years. As it proposed to leave hoodle alderman high and  
 dry on the beach they naturally fought it. The Allen bill  
 authorizes city councils to extend existing franchises 50  
 years, prevents a reduction in the 5 cent fare for 20 years,  
 and says nothing about compensation. The bill will permit  
 assurance of stability to street railway properties which will  
 enable them to proceed with desired improvements and  
 extensions, not otherwise possible.

GOVERNMENTS and municipalities do not, and as a matter of fact cannot operate as economically as corporations. The most impressive example of this is the announcement of the Brazilian government that it desires to be relieved of the operation of its railroad system comprising some 14,000 miles, the object being to relieve the tax payers of a large annual deficit. William E. Curtis to the Chicago Record says:

"Government operation of railways, which is advocated by many people in this country, has not proved successful in Brazil, the chief reason being the difficulty of keeping politics out of the management. The Central road, for example, which used to pay nine per cent dividends, is now a burden upon the government to the extent of two or three millions a year, which is entirely due to politics and the employment of incompetent men for political reasons. The same is true of other railways, and, although they have been very important in the development of the resources of the country, it is believed by the wisest men that they would serve this purpose equally well under private management. In addition to the government system of 14,000 miles, there are about 4,000 miles under private management, most of which is subsidized. Several of these roads are paying good dividends; others, which have a six per cent guaranty, do not call upon the government for more than two or three per cent."

TORONTO after taking a popular vote three times, has now declared in favor of Sunday cars by the small majority of 479. The contest was keen, almost bitter, and public meetings during the week, and sermons on Sundays were employed to defeat the effort. Fortunately for itself, as for all concerned, the opposition failed to hold its own. We cannot overlook the strange inconsistency of many of the objectors to Sunday cars who see no harm in private carriages on the same day, although a carriage requires one servant to carry four people while the street car accommodates 50 and uses only two employes. It was not so bad in the old horse car days, but now with the rapid transit which electricity has brought it is positively sinful to compel the working classes to remain cooped up in a hot city during summer months, when for a few pennies they might spend several hours in the country. Provision certainly should be made, and generally is, for a division of the Sunday work so as to divide it as evenly as possible, and allow for a certain number of days off for rest during the month. By a singular coincidence the first Sunday the cars ran, the rain fell incessantly all day, so that the cars were largely used by church goers, sightseers and pleasure parties remaining indoors. The earnings of the first Sunday were donated to the city hospitals.

### STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

The following circular letter has been addressed to all the street railways in the United States and Canada by the committee of the Accountants' Association which was appointed to consider the question of a standard system of accounts and kindred subjects:

ST. LOUIS, June 10, 1897.

DEAR SIR:—A meeting of some 40 gentlemen, representing many of the large street railway properties in the country, all interested in a uniform, comprehensive and economical system of accounting, was held in Cleveland, Ohio, March 23 and 24, 1897. A permanent organization was perfected known as the Street Railway Accountants' Association of America, the aims and objects of which are clearly defined in the copy of the constitution and by-laws enclosed herewith.

At the suggestion of Mr. H. J. Davies, of Cleveland, upon motion of Mr. E. D. Hibbs, of Jersey City, a resolution was unanimously

adopted appointing a committee to consider the question of a standard system of street railway accounting, covering the classification of operating expense accounts, classification of construction and equipment accounts and form of annual report, in a comprehensive and concise manner, which will enable the managements of the different roads to make quick and just comparisons, thus forming a uniform basis for the interchange of information between companies, when such is desired.

The committee was instructed to correspond with the officers of all street railways, earnestly request that for their mutual interest and good, they acquaint us with their methods and system of accounting, furnish us with a set of blanks and forms used by their companies covering the classification of operating expense accounts, classification of construction and equipment accounts and form of annual report, with the special request that they give us the benefit of their experience, help us with their advice and suggestions, to enable the committee to make such recommendations as they may deem advisable and proper, and report at the next meeting of the association to be held at Niagara Falls, October 19, 20, 21 and 22, 1897, when the report of the committee will be discussed and some action taken.

The committee desires to assure you that any information that may be given them, as well as all blanks and forms entrusted to their keeping, will be treated as strictly confidential and will not go outside of the three members whose names appear on this letter.

We trust that you are in sympathy with and heartily endorse the aims and objects of the Street Railway Accountants' Association of America, that if your company is not a member, you will have them join at once and be represented at the next meeting.

Your prompt and favorable reply will be gratefully appreciated by the committee and will materially aid and expedite the successful completion of the work assigned to them.

Relying on your co-operation and valued assistance, and thanking you in advance for any courtesies you may extend, we are,

Very respectfully,

C. N. DUFFY,

WM. F. HAM,

J. F. CALDERWOOD,

Committee.

Please address all communications to C. N. Duffy, 3800 Easton avenue, St. Louis.

Secretary Brockway, Toledo, reports a very gratifying number of inquiries regarding the association from roads which contemplate becoming members. During the past month the following have filed applications for membership:

The People's Railway, St. Louis.

St. Louis & Suburban Ry., St. Louis.

New Orleans Traction Co., New Orleans.

Lowell, Lawrence & Haverhill Street Railway, Lawrence, Mass.

The inquiries from eastern roads are especially numerous and leave no doubt as to a large additional membership soon, from that direction. The program for the October meeting is making excellent progress and will furnish information of the greatest value. Scarcely a road is so small it can afford to miss this work.

The good result in dollars and cents of the March meeting of the accountants, is already becoming manifest. One auditor wrote the secretary recently that he had already effected a saving to his road of \$70 in the two months since the meeting, as a direct result and application of one pointer he received at that convention. This is but the beginning of numerous improvements and economies possible in the accounting department as the scope of the association broadens.

W. C. Weaver resigned as travelling auditor of the Western Weighing Association to become auditor and assistant superintendent of the Northeast Electric, Kansas City.



## ELECTRIC TRACTION ON THE NEW YORK, NEW HAVEN & HARTFORD.

In the discussions as to the relative economy of electricity and steam on those roads which cover territory where a frequent and high speed suburban service is required it has been pretty well demonstrated that the advantage would without doubt lie with electricity were a new equipment to be installed, but that in many, perhaps most instances, the economy of operation over steam is not sufficient to pay the fixed charges on the capital invested in the steam equipment at present used and which would need to be thrown away. The question of the preference of the patrons of the line and the competition of trolley lines which will inevitably parallel the existing steam roads must however be

line between Hartford and Berlin which was officially opened on May 11, 1897.

This new section is the longest section of any railroad in the world, hitherto exclusively operated by steam locomotives, to be equipped for electric traction; the total distance is 12.3 miles divided in two parts; the first running from the power house at Berlin to New Britain, 3 miles, and the second extending from New Britain to Hartford, 9.3 miles. The road from Berlin to New Britain is single track; from New Britain to Hartford double track, the east-bound track only being devoted to electric service. In the operation of this road the electric trains will run from Berlin to New Britain and back. The trains from New Britain to Hartford and back will run as a separate service, the change of cars being made at New Britain.



TRAIN, MOTOR CAR AND PASSENGER COACH, N. Y., N. H. & H. R. R.

considered, and such a preference will compel the use of electricity on many lines where present economy would not justify the new installation, in order that future losses may be lessened.

The New York, New Haven & Hartford Railroad by reason of the small territory covered when compared with the mileage of the system and the very large ratio which its passenger traffic bears to the total was in a position to suffer from street railway competition, or if it were shown to be profitable to operate its lines electrically, to check such competition and retain the passenger traffic to the profit of its own stockholders. The conditions were realized by the management and the Nantasket Beach line was equipped electrically and put in operation in 1895. That section was 7 miles long and the following year an additional  $3\frac{1}{2}$  miles were equipped with the third rail conductor. The experience gained on this line has led to the adoption of the third rail for the electric

The train schedule is given in the following order of the company:

"Commencing on or about May 11, 1897, an additional express line will be put in operation between Hartford and New Britain for passengers without baggage, using electricity from a third rail. No intermediate stops will be made. Only special tickets specifying electric service will be accepted. The rate of fare upon the electric trains will be ten cents, subject to change without notice. No change in existing steam passenger schedule, service or rates will be made. Electric trains will leave Hartford and New Britain every twenty minutes.

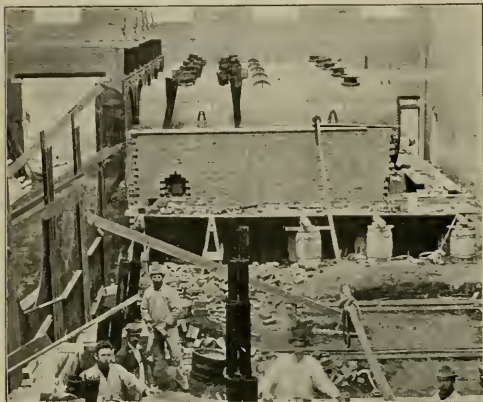
"In explanation of the clause stating that only special tickets specifying electric service will be accepted, the management have decided that as this electric service is in the nature of an experiment, they should keep the two classes of service, steam and electric, entirely separate, and with that end in view, have decided that tickets, whether local, trip or commutation that have been issued for the regular steam service, in which there will be no change whatever will not be good or accepted on the electric trains.

"Passengers wishing to use the electric service will be required to purchase tickets, which will be collected before they enter the train.

No baggage, bicycles or express matter will be carried. Electric trains will leave Hartford and New Britain every 20 minutes, schedules to be issued later, but it is understood that they will start early enough in the morning to accommodate the business travel between New Britain and Hartford and will run late enough at night to accommodate theater or other evening parties."

The steam service consists of 8 trains per day each way between Hartford and New Britain and 14 trains each way per day between New Britain and Berlin.

The power station for the two sections is at Berlin the



BOILER SETTINGS.

extreme end of the line; it is the third built by the company and is known as No. 3.

Ground was broken on December 18, 1896, and on May 10, of this year the track construction and station were so far advanced that a successful trial trip was had and a car ran over the line into Hartford via New Britain.

The power station as built is of brick, 105 ft. wide and 113 ft. long. A little over one-half of the intended station has been erected; one end is of wood, which will be removed when the whole building, 200 ft. in length is built. The frame work and roof trusses are of steel, built by the Berlin Iron Bridge Company; heavy steel girders support the weight of a 35-ton traveling crane, thus relieving the brick walls of much stress.

A 26-in. brick wall extends lengthwise through the building rising to the peak of the roof, 60 ft. high. On one side of this wall, in front, is a heavy floor supported on iron beams, 14 ft. above the basement. On this floor is the engine room, the engine and generator foundations extending from the basement up to it. These foundations are about 30 ft. square and consist first of four feet in depth of stone work laid in cement in the ground, and on that is the foundation proper of brick grouted in Portland cement and 14 ft. high, each containing upwards of one half million bricks. The boiler room occupies the rear half of the building and contains no floor. This places the boilers somewhat below the engines. The roof is of Georgia pine covered with slate. A bow window with a small roof is on the front in which is placed the switch board. The brick chimney is an exceedingly massive one, 125 ft. high and 15 ft. in diameter, at the base. It is round with a curved overhanging top.

The engine room contains two 1,500-h. p. cross-compound condensing improved Greene engines 28 and 48 x 48 in., running at 100 r. p. m. Direct connected to each engine is a General Electric 850-k. w. generator. The dynamos are over-compounded and furnish current at 600 volts at no load and 650 volts at full load. The engine fly wheels are of cast iron in four segments and each wheel weighs 52 tons. The shafts with armatures and crank discs attached weigh 58 tons each. When the station is enlarged two more of these generating sets will be added, making 6,000 h. p. available. The switchboard is the General Electric standard heavy service railway board of black enameled slate. There are four generator panels, a totalizing or station panel for indicating and recording the entire output, and two feeder panels. All are fitted with Weston illuminated dial instruments. General Electric circuit breakers, switches and a Thompson recording wattmeter of 10,000 amperes capacity are used. In the basement are two large Deane condensers and a special system of valves and piping by which the engines may be run non-condensing if desired, or either side of an engine may be run without the other.

In the boiler room are installed 10 horizontal return tubular steel boilers, especially stayed and braced for high pressures, built by Edward Kendall & Sons, of Boston. These boilers are in two batteries of five each. Across the top of the brick settings of each battery, at right angles to the boilers are a pair of iron girders from which each boiler is suspended by four hangers, thus leaving them perfectly free to expand in any direction without coming in contact with the settings. The boilers are fitted with steam nozzles, from which 9-in. copper bends rise, turning an arc of 90° and connected with the main steam header through a heavy gate valve. These copper bends are seamless drawn pipes and were bent cold with heavy copper flanges brazed on. Embedded in the division walls between the furnaces of the different boilers are 6-in. thin iron pipes, four to each boiler, opening into the ash pits and extending up through the walls to the top of the setting. Here a brass ring per-



SWITCH BOARD, BERLIN POWER STATION.

orated on its lower side is placed and connected to the high pressure steam supply. This gives a circle of fine steam jets which blow down the pipes, drawing air with them, forming the system of forced draught. The necessity for

forced draught will be understood when it is known that the company does not burn coal in any of its power stations, but the cinders or sparks which have once been through the fire boxes of the steam locomotives and dumped from the extension fronts. Thousands of tons of these sparks are available and the saving in fuel is enormous.

The system for handling coal and ashes was made by the C. W. Hunt Company, of New York. It consists of two narrow gauge tracks running parallel to the boiler fronts



THIRD RAIL AT SWITCH.

one near the rear wall of the building where coal is run through holes into the coal cars, which hold one ton each. This track passes over scales where the coal is weighed and the car is then switched onto another track, passing directly in front of the furnaces. The coal is then shoveled directly from the car into any furnace requiring it. Ashes are conveyed in a small dump car running on the same tracks. All cars are pushed by hand. A Locke damper regulator is used to work the main damper.

All the piping, valves, etc., are standard extra heavy and correspond closely to that called for in all U. S. Government work. The main steam header to which the boilers are connected by the 9-in. copper bends is 20-in. extra heavy wrought iron pipe. This pipe is about  $\frac{3}{4}$  in. thick and guaranteed to stand a pressure of 250 lbs. per sq. in. It is divided into three sections by two 20-in. extra heavy gate valves weighing nearly three tons each. This header is supported on brackets bolted through the division walls and steel columns of the building. There are two primary and one auxiliary heaters through which the exhaust from the engines, condensers and feed water pumps passes.

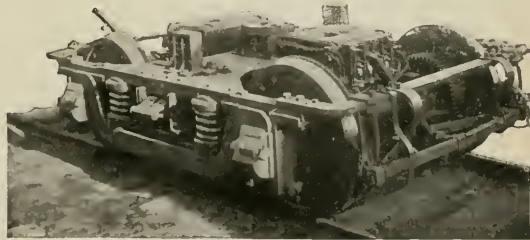
The feed water is thus raised in temperature to nearly 200° F. before entering the boilers. Steam is supplied to the high pressure cylinder of each engine by an extra heavy 12-in. wrought iron pipe which leaves the steam header vertically through a 12-in. stop valve, and passing through the division wall bends downward through 90° to the throttle valve on the cylinder. The Holly gravity drip return system is used to return all condensation from steam pipes to the boilers. The engines, besides having the usual oil cups are also supplied with an extension automatic oiling system in which oil flows down from an elevated tank through a large number of pipes to each bearing or pin that needs oil. It then runs down to a filter in the basement, from which a small pump takes it and forces it up to the tank to be used again.

The third rail system of the company is remarkable for its simplicity and practicability. The question of leakage or of insulating a positive conductor carrying 600 volts from a negative ground return has been solved to the company's entire satisfaction.

The whole three rails have been submerged for a distance of 200 ft., and several feet of the third rail have been found lying in the mud. The loss in the first case was not serious and in last case only a few amperes. In dry weather there is absolutely no loss and none can be seen on the instruments when it is raining heavily.

The third rail is similar in shape and weight to that used on the stretch of track between East Weymouth and Nantasket Junction on the South Shore Branch of the Plymouth Division of the N. Y., N. H. & H. R. R. In cross section it resembles a flattened "A" and weighs 93 lbs. to the yard. It is laid on blocks of wood impregnated with insulating material, but not fastened to them. The blocks are only about one-half as high as those used at East Weymouth, allowing 1 $\frac{5}{8}$  in. from the cave of the third rail to the tie, and in some places only 1 $\frac{1}{2}$  in. This reduction in the height of the insulating block is due to the fact that no greater height could be allowed in view of the height of the service rails. The top of the third rail is about 1 in. higher than the level of the tops of the running rails. The conductors are bonded, not by the ordinary leaf or stranded copper bond, but by plates of sheet copper  $\frac{3}{8}$  in. thick, 12 in. long and 4 $\frac{1}{2}$  in. wide. These are fastened to the underside of the third rail joints by means of a drop-forged iron angle-plate bolted by 16 bolts, 8 for each copper plate, on each side of the third rail joint, the nuts being outside of the rail. Each bond has a capacity of 900,000 circular mils; the total bond at each joint having about twice the carrying capacity of the rail itself, while its measured resistance is less than an equal length of the 93-lb. third rail. One of the most striking facts in this installation is the absence of feeders, entire dependance being placed on the carrying capacity of the well bonded rail.

On the Berlin branch are four grade crossings; on the New Britain and Hartford line 18. At all of these cross-



TRUCK OF MOTOR CAR.

ings the third rail is omitted, the circuit being continued underground by two stranded bare copper cables of 500,000 c. m. and in some cases 850,000 c. m. These cables are first drawn into creosoted wooden conduits filled with an insulating material made of residuum and asphalt. They are then laid in creosoted wooden troughs, in turn filled with the same compound and then boxed over and buried. The broken ends of the third rail are fitted with wooden inclines or approach blocks to allow the shoe to rise upon the rail



without danger of catching and breaking. The service rails are carefully bonded with two very short bonds at each joint of 500,000 c. m. each, placed in the flange of the rail under the angle-plates.

The motor equipment will consist at first of five motor cars. These are open cars 50 ft. in length used last season at Nantasket but deprived of the trolley. Each car weighs about 32 tons. Each is equipped with two G. E. 2,000 motors and two "L" series parallel controllers. The car cut-out is a "K" automatic circuit breaker fixed beneath the hood. Each motor car is fitted with air brakes, two gongs and a chime whistle. Air for the brakes and whistle is furnished by a vertical double cylinder air pump driven by a motor automatically controlled by special switch which is opened when the pressure in the main tank reaches 90 lbs. and closed when it falls below that. These motor cars pull a standard combination baggage and passenger coach as a trailer.

Contact is made with the third rail by means of sliding shoes. These are of cast iron, 12 in. long and 4 in. wide, weighing about 20 lbs. They are suspended by two links from a casting fastened to a beam set immediately beneath the king pin of each truck, connection between motor and shoes being made by flexible cables. The distance between the two shoes is about 33 ft.

Many of the grade crossings are wider than this and to avoid carrying the train over the crossing by momentum another shoe is fitted to each truck of the second car of the train, a connection running from this shoe to the motors. Thus, by the time the last shoe has left the third rail at one end the first shoe is in contact with the next section of the rail.

The question of the safety of the public was not the least important which demanded the attention of the officials of the New Haven Road and the greatest precautions are taken. At the Berlin and Hartford stations, the third rail section is fenced in on both sides. At New Britain, where the lines of the New Haven and New England systems converge, in addition to the fence, a method which almost amounts to interlocking is adopted. In the Y formed at the convergence of the roads is the switchman's tower. From the section of the rail entering the station cables run underground to a switchboard in the tower, by which the third rail may be connected to or disconnected from the circuit. As the train comes to a stop in the station, the third rail is cut out, and is not thrown into circuit again until the outgoing train is ready to start. The chance of accident is thus reduced to a minimum.

The entire work was carried out under the direction of Col. N. H. Heft, chief of the electrical department of the company.

### OHIO STATE MEETING.

President A. A. Anderson announces the annual meeting of the Ohio State Tramway Association will be held at the Chittenden Hotel, Columbus, on Monday, June 14, and desires a large attendance. Timely topics will be discussed and the local members hope to welcome at least one representative from every road in the state.

The work of cast-welding by the Falk process of the Union Traction lines, Philadelphia, is under way.

## ACCUMULATORS.

### Their Application to Central Station Lighting and Power.

(Read before the Canadian Electrical Association, by W. A. Johnson.)

Considerable misconception seems to exist in reference to the cost of installing a storage battery. Like all good things having value, accumulators are not given away, and the station manager who is waiting for them to get cheaper is letting one-third of the earning power of his station go to waste. Local conditions of course determine the capacity and consequent cost of battery, but in general terms, the cost may be stated to be less in most cases than the cost of generating plant.

When it is desirable to increase the capacity of a station, it means besides new dynamos, increase in engines, boilers and all steam appliances, and usually alterations in the building, and while the output of the station is increased, the general efficiency remains about the same, and oftentimes the running expenses of a moderate sized station is greater per h. p. output, owing to the increase in the working staff.

On the contrary, to increase the capacity of a station with accumulators requires as a rule no alteration or increase of existing steam plant, no new dynamos, and usually, owing to the small space required, plenty of room can be found in the station for the storage battery.

When such a change can be made, what are the results? The available output of the plant has been largely increased. No increase in working staff is required. The operating expenses are no higher than before. The all round efficiency of the station is fully 30 per cent more, and consequently, the profits are enlarged by nearly the same proportion. The plant can thereafter give uninterrupted service, 24 hours per day, every day in the year, as the battery is always available when a temporary shut down of the machinery is necessary. The regulation of the voltage to the lamps is kept constant, more perfect than can be possible when no batteries are used, as the battery is a regulator to the whole system. When motors are operated, this is a big advantage.

No gas company would, for a minute, consider the operation of its plant without a storage tank; just think of the large increase in retorts and men to keep up a constant gas supply, without a storage tank. Most waterworks systems require a reservoir, and yet electrical people, who are supposed to keep abreast with the times, try to get along without a storage tank to fall back upon for hours of maximum, minimum or average demand.

The central station manager will answer that he does not know the cost of maintenance and is waiting for the other fellow to prove the case. The other fellow has proved it. In Germantown, Pa., there has been a battery having a capacity of 120 h. p.-hours, in use for over three years, or long enough to give a fair idea of the cost of renewals. The management of the large stations in Boston, Brooklyn and New York, however did not await the results in Germantown, but put in large batteries from one to two years ago, and these have since been doubled, and in one case, enlarged for the fourth time.

But interested parties can go back of the returns from the United States for further evidence of the practicability of accumulators. In Germany, France and England, they have been largely used for years past. Out of a recently published list of thirty cities in Germany, only ten are without accumulator plants. The population of these cities ranges from 4,000 to 350,000. This shows that there is hardly a town or city electric plant but can use accumulators to advantage.

I mention the following among American companies who have put in large batteries and the capacity installed as rated in h. p.-hours:

COMPANY.	H. P.-HOUR CAPACITY.
Hartford Electric Company.....	3,000
Boston Edison Company, four batteries, a total of.....	7,400
New York Edison Company.....	3,200
Brooklyn Edison Company.....	1,600
Germantown Electric Light Company.....	300
Electric Railway, Light & Power Company, Anaconda, Mon.,	500
Woonsocket Electric Machine & Power Company.....	400
Easton (Pa.) Edison Company.....	200

These last three plants are used both for railway and lighting work. As good an illustration as I can give of the application of the storage battery to railroad work is to refer to the equipment of the Union

Traction Company of Philadelphia, which uses a battery of 400 h. p. hours for keeping up the pressure at the end of a feeder at a point about 11 miles from the power house, the new extension continuing several miles beyond; in this case the battery took the place of a new power house or what amounted to the same thing, an increase at the old power house with enlarged feed wires. It was found that the cost of copper feed wire to operate from the main power house, alone, would have cost four times the total cost of the battery. Previous to the installation of the battery, the pressure at the end of the feeder formerly in use, frequently varied as much as 50 per cent, the battery however gave practically a steady pressure at all times. Railway men need not be told how much better for their motors and controllers the maintenance of a standard working pressure is, than one which falls so low as to require an increase in the current passed through the apparatus, of from 50 to 100 per cent. In the above case, the load varied from 100 to 700 amperes, and with the feeder of a capacity at a constant load for 400 amperes, the demand upon the power house was at all times equal and independent of the changeable load on the batteries.

Under such an arrangement, the power house generator always operates at full load and highest efficiency and the battery acts as a cushion to the engine when the line circuit breaker opens from any cause.

Some of the electric street railways in Canada, serve a district up to 7 miles from the power house, as originally laid out, and in all cases extension will be called for to reach suburban points at a greater distance and to connect through as radial lines to still more distant points. In such work, the accumulator plant at the end of a feeder is destined to be an important factor in the near future, and the little trouble in operating a sub-station for this work is very satisfying to the purchaser, as the battery is automatic in charge and discharge, the only attention required being the usual occasional testing of the e. m. f. of the individual elements and the keeping of the electrolyte to the standard specific gravity (1.200). The sub-station apparatus and connections are very simple, being only the main switch, ammeter, circuit breaker, voltmeter and recording voltmeter. The flow of the current to the line being always proportionate to the demand. One central station can therefore take care of any number of accumulator sub-stations, and the area which can profitably be covered with continuous current either for railroads, lighting or power greatly increased.

The claim has been made, and experience seems to prove it true, that it costs practically nothing for the energy stored in accumulators in the average lighting, power or railroad station, whether operating on a 12 or 24 hour basis, as, if judgment is used in proportioning the size of the battery to the generating plant, the battery is always being charged during light load and discharged during hours of heavy load, and owing to the all round higher efficiency, the amount of coal burned will be about the same and the current given off from the batteries will represent net profit.

While the above is a simple way of putting it, the following gives in figures the actual conditions obtained in a plant now working.

Total time of operating steam plant 9 hours.	
Total steam plant required, dynamos working at an efficiency of 90 per cent.	93 h. p.
Total steam plant required if battery is not used.	165 h. p.
Saving in steam plant.	72 h. p.
Total dynamo capacity required when using battery.	62,500 watts.
Total dynamo capacity required without battery.	111,250 "
Saving in dynamos.	48,750 "

In this case the battery was in service a total of 18½ hours and during 15 hours the battery served the entire plant.

In making provision for a storage battery the room provided should if possible have a cement or tile floor, and should be well ventilated. Owing to the compact form of the elements, sufficient room can usually be given when arranged in tiers, one above the other. The space required for a battery capable of giving 400 h. p. for one hour, is 14½ by 20½ inches per element and as 248 cells would be used on a 500-volt system only about 630 square feet would be necessary, this being for a battery of fairly large capacity, in fact being equivalent to that installed by the Union Traction Company in the before mentioned instance.

A suitable battery having been purchased it requires as careful attention as is given to any other class of electrical or steam apparatus, and no more, and yet this attention is very simple, but it must be given as required, otherwise the results would be similar to that caused

by neglect of a dynamo or steam boiler. There has been no instance where a properly constructed battery that has received fair treatment has failed to give good results. Attention should be paid to the proper strength and nature of the acid, the specified gravity of the acid being tested at regular periods; the individual testing of each cell by a low reading voltmeter is the keynote to successful battery operation. While in general the reading of the voltmeter connected with all the elements will give sufficient information, yet the occasional individual testing of each element prevents any single cell from being allowed to work at a disadvantage. The chloride type of negative plate has been found to be most satisfactory, and is largely in use for central stations. The positive plates generally used with chloride negatives are of the Tudor type, and are capable of giving a very high discharge, their capacity being at nominal rating from 3 to 5 ampere-hours per pound of element. Such a battery is not liable to buckle or sulphate. There are numerous small water-powers that have not been considered as applicable to electric lighting owing to the small power available, but if 20 h. p. can be obtained for 24 hours per day and if a battery is used in connection therewith, 120 h. p. is available for four hours, or sufficient for the requirements of a fair sized town. I know of one instance, in a town of from 8 to 10,000 inhabitants where a water-power of 50 h. p. is available, and not used at present. This power if stored in batteries would give 200 h. p. for six hours, or sufficient to supply all the street, commercial and residential lighting which is now operated by steam.

## THE CHICAGO CITY RAILWAY POWER HOUSE.

Commenting on the controversy between R. J. Hill, chief engineer of the Chicago City Railway, and Pierce, Richard-son & Foster, the Chicago engineering firm, in regard to the new power station, Power, editorially, says in part:

"It is to be regretted that these engineers did not rise to the occasion and furnish a comprehensive analysis of the present and what may be termed the modern plant, as adapted to the case in hand, instead of dealing principally with the details of piping, the class of boilers used, the advisability of an economizer, etc., questions which would apply equally to either plant. They say little in detail upon the main issue as to the comparative efficiency of the two classes of plant, but arrive at the following conclusions:

"First. That a plant of the same capacity could have been installed in about one-third the space.

"Second. That such a plant as we have outlined (a compound condensing direct connected plant) could be operated at anywhere from 25 to 50 per cent greater economy in fuel.

"Third. That a great saving would have resulted in the first cost of land, foundations and buildings, which savings would have largely, if not entirely, offset any increased cost of machinery due to using types better adapted for your needs.' \* \* \* \*

"If on the other hand, Mr. Hill is correct in his estimate that a compound condensing direct connected plant, land and buildings included, would have cost \$600,000 (as against \$345,000 for the present plant) he appears to be justified in his selection of the cheaper machinery with fuel at the price given, inasmuch as his costs of operation, labor, repairs, etc., will certainly be no more with the simple station. If fuel cost nothing, one would buy the cheapest kind of an engine that would run his work without regard to its efficiency.

There is evidently a price for fuel so low that the increased efficiency attainable by a high-class engine is not sufficient to pay the fixed charges on its increased cost. Whether Mr. Hill is within that limit with coal at \$1.10 a ton and the present price at Chicago of real estate and machinery, is a question which only a careful analysis of figures not at our command can predetermine and only the future can demonstrate. The several costs of operation of the station aggregate .6385 of a cent per kilowatt-hour. Will our readers in compound condensing direct connected plants send their costs for the same items for comparison?"

The Suburban Railway, of St. Louis, is said to have obtained control of the Houseman air line, parties interested in the Suburban having purchased the bonds of the latter.

**GAS ENGINE AT LANCASTER, O.**

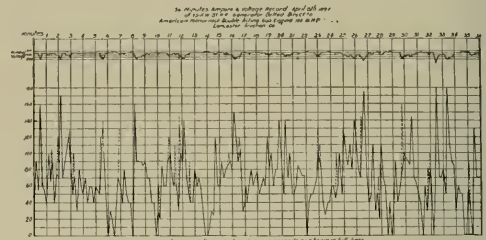
In connection with the article on "Gas Engines," by W. F. Kelly, which appears on another page, a description of the engine of the power plant of the Lancaster (O.) Traction Company, of which Mr. Kelly is president, will be of interest. This company operates from three to five cars over about four miles of track, and as there are some long eight per cent grades it is readily seen the conditions require an engine which is above all capable of close regulation.

Feeling that the cost of operating a steam plant would be so great as to be prohibitive for a small road under the conditions at Lancaster, the management decided that the gas engine was the only alternative. With no precedents to follow, and even with no gas engine of sufficient size on the market, Mr. Kelly entered into negotiations with the Western Gas Construction Company of Ft. Wayne, Ind., which agreed to build a suitable engine. It was installed in the summer of 1896, and after a few minor difficulties, due to the fact that the machinery was new and that the engineer was without experience with gas engines, had been overcome, the engine was put in successful operation, and for six months has been running without any delay or interruption whatever, and has demonstrated its ability to handle the rapidly fluctuating load of a street railway.

The engine is shown in the illustration. It is known as the American Kilmarnock, and is a single-cylinder double-

acting engine. It develops about 130 indicated h. p., and gives at the brake 110 h. p., being rated at 100 h. p. It runs at 180 r. p. m., and is belted to an 80-k. w. Thomson-Houston 6-pole generator.

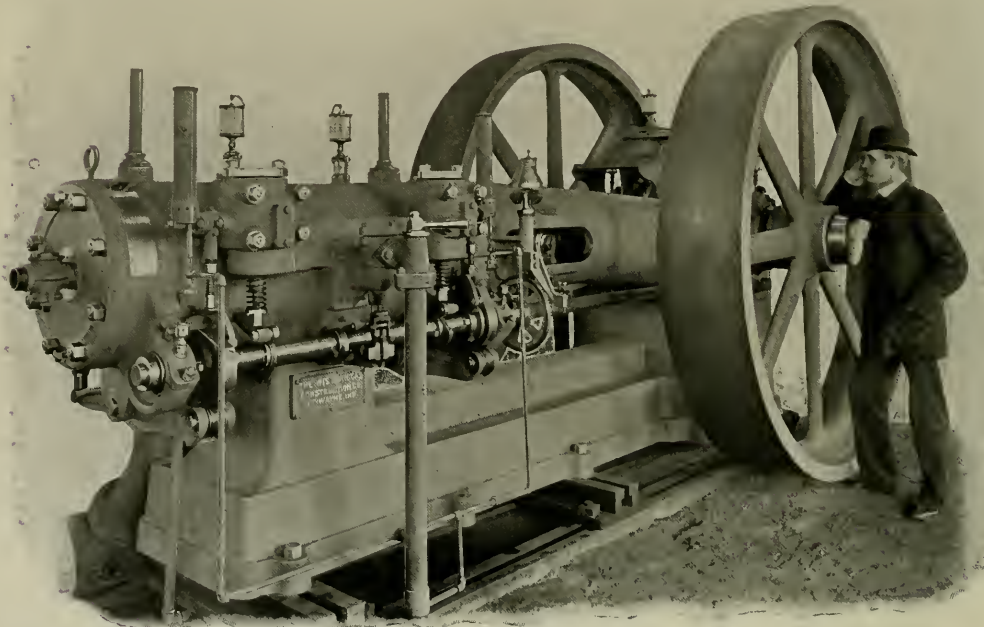
The general dimensions are as follows: Cylinder 16 in.



LOAD DIAGRAM, LANCASTER, O.

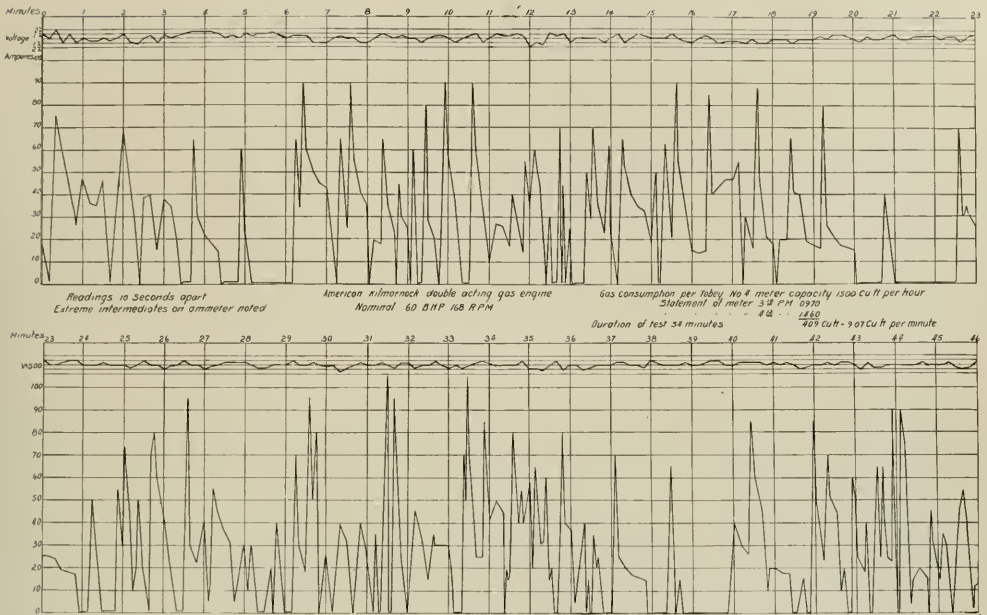
by 20 in. stroke. Diameter of piston rod, 3 in. Diameter of shaft, 7 in. Diameter of fly-wheels (two), 8 ft.; face, 16 in.; both faced for belts. Length of engine over all 15 ft. 11 in.; width over fly-wheels, 6 ft. 10½ in.; height of center line above foundation, 3 ft. 5 in. The total weight of the two fly-wheels is 13,500 lbs.; the total weight of the engine, 34,000 lbs.

The cross-head is of cast steel, and the bearings through-



GAS ENGINE AT POWER HOUSE OF LANCASTER TRACTION COMPANY.





LOAD DIAGRAM, GAS ENGINE PLANT, MARIETTA, O.

out of phosper bronze without habit. Porcelain ignition tubes are used. The starting device is positive in its action, natural gas under high pressure being used. The governor is an electrical one and very sensitive, being guaranteed to regulate within two per cent. The load varies from zero to 180 amperes, and the time required to find the point of equilibrium is but one-sixth of a second.

The load diagram shows the heavy fluctuations. It should be remarked the heavy drops in voltage are due to an overload rather than to poor regulation. The gas consumption is given at 16 cu. ft. per brake h. p. per hour.

There are installed in the plant of the Marietta (Ohio) Electric Company two engines, also built by the Western Gas Construction Company. One is of 130 and one of 90 h. p., both belted to a jack-shaft. The generators are one 100-k. w. Walker and one 100-k. w. Stanley alternator. The lighting and railway loads are taken from the jack-shaft, and although it has no fly-wheel the incandescent lamps do not show the effect of the varying railway load. These engines are similar to the one at Lancaster, but compressed air is used for starting.

## THE BOSTON ELEVATED.

It is probable that Boston will have an elevated road at least 10 miles long. A bill granting a charter to the Boston Elevated Railway Company has been passed by the Massachusetts House. Four of the 10 miles to be built at once or a forfeit of \$500,000 paid, and the remaining six miles must be constructed within the coming three years; the tenure is for 25 years. One amendment to the bill provided that the line should be considered as a railroad instead of a street railway.

## MUST PAY SUBSCRIPTIONS TO STOCK.

When the road to Westerville from Columbus, O., was planned a subscription of \$35,000 was made by local capitalists but only a part of it paid in. When this line was merged into the Columbus Central Railway suit was brought by the latter company to collect the outstanding subscriptions. A test case was brought against J. M. Dumm and a verdict for the company resulted. It is expected that the rest of the \$12,000 not yet paid will be received as the result of this suit.

## A RAILWAY BUILT IN A NIGHT.

The Suburban Railroad Company of Chicago has been desirous of laying track through Riverside, connecting Harrison and West 48th street with the Desplaines river. The citizens of Riverside did not look with favor upon this proposal and an injunction was secured restraining the railroad company from using the streets of the town. This injunction expired June 8, and the very minute the legal restraint terminated 500 expert trackmen began work with a will. All night long they toiled, and before 10 o'clock in the morning five miles of track, with trolley wire and all connections, were ready for the trolley cars. When the residents started to their places of business in the morning they were surprised to see "clanging, sputtering trolley cars flying through the village."

W. B. Bradbury, a San Francisco millionaire, was sentenced to 2 1/2 hours imprisonment in the county jail for expectorating on the floor of a street car. It was his second offense.

## REPAIRS ON THE LIVERPOOL OVERHEAD RAILWAY.

There are several essential features in which the equipment of the Liverpool elevated railway differs from that on the Chicago elevated roads. As may be noted from the description and illustrations in the REVIEW of March, 1893, the motors are mounted directly on the axles of the trucks with no gearing whatever. In regard to these motors S. B. Cottrell, engineer and general manager, says, "I consider that the gearless motor is better for our work than a single reduction motor. The cost of repairs to motors is trifling compared to what the cost of repairs of locomotives would be to work a similar service. To effect repairs the wheels and axles are taken out of the truck frames and there

## STREET CAR FOR FIRE ENGINES.

The Wason Manufacturing Company of Springfield, Mass., has recently completed for the Springfield Fire Department the truck car which we illustrate. It is designed to furnish a quick and convenient means of transporting fire engines to the outskirts of a city and to all points reached by street car lines where the engines may be needed. The car consists of two four-wheeled diamond trucks of the ordinary pattern but of a somewhat lighter construction than those used on steam roads, which are surmounted by platforms on which the men can ride with hose, tools, etc., and connected by girders from which is suspended a platform to carry the fire engine. The side girders are built up of two channels separated by suitable distance pieces, and are permanently



STREET CAR FOR FIRE ENGINE—SPRINGFIELD, MASS.

is no difficulty in repairing the armatures on the axles. I do not see that there is any more trouble with the failure of armatures with gearless motors than there would be with geared motors. I do not think that either gearless or geared motors make any difference to the track joints as the blow in either case must be the same."

There is one motor to each car and when two or more cars are in the train there is electrical connection between the cars so that all the motors can be controlled by the motorman at one point. The cars are never run singly except for shunting purposes and all the cars are electrically connected and interchangeable.

The third rail consists of a steel channel, 4 sq. in. in cross section, mounted on porcelain insulators. The surface is about 1 in. above the surface of the track and is in the middle instead of on the outside. In favor of this practice Mr. Cottrell says, "The conducting rail should be, wherever practical, put in the center as we have done here, for we find no difficulty with it even at complicated crossings, whereas, placing at the side and higher than the running rail, would offer many complications at cross-over roads."

attached to the rear platform and connected to the bolster of the front platform so that the fastenings may be quickly loosened and the front truck removed to permit the engine to be backed into place. Suspended from the upper girders and strongly braced are beams 13 ft. long built up of channels of lighter section; these clear the rail by 6 in. The engine platform is of timber, the planks running transversely and resting upon the lower flanges of the inside channels.

As mentioned above one end of the middle platform is lowered to the ground and the front truck run out of the way when it is desired to load an engine onto the car. The mechanism for raising and lowering is very well shown in the illustrations. At each girder are two chains passing over windlasses, and all four of these are given uniform motion by means of a worm and pinion gear, operated by the rod and hand wheels on the front truck. When the girder end is lifted into place in the U which receives it, a bolt is slipped in which relieves the stress on the chains. A winch operated by the hand wheels on the rear truck is used to draw the engine onto the car.

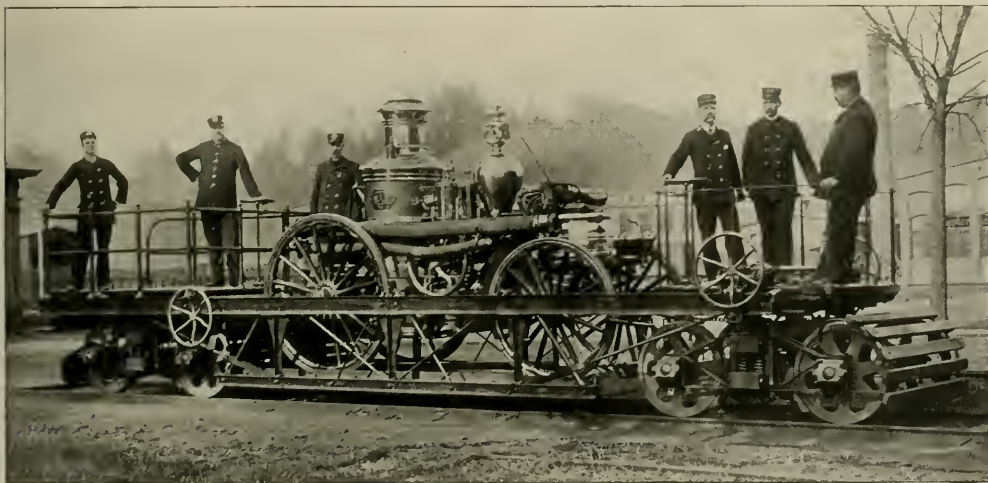
The truck weighs about 12,000 lbs. and the heaviest fire steamer in Springfield weighs 10,000 lbs., so that the car loaded will weigh about 11 tons. No motors are provided on the car and it is the intention to draw it by one of the snow plows of the street railway company which will be housed next door to one of the engine houses of the fire department.

A drill in handling the new car was held on May 6 and demonstrated that very quick work could be done. Beginning with the car standing on the track, the pins were pulled, the platform lowered, the front truck detached and pulled out of the way. Then the engine was backed in front of the platform and drawn into place, the truck run back and connected ready to start. The time required was 2½ minutes. The unloading was accomplished in ¾ of a minute

and the commutator cleaned. The brushes are in duplicate and those not in use are put in a case each compartment having the number of the motor upon it. In this way the same brushes are returned to the same commutators and little trouble is experienced from sparking.

One time the brushes are soaked for one hour in liquid vasoline and the next time in paraffine, heated to the melting point. The vasoline is the better lubricant but its low melting temperature sometimes causes the brushes to run dry when an excessive current heats them. The paraffine wax is not so liable to cause such trouble.

Some inspectors and electricians are disposed to send the armatures into the shop and have the commutators turned down too often. Especially is this undesirable with some of the older styles of commutators as there is little depth to



STREET CAR FOR FIRE ENGINE—SPRINGFIELD, MASS.

and the horses attached and the engine ready to start in ½ minute more.

We are indebted to the Wason Manufacturing Company for the illustrations.

### CARE OF COMMUTATORS.

To get a smooth, shiny dark brown commutator on each motor is the aim of every street railway electrician. In many cases this seems almost impossible and is doubtless due to the inherent defects in the design of the motor. Again, poor carbon brushes, which wear unevenly will cause bad commutators. When the apparatus is of some standard make and all the parts are thoroughly reliable some other cause must be sought for. If the brushes are held in place with the proper tension the source of trouble is probably the lubrication of the commutator. Some lubricants will carbonize and form a tough gummy covering on parts of the commutator and such lubricants should be avoided. At the car barns of the Calumet Electric Railway the brushes of each motor are removed every night

the bars and a few turnings will cut them through. When the brushes are removed a touching up of the rough or high places and replacing the same brushes in the same brush-holders from which they came will gradually wear the commutator smooth and even. In one case where economy was imperative, by this method the commutators on some motors were used until the bars were worn down to 1-16 in. On one large city system the practice is to inspect the commutators every other day and remove the brushes once in six days. The brushes are placed in a perforated can and soaked for four days in machine oil. The can of brushes is then lifted out of the oil bath and the oil allowed to drain for two days. No sand-paper whatever is used for it is claimed that the smooth finish on the brush which comes from contact with the commutator is better than can be attained by any other means and a sand-papered brush will blacken the commutator more or less. Under this system the carbon brushes are good for 30 days service, and the commutators are turned down 1-8 to 3-16 in. once every 13 to 15 months. The commutators have a smooth finish and little trouble is ever experienced with them.



On the suburban roads, although consuming less current than the city lines, the trouble with commutators is more pronounced. This is incident to high speeds where any defect in the commutator causes a jumping of the brushes and excessive sparking. The greater demand for current on the urban lines is largely due to the greater traffic and the frequent stopping and starting but the speed of the commutator is moderate at all times. The commutator is regarded as the weak part of the street railway motor, yet cleanliness, good lubrication and using the same brushes on the same commutator and in the same position will go far in removing all trouble from this source.

### CUSHION CLEANER AT CHICAGO CITY RAILWAY SHOPS.

The Chicago City Railway has recently completed at its shops a mechanical cushion cleaner which effects the desired

blade is bolted. The blades are of hickory 4 in. wide and 24 in. long steamed and bent to conform to the outline of the cushion top; they are slit back as far as the butt-piece, making three fingers 1½ in. wide to each blade. The paddles are kept properly spaced along the shaft by sleeves made of pipe.

When engaged by the cam the paddle is lifted until it stands at an angle of about 80° with the horizontal and then released, when it is drawn by a spring connected at one end to the butt-piece and at the other to the floor, giving a sharp blow upon the cushion; the intensity of the blow can of course be regulated by the tension of the spring. These springs are of ¼-in. wire 2 in. in diameter and 13 in. long.

The cushion frame is 32 in. by 11 ft. 2 in. outside and 17 in. by 10 ft. 5 in. inside; it is hinged to the main frame and when a cushion is to be put in place or removed the frame is dropped as shown in one of the illustrations. When horizontal it is held in place by the two props hinged to the



CUSHION CLEANER—CHICAGO CITY RAILWAY.

object in a manner entirely different from that employed by other cleaning apparatus with which we are familiar. It is a beater operated by power, and is very well shown by the illustrations.

The frame supporting the mechanism is of timber 16 in. wide and about 13 ft. long. At one end is a bracket to support the driving wheel and clutch. The top of this is frame is 38 in. above the floor, to which the legs are firmly fastened. In this frame are mounted two 1¼ in. shafts supported in bearings, 32 in. between centers. To one are attached 20 cams of 2¼ in. throw; they are fixed to the shaft 6 in. apart and spaced 18° apart angularly, so that the extremities of the maximum radii lie in a helix. On the other are pivoted the beating paddles, 20 in number and each actuated by a separate cam. The paddle consists of a blade and a cast iron butt-piece in the center of which is a sleeve slipping over the shaft; on one side is a finger which the cam engages and on the other flat lugs to which the

front edge; ropes leading to counterbalances are attached at the corners to facilitate raising and lowering this frame.

A cover of galvanized iron is placed over the beater and connected at one end by an 8 in. pipe to an exhaust fan, thus carrying all the dust to some convenient place, in this case to the boiler furnaces. The joints between the casing and the cushion frame are provided with gaskets of rubber tubing and all the large openings are closed so that the greater part of the air entering the case is drawn through the cushion itself, preventing the dust from settling. Doors are provided for reaching the mechanism with ease.

Experiments showed that the best results were obtained when the paddles struck 50 blows each per minute, and that four minutes in this machine was ample time to clean the dustiest cushion. The driving mechanism and automatic clutch for stopping the machine after the four minutes or 200 revolutions of the cam shaft is well shown in the illustration. The cam shaft is extended beyond the casing and

carries a clutch, a loose pulley and a worm which gears with a brass wheel having 200 teeth. On the side of this wheel is cast an annular projection  $10\frac{1}{4}$  in. in diameter which is continuous except for about 1 in. When the machine is not working a lug or toe on the foot lever rests in this slot. By pressing down on the foot piece the lever is pulled down, disengaging the lug and at the same time throwing the clutch in gear; during the revolution of the large gear the lug rests on the exterior of the projecting ring until the slot returns to its original position, when a spring throws the lever back and disengages the clutch, stopping the machine.

It is found that with this machine one man can thoroughly beat 12 cushions per hour, that is, 96 cushions or 24 cars per day, where formerly two men beating them by hand cleaned the cushions for but 6 cars. The machine thus replaces seven men and does the work better than they possibly could. While built as an experimental device it has proved to be such a success in practice, that C. E. Moore, the master mechanic of the company, who designed it, will make application for a patent and the machines will be placed on the market. It is almost needless to point out that it can be built for any size cushion.

## GAS ENGINES.

By W. F. Kelly, General Superintendent Columbus (O.) Street Railway.

(Read before the Engineers Club, Columbus, O.)

Like all great inventions, the modern gas engine is the product of the long continued labors of many minds. For two centuries the scientific minds of the whole enlightened world sought to harness flame and gas and make them subservient to the use of man. Until the last quarter of the 19th century, the history of their efforts is one long record of struggle, failure and disappointment. What was apparently simple in theory presented innumerable difficulties in practice. Each time, when success seemed almost certain their hopes were dashed by failure. This failure was due not so much to wrong theory, as to crude and imperfect mechanical design. Each inventor in turn, profiting by the experience and failure of his predecessor, added an improvement here and there, until a practical working machine was evolved. Since that time, development and improvement have gone rapidly and steadily onward, until today, this young giant is a formidable rival of the steam engine and electric motor.

A consideration of the modern, successful gas engine would be incomplete without at least a brief reference to the earlier types. The character and limitations of this paper will not admit of an extended review of their merits and defects, as their chief value to us is in showing by what a long and arduous struggle the present types were produced.

As early as 1680, Huygens proposed using the explosive force of gunpowder as a motive power, and made a series of experiments to that end.

In 1690, Papin, a noted physicist, continued the experiments of Huygens, but instead of burning the powder directly in the cylinder, it was exploded in an auxiliary cylinder, which forced the air out, and on cooling a partial vacuum was produced, which communicated motion to the crank.

In 1704 the first real gas engine was invented by Streets. In this an iron cylinder was heated by fire; turpentine was then dropped in and vaporized by the heated cylinder; air was admitted, mixed with the vapor and the mixture ignited.

In 1823 Brown designed a 3 cylinder vertical engine, in which a flame was used to produce a vacuum instead of steam. Into the cylinders, having a movable cover, was introduced a mixture of gas and air, which was ignited, the air expelled and a partial vacuum produced. By varying the time of these events in the three cylinders, motion was communicated to the crank-shaft. This engine is interesting as being the first gas engine to do real work. A boat was constructed and operated for a short time on the Thames river, and a car-

riage was propelled through the streets of London by an engine of this type.

In 1833 Wright's engine was invented. It used an explosive mixture of gas and air acting directly on the piston; was double acting and water-jacketed, a distinct advance over the then existing types.

In 1838 Barnett added an improvement to the Wright method, by first compressing the gas in the cylinder and using a flame for ignition; which method with some modifications, is essentially the method in use today. He also arranged that ignition of the explosive charge should take place when the engine is passing its centers. The ignition cock by which the charge was fired was exceedingly ingenious, and was in use on many engines until quite recently.

In 1855 Newton improved on the method of Barnett, by igniting the charge by contact with a red-hot closed tube instead of by an open flame. This method is still in use on a number of gas engines today, and in many respects is the most satisfactory and successful yet devised.

In 1857 Barsanti and Matteucci, Italian scientists, designed a type of engine radically different from any yet invented. There were no connecting rod, no guides and no cranks. The piston rod was a rack, acting on a pinion attached to a shaft. The explosive mixture was ignited, the piston forced upward by the expansion of the gases. In falling the rack communicated motion to the shaft.

After more than a century and a half of experiments, no successful gas engine had yet been produced; all of those above mentioned never having gone beyond the experimental stage.

To Lenoir must be given the credit of inventing the first gas engine ever actually introduced for public use. It contained nothing especially novel in design, but more nearly resembled an ordinary high pressure steam engine, with sliding valves to admit gas and air and exhaust the products of combustion. An electric battery was used in igniting the charge. His success was due to a careful working out of the mechanical details, rather than to a superior knowledge of design and construction of the engine. The Lenoir engine was very extravagant in gas consumption—consuming fully five times as much per horse power as the modern type; and yet it was very smooth in operation; there was no noise of explosion, and the accounts published at that day of its operation, state that it was as silent as the best steam engine. A report of 1865 says that 300 or 400 engines, of from  $\frac{1}{2}$  to 3 h. p., were in use in Paris at that time. The Reading Iron Works Company, of England, completed and delivered one hundred engines of this same type. They were used for pumping, in printing offices, bakeries, stone yards, etc.; and some of them have been working more than 20 years and are still in good condition.

In 1867, Otto and Langen, German engineers, reduced to successful practice the theories of the earlier inventors. Their engine was identical in principle with that of Barsanti and Matteucci. They succeeded by the most careful attention to the details of mechanism, where the Italians failed on account of crude plans. This engine was noisy and crude in design, but was vastly superior to the Lenoir engine in gas consumption, requiring less than one-half the amount of gas to produce the same power.

In 1873, Brayton an American inventor, produced an engine which was in many respects better, mechanically, than the Otto and Langen engine, but not economical in gas consumption. Owing to the then high price of illuminating gas and the low cost of coal, there was no demand for an engine of this kind.

The year of our American Centennial marks the appearance of the first gas engine which is nearly like the modern type. It was in every way so far superior to anything that had been produced up to that time, that it was considered as the first successful type of gas engine in America. This was called the Otto silent engine, presumably because it was much less noisy than the earlier inventions. The design was adapted to the use of a cycle, described by De Rochas in 1862, but which was afterward and is now known the world over as the Otto cycle. This engine had improved ignition valves, more perfect mechanical details and governing device, and was noted for its high economy, yielding as it did an indicated horse power on 20 cubic feet of gas. Since that time over 15,000 engines of substantially this type have been manufactured. To the patience and persistence of Otto must be ascribed the success of the modern gas engine. To him more than to any other inventor is due the credit of having made possible the many existing styles of engine now using what is known as the Otto cycle. Strangely enough, Otto attributes his success to the comparatively slow explosion of the

mixed gas in the cylinder rather than to the compression of the charge before ignition.

Turning from this brief historical sketch it is well to consider, briefly and simply, avoiding as far as possible technical features, the theory upon which the gas engine operates.

Gas engines may be divided into three types:

1. Engines igniting at constant volume, but without previous compression.
2. Engines igniting at constant pressure, with previous compression.
3. Engines igniting at constant volume, with previous compression.

Of these three types the third is the best known and most extensively used, and is generally known as the compression type; all the principles being embodied in the well known Otto of today, requiring four strokes to complete a cycle, or not more than one explosion for every two revolutions in the case of the single acting engine.

The steps of the cycle are:

1. Drawing in the charge of gas and air in such a proportion as to give complete chemical union when ignited.
2. Compression during return stroke up to a pressure as a rule of about 60 lbs. per gage.
3. Ignition at dead point when pressure instantly rises to about 100 lbs. per gage for the above compression; also, the temperature to about 2,880° F, estimated; the pressure produced by the explosion depends upon the amount of compression as well as the proportions of the mixture. This ignition is immediately followed by the expansion of the gas for the third stroke, the pressure at the end of the stroke falling to about 25 lbs. per gage.
4. Discharge of the burnt gases from the cylinder during the fourth or last stroke, thus completing the cycle in four strokes or two revolutions.

For complete tests made in 1882 on a 6-h. p. Otto engine by Dr. R. H. Thurston, the disposition of 100 heat units was found to be as follows:

Work indicated in cylinder.....	17.
Heat lost to cylinder walls and carried away by jacket water....	52.
Heat carried away by exhaust gases, (temp. 750°F).....	15.5
Heat lost by conduction and radiation.....	15.5

The actual indicated efficiency was 17 per cent, but with more recent developments the absolute efficiency has been raised to 28 per cent, partially due to increasing the compression.

The most important mechanical features about gas engines are the starting, oiling, igniting and governing devices.

In small engines the starting device is not necessary, as they can be readily started by hand, but in the larger units the failure or partial failure of any one of these features usually results in unsatisfactory service.

The bearings, shaft, connecting rod, bed plate, etc., are not difficult to construct and can be as readily made as the corresponding parts of steam engines.

The question of lubrication is much more difficult. The temperatures in steam engine cylinders are comparatively low, steam is readily condensed into water and lubrication becomes a very simple matter. In the gas engine the temperature in the cylinder at the moment of explosion is probably not less than 2,500 degrees. The oil is instantly vaporized and a fresh supply must at once be admitted; otherwise, there are large friction losses, and cylinder and piston are quite likely to be seriously cut or scored. If animal oil is used, carbonaceous matter is likely to accumulate in large quantities and prevent proper lubrication. Nothing but the best grade of oil, especially compounded for gas engine use, will give satisfactory results for internal lubrication. The various bearing, not exposed to undue heat are of course, lubricated in the usual manner.

Much time and attention has been given by various inventors to a suitable governing device. While the present mechanical device answers very well for mill work or other work where close regulation is not necessary, for electric work an electro-mechanical governing device seems absolutely necessary. Slight variations in speed by means of a multiplying lever make and break an electric contact, which controls the current flowing through an electro-magnet, which in turn controls the gas admission valve. This device is exceedingly sensitive and governs the engine very closely through a wide range of load.

Many ignition devices have been proposed, but for thoroughly reliable service none, perhaps, are so satisfactory as the hot tube as proposed by Newton in 1855. A number of small engines are operating

with an electric spark from a primary battery. While this method has its advantages, it likewise has its annoyances; contact points corrode and require brightening, batteries become exhausted and require renewal, and unless given attention at the proper time, stoppages of the engine may result from failure of the battery. Or, if the battery is not used, a small generator, belted from some portion of the engine may furnish the current. This is more reliable than the battery, but is an additional machine to be maintained. The heated tube of iron or steel is rapidly oxidized and requires frequent renewal. If of nicked steel, they are much more durable, much more expensive and very easily broken. A porcelain tube, of unglazed earthenware lasts indefinitely, and if carefully handled and kept free from moisture, gives very satisfactory results. At Lancaster, Ohio, a tube of this character has been in use nearly eight months, with no apparent deterioration. It has never been touched or removed since placed in service, and seems likely to last indefinitely.

It is frequently asked, how do gas engines compare with steam, as regards first cost, economy, durability, etc.?

Comparing prices obtained from those who deal in both kinds of engines, we would estimate that for the same capacity a gas engine set up in complete running order will cost about 5 per cent more than a high speed, automatic steam engine, with boiler, pumps and necessary equipment, also in complete running order. As compared with a medium speed steam engine with throttling governor, the gas engine would cost about 15 per cent more. Extra heavy, large size gas engines of 100 h. p. and upwards, 50 per cent more.

Information from those who have replaced steam engines by engines using gas, would lead to the conclusion that with natural gas at 20 cents per 1,000 cu. ft. and coal at \$1.10 per ton for slack, or \$1.50 for pea coal, their gas bills average less than their coal bills had formerly done. As these comparisons, however, are usually made with a steam plant that has seen its best days and which was probably poorly designed in the first place, as against a gas engine of modern construction, the comparison is hardly fair, and it is reasonable to believe that there is no material difference in the cost of the fuel where each plant is strictly up to date. Some manufacturers of gas engines guarantee that their engines will not consume more than 15 cu. ft. of gas per indicated horse power per hour.

In cost of attendance the gas engine has a marked advantage. A Columbus manufacturer states that in his work the cost of attendance does not exceed 5 per cent of that necessary for a steam engine. Outside of a few minutes' time in the morning and at noon required for oiling and starting, a good gas engine needs practically no attention. This alone makes the total cost of power in small units by gas engines not over 25 to 30 per cent of similar power derived from steam.

The nature of the valve's motions in gas engines is such that cam motions are almost universally employed, and these are in theory short lived. The work done by these cams, however, is so light in practice that they usually give but little trouble, and outside of the occasional renewal of the ignition devices, which can be done at small expense, we see no reason why gas engines should be harder to keep up, or shorter lived than steam engines.

It seems strange that America, which leads the world in novel, ingenious and useful invention, which has no superior in mechanical design and the application of machinery to the industrial arts, should be so far behind European countries in the application of the gas engines to mechanical uses. Even now the gas engine is a curious and mysterious thing to many intelligent Americans, who are familiar with the use of steam.

No accurate information is available as to the number of gas engines in use in America. Every large city has a number of them, but their use is exceptional rather than general. In Columbus, where natural gas is cheap and abundant, an ideal place for the gas engines, their use is quite limited. The aggregate horse power is estimated at about 600, made up of small units, ranging from 2 to 40 h. p. Most of them are of intermediate sizes, such as 6, 10, 12 and 15 h. p.

Some idea of the extensive use of this form of motive power abroad, may be obtained from the following statements gathered from recent reliable sources.

An English engine maker states that his total sales had at the close of 1894 reached 20,000 installations.

The engineer of the London Gas Light & Coke Company, states that there were at that time 2,500 gas engines in use in London, and he estimated that the number in use in England was not less than 35,000.



In Germany there is said to be not less than 85,000 in use.

J. E. Dowson, an English inventor, and one who has given careful study to the gas engine industry for a number of years, states that in Great Britain and Ireland the number of engines sold and in use up to the present time, represents something like 600,000 h. p., and the gas consumption annually was valued at \$5,000,000.

In Berlin, a city of 1,800,000, it is estimated that there is one gas engine in use to every 1,300 population.

In Hanover, Stuttgart and Erfurt, one to every 600.

In Saxony, famous for its manufactories, one to every 200.

Gas in these various cities costs from 95 cents to \$1.30 per thousand.

The gas engine is not alone adapted to various forms of shop work and light manufacturing, but is now operating and very successfully, electric lighting plants of no inconsiderable size.

In Royan, France, at the Municipal Casino, a splendid pleasure resort on the seashore, with ample grounds, beautifully laid out and brilliantly lighted, there is an electric lighting plant having one 80-h. p. and two 40-h. p. engines. A recent report shows that it is not only operated very satisfactorily, so far as the character of the service is concerned, but is also very economical, and with but small outlay for attendance or repairs.

At Calais, France, the lighting station contains two 80-h. p. double cylinder gas engines, operating in a very satisfactory manner.

Perhaps the most notable installation in the world of a gas engine electric lighting station, is at Belfast, Ireland. This municipality owns the gas plant, as well as the lighting station. It contains four 120-h. p. tandem double acting, two 60-h. p. single double acting and two 150-h. p. four-cylinder vertical single acting high speed gas engines. Reports from the engineer in charge show that the service has proven very satisfactory, and as gas is furnished at cost, the operation is more economical than any other form of motive power.

A singular application of a gas engine is that of a steel express barge, which plies on the Seine between Paris, Rouen and Havre. This barge is 98½ ft. long, 18 ft. beam, and has a capacity of 275 tons, and is fitted with an 80-h. p. gas engine. The gas, which is compressed to a pressure of 1,420 pounds, is contained in small steel tubes, about 16½ ft. long, 10 inches diameter and 5-16 of an inch thick. These tubes are 80 in number and are laid on the deck, partly to avoid occupying valuable cargo room, and to be more easily accessible.

The limited number of gas engines in use in America may be chiefly attributed to three causes; the high first cost compared with steam engines, the high price of gas and cheap coal. These conditions are changing rapidly, and are much more favorable than they were a few years ago. Coal in many places is dearer, wood is scarce, gas is much cheaper, and gas engines are better and much lower in cost. Formerly there were but one or two firms engaged in the manufacture of gas engines, and those of but small capacity. Now there are in America about 50 manufacturers bidding for work; many of them manufacturing but small units, while others are manufacturing engines as large as 100-h. p., and if required are willing to undertake an installation as high as 300-h. p.

The best gas engines now yield a horse power per hour for 16 to 20 cu. ft. of gas, depending largely on the quality of the gas and the type of engine.

The annoyances and delays experienced by power users with the earlier types of gas engines, together with the high price both of gas and engine have done much to discourage and retard the use of gas engines in this country. There is in the mind of the power user a distrust, both as to its reliability and economy, and frequent inquiry is made of those who have been so hold as to purchase them, as to whether or not they are giving satisfaction and if in the light of their experience they would purchase another in the event more power was required.

An intelligent gentleman, who wished to obtain information on this point, sent out the following inquiry to a large number of users:

Do gas engines, as machines, do their work well, and are they all right in themselves? All but three said, "yes" and that the repairs were reasonable, moderate or low. To the inquiry: Do they as a rule give satisfaction? 16 per cent answered "yes."

Aside from the steam engine which has been so long in use, certainly there is no other form of motive power, not excepting the electrical motor which has been recently introduced to the consideration of power users, that can show so successful a record as this.

Dr. John Hopkinson, recently called attention to the fact that illu-

minating gas burned in a gas engine, driving a dynamo, would yield more light than if the gas were burned in the usual way, and there are a number of instances in which the fact has been demonstrated in actual practice.

When gas engines fail to give satisfactory results the failure may generally be ascribed to ignorance or neglect. Gas engine builders make serious blunders and too frequently try to convince the purchaser that they are blameless. On the other hand the purchaser, who after many doubts and fears, has installed a gas engine, expects results not possible with any other form of motive power. In current phrase, any old place is considered good enough for a gas engine; hence it is put in a damp cellar, a dark corner, or a back shed, exposed to dirt and grit, no attention is given to the bearings or oiling or cooling devices, and then some morning he wonders why it doesn't go. He damns the friend who recommended it, as well as the firm that built and installed it. He doesn't know what is the matter with it, and thinks it useless to try and find out. He is ignorant of the most elementary principles of its operation and considers it a mysterious, erratic machine that gets tired and stops to rest in a most exasperating and unexpected manner.

If it were a steam engine or an electric motor he would consider that it required at least some intelligent attention, and if it failed to work, would concede that it might have been neglected, but that there was nothing inherently wrong with the machine. But he thinks any dunderhead can run a gas engine, and if it isn't always ready for duty, it is the inherent cussedness of the machine and not the neglect of the attendant. Had the purchaser sufficient knowledge of the machine to recognize its limitations and consider that it should be properly lubricated, that bearings and valves should be in proper adjustment, that as a machine it requires a fair amount of intelligent attention, there would be less cause for complaint and much more satisfactory results.

It must not be assumed, however, that gas engines are without fault or are not at times apparently erratic in their action. Tight brasses, poor oil, leaky valves, late firing, early firing, late exhaust, cold ignition tubes, variation in gas pressure, sticky governor, insufficient water supply, or some one of a dozen other things might derange the working of the engine. All these things, however, are capable of correction and are not properly faults of the engine.

When it is considered that the use of a gas engine dispenses with boilers, fire, smoke, ashes, engineer, smoke-stack, expensive foundations, valuable room, reduces fire risk, reduces insurance, can be installed anywhere, on the top floor or in the basement, is ready for use at a moment's notice, with no loss of fuel in banked fires during the night or at the noon hour, is clean, economical and reliable, it must be conceded that the gas engine has a wide field of usefulness, and a better acquaintance with its merits on the part of power users, will witness its adaptation and uses in hundreds of places where steam or the electric motor now holds sway.

## A BRAVE SUPERINTENDENT.

A suburban car of the Tacoma (Wash.) Railway Company while running from Steilacoon to Tacoma was held up by a highwayman. He covered the motorman and Superintendent F. A. Dame with a revolver and ordered them to the rear of the car and proceeded to relieve the passengers of their valuables. Superintendent Dame watched for a favorable opportunity and shot the robber, only wounding him. A fusillade followed, Dame, the motorman and one passenger being slightly wounded but Dame's marksmanship was good, for his second shot lodged in the highwayman's abdomen killing him instantly. There were several ladies in the car but they escaped injury. Everyone loudly praised the courage of the superintendent.

As a well filled trolley car on Almonesson road was approaching Woodbury, N. J., it left the track to the great consternation of the passengers, except one kodak fiend, who begged the others to be still till he could get a shot at them. They were so amazed that they obeyed.





## THE ROME LIGHT AND POWER STATION

(From our own Correspondent.)

Probably the Rome power station, interesting for so many reasons, was the first instance in Europe where energy for lighting and tramway purposes was supplied from one center. The success which has attended the system is all the more noteworthy because the supply of electricity to the tramway was never contemplated when the original plant was installed; indeed, the system for two or three years was entirely devoted to lighting and it is only within the last twelve months that energy has been utilized for the tramways.

The main source of electrical energy is at Tivoli some eighteen miles from Rome where a water-fall is utilized; there is also an auxiliary steam station in the center of Rome which is used at times of maximum demand. About 2,000 h. p. is obtained from the Tivoli waterfall, the plant at this point consisting of six 250-k. w. alternators which are direct connected to turbines and run at 170 r. p. m.; in addition, are three continuous current exciters of 27-k. w. capacity each. The power is transmitted to Rome by means of four bare copper wires of a sectional area of 100 square millimetres each and they are supported on poles by oil insulators which have been specially designed by Professor Mengarini. Single phase currents are employed at a pressure of 6,000 volts and a periodicity of 43 cycles per second. Means, however, are provided at the Tivoli end to vary the pressure so as to deliver at the Rome substation current at 4,100 volts under all loads. The loss of energy on the whole length of line is slightly under 18 per cent. The Porta Pia station contains the necessary transforming apparatus which transforms the current down to various pressures for incandescent lighting, for series arc lighting and for tramway purposes.

The current for tramway purposes is transformed into direct current by means of rotary converters and motor generators. Following out the theory of Professor Mengarini, who considers it unwise to use rotary converters of much higher power than 60 k. w., the converters do not in any case exceed that size and larger units than that take the form of alternating motors coupled to direct current dynamos. Current for the rotary transformer is reduced by static transformers to 400 volts and it then enters the armature of the

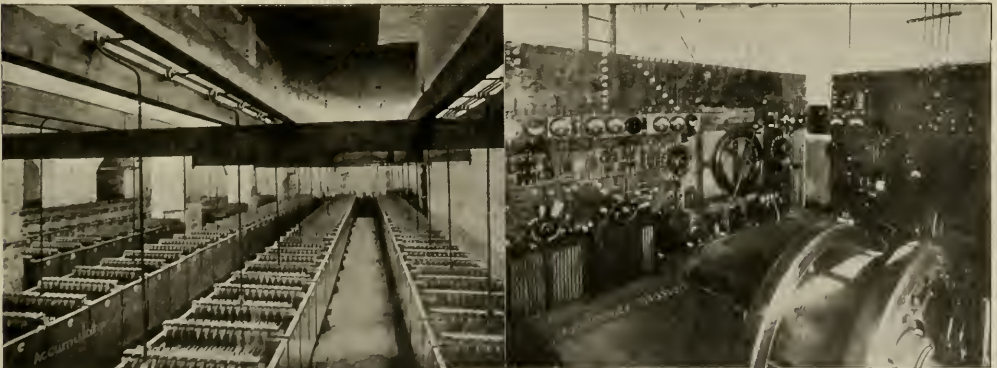
converter and is commutated at the opposite end of the armature into a direct current of 566 volts. The motor generators consist of a synchronous alternating motor (4,100 volts) coupled direct to a direct current shunt dynamo which generates current at a pressure of 550 volts.

In parallel with the direct current side of the converters or motor-generators is an accumulator battery of 304 Tudor cells. The charging current is 545 amperes and they can discharge 621 amperes for three hours or an emergency discharge of 1,738 amperes can be obtained for a short time; 108 of these cells are connected in groups of three to an automatic switch which cuts cells in and out, by this means



THE ROME LIGHT AND POWER STATION.

keeping the pressure practically constant on the tramway line. The automatic regulator is composed of two solenoids, containing pistons which they suck in or push out as the case may be and which cause a ratchet to move either one way or the other according to the direction of the current in the solenoids. The direction of this current is varied by a small switch which is also worked by a solenoid and which is changed over to the one or the other position, according to the direction of the currents going through it. This current is very small and its direction is regulated by another solenoid which is wound as a voltmeter and which is placed on the terminals of the railway circuit. An ingenious arrangement devised by Professor Mengarini keeps the load on the continuous current generators constant whatever the demand



THE ROME LIGHT AND POWER STATION.



on the tramway circuit may be, this demand being equalized by the accumulators. To start up the alternating current motor a continuous current is sent through the commutator on the generating side and the motor is thus started up and brought into step. The moment this has taken place the continuous current is switched off, the alternating current is switched on and the motor then runs at constant speed and the continuous current side can be switched onto the tramway circuit.

The trolley wire is supported by span wires which are fastened to the sides of the houses. The sharpest curve has a radius of 24 metres and the heaviest gradient is 10 per cent. Fairly heavy rails are used and they are bonded with Chicago rail bonds.

There are at the present time 40 cars on the line and they are each fitted with two 25-h. p. General Electric motors. The price paid for electrical energy by the Tramway Company is equivalent to 3.54 cents per kilowatt-hour and the fact that the system has worked with unvarying success will have much influence on the question of combined stations in England.

### ELECTRICITY INSTEAD OF HAND-POWER FOR TRAVELING CRANE.

In the Western avenue station of the West Chicago Railroad Company, there are two 35-ton traveling cranes of the Walker make. These have been worked by hand until recently. The addition of a 2,000-h. p. unit and some changes with the large generators made it necessary to lift

the bridge and a small counter-shaft with gears was erected to suitably reduce the speed. On the traveler a bracket of bar iron was bolted to the frame and a motor suspended in a manner similar to the suspension on a car truck. As it is necessary to start the traveler slowly and with little jerk a double reduction is interposed between the motor and the gears actuating the carriage wheels. On the other side of the traveler a motor of the same size is attached to the frame and works the hoisting drum.

On the counter-shaft, geared to the hoisting drum, is an automatic brake of ingenious design, the outline of which is shown in Fig. 2. Around the brake pulley, which is attached rigidly to the counter-shaft, is a band of spring steel. The two ends of this band are fastened to a toggle joint connected to a 45-lb. armature of an electro magnet. The coils of this magnet consist of 400 turns of No. 7 B. & S. wire in series with the armature of the motor. When the current is turned on for hoisting purposes the armature of the electro-magnet is drawn up over a 1½-in. air gap and the band around the brake pulley is loosened. As soon as the current is turned off the armature of the electro-magnet drops, turns the toggle joint and clamps the band tight around the pulley, bringing the hoisting drum to rest very quickly. For light work a supplementary hoisting hook has been provided and the wire rope wound around the drum. A pawl is attached to one of the gears so that for lifting light pieces the drum revolves four times as fast as it does for heavy lifting.

A Sprague controller was placed in the cab for each motor, the electrical connections being as shown in Fig. 2.

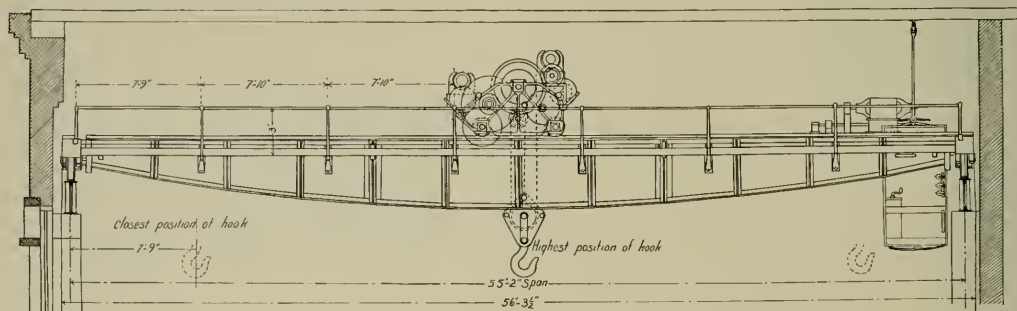


FIG. 1.—ELEVATION OF TRAVELING CRANE.

the heaviest parts of the machines. This would be very tedious and laborious by hand and plans were made to use electricity for operating one of the cranes. W. A. Hopkins, the electrician at the Western avenue station, designed the electrical connections and John Murphy, master mechanic, arranged the alterations for the traveler and the details of construction. All the material was taken either from the scrap-pile or from the store-room.

A trolley wire, of standard dimensions, was suspended from the roof trusses the entire length of the engine room and connected to a 500-volt circuit. Upon the bridge was mounted an old Nuttall trolley base and rod. Three 15-h. p. Sprague street car motors were used to run the bridge and the traveler and to lift the hook. A cab, 4 x 6 ft. and 10 ft. deep was built at one end of the crane and contains the controllers and rheostats. For moving the crane along the length of the engine room a motor was mounted on the floor of

The current passes from the trolley through a switch and fuse, then through a rheostat into the controllers. A represents the controller for the motor running the whole bridge. The two sets of three field coils are in multiple. Controller B governs the motor running the traveler, the field coils of which are in parallel. Controller C is in multiple with controller B. The resistance is in the form of five Sprague laminated iron rheostats and these are bolted to the walls of the cab.

Between the girders of the crane are strung eight wires which extend the length of the bridge and are connected to two of the controllers. Copper sliding contacts, beneath the traveler, take the current from these wires for the armatures and fields of the motors. Near the two ends of the bridge are little strips of brass, connected by a small wire to two dry cells in the cab and to a door bell. As soon as the wheels of the traveler touch these brass strips the

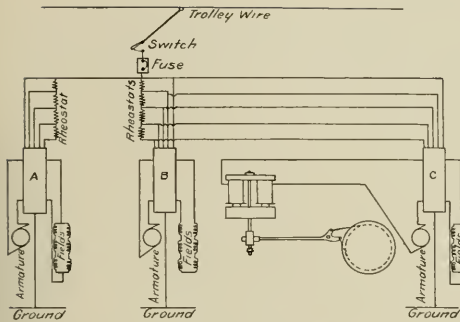


FIG. 2.—CONNECTIONS FOR MOTORS.

bell sounds an alarm and the traveler is stopped before it reaches the end of the bridge.

These additions to the crane have been made at small expense and yet are very satisfactory. At present one man in the cab can run the crane the length of the engine room, 250 ft., or lift a piece from the floor to the girder in two minutes, whereas formerly it required four men twenty minutes to perform the same operation by hand. No break-downs or trouble of any kind have been experienced with any part of the apparatus.

### THE "PHILISTINES" GET SUNDAY CARS IN TORONTO.

The law in Toronto, Ontario, provides that only once in three years may the people vote on such questions as Sunday cars. Twice the battle has been fought, and lost to the riding public. The recent contest, which was won by the railway party on May 15, was waged the most hotly of any, and public meetings held nightly, with thunders from the pulpit, combined to make a condition like unto the days of Humphrey bills. "The Philistines are upon us" was the cry; and so they were by a majority of 479 in favor of Sunday cars. The history of Sunday cars in Philadelphia, and other large cities which at one time did not allow cars on Sunday, has unmistakably proved that when the car service was put on there was a marked decrease in drunkenness and crime on that day, to say nothing of the physical and moral advantages to the masses who are thus enabled to get out into the parks and country.

### ENGLAND FORCED TO BUY IN AMERICA.

On April 30 the president of the Board of Trade, in replying to a question in the House of Commons, stated that the government was not willing to compel companies applying for railway charters to buy their equipment in the United Kingdom, and added that the Waterloo City Railway had ordered 22 cars in America, because of the seven English firms bidding on the work not one was able to deliver the stock in the time required by the company.

It is stated that as a result of the death of J. A. Rhomburg, president of the Dubuque Street Railway Company, this company will be consolidated with the Dubuque Light & Traction Company. The latter is in the hands of a receiver.

## REPAINTING OLD CARS.

BY CHARLES KOONS.

PART II.

The glory and pride of the painter's profession is to know how to use colors, so that they will not fade and so that they will wear to the full limit of their strength. To do this successfully requires a great deal of thought and study and many practical experiments in testing. All prepared paints of the same name are not always the same; this is true even of the dry pigments, and particularly so with japan or oil colors, and hence the knowledge that the practical painter gains through handling and using the different makes of paint is valuable in many ways. He learns to know the strength and wearing qualities of the standard colors just as a blacksmith learns the strength and properties of different irons and steels, or a builder the properties of the various kinds of timber that he uses; although the painter's trade is more complicated than either and more dependent on the judgment of the color maker.

All the standard colors, and in fact everything else in the color line, are placed on the market ready for use, either in oil or japan. It is an open question with all painters whether this is the wisest course to pursue in preparing some of the delicate colors, as the less japan that is mixed with the lighter pigments the better. The japan has a tendency to turn and darken them, while a lighter medium would keep them from going so quickly. As a rule the whole line of japan colors are ground in probably the same japan by the manufacturer and no distinction made of the separate needs of each color. With the dark colors this is not so important as they all have a tendency to darken with age. There is, however, one exception, vermilion, which should never be mixed with japan of any kind, as it turns quickly enough when mixed with the lightest oils and varnishes and does not need to be helped along with a dark medium.

There are different colored japans on the market and some very light driers called gold size. These latter answer better than japan because of the light color, as the lighter the drier the better for mixing with light delicate pigments. Although there are some very good dark japans they must be used with extreme care when mixed with light pigments. There are also some colors which cannot be ground in oil. Those that are naturally oily when combined with an oily medium will not dry quickly enough for practical purposes in car painting, but answer very well for outside house work where slow drying oil colors are necessary. For the car roof, however, an oil paint is necessary. The constant swinging and twisting of the car causes the roof to give more or less and the canvas to move first one way and then another, which motion will naturally break the paint unless it is elastic enough to spring and give also. The more oil used in making up the paint for the roof the more of the necessary elasticity will it have.

In painting old cars the roof does not generally need more than one coat of paint unless it leaks badly, in which case two coats of heavy oil paint are required. If the old paint is badly cracked so that water comes through it there is only one sure way to remedy it. Give one heavy coat of good graphite mixed in boiled oil and work it into the cracks and crevices. The graphite is the most elastic paint

known and when the cracks in the old paint are filled with it, it holds a long time before it allows the rain to come through. The only objection to it is that the color is a dark slate, but this can be obviated by giving another coat of lead paint mixed in oil, with very little drier as too much mixed with the coat that is placed over the graphite will surely crack and leave the roof in worse shape than before. Roof paint should be made with nothing but oil and pigment as anything else added makes the paint too hard and brittle when dry. If this rule were followed when the canvas is first painted, there will be no need of repainting it so often. All quick drying paints will crack if not protected with varnish, and as it is out of the question to use varnish on this part of the work, the best and only way out of the difficulty is to use an elastic paint as described. The question naturally arises here as to how such a paint can be used because of the short time given for such coatings to dry. Let me answer there should no time be wasted when repainting a car; the roof should be the first thing looked after, and coated just as soon as the car is housed for repairs; good management in the painting department in this respect will readily solve the problem, and cause no delay whatever; the master painter should be governed as to this by the time that is given him to do his work and should mix his coatings accordingly; time is precious in his department and every minute should be utilized.

Let us return to the colors best adapted for street car work. Light delicate colors are not the best for dirty and smoky cities, however much they may be admired when newly painted. Constant cleaning is necessary to keep them looking fresh, and so much soap and scrubbing or cleaning with patent renovators soon kills the varnish gloss and it is not long before the paint is affected; this is an unnecessary injury.

If the colors show dirt easily, it is proof positive that it would be more economical to use another and darker color. Mud and grease may be removed often without injuring the paint and varnish, but smoke and soot must be cut and rubbed off and this in time wears away the varnish and then it is only a question of a little more time when the paint is affected. With dark colors the dirt is not so noticeable and does not need so much cleaning, and as a result dark colors wear better and longer.

There is this objection, however, to the dark colors; they make the car look heavy, and to some people too much like a passenger coach; the light color is better adapted so far as looks go for lightening up a heavy cumbersome looking car. The darker colors can be striped and ornamented so as to give a little relief to the heavy appearance caused by the color, and it is here that the painter's skill and judgment come in; if he cannot remedy the matter he has surely missed his calling, but if he is governed by instructions from the office and is dictated to by people who know more about handling the pen than the brush he is in a bad way and is not responsible. Street railway superintendents should allow the painter some freedom in exercising his taste in decorating the heavy colored street car; that is the painter's business and if he cannot find the remedy, surely no one can.

There is another style that is a happy medium between the dark and light colors; that is to paint the main panel, top belt or letter board, top ends and dash boards a dark, and the window framing, concaves and hoods underneath a light color. Another style, is whatever be the color that is used

on the main panel and letter board, to paint the rest of the car a lighter shade of the same color; if it a deep red, lighten it up with vermilion for concave color; or if blue lighten with lead; if green with chrome yellow with lead; if umbers are used, lighten with yellow. Any of these colors lightened to any shade will harmonize with the same color used pure.

Combinations like green and blue, and red and green are in bad taste; the colors do not harmonize and should never be used. White may be used with all colors; and black for lettering, edging, trimming and the iron work can be used with any color known and always harmonizes and looks well; in fact these are standard color for the car painter, and are used more or less on every car.

In naming these colors for street car work it must be remembered that there is a difference between house colors and colors used for street car work of the same name. All of the common pigments are used in both, such as lead, common chromes, all of the mineral and many of the standard colors, such as indian red, venetian red, lamp black, the ochres and some of the common umbers; but they are mixed in a different way. All of these colors for house work are always mixed in oil, that being the best wearing medium known and needing no protection over the last coat. But with the street car there is a different surface altogether; the wear is ten-fold more severe and the colors need to be of a different nature entirely; the paints must be more substantial and less liable to fade, hence the need of a better quality for all outside colors. The knocks and scraping, together with the continual washing and cleaning from one year's end and to the next that an average street car gets makes the wear far different from house wear. To stand, the surface must be brought up in a more hardened state, and this in turn protected with the best of varnish. The soft pliable nature of the oily coatings that are used on house work makes them very unfit for common street car use, though for house painting there is nothing better.

House colors, as a rule, are the commonest known, and fade very quickly after being exposed and the same colors would never answer for outside street car surfaces; they have not the strength that is necessary for the extra hard wear that a street car gets. In street car work lead is never used except as a base or foundation for some finer white, either flake white or fine zinc being always coated over it for a finish; these do not color or tarnish like the lead.

For the yellows, the house painter invariably uses the common chromes; these all fade more or less in a short time, and are hardly ever used by the car painter except in a way of combination colors for the grounds, or undercoats for more substantial yellows. For the light yellows, English or French yellows in either the milori or finer chromes are much more durable, fading only after long usage and wear, when properly prepared in the proper medium. For the dark yellows, there is only one class of colors that will stand, namely, the cadmiums; the English is the best, although some German cadmiums are very good, but they are not considered sure and reliable; there are many adulterated cadmiums on the market that cannot be distinguished from the real in looks when first used, but the difference is seen when they are exposed to the elements. The only sure way of obtaining the genuine is to purchase it from reliable color houses.

For the greens, instead of the common chromes that are used for all house work, the milori, emerald and zinc greens



are better and more durable; almost any shade needed to taste, can be obtained from these three standards. For the ground work for the above the common chromes may be used; there are still finer colors in this line, but too expensive for street car purposes. For combination colors on this order such as standard Pullman color, used on the passenger coaches of that name, and the umber greens that are used principally on carriage work; the common chromes may be used in either the green or the yellow, but they should be used very charily and only in conjunction with a substantial color as a base for the mixture, on account of the combination of so many different pigments having a tendency to spot so easily. If there is stability in the mixture to keep and hold the colors together it is not necessary to use any fine color in the combination, but unless the painter knows his colors well, it is safest to always use a greater proportion of some substantial color in order to hold it. However, these standard colors in the combination line can always be procured of reliable color houses already for use; they are formed and mixed only after a great many practical experiments, and then are generally tested as to wearing qualities before being placed upon the market; they are generally reliable, more so than the average painter could make with his limited paintshop apparatus. Still, if the master painter is able to prepare and grind his own colors, it is far better to do so, as was noted in the beginning of the article, because he can use the proper medium for each color, which is not always the case with prepared ground paints, they being generally all ground alike in one kind of japan.

For the reds, there are such a variety of vermilion in both the quicksilver and the analine color that it is almost impossible to say which is best adapted for street car painting; almost every paint house has its own vermilion, labeled after its own idea for naming vermilion. There is, however, only one general name for pure vermilion, namely, quicksilver vermilion. All other so-called vermilion are made from a lead base, and colored, principally with analines, to the desired tint or shade. Some of the analine colors are very brilliant and beautiful, but that is all that can be said for them; they invariably fade, and die, and dim away to a pinkish cast that is far worse than no color. The quicksilver pigment will not fade but will turn darker, and in time will lose its vermilion color altogether and become more like venetian red or light indian red; sometimes it blends into two or three different colors, the lower part of the panel turning the darkest, something like reddish brown and blending gradually lighter toward the top. The ground sometimes has some effect on the vermilion and causes it to turn more quickly than it otherwise would. The medium used in under coats should be thoroughly dry before the vermilion coat is put on, because of its tendency to work out through the vermilion coating; this is often the cause of the color turning. The vermilion should also be mixed so that the color dries flat, and thoroughly dry before it is re-coated. The ground best adapted for all kinds of vermilion is venetian red lightened a little with the kind of vermilion to be used over it and with lead. All vermilion should be used just as soon as mixed and thoroughly stirred from time to time while using it, as it is heavy and settles to the bottom, leaving a small proportion of the pigment united with the medium with which it is mixed to rise to the top; this makes the general coat unevenly spread with the vermilion pigment. Carelessness of the workmen in using this,

the most difficult paint to be handled, is one reason why it gives such unsatisfactory results.

The English quicksilver vermilion is the best manufactured, both light and deep, for all outside exposure. The Chinese vermilion is the finest in pigment, but not any more durable on that account. There are any number of American quicksilver vermilions, but none as durable or as reliable as the English. Of the thousand and one cheap vermilions on the market some are good, many pretty fair and many more no account at all. One of the most unscrupulous claims put out by color manufacturers is for the so-called unfading vermilions. There is no such a thing as an unfading pigment of this kind; it is an utter impossibility to keep such a bright color intact from the ravages of sunlight; some are made so as to withstand the elements longer than others, but they will all lose their brightness, and in time their color altogether, the quicksilver pigment turning darker, and all the vermilion made from a lead base and so-called analine colors fading or dimming out into nothing.

The darker reds suitable for car painting such as indian red, tuscan red, aurora red and all the red lakes, are all different in make and quality and also in price, the cheaper the price the more adulterated is the color. The finer reds and lakes being adulterated with lamp black and the analine reds, while the standard reds like indian, tuscan and all straight madder colors are cheapened with mineral pigments "analined" up to the right tint of the pure colors when first used, and sometimes even brighter and more brilliant; but when exposed to the sun's glare for a few weeks these change to different colors altogether.

This brilliancy shown in some cheap colors is misleading and catches the unwary painter by its first appearance; as a rule it is not the brilliant looking colors that are the best or the purest, but those which have a solidity in color that shows body and strength, and this will generally be found true when they are tested.

The blues are not so numerous, prussian, french ultramarine and the cobalts, with two or three chinese blues fill the quota of standard blues; there are others called perfect blue, azure blue, and permanent blue, but they are far from being what their names would imply, and most of them are combination colors tinted and brightened up to suit the name.

There are many imitations of all of these colors for sale, but it is only the pure colors that will stand. The difference between the pure and the imitations can readily be noticed when they are compared with one another.

This about covers the field for colors used for street car painting, although there are combination colors that are leading fads in different parts of the country. There is one in St. Louis called the mahogany; it is far from imitating that wood, but is about as near to it as a straight paint could get. It is of a reddish yellow umber cast, and made with substantial yellow, light and medium raw umber and a little burnt sienna (best quality). It can be lightened with light yellow or deepened with burnt sienna to suit the taste or the painter's idea of mahogany; there is no standard for the color as yet but probably some color house will soon pick it up and make it a leader.

The city council of Des Moines, Ia., has been petitioned by a number of teamsters to grant no permits to the street railway to do teaming or haul coal and other freight for private parties.

## PRIMITIVE RAILWAY APPLIANCES.

BY C. B. FAIRCHILD.

"There is nothing new under the sun" is an expression frequently made by those whose historical researches bring them upon an illustration or description of some mechanical device that contains the essential features of some new invention that is heralded as a useful appliance, sure to work a revolution in present methods of doing things, or highly valuable as a labor saving device.

Again it is often said, "The possibilities of scientific discoveries are beyond all imagination." It is a sign of ignorance and superstition to hold always to the first statement, and deny that nothing new can be, while it is equally a sign of ignorance to receive all new things as really new because they have never before come into one's experience. The new old things, however, may be adopted and serve our purpose just as fully as though they had never before been known to others, or had never been lost and found. It is a curious fact that many so-called modern inventors spend a great deal of time and money developing a device that has been tried and

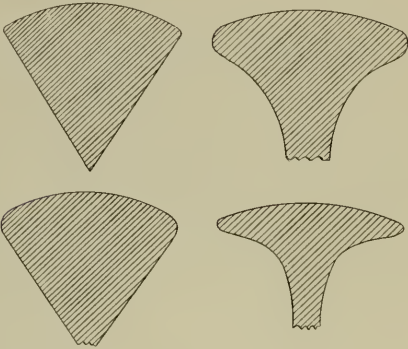


FIG. 1.

found wanting years before. Some of them, being entirely ignorant of previous experiments along the same line, may justly lay claim to originality, while others, perchance, may know of former efforts along the same line, and thinking to improve on some points, that had baffled some former inventor, may produce a useful device, but not be able to patent it, or if patented, not be able to sustain the claims should the existence of the former device come to the light.

For the above reasons the presentation of some of the primitive railway appliances will prove historically interesting to those who like to watch evolutionary processes, while some of the contrivances, although they may have failed in their object on first application, or turned to very little account, either from inherent defects, or from being only useful under circumstances which rarely occur, may nevertheless exhibit such admirable combination of parts that ultimately they may be rendered subservient to other uses than those which their inventors designed. The statement made many years ago by Sir Humphrey Davy, in regard to experiments in chemistry, applied equally well in mechanics, that, "The history of failures invariably shortens the road to success."

In any event people are disposed to venerate those who express original combinations of genius when founded upon

correct scientific knowledge, because they think it the manifestation of a latent power inherent in man, to imitate for his own use the works of a divine author.

It is claimed by those who have made a careful search that the first account of railways occurs incidentally in the life of Lord Keeper North, which states that railways have been employed from time immemorial in the coal mines of Wales, and also states that about the year 1670 they were made use of at Newcastle upon Tyne for transporting coals from the mines to the shipping in the river.

Wooden rails were employed, so far as the record shows, until 1767, when at Colebrook Dale flat cast iron plates were employed over oak stringers. In 1776 Mr. Carr at the Sheffield Colliery introduced a different form. These were also of cast iron, and the first description of these tram plates, as they were called, states that they were 3 ft. long, 4 in. wide,  $\frac{3}{4}$ -in. thick with a flange (flange)  $1\frac{1}{2}$  in. high. These were designed for flat wheels, the flange on the rail being designed to keep the wheel on the track.

In 1789 Jessop introduced cast iron edge rails with flanges cast upon the tires of the wheels instead of on the rail.

Wrought iron rails or malleable, as they were then called, were probably introduced about 1811, at least in a letter dated May 1819, the agent of the Earl of Carlisle at Tindall Fall states that malleable iron rails had then been employed on a line for about eight years with little wear except creasing. In 1817 a patent was granted to John Hawks of Galehead, Durham, for a method of casting strips of malleable bars on top of a cast base, making the casting embrace the flat or square rolled bar. It is a wonder that this process did not also suggest the cast-weld joint. Up to this time it seems that wrought iron rails were forged out by ordinary blacksmiths. The first successful attempt to roll iron rails and bars of those varied and useful forms, now so common, was made in 1820 by a Mr. Birkinshaw, who was induced to undertake the manufacture, by the recommendation bestowed upon this form of rail by George Stephenson, in a paper descriptive of the Edinburgh Railway. In his specifications Birkinshaw says, "The rails or bars which I have invented are formed as prisms, though their sides need not of necessity be flat. Fig. 1 shows sections of the bar thus formed, the

upper surface upon which the wheel of the carriage is to run is slightly convex in order to reduce the friction and the under part rests on the supporting blocks, which are mounted upon the sleepers. The wedge form I propose, because the strength of the rail is always in proportion to the square of its breadth and depth, hence this form possesses all the strength of a cube equal to its square with only half the quantity of metal, and consequently half the cost. Sufficient strength, however, may be still retained and the weight

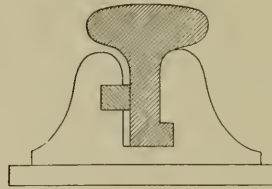


FIG. 2.

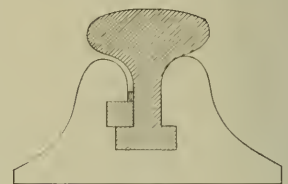


FIG. 3.

of metal further reduced by forming the bars with concave sides as shown."

A technical publication of about the same period as that of the above patent contains the following two paragraphs relating to the claims made by the inventor.

"It may be deserving of remark in this place that Mr. Birkinshaw suggested at the end of his specifications that his railway bars (18 ft. long) should be welded together end to end continuously so as to form an extensive line without any joint and thus avoid the jolting and concussions consequent upon the carriage wheels striking against the ends of each length of the ordinary rails when they are connected to the chairs."

The editorial remarks are as follows:

"The introduction of this suggestion serves to show what great mistakes are made sometimes by the cleverest men for want of a little reflection, and we make no doubt that the patentee became soon sensible of what most of our readers

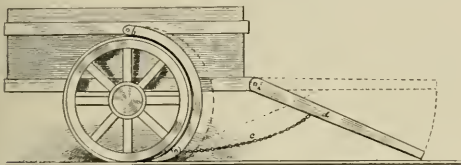


FIG. 4.

are aware of, that a rail so constructed without any provision for its expansion and contraction which takes place in the metal from atmospheric changes of temperature, must inevitably soon be thrown into ruins by the twisting of the rail and the continual motion of the chairs and sleepers. And our only motive for noticing so singular an oversight is that the inexperienced and confiding reader of the specifications may not fall into a similar error."

In this record we evidently have the origin of the girder rail, as well as the method of forming bars by passing the metal when heated through rollers. It is interesting to note that there was much opposition to rails of this type on the claim that wrought metal would rust faster than cast metal, and also become splintered by the action of the wheels, and this called forth a long article from Stephenson relating to the questions, in which he remarks, "It has been said by some engineers that wrought iron will exfoliate or separate in the laminae, on that part which is exposed to the pressure of the wheel. This I pointedly deny, as I have closely examined rails which have been in use for years with a heavy tonnage passing along them, and on no part of them

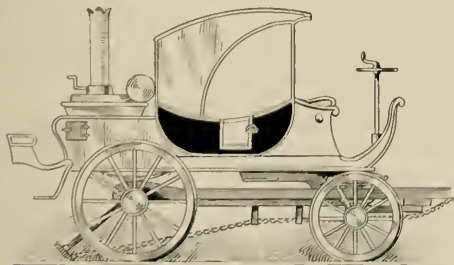


FIG. 5.

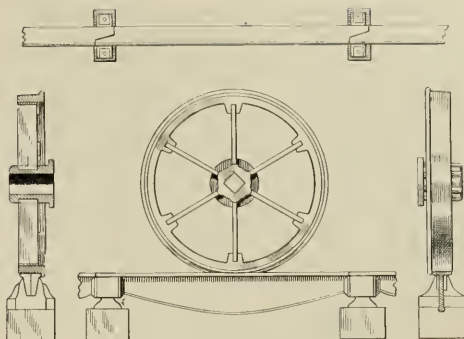


FIG. 6.

are such exfoliations to be seen. The effect of the atmosphere on cast and wrought rails is not so different as to be of much moment. I am inclined to think that the effect is prevented on the bearing surface of much used railways by the pressure upon them. One phenomenon, in the difference in the tendency to rust between wrought iron laid down as rails and subject to continual motion by the passage of the carriages over them and bars of the same material either standing upright or laid down without being used at all, is very extraordinary. A railway bar of wrought iron laid carelessly upon the ground alongside of one in the railway in use shows the effect of rusting in a very distinct manner. The former will be continually throwing off scales of oxidated iron, while the latter is scarcely at all affected."

In a description of the Liverpool & Manchester Railway,

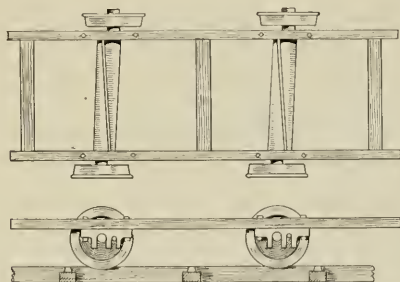


FIG. 7.

built by Stephenson, the following particulars are noted. The rails, which were 15 ft. in length and weighed 35 lbs. per yard, rested upon blocks of stone embedded in the road bed and placed 3 ft. apart. Each block contained four feet of stone, and into each block were drilled two holes 6 in. deep and 1 in. in diameter, and into these were driven oak plugs, and the cast iron shoes, to which the rails were immediately fastened, were firmly spiked down to the oak plugs, forming, as the account reads, "a construction of great solidity and strength."

The sectional form of the rail is represented in Fig. 2. A lateral projection was rolled upon one side of the base of the rail, and on one side of the cheek of the chair a cavity is cast equal in size with this projection. On the opposite side of the chair another cavity is cast for the purpose of receiving an iron key. When the rail is laid into the chair, the



key is driven into the cavity, thus effectually securing the rail from raising up.

A Mr. Losh designed a rail with a projection rolled on both sides and made a chair to correspond as shown in Fig. 3.

Wrought iron chairs, which were rolled the same as rails, were patented by Harry Scrivenor, in November, 1832.

The first brake applied to wheels seems to have been invented in 1807 by Le Caan, and was applied to a Welsh cart used upon rails (Fig. 4).

Curiously enough it was of the tandem automatic type, and seems to have been designed for use only when the animal drawing the cart should fall down. The shoe was made of iron and the top turned on a pivot at h, and the lower part was connected by a strong chain, c, to the shaft, d, the shafts being jointed at, i, to the frame of the cart. The description reads: "When

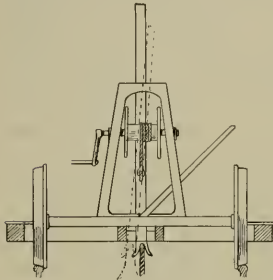


FIG. 8.

the horse is upon it legs, the shaft, chain and brake are in several positions shown by the dotted lines, but should the horse fall, the shafts take the incline position and the brake is thrown under the wheels which it takes off the track. A drag brake of an early period is shown in Fig. 5. The first

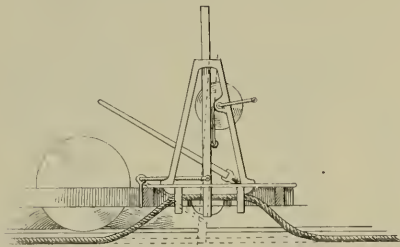


FIG. 9.

composite wheel, composed of cast and malleable iron, was designed in 1816 and was made with flanges, Fig. 6.

Robert Stephens patented in January, 1826, a design for a loose wheel to facilitate the rounding of curves, (Fig. 7.)

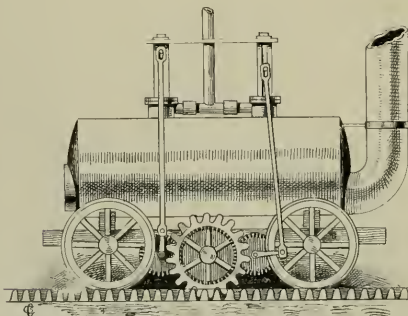


FIG. 10.

Instead of two wheels rigidly fixed to the axle, Stephens employed two axles mounted parallel to each other. The same illustration shows a journal box having a slot for the

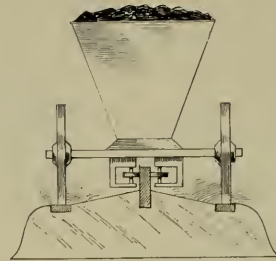


FIG. 11.

journal so that the carriage could pass over uneven places without being derailed.

An oil box was patented in August, 1827, by William Chapman, of Newcastle upon Tyne, having a woolen cloth supported by a weight or spring against the underside of the journal for the purpose of applying lubricants to the same, in an almost identical manner as the felt wicks are now employed.

In 1825 A. M. James patented a system for rounding curves easily, in which were employed rails having ribs or elevations to correspond with grooves and flanges on the peripheries of the wheels, so that the outer wheel would travel on a larger diameter when rounding curves.

In the early history of surface railways, incline rope ways

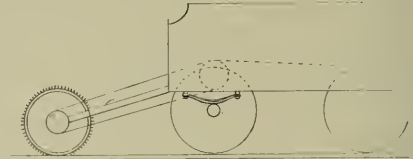


FIG. 12.

were developed in which the loaded car pulled up the empty ones, and in October, 1821, B. Thompson, of Ayton, took out a patent for applying power to the rope to haul cars over uneven surfaces. Two engines were employed, one to haul the rope in one direction, and one in the other. Thompson also designed curve pulleys. An apparatus was also designed in 1830 (Fig. 8) for gripping the rope to give an intermittent motion to the cars. Another early grip is shown in Fig. 9

A design for propelling a vehicle by means of a stationary chain or rope wound over a wheel on the carriage was patented in 1812 by William Chapman. Both animal and steam power were to be employed. Rack rails were favorite means for securing propelling power and the first rack rail proper was patented in 1811 by John Blenkinsop, of Middleton. In the first experiments the rack was placed to one side of the track as shown in Fig. 10 instead of between the rails as in modern practice. A third rail with friction wheels was also employed, Fig. 11. Propelling wheels without racks were also employed, and one illustrated in Fig. 12 was patented in 1825, by John and Samuel Seward, in which the power was transmitted from the engine to a stern wheel by means of a belt.

(To be Continued.)

## COST PER CAR MILE

vs.

## COST PER PASSENGER.

## A Symposium. Part II.

Continuing the discussion of "Which affords the better comparison, the cost per car-mile run, or the cost per passenger?" begun in the May REVIEW, we submit opinions by well known street railway accountants and managers as follows:

**H. L. Wilson, Auditor West End Street Railway, Boston.**

In reference to the division of operating expenses, I would say that a comparison in either case between different railroads would be of very little use unless the following facts were known:

First. What is the length and equipment of the car.

Second. What is the length of the routes.

Third. What is the speed operated.

If it were possible as it is on the steam railroads to give the passenger mileage, I should say that it would be well to divide it in the cost per passenger-mile, but as this is impossible on the street railway, I prefer the cost per car-mile run.

With us as you know we have something over 300 separate routes. They vary materially in their lengths and of course we keep the earnings per car-mile of each. In many instances these run over the track operated by other lines. We can not keep a separate division of operating expenses by routes but we can by proportioning some accounts, keep it in a general way by divisions and of course even when comparing these we have to take into consideration the physical condition of the different divisions. I think this question will be a hard one to settle satisfactorily to all managers.

**C. N. Duffy, Secretary Citizens Street Railway, St. Louis.**

In response to your request for my views on the subject of which gives the best and fairest expression for comparison, "Operating cost per mile run," or "Cost per passenger carried," I beg leave to say that as between the two, for a basis of comparing the operation of one road with another, I would without hesitation declare in favor of "Operating cost per mile run," assuming of course, that you mean "Operating cost per car-mile run."

It appears to me, that if "Cost per passenger carried" was taken as a basis of comparison, a road enjoying heavy traffic would have such an advantage over a road having light traffic, that a fair comparison would be out of the question, as the cost of carrying each passenger would be increased or decreased in proportion to the number of passengers carried. The number of fare and transfer passengers, and the number of adults and children would also have to be taken into consideration, as having an important bearing on the matter. Then too, local conditions would have a great deal to do with promoting riding, thereby increasing or decreasing the number of passengers to be carried.

For the purpose of comparing results, "Operating cost per car-mile run," as a basis to figure from, is often misleading and unsatisfactory by reason of conditions of operation. The kind of cars in use, whether single or double truck, open or closed, the size of the car bodies, whether or not trail cars are operated, the type and capacity of motors, materially affect "Operating cost per car-mile run," and

should be fully understood and carefully considered in making comparisons.

As a matter of fact, it would seem that there is no satisfactory basis to figure from, in comparing the operation of one road with another, as what has been said about conditions with reference to "car-mile run," or "passenger carried," applies with equal force to "per car operated," or "per mile of single track operated." It will not do to use the basis adopted by our steam railroad friends, "per ton-mile," as we would have to estimate the weight of the passengers, usually averaged at 16 to a ton of 2,000 lbs., and then estimate the average distance each 125-lb. passenger rode.

In order to overcome the difficulties and complications that naturally arise in making comparisons between roads, I believe more satisfactory results could be obtained by giving for a year, month or day, the operating expenses of a road, the miles of single track operated, the number of motor cars operated, giving size, description, weight, separately, type and capacity of motors, the number of trail cars operated, the number of motor car-miles made, the number of trail car-miles made, the number of adult fare passengers carried, the number of children fare passengers carried, the number of adult transfer passengers carried, the number of children transfer passengers carried, the average revenue per passenger, and the average speed at which the cars are operated.

From the data given as outlined above, any or all of the figures could be used to any extent that would be desired, and comparisons could be made on the basis of "per mile of single track operated," "per car operated," "per car-mile run," or "per passenger carried."

**W. E. Baker, General Superintendent Metropolitan Elevated Railway (Electric), Chicago.**

The cost per car-mile (or as you express it "the operating cost per mile run," which I understand to be the same) is the best expression for comparison of operating expenses; from a financial point of view the cost per passenger carried, or the percentage of operating expenses to gross receipts, especially in roads whose business is carrying passengers solely or mostly, is generally looked upon as the most significant figure, as it gives more fully than any other the net financial result. Therefore you will find as a general thing that persons interested solely or mostly in the ultimate financial outcome desire information as to the cost per passenger or as to the percentage of operating expenses, which represents best the financial success or failure of the enterprise from an investor's point of view. You will find on the contrary that operating men, managers, superintendents and others, speak more frequently of the cost per train or car-mile, as this forms the best basis by which the operating expenses or the handling of the property from the superintendent's or operating standpoint can be judged. In other words, the expenses per car-mile represent the degree of economy reached in the operating of a road upon which cost the traffic carried has only an indirect bearing, while the cost per passenger indicates the relation between earnings and expenses from an investor's point of view. Neither one of these statements taken independently will represent fairly from all points of view the condition or prospects of the property. For this reason, therefore, you will find them both frequently used, depending upon the

point of view of the person who is desirous of the information and neither the one nor the other alone will convey an exact or fair basis of comparison, but the two together, with other information in regard to the location of the property and its condition, will give a very satisfactory comparison.

**Dana Stevens, Accountant for Receiver, Belt Railway,  
Washington, D. C.**

For purpose of comparison the "cost per mile run," in my opinion, is better than the "cost per passenger carried."

From an accountant's standpoint, I cannot see that the decision comes within my province, or to any great extent concerns me, as the data, either or both ways, can be readily obtained; the showing only affects the management.

However considered, the comparisons would be of value almost entirely to managers, as a holder of securities and stock or an investor would prefer to look at gross and net earnings, or granting he wished to make a careful investigation as to the proper and economical management of the company's affairs, could judge the physical condition by inspection and obtain a fair idea of cost of operating by comparing the "cost per mile run" with that of similarly equipped lines, of course, considering such main factors as price of supplies and cost of labor at different points.

As to "cost per passenger carried," take for instance two companies in the same city, lines similarly equipped, and giving equally good service; one may run through such a section as to carry passengers at a cost of four cents each, while six cents is the cost per passenger on the other line, owing to present disadvantages, such as running through a new and undeveloped territory, or strong competition, or other causes which the management or owners hope time and first class service from the start will overcome. In the two imaginary cases to publish the "cost per passenger carried" would be very gratifying to the management of the successful line, and, at the same time, manifestly unjust to the manager of the handicapped line, when he could show that he operated his line, giving first class service at a less "cost per mile run" than his competitor, or any similarly equipped lines.

In our monthly and annual reports we show earnings, expenses and net earnings; and per cent of expenses to earnings; earnings per mile run, and expenses per mile run, also mileage, number of revenue passengers, transfers and passes, and total number of passengers; the cost per passenger can thus be readily ascertained by any one so desiring; however, for results, I think it would be found best to compare the cost per mile run with reports of other lines, allowing for conditions in different sections, and, if too high, endeavor by comparisons of subdivisions of expenses to discover just where the leakage, if any, has crept in.

I will be pleased to learn the views of others on this subject, after which I may have to change mine.

**J. P. E. Clark, General Manager, Binghamton (N. Y.)  
Railroad Company.**

In response to your request for an opinion relative to "the best and fairest" basis for comparison, the "operating cost per mile" or the "cost per passenger carried," will say that where only one is used I prefer the latter, for several reasons, the principal one, however, is that the passenger carried is the "stock in trade" and the producing quantity,

therefore is the proper basis on which to compute operating expenses.

In view of the fact that the proportion of trackage to population is widely at variance in different cities—conditions and circumstances being responsible for this result—the "cost per car-mile" does not in my opinion afford the opportunity for as fair a comparison as the "cost per passenger carried." I believe that for the information of the individual street railroad company and a thorough and satisfactory comparison, both are necessary and essential, and can be secured with very little additional work.

The New York State Board of Railroad Commissioners submits a complete and satisfactory comparative table of earnings and operating expenses of street railroads in the Annual Report for 1896, recently issued, compiled from the reports made by the respective roads of the state. I take the liberty of submitting the headings:

Street Surface Railway Receipts, Expenditures per Passenger, Cost of Operation per Car-mile									
Name of Road	Number of Passengers Carried	Total Car-Mileage	Average Earnings per Passenger	Average Cost of Operation per Passenger	Average Receipts per Passenger	Average Expenses per Passenger	Net Earnings per Passenger	Other Earnings per Car-Mile	Total Earnings per Car-Mile
Receipts upon gross fares, upon receipts from all other sources, and upon a special operating fund, including transfers and passes.									
Expenses for fuel, oil, grease, repairs, and other operating expenses, including transfers and passes.									

You will observe from the above that they give "the cost per passenger carried" "the right of line."

### What One Who Signs Himself "Yankee," Says.

Your request for our ideas as to which of the two methods of comparison of operating expenses, viz., upon the basis of the "cost per car mile run," or upon the basis of "cost per passenger carried," came rather in the nature of a surprise to the writer.

In this state, in the blanks furnished to street railways for their annual reports, the railroad commissioners require answers to the following questions, viz.:

- "Number of passengers carried during the year."
- "Number carried per mile of main railway track operated."
- "Number of round trips run."
- "Number of car-miles run."

In the same report are given the earnings and operating expenses, both in detail, also the net earnings.

From the above information, the commissioners compute and publish in their reports the gross earnings, operating expenses and net earnings, per mile of main track operated, per round trip run, per car-mile run and per passenger carried. The writer does not know, however, of any roads in the state that figure for themselves, as a means of comparison, the earnings per passenger carried, and he was not aware, until asked to write on the subject, that roads in any section of the country were in the habit of so doing.

It does not seem to the writer that it can be done in any other way accurately, then upon the car-mile basis. A mile in this country is 5,280 feet.

Expenses must be figured on the same basis as are earnings and a revenue passenger may be one who has paid a 2½ cent fare or a 50 cent fare.

On some of the lines operated by our company, persons paying 4, 5, 8, 10, 12½ and 15 cents, ride on the same car and are each counted as one passenger. Is it not absurd to say that it costs us no more to carry the passenger who paid 15 cents than it does the one who paid the 4 cents? Yet they



were each counted as one in the returns to the commissioners. On other lines passengers make a trip, for which they pay 15 cents, but this is collected in three installments of 5 cents each, and although they make a continuous trip, in the same car, each one is counted a passenger three times and is so included in our reports.

The commissioners, without knowing how many passengers, in the first place, were actually carried, (and the company cannot tell them for the reason that no account is kept which shows the number who make more than one payment) or how many were carried at one rate and how many at another, figure it out that the average receipts and expenses have been so much per passenger.

It seems to the writer that, in order to do this accurately, it would be necessary to reduce the number of passengers carried to a uniform rate, say 5 cents, that is, count two passengers paying 2½ cents each as one, and one passenger paying 15 cents as three, then the average earnings per passenger would be 5 cents, and the expense would be divided between so many passengers paying 5 cents each, if there were no other complications.

It is not the custom with our company to have transfers registered, but many roads do so, and the writer presumes that they are counted as revenue passengers, when riding on a transfer. As a matter of fact, however, unless an additional charge has been made for the transfer, they are, at the most, half rate passengers, on both the original line where the fare was paid, and on the line where the transfers were used. In cases of roads that issue a transfer on a transfer, the passenger should be counted as one on one line, or as one-third of a passenger on each of the three lines on which he rides.

Without going into further details, it seems as though innumerable instances might be cited that would show that it would be almost impossible to obtain the actual earnings or expenses per passenger. There is no such uncertainty to be encountered about figures based on the car-mile run. It is possible to get this information exactly accurate and in consequence the conclusion reached is accurate.

**Morris W. Hall, Secretary Camden & Suburban Ry., Camden, N. J.**

To my mind the car-mile basis is the proper method of calculating expenses, as it gives a more accurate and less variable amount than when made per passenger.

There are certain days in the week when the number of passengers carried will be from 15 to 20 per cent less than on other days, yet the expense of operating is practically the same, as it requires as many cars, crews, and help at the power station as on the days when the greater number of passengers are carried. As the travel on nearly all roads is greater during the summer than in the winter months, if the per passenger plan is used, the expense of operating must show considerably less in the summer than in the winter, while the actual expense varies but little.

The car-mile is better on account of the uniformity, as our records of service for car bodies, trucks, motors, car and trolley wheels, etc., are all kept on this plan and would not give satisfactory information if any other were used.

**F. W. Wood, General Manager Los Angeles Railway Co.**

Replying to your inquiry asking an expression from me as to which is the preferable unit for comparative purposes, "operating cost per mile run," or "cost per passenger car-

ried," I always have my records kept to show both costs, but it seems to me that the "operating cost per mile run" with all its faults and deficiencies is a fairer unit of comparison than the "cost per passenger carried." For instance, I am connected with one small road that gives a reasonable service for its length but through a variety of circumstances has an abnormally small amount of traffic. The superintendent of this particular road has, by careful study and close management, got the operating cost per mile run down to a very low figure and one that compares favorably with other roads. His cost per passenger carried would be abnormally high, not because his expenses are exorbitant or his management bad, but because the number of passengers is small.

It seems to me that it requires a far more intimate knowledge of the local conditions in each case to compare the cost per passenger carried than it does the cost per mile run. In this connection permit me to emphasize the necessity of certain information accompanying all statements of cost per mile run, among which are rate of wages, price of fuel, etc.

**Joel Hurt, President Atlanta (Ga.) Consolidated Street Railway.**

Upon our roads where we have a light travel the most satisfactory method of obtaining the cost of operating the properties is by determining the cost per car-mile for the cars operated. When business increases sufficiently to run up the cost, additional cars are placed upon the road, which has the effect of reducing the cost of operating per car-mile at a time when the increased travel would on the other hand increase the cost of operating per car-mile. No test taken by itself is altogether satisfactory, but the one above referred to is the most satisfactory if one is to be taken alone.

**B. F. Harris, Jr., President Urbana (Ill.) & Champaign Electric Railway.**

I have your request for my opinion on the subject as to whether operating "cost per mile run" or "cost of passenger carried" is the best and fairest expression for comparison. If you wish to decide which one of these items is best for all the roads in the country so that one road may compare its expenses with another, I should say that the operating expenses ought to be estimated on the cost per mile run. For instance, down here in the country on our interurban road we might be operating really at a lower expense per mile run than a large city road, and yet the large city road would really carry ten passengers per car-mile run to where we would carry one passenger. Therefore the showing on its face and the cost per passenger basis would not give one an accurate idea of the actual mechanical operating expense. As a matter of fact I do not consider the question serious, because any street railway company that has a thoroughly ample and accurate accounting system may very easily compute both the cost per mile and the cost per passenger expense. We all know that it costs about as much to run empty motor cars as it does to run cars fairly well filled. As the chief respect in which one road differs from another is in the number of passengers which it carries, the real item for accurate comparison is therefore, in my opinion, on the basis of car-miles run.

**E. S. Doud, Secretary Lehigh Traction Company, Hazleton, Pa.**

If you can have but one item of cost to operate, that of the two submitted the "operating cost per car-mile" would

be preferable for comparison, but I would prefer both, or figures from which I could derive both. I believe that the cost per car-mile does not increase nor decrease proportionately with cost per passenger carried, admitting that cars are put on and taken off as traffic demands.

Some roads are so located that they naturally carry more passengers per car-mile than others, the cost to operate need not necessarily be more per car-mile, and still differ materially per passenger carried. It would show that while it cost two roads about the same to operate a car-mile, one road would, with the same expense, carry many more passengers and of course carry them for less per capita.

The object we are all after is passengers, (by "passengers" I mean those who pay their fares), and I believe that there is not a road in the country operating today but could with ease and comfort carry more passengers than it does, with the same expense, if the passengers were only there and wanted to be carried. It might not cost roads similarly situated .002 difference in operating per car-mile yet the difference in the cost per passenger carried could easily be .01.

It costs to operate whether you carry passengers or not, and although we are after fares, we run our cars, filled, partially filled or empty. Everything that enters into operating expense is going on, passengers or no passengers. Therefore if we know what it costs to operate per car-mile we can determine whether or not we operate as economically as others, or otherwise; and we can't tell it by knowing the cost per passenger.

I believe there are roads that carry passengers for one-half the amount it costs other roads, and I as firmly believe it costs some fifty per cent more per car-mile; it depends entirely upon the conditions.

We are more than likely to become confused in the discussion of the question as put for we naturally argue the income side, or receipts. We drift into a statement like this: If a road received four and a fraction cents per passenger and it costs three or even four cents, it is making money, but does it necessarily follow that the expense per car-mile is less than another road that can't make as good a showing as to profits per passenger?

Some roads keep no record of car mileage but do of passengers carried. Such roads are unable to give cost per car-mile but can give it per passenger carried. I could tell whether or not we carried passengers as cheaply as they did but it would not show me that it costs more or less to operate; except per passenger carried, which would not show what I would like to get at, viz.: Can we manufacture, distribute and use power as cheaply as another? Fuel, water, engineers, firemen, motormen, conductors, oil and waste, heat, repairs to power plant and equipment, etc., etc. The costs that go into operating should be classified alike, otherwise comparisons would be of little or no value.

It may cost a road 9 to 11 cents per car-mile and three or four cents per passenger carried, and another road with the same number of cars, etc., it may cost 12 or 13 cents per car-mile and but two or three cents per passenger carried.

I think the first is operating at less cost, although I believe the second is making the more money. I believe such a showing is not only possible but that it is actually a fact.

It costs more to carry a passenger six miles than it does one mile, but it does not necessarily follow that it costs more

to carry 100 passengers six miles than it does 600 passengers one mile provided accommodations are arranged to meet the conditions.

If one road carried as many passengers per car-mile as another the cost per passenger would compare proportionally with cost per car-mile, but the cost of operating continues, and does not differ so much with the increase or decrease of the number of passengers carried as it does with miles run.

Some roads have long runs with few passengers, others short runs with many, the cost per car-mile might and probably would compare proportionately, but the cost per passenger carried might not.

The cost of operating increases with the car-mileage, but not in the same proportion as with the passengers carried, additional car-miles operated increase the cost, while on the same road added number of passengers carried decreases the cost per passenger.

With very little or no additional expense any road could carry more passengers.

With the operating expense at about 9 cents per car-mile, the expense per passenger carried could easily vary 1 cent. A railway could correctly report operating expense at 10 cents per car-mile and 3 cents per passenger carried, while another road similarly situated could as correctly report operating expense 10 cents per car-mile and 2 cents per passenger carried. The same operating expense, but 50 per cent difference per passenger carried. I would conclude that both roads were operated with the same economy, but that one road had better traffic than the other and was making more money, because it had the passengers and not because it was more economical or better managed.

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### TROLLEYS GAINING IN ENGLAND.

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The prejudice against overhead wires is fast melting away in Great Britain, as evidenced by the following from a London daily:

"The long controversy as to the best form of mechanical traction for tramways in our large cities seems to be gradually deciding itself in favor of the overhead electric trolley system. This method has already been adopted in several towns, and the corporation of Glasgow has now resolved to give it a trial, after a year or two of deliberation, since it acquired the local tramways. The Tramways Committee has been authorized to spend about twenty thousand pounds on the establishment of the system on an experimental route, that is, on an isolated section of the lines, about two and one-half miles in length."

There are still some old fossils who are afraid of their shadows, as witness the following extract from an open letter in another London paper of about the same date:

"Amongst the many objections against the introduction of the overhead system is one that I particularly noticed in the working of the said system in the city of Toronto, viz., that as the cars pass along the roads the connecting rod from the top of the car where it joins the overhead wire is continually giving off bright sparks, sufficient to frighten nervous people with the fear of possible danger, and also to startle nervous horses."

Blinders on the "connecting rod," or a pair of blue goggles for the "nervous" writer might solve the difficulty.

## DOES SWEEPING PAY?

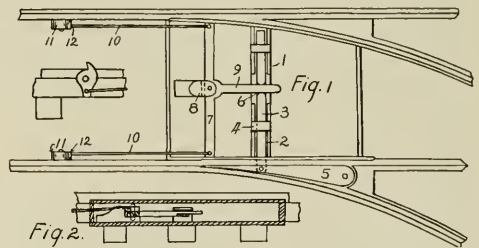
We venture the opinion that if more managers would look carefully into the matter of clean tracks vs. dirty tracks and the cost of sweeping vs. the cost of power, that sweepers would be used more liberally than they are now, or at least more track brushes would be used. Since street railways must be operated in all kinds of streets and since municipal management often decrees that streets must remain dirty for want of street cleaning funds, the only loophole of escape for the manager is to clean his portion of the street himself. The question then arises as to how much sweeping and cleaning is justified by the return therefor in dollars and cents. One concrete example will give some idea of the economy of running a sweeper over tracks once a day, where there is moderately heavy traffic. A double track route 5 miles long, running cars at 5 minute headway, at 8 miles per hour for 10 hours of the day, and cars at 10 minute headway 10 miles per hour for 8 hours of the day will require 15 cars during 10 hours and 6 cars for 8 hours of the day. The total mileage during the 5 minute headway hours is equal to the 15 cars in service multiplied by 8 miles per hour, multiplied by 10 hours or 1,200 car-miles. Adding to this the mileage made by 6 cars running 10 miles an hour for 8 hours or 480 car-miles the total daily mileage will be 1,680. Assume that power costs \$.01 per car-mile with a clean track and the power to run that route costs \$16.80 per day. A dirty track may easily make this 20 per cent more, making the amount to be charged to dirty track \$3.26. To run a sweeper once over that route each day would take the time of two men for about one hour, making cost of labor about 40 cents, and allowing 3 cents per mile for power to run the sweeper, we have 30 cents more, or a cost of \$.70 per day to run the sweeper once over that one route to save \$3.26. This, of course, does not include sweeper maintenance, but neither does the other calculation include car wheel, truck and motor maintenance. The amount saved relative to the cost of sweeping decreases as the traffic gets lighter, but there is a considerable margin of economy in favor of the sweeper, even allowing for a considerable decrease of traffic. Besides this there are track brushes to fall back on in case it does not pay to run a sweeper and in many cases sufficient sweeping can be done by a special attachment to one or two cars.

## MICHIGAN LEGISLATION.

The governor of Michigan has approved the bill passed by the legislature amending in several particulars the act under which street railways are incorporated. Corporations organized under the act may do a suburban express business and may carry farm produce, garden truck, milk, merchandise and other light freight, provided that no cars for the conduct of such business shall be operated on any street railway within the limits of any incorporated city or village between the hours of 8 a. m. and 8 p. m. without the consent of the municipal authorities and under such rules as they may prescribe. The Commissioner of Railroads is given authority to make reasonable regulations for the conduct of this suburban express business. A third section provides that any attempt to wreck a street car whereby a passenger shall be injured shall be punished by imprisonment for a term of not less than 10 years.

## A SWITCH TURNING MECHANISM.

The accompanying cuts illustrate a railway switch and operating devices recently patented by R. C. Hart and R. S. Field. The purpose of the whole design is to dispense with the switch-hook and do away with the delay and uncertainty incident to its use. Beneath the car on opposite sides of the truck frame are two vertically moving bolts which are held in the highest position by springs. Levers rest on the heads of these bolts and press them down when necessary to actuate the mechanism. These levers are connected to a handle on the dash which the motorman turns to the left or right depending upon the direction which the switch is to be turned. Fig. 1 is the plan view of the track, showing also a side track and the switch. Between the rails of the main track is placed a cross-head, 1, with a longitudinal groove, 2, on the upper side. The sliding bar, 3, is held in the groove



by cross-plates, 4, and one end is connected to the switch-tongue, 5. In the middle of the sliding-bar is a transverse groove, 6, the side walls of which are rounded at the corners. A lever, 7, is pivoted at the center, 8, from which an arm, 9, extends through the transverse groove in the bar. At each end of the lever a rod, 10, is connected to it and extends backward along the track a short distance where it is pivoted to a dog, 11, which is joined to the inner side of the track in a suitable manner for it to turn. Fig. 2 shows the cross-head, sliding bar, lever and the parts connected therewith enclosed in a casing. If a car, moving on the main track in the direction of the arrow, is to be switched on the side track the lever on the dash is moved, depressing one of the bolts. This bolt strikes the prong, 12, of the dog on the side of the track opposite the arrow. This actuates the lever and arm which pulls the sliding-bar and this moves the switch in position to run the car on the side track.

## DECISION IN THE BEMIS CASE.

The United States circuit court of appeals, April 21, rendered a decision in the case of the Bemis Car Box Company, against the Boston & Revere Street Railway Company, affirming the interlocutory decree of the circuit court granting an injunction and accounting against the defendant for infringing upon claim 1, of patent No. 239,702, for a car axle box invented by Sumner A. Bemis. The defendant was using a box patented and owned by the J. G. Brill Company, of Philadelphia, and the suit was defended by this last named company. Fish, Richardson & Storrow, of Boston, were attorneys for the complainants. Francis Rawle, of Philadelphia, was counsel for the defendant.



## THE USE OF ALTERNATING CURRENT.

Application to Street Railway Service—Phase Relation—Impedance—Capacity—Self-Induction—Wave Forms—Torque.

## PART I.

It is well demonstrated in practice that for nearly every condition of street railway traffic electricity is the most convenient, the least expensive, and in every way the best adapted as a motive power. Direct currents are almost universally used as a means of transmission. In a few cases they have been used with storage batteries, but with indifferent success. In Europe and on two or three roads in the United States the underground conduit has found favor. But these systems are largely experimental and of small consequence compared with the trolley system. This method of street railway propulsion has been developed with wonderful rapidity, and today most of the material, apparatus, and machinery are nearly of standard form, differing only in minor details of design and construction. The continuous current system, with a voltage of 500, was found to be best suited to the general needs of street railway traffic. There is little probability that this system will be replaced by another in our cities, for it is well adapted to the work required, and the machinery is so perfected that it is simple, efficient and durable.

As long as street railway lines are confined to the principal streets of a city their length will not be such as to present troublesome problems in transmission. A voltage of 500 or 550 is sufficiently high, with good bonding, line connection and track return, to insure but moderate loss from fall of potential with moderate investment. The network of intersecting lines, with a well designed feeder system, will keep the copper resistance at a small figure.

When the suburban roads began to stretch out into miles the cost of copper for lines and feeders reached such a sum that it balanced the cost of additional power houses. The losses from transmission were enormous. Cases in actual practice might be cited where the potential at the power house would be boosted to 750 to maintain a voltage of 400 at the terminals of some of the long lines. This drop of 45 per cent means not only a great loss in the operation of the power station, but a great initial investment in station machinery and copper for the conductors. Boosters have come into extensive use on such lines, but they are inefficient and are only employed for the want of something better.

Within the last year engineers have had even more difficult conditions to overcome, as interurban railways have been planned to run longer distances than heretofore, from one city to another. Nearly every city in the United States, whose population is sufficiently large to justify the possibility of even a prospective profit, has electric traction. Railway men appreciate that this field is well nigh exhausted, but the opportunities for building profitable roads between cities and towns not widely separated are very numerous, and the work is going on in nearly every part of the country. The distances are from 10 to 100 miles, and the question of transmission is now of paramount importance. One station, even though centrally located, is quite inadequate. The copper expense to keep a voltage even approximately 500 soon surpasses the cost of power house, machinery and all else. This is readily appreciated when it is remembered that the amount of copper required

varies inversely as the square of the voltage. It resolves itself into this; cost of copper in transmission lines balanced against the initial cost and cost of operation of one or more stations or sub-stations. Some engineers maintain that the length of our interurban lines has not yet reached a point where two power houses, centrally located, cannot supply a direct current of 500 volts with greater economy than any other system. The inertia of practice has much to do with this view, and also the fact that standard machinery, material and apparatus can easily and cheaply be procured. Experience has taught street railway men how to deal with all the peculiarities of such apparatus, and improvements have been constantly made until direct current machinery can be worked with high economy, little expense for repairs and with great reliability. Direct currents cannot be used in railway motors at very high voltage. They are quite difficult to transform, for it can only be accomplished by rotary machines. Moving parts, with the accompanying difficulties of insulation, will not permit the use of high voltages. These characteristics of direct currents have turned the attention of railway engineers to alternating currents for transmission. Perhaps the development of some large water powers, where alternate current machinery was of necessity installed, has much to do with this consideration. The electric roads in Buffalo and in the vicinity of Niagara Falls, those in Salt Lake City, the Dublin-Dalkey Tramways Company, and a number of other lines, have had to deal with alternate current transmission. The Twin City Rapid Transit Company, of Minneapolis, and the Port Huron & Detroit Company will soon make use of high voltage transmission. But one system has as yet been put in practice, and that is the generation of alternate currents at the central station and the use of step-down transformers with rotary converters. This is suited for suburban or interurban lines where direct apparatus is already in service in one or more of the cities or towns connected, as it permits the use of alternate currents at high voltages for transmission and the use of the same direct current motors on the cars.

The advantages of alternate currents resolve into this one thing, to-wit: The facility with which the voltages can be changed and adjusted. On the generators and motors the absence of commutators is a great merit. As an offset to this there are phenomena in the working of alternating currents, such as capacity, self-induction, reactance and resonance,

which render its advantages less, yet these very characteristics are made use of in its regulation. These properties are not so well understood by electrical engineers, especially street railway men, as are those of direct currents, so that there is considerable hesitation about using alternating current machinery. The theoretical consideration of alternating currents is so abstruse that practical men neither have the time nor the patience to give to it, yet the actual operation of alternating current machinery is quite as simple as direct current apparatus. An armature winding in passing through a magnetic field induces an alternating current, and this is only available as a direct current through the medium of a commutator. The flow of an alternating current is illustrated by Fig. 1. When the winding is cut

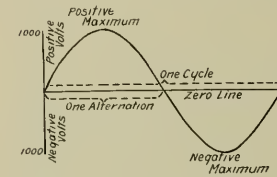


FIG. 1.

ting no magnetic lines of force no current flows, but as it revolves into a stronger magnetic field and the rate of cutting lines increases, the electromotive force rises in direct proportion, and this may be represented by a sine curve as shown. The electromotive force rises to a maximum, dies away to zero, and is immediately followed by a reversed electromotive force, or for one half-period the current flows in one direction and then in the other. Such a complete set of operations is called a period, or the number of them in a second, is known as the frequency or the periodicity of the current. In Fig. 1 the curve is shown for an alternator generating a current at a maximum difference of 2,000 volts. The length of the line for one cycle would represent .04 of a second if the frequency is 25. If the machine has two poles there would be one cycle completed each revolution of the armature, but if it has four poles there would be two complete cycles. The frequency is equal to the speed per second times the pairs of poles.

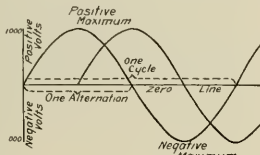


FIG. 2.

In the single phase system the windings are all in series, but if the armature be divided into two sections and the leads be brought out to four collector rings another set of curves will result, as shown in Fig. 2. The combination of two simple alternating currents forms a two phase current and in practice one of these two waves is one-fourth of a cycle, or 90°, behind the other, coming to a maximum as the other wave passes through zero.

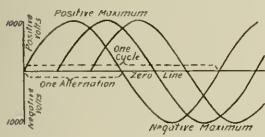


FIG. 3.

The curves of Fig. 3 represent the waves of electromotive force of a three phase machine, or as the current would come from an armature winding tapped at three equidistant points. Instead of six wires to lead out these three currents, each pair of wires can be so connected with the other two that only three are necessary. By special design almost any number of waves can be secured, but for actual work, the three phase system has all the advantages that could be derived from those having four or more alternating currents and with these the wires become more numerous and complicated. Alternating currents, having two or more waves of electromotive force are called multi-phase or polyphase currents.

In conducting an alternating current a circuit has apparently more resistance than normal with a direct current and this is due to self-induction or to capacity. The self-induction acts as an extra resistance to choke the flow of current. It is due to the magnetic lines threaded through the circuit itself by the current flowing in it. In a simple circuit the number of lines will be proportional to the area enclosed but for a loop of many turns the co-efficient of self-induction is proportional to the square of the number of lines. So

E  
that instead of Ohm's law for current,  $C = \frac{E}{R}$ , the equation  
E  
becomes  $C = \frac{E}{\sqrt{R^2 + L^2 W^2}}$ , where C is the current, R is the

resistance of the circuit, L is the co-efficient of self-induction and w is equal to 2 π times the frequency. This is called the impedance of the circuit. Another peculiarity of the alternating currents in a conductor is the "skin effect" which tends to make the density of the current much greater at the surface and this only makes a part of the cross section of the conductor fully available for conducting the currents. The frequency of the current has much to do with the self-induction, but this can be easily regulated if the current is to be used exclusively for street railway or power purposes. A low frequency is very desirable, not only for diminishing the effect of self-induction, but also on account of the better mechanical design of the generators—fewer poles being used and the generator can be run at lower speed. The effect of impedance, including the size of conductors and the spacing of the same, may be noted by the table which is for a frequency of 40. The figures are the co-efficients by which the ohmic resistance is multiplied to give the correct impedance or resistance of the circuit. In the first column is the size of wire, Brown & Sharp gage, and in the other columns the value for lines conducting the current and separated by the number of inches or feet given at the top of the column.

B. & S.	3 in.	12 in.	100 ft.	1,000 ft.
0000	1.38	1.73	3.13	3.87
000	1.27	1.53	2.59	3.10
00	1.17	1.34	2.13	2.50
0	1.12	1.25	1.83	2.17
1	1.09	1.18	1.58	1.83

The table plainly shows that wires of small diameter should be used and several of them rather than one large conductor, also that the wires should be placed as close together as is consistent with safety. As these factors increase with the frequency this should be as low as the design of the machines permits.

Capacity in a circuit means that some part of the circuit is so shaped that it stores up energy in the form of electrostatic stress when there is a certain impressed electromotive force and as soon as this electromotive force dies away the energy returns to the circuit as so much current. This electrostatic capacity is analogous to a reservoir connected to a gas main and, when a certain pressure is on the pipe will force a certain amount of gas into the reservoir. The quantity of gas in the reservoir will depend on the pressure applied and if this pressure be diminished the gas in the reservoir will return to the mains. This same effect can be produced in an alternating current circuit by introducing a condenser. A condenser is formed by two plates, A, A, of some conducting material and separated by an insulator, B. These plates are connected to the circuit from the generator as shown in Fig. 4. When the voltage is changing, as in Fig. 5, the condenser is receiving its greatest electrostatic charge and this sets up stresses in insulator, B. This energy is returned to the circuit as so much current, depending on the capacity of the condenser which is proportional to the area of the plates. In practice many plates are joined together, thus giving the area of a very

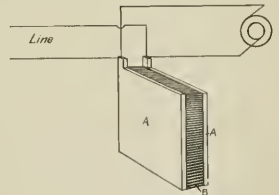


FIG. 4.

large plate. The effect of the condenser is to give a lead to the current curve over the curve of electro-motive force.

The self-induction causes the current to lag behind the electromotive force and decreases the amount of energy transmitted, increases the armature reaction and causes a drop in voltage in the line. In a long transmission the inductance of the line represents a large per cent of the total and the rest is made up of the inductance of

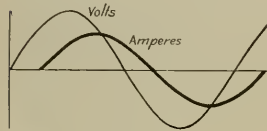


FIG. 5.

the generator, the transformers and the receiving apparatus. Fig. 5 indicates the lag of current behind the electromotive force, this being due to self-induction. Capacity has the opposite effect and acts to accelerate the phase and produces a lead instead of a lag in the current. When the self-induction and capacity exactly balance the circuit is non-inductive and simply obeys Ohm's law. However, for a given frequency, resistance and self-induction, there is one particular value of capacity which would enormously increase the current and voltage as by a sort of resonance. A condenser or a synchronous motor in the circuit will give the capacity effect.

One other feature in which an alternating current differs from a direct current is that the measuring instruments do not give the average value of the voltage or current but the square root of the mean squares of the values, that is, .707 of the maximum values. If the voltage oscillates between + 100 and - 100 the reading would be 70.7 volts. This is due to the fact that the electromotive force and the output of current follow a sine curve. The exact shape of the curve depends upon the design of the machine but for the smooth running of the generators, motors and the line, the simple sine curve is the best. As far as the transformers go the "saw tooth" indicates a condition where the loss from hysteresis is the least. Fig. 6 represents a curve of electromotive force from the Niagara generators, the dotted line being a sine curve.

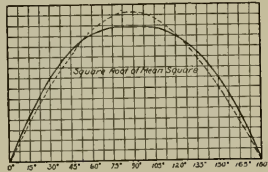


FIG. 6.

When the torque of a motor is mentioned it means the turning force acting on the armature to cause it to rotate and is equal to the radius of the armature multiplied by the pull of the magnetic lines on the circumference. It is usually expressed as the pounds pull at the end of an arm one foot in length. The torque, expressed in foot-pounds is C N M

—————where C equals the current flowing in the armature,  $8.52 \times 10^6$

M equals the number of armature conductors, M the magnetic flux or the number of magnetic lines and the constant in the denominator reduces the C. G. S. units to foot-pounds. It is essential in the design of machines for street railway or power service that the armature reaction be as small as possible, that is the drop in potential from no load to full load. The induction motors constitute an inductive load which causes a large drop in voltage and the current to

lag behind the electromotive force. This lagging of the current renders a portion of the power of the circuit unavailable and instead of the power being the product of the volts by amperes, it is only the watts times the cosine of the angle of lag. This ratio is called the power factor and must be considered whenever the amount of power to be generated or consumed is calculated. One effect of this is that the dynamo and the line must be of greater capacity than the summation of the motor capacities, inversely as the ratio of the power factor. This power factor is an element in the actual efficiency of the system and in comparing the operation of an alternating current with a direct current motor, the efficiency of the alternating current should be multiplied by the power factor. Fig. 7 shows the efficiency and power factor of a 50-h. p. induction motor.

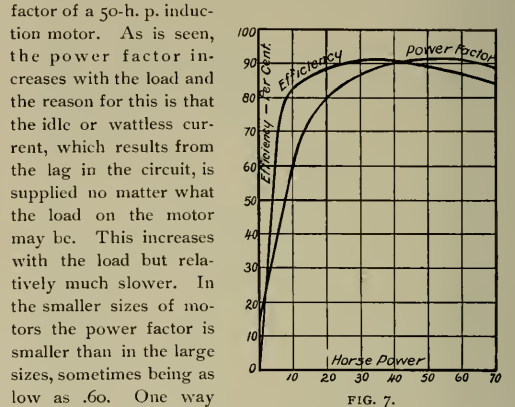


FIG. 7.

As is seen, the power factor increases with the load and the reason for this is that the idle or wattless current, which results from the lag in the circuit, is supplied no matter what the load on the motor may be. This increases with the load but relatively much slower. In the smaller sizes of motors the power factor is smaller than in the large sizes, sometimes being as low as .60. One way which has been successfully practiced to raise the power factor is to introduce condensers in the circuit, thus giving a capacity which neutralizes the self-induction which is the cause of a low power factor. On a long transmission line the self-induction can be avoided by transposing the position of the wires at intervals.

STANDARD AIR BRAKE CATALOG.

The latest catalog of the Standard Air-Brake Company, 100 Broadway, New York City, is dated the current month and known as No. 6. A comparison of this with former catalogs will show how rapid has been the introduction of air-brakes and that portion containing illustrations of specimen cars demonstrates that the air-brake is a permanent thing on street railways as well as on the steam roads. The application of these brakes abroad has been quite extensive, the stringent regulations of the authorities made with a view to insuring the greatest safety of the passenger making their use a matter of necessity. Numerous illustrations are given which show the different types of compressors, axle driven and motor driven, the controlling apparatus, the brake cylinders and the mode of applying the system to both motor and trail cars. Special sizes are built to meet unusual requirements. The company will be very glad to furnish bona fide inquirers with catalogs on application and also to give those details of construction which it deemed best for its own interests to omit from the catalog.

The pamphlet gives evidence of that careful preparation and painstaking detail which characterizes all the printed matter prepared and issued by General Manager Wessels.



EARLY SUMMER CARS.

The original street or tram car for passengers was designed and built by John Stephenson in 1831 for use on the New York & Harlaem road which was opened for traffic in the following year. This car had a body constructed on



FIG. 1—THE STREET CAR 1857.

the lines of the stage coaches of the time; there were three separate passenger compartments entered from the side, and a seat on the roof for the "coachman." This type was soon modified in many ways and the horse car with a single compartment entered by means of platforms at the ends

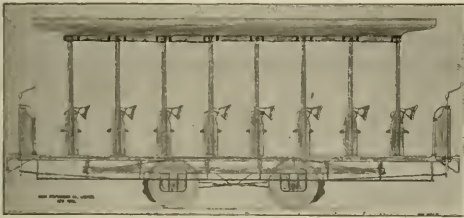


FIG. 2—FIRST OPEN CAR, 1859

developed. The early open cars which served to make the journey of the summer patron of the street car more tolerable did not appear until nearly 30 years later, the first one being built in 1859 by the Stephenson Company for the Broadway Railroad Company of Williamsburg, (now Brooklyn), Long Island.

With electric traction the open car became an important



FIG. 3—EARLY BROWNELL CAR.

institution and now the trolley party is a recognized social function. To the suburban and interurban lines of smaller

cities and even in some of the larger ones the purely pleasure riding is an important source of revenue and as the season of the open car approaches it may be of interest to glance at a few of the early cars and see wherein we are better off than we were in this respect.

Fig. 1 is from a photograph of a closed car built by the John Stephenson Company in 1857, and serves to show from what the open car was evolved. Fig. 2 shows a side view of the first open car; the seats and backs were upholstered

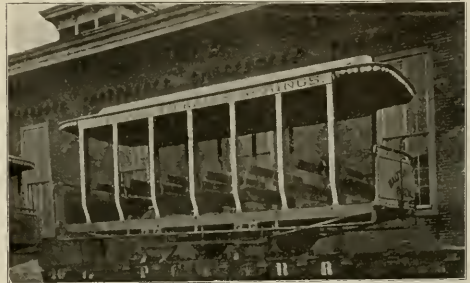


FIG. 4—FIRST BRILL OPEN CAR, 1870.

with red enameled cloth stuffed with hair, and the curtains were of red enameled cloth.

The first open cars used in St. Louis were most probably those on the St. Louis Railroad and built by that company in 1866 or 1867. Fig. 3 is from a photograph lent us by the Brownell Car Company and shows the first open car built by it; this car was built in 1868 for the Fair Grounds Railroad of St. Louis, a short line connecting with

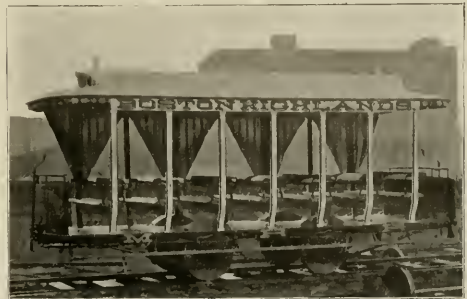


FIG. 5—BRILL CAR, 1871.

the Bellefontaine line. This was a short bob-tailed car capable of seating perhaps 16 or 18 persons on the two longitudinal seats. In appearance it very much resembles the early closed car shown in Fig. 1 with a part of the side panels and the window sashes removed.

The first open car built by the J. G. Brill Company is shown in Fig. 4. It was built in 1870, the side posts running down to the sills without panels. Fig. 5 is a car built the following year for use in South Boston and differs but slightly from that shown in Fig. 4; curtains are provided at the sides as well as at the ends. In cars built in 1872 seat end panels were added and the open cars lost a little of their skeleton appearance.

In all the older types the curtains, when any were provided, were either rolled up by hand or as in the case with the duck curtains, merely lifted up and buttoned in place. The first open street car to have spring roller curtains was built by the Stephenson Company in 1883 and is shown in Fig. 7. While this car was a considerable improvement over those of 15 and 20 years previous the contrast is not so marked as between this and the modern open car.

There is little wonder at the absence of anything like pleasure riding up to the time of the first open cars. The

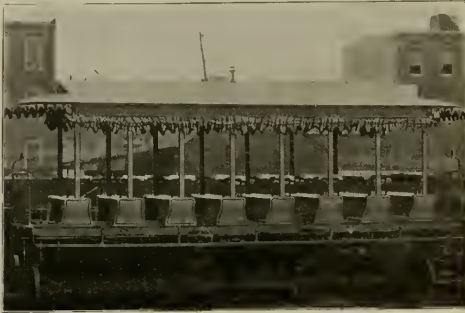


FIG. 6—BRILL CAR, 1872.

little box cars with dim oil light at two corners, and the tedious motion imparted by one or two horses or mules, were not especially inviting. There were no regulations in those days limiting the speed at which a car might travel, for none were necessary or even thought of. The routes were from one-half to one-fifth as long as now, and population in those early days had not congested to the exclusion of light and air and comfort.

With the open car came new possibilities in the line of increased regular, and after a time a created pleasure riding, which assumed very large proportions on hot summer even-



FIG. 7—STEPHENSON CAR, 1883.

ings on such roads as had cable or other mechanical power. The first year the cable was in operation here in Chicago the evening travel on warm nights taxed the car equipment to its utmost capacity, and often lasted until after midnight. People boarded an open car early in the evening and remained in the same seat for several hours. Frequently a car would double back on the return half trip with the same load it carried out. This was in the early 80's. When electricity came into use as a motive power the range of pleas-

ure riding was enormously enlarged, and as a feature of it "trolley parties," which in many cities constitute a large business. But with electricity came also the trouble of changing the car bodies or maintaining a double equipment of trucks and motors, and this has led some roads to adopt a style of box car with large windows, which when let down or removed approaches the open car in freedom of sight and air. Whether in time the open car will drop out of use is a question on which many excellent managers differ, but the probability is open cars will continue in demand and therefore in use.

## ARGUMENT OF THE INDIANAPOLIS 3-CENT FARE CASE.

The manner in which a test case was brought before the Indiana Supreme Court that a state decision as to the validity of the law might be had without putting all parties in contempt of the Federal Court was described in the REVIEW for May. The case was argued on May 19, and a decision is expected in June.

The title of the case is City of Indianapolis vs. John N. Navin; the city attorney appears for the city and argues against the constitutionality of the new 3-cent law and the attorney general appears in behalf of the defendant and speaks in favor of the law. The Citizens Street Railway Company, the party most interested, refused to recognize the proceedings and was not represented by counsel; one of its stenographers was present however and made note of the arguments.

The arguments presented were of very different types and to an unprejudiced reader the manner in which the contentions were presented to the court cannot but appear indicative of the relative righteousness of the claims. That of the city attorney, Mr. Curtis, albeit he was like a cat in a strange garret, having heretofore opposed the interests of the Citizens Company, was a masterly argument against impairing the obligations of a contract by any subterfuge, of so-called general legislation which is both local and special, and was dignified in tone and convincing. That of the Attorney General Ketcham, on the contrary, was more like a populist oration. Among other things he said, "Like the ostrich of old, they (the Citizens Company) are not here. Their heads are in the sand."

## TRACK RENTALS IN DUBLIN.

The negotiations for some time pending between the city of Dublin and the Tramway Company have finally resulted in an agreement which is to the American mind rather more favorable to the city than to the company. The latter has agreed to pay a franchise rental of £500 per annum per street mile of track, with a minimum rental of £10,000; and further the company will maintain the wood paving where it has been laid down by it and will pave with wood all the streets in front of the hospitals in the city near which the company's lines are placed. The city on its part agrees to forego all its rights to purchase the railway for a period of 40 years.

Governor Griggs of New Jersey has signed the Scovel bill requiring trolley cars to be vestibuled in winter.

## STREET RAILWAY LAW.

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

*Vehicle on Electric Car Tracks.*

In the case of a trolley car overtaking another vehicle directly in a line with its progress, and a possible obstacle in its way, a proper regard for the rights of others requires that the car be reduced to such control that it may be brought to a standstill if necessary, before reaching the obstructing vehicle.

It is the duty of others not to obstruct the track, but a violation of such duty does not necessarily constitute negligence as will relieve the trolley company from responsibility for an accident which might have been avoided by the exercise of proper care.

The opinion of the Court is in part, as follows:

The errors upon which counsel for the defendant seem chiefly to rely are first, that stated in the twenty-second assignment, which objected to the charge of the judge that if the truck was visible upon the track from a distance of 500 or 600 feet, being subjected to the risk of danger, it was the duty of the motorman to use all means in his power to bring the car to a standstill. But this statement must be considered in connection with the subsequent application of the law, that "if it appears as a result of the evidence in this case that, immediately upon discovering the wagon or truck of the plaintiff approaching the tracks, the motorman in charge of the car did apply his brakes and did make every effort to prevent a collision, then the company is without fault." There was nothing in the above statements to mislead the minds of the jury. It was simply that at whatever distance from the truck, whether 600 or 60 feet, if the truck was visibly subjected to risk of injury by further advance, it was the duty of the motorman to make every effort to stop his car. Many elements must be considered to determine the risk, as for instance, the speed of the car, the condition of the tracks, the efficiency of the brakes, of the reverse upon the car. It would be a strained construction of such a phrase to understand that whenever, and under any circumstances, a car approached within 600 feet of a wagon on the track it must immediately come to a standstill. By the language used, the jury were substantially instructed that the true rule in regard to trolley cars, as in regard to all other vehicles, should be applied; that when overtaking another vehicle directly in the line of their progress, and a possible obstacle in the way, a proper regard for the rights of others requires that the car be reduced to such a control that it may be immediately brought to a standstill, if necessary. In the case of *Hicks v. Railroad Co.*, 124 Mo. 115, 27 S. W. 542, cited by defendant's counsel as deciding the above rule to be too broad, the car was slowly and carefully following behind a buggy upon the track; and the court said there was no danger of collision in moving the train slowly and cautiously, and not negligently near the buggy. In the case before us the car rushed along without diminished speed, so far as the evidence shows, until within a few feet of the truck, and did not approach it slowly and cautiously with a view to avoiding a possible collision, as was its duty in the exercise of reasonable care. The rights of a street railway company in a public highway, and its obligations, modified by its limitations to the use of a fixed line of track are the same as those of the driver of any other vehicle and both of them, in approaching near to, or attempting to pass the other directly in its path, are required, in the exercise of reasonable care, to keep themselves so far as consistent with a legitimate use of the street, under such control as will

enable them, without willful negligence on the part of others, to avoid collision and damage.

Another of the numerous assignments of error claimed that the trial judge was in error when charging the jury that it was the duty of the defendant corporation to give timely warning—timely signals indicating the approach of its car—so that the persons who were using that portion of the highway covered by the tracks might have timely warning to enable them to avoid danger from the approaching cars. This statement of the law is in accord with the rule laid down in the case of *Traction Company v. Chenoweth* (decided by this court in its term of June last.) It is the only rule consistent with the general principle to be applied to all vehicles traveling upon the public highway. The street trolley has no special right of way accorded to it by law, and the duty imposed upon other vehicles is equally imposed upon it. No vehicle can, without reasonable notice of its approach (what is reasonable notice is a question for the jury), violently run into, force from its way, another having a legitimate right upon the street, without becoming responsible for any damage that may result. In this connection the additional assignment of error may be considered, namely, that the judge refused to charge that, if the motorman gave timely notice, he had a right to assume that the driver of the truck would turn out on time, and it was only when it became apparent to him the latter did not intend to do so, that it became his duty to check the speed of the car. To maintain such doctrine would be to hold that, if audible and sufficient notice was given by a car, it rested solely in the discretion of the motorman to determine when he should begin to exercise care to avoid a collision, and the whole question would be taken out of the domain of issue to be decided by the jury, as to whether or not reasonable care had been exercised, which is the true rule of law, and test of responsibility.

The alleged error in refusing to charge that it was the duty of the driver to look behind from time to time, as well as to listen, so that, if the car is near, he may turn off and allow it to pass without undue slackening of ordinary speed, involves the assumption of many premises and circumstances, the non-existence of which would make the application of such rule illegal and inequitable. In the case of *Traction Company vs. Scott* (N. J. Err. and App.; June 15, 1896) 34th Atl. 1094, it was held that the rule requiring one to look and listen before crossing a steam railway, in order to be in the exercise of ordinary care, does not apply with equal force to one crossing the track of a street railway in a city street, where the company and the public stand upon an equal footing in the use of the highway, and that failure to do so was not necessarily, under all circumstances, negligence, per se.

The second, third, fourth, fifth, sixth, eighteenth and nineteenth assignments are based upon the refusal of the trial judge to charge the jury as requested upon the duty of the plaintiff below to yield the right of way to the defendant. It has already been decided in this court in the case of *Railway Company v. Preston*, 35 Atl. 1119, that it is the duty of the drivers of other vehicles, not to obstruct the trolley company, but at the same time it was held that neglect to fulfill this duty did not necessarily relieve the con-



pany from responsibility for injury caused by the want of care on their part. The offending driver may be punished by action at law, and the obstruction removed by police interference; but the illegal act of the injured party does not always absolve the company from its duty so to act as, if possible, to avoid collision and harm to others. The trial judge covered the points contained in the several requests, upon which the above assignments of error are based, by instructing the jury that other vehicles are subject to a duty to yield to the rights of the company in the use of their tracks, when they have occasion to use them, and under a duty to make no unnecessary obstruction to the passage of cars of the company." The charge of the trial judge stated the law correctly and sufficiently, and the judgment under review should be affirmed.

(Court of Errors and Appeals of New Jersey. Consolidated Traction Company vs. Haight 37 Atlantic Reporter 135).

[NOTE.—Where a wagon traveling in the same direction as the car was first seen by the motorman, going at a speed of seven miles an hour, when ten feet away and the driver was injured, the judgment was affirmed. Appellate Court of Illinois, Calumet Electric Street Railway Company vs. Christensen, 29 Chicago Legal News 319.—ED.]

*Street Railways May be Subject to Inter-State Commerce Act—Road Partly in District of Columbia and Partly in Maryland—Rates of Fare.*

1. The defendant, operating a line of electric railway lying partly in the District of Columbia and partly in the state of Maryland, is subject to the provisions of the act to regulate commerce, although it appears to be constructed upon or along public highways, and is essentially a street surface road for the conveyance of urban and suburban passengers. Yeomans and Prouty, commissioners, dissenting.

2. All internal commerce is either state or interstate. Commerce carried on between the state of Maryland and the District of Columbia is not subject to regulation by Maryland laws, and is therefore within the jurisdiction of Congress.

3. The defendant railway company and a land company owning land and a suburban hotel along the line of railway are distinct corporations, but under substantially the same ownership and control. The land company purchased passenger tickets of the railway company at full rates of fare, and sold them at half rates to guests of its hotel, to persons residing upon land which it had sold or otherwise transferred, and to others, but refused to sell such tickets at half rates to complainant, who, though living in the same locality, resided upon ground not acquired from the land company. *Held*, upon the evidence presented, that no discrimination was practiced by the railway company; that the community of interest between the two corporations resulting from common ownership was not made a device for enabling the railway company to evade its legal obligations; and that the action of the land company in discriminating between persons in the sale of tickets for the benefit of its separate business, is not subject to correction by this commission. Morrison and Clements, commissioners, dissenting.

4. Defendant charged one fare of five cents for the ride in Maryland, and another for the ride in the District of Columbia, selling, however, six tickets for twenty-five cents, good for passage in either the District or State, making a through fare of ten cents, or two such tickets for a continuous ride between Maryland and the District, the total length

of its road being about 7½ miles. *Held*, that unreasonableness can not be presumed from the amount of fare so charged, and the other facts incidentally appearing, no direct evidence upon that question having been presented.

(Interstate Commerce Commission, Willson v. Rock Creek Railway Co. of the District of Columbia, 29 Chicago Legal News 263.)

*Collision of Carriage with Cable Car—Contributory Negligence.*

It is only because the appellant is a railroad that it can be pretended that the collision was without contributory negligence on her part, which bars a recovery: L. S. & M. S. Ry. v. Hessions, 150 Ill. 546; N. C. S. R. R. v. Eldridge, 151 Ill. 542.

She [plaintiff] testified that when she saw the car had slackened up, she started the ponies and began to cross; she was watching the horses and did not look at the car, paid no attention as to how it was coming, at what rate of speed it was coming or how near it had arrived.

Her cousin, a young man who was riding with her, testified that when the horses' heads were north of the north track, he looked both ways to see what was going on and told his cousin to drive ahead. "I thought we could make it because I saw the car slacken up, and I told the young lady to drive across; I knew this was a new team and was afraid of them, as I thought they might get scared at the car, but they did not.

I told her to go across because I thought there was sufficient time to get across."

The distance each had to travel demonstrates that the car must have started before the phaeton. The occupants of the phaeton could see the movements of the car because it was lighted, while the phaeton could be but dimly seen in the obscurity.

The judgment is reversed and the cause is not remanded. (Appellate Court of Illinois, West Chicago Street Railway Co. v. Boecker, 29 Chicago Legal News 287.)

*Notice to Conductor of Intention to Alight—Actions of Passenger.*

The jury had the right, as they probably did, to find from the evidence that one of the conductors or gripman or both had notice from the conduct of the appellee in their immediate presence and sight, that he wished to alight from the grip car as soon as it came to a stop, which the would-be passenger had signaled it to make; and if they, either of them, did have such notice, it was as good as if given by the express warning or notification of appellee.

(Appellate Court of Illinois, West Chicago Street Railway Co. v. Stiver, 29 Chicago Legal News 279.)

An electric line between Detroit and Pontiac having become almost a certainty, the Detroit, Grand Haven & Milwaukee Railroad has reduced its rates to meet the expected competition. The rate to Pontiac is now 25 cents.

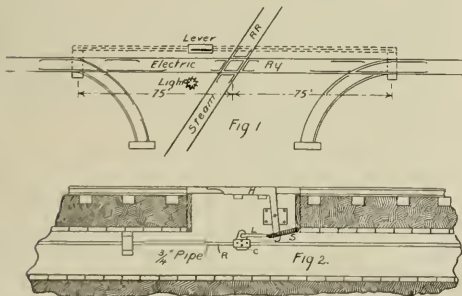
The Atlantic Highlands, Red Bank & Long Branch Electric Railway is engaged in a controversy with the township authorities at Eatontown, N. J., and in retaliation for restrictive legislation has raised the rates for school children from half to full fare. Fifty men in the employ of the company are preparing to move out of the township.

**SAFETY DEVICES IN DENVER.**

While the question of how to make a grade crossing absolutely safe has never been solved in an entirely satisfactory manner, there have been many devices introduced which greatly reduce the danger of accidents at such crossings. We illustrate one which has been in use on the lines of the Denver Consolidated Tramway Company and has proved to be very economical and has given satisfaction.

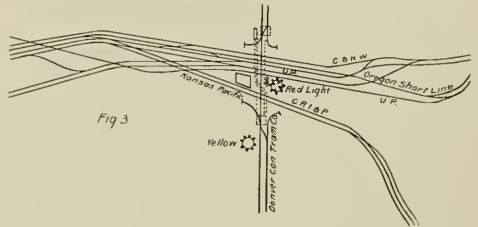
Fig. 1 shows the layout at the crossing. There are two blind curves, one on either side of the railroad track, the entrance to the curves being about 75 ft. from the crossing. The switch points are always set so as to throw the cars into the curve, making it impossible for the car to reach the crossing unless it be stopped at the switch and the setting of the latter changed. The car having come to a stop, the conductor must walk forward to the hand lever and throw the switch. The hand lever is placed on or near the crossing where the conductor has an unobstructed view of all the various tracks. The lever operating the switches has sufficient motion to permit the conductor to stand upright while the car is passing.

The hand lever, H, is bent at an angle of 100° as shown in Fig. 2. It connects, by means of the rod L, which is about 2 ft. long, with a casting, C, clamped to a rod, R, made of 3/4-in. pipe. A motion of the end of the hand lever of 3 ft. will move the rod R 8-in. A coil spring, S, attached to the lever L, pulls the apparatus back to the original position when H is released. The rod R, is carried to the switch points in a plank conduit 1 ft. square and at each end is connected to one arm of a bell crank with arms 8 in. long and at right angles. The long connecting rod is supported in bearings spaced 16 ft. apart. The bell crank at each switch is connected to a cross rod which in turn is connected to a slide holding the loose ends of two 36-in. flat springs, which control the motion of the switch point. These springs are held in place at the opposite ends by studs screwed into the switch casting, and rest against



against the switch point and the wheel flange presses the tongue aside, the spring yielding and returning to place after the car has passed.

These switches were designed by Frederick Simmons, foreman of the company's construction shop. They have been in continuous use for over four years and no repairs have been required; they are easy to operate and require no attention except an occasional oiling of the pivot at the switch tongue. The same safety could be secured by the use of a much cheaper derailing device but it is considered that, when the damage to the cars and the loss of time is taken into



account, this apparatus is the more economical. It is apparent that a similar arrangement could be devised for use at draw bridges, and one that could be worked automatically by the opening and closing of the bridge.

This company has also installed at all its grade crossings a large red signal light consisting of 10 or 12 incandescent lamps. These are burned all the time from dark until the last car is withdrawn and serve to warn the crews that the locality is a dangerous one. These lights are also placed at sharp curves. The West End Company also makes use of similar groups of lamps, but of a yellow color instead of red.

Fig. 3 shows the layout of a very bad grade crossing in Denver, which is protected by the arrangements above described. At this crossing there are 78 passenger trains per day and 64 on Sundays.

**MUNICIPAL OWNERSHIP IN MILAN.**

The street car system of Milan, Italy, which was formerly owned and operated by a private company, was on January 1 purchased by the municipality, which however will not work the lines. There are at the present time 42 miles of single track and the tramway lines in 1896 carried something in excess of 35,000,000 paying passengers. The fare is two cents from the center of the city to the suburbs and a half rate to workmen for one hour each morning and each evening is contemplated. Under the new regime the motive power is to be electricity; one line is already so operated and the work of equipping the others is being pushed as rapidly as possible. The lines are to be operated on the overhead trolley system; the Edison Company is to provide the motive power and all appertaining thereto, the cars and the working force at its own expense, while the municipality will furnish the lines and keep them in repair. The city takes charge of the receipts which are divided on a rather peculiar basis: The company is to receive first 7.60 cents per car-mile for motor cars and 3.88 cents per car-mile for trail cars. The city receives \$873 per mile of single track

the end of a second slide that runs through a cored hole which receives the center pin of the switch tongue.

One of the springs only is in contact with the switch point, and the motion of the hand lever moves the switch point by reversing the position of the bell crank and permitting the other spring to come into play. The one hand lever moves the two switches and as the conductor boards the car as it passes him the switch points have returned to their ordinary positions by the time that the car reaches the farther one, but at this latter the motion of the car is not

per annum. The remainder is then divided between the municipality and the company in the ratio of three to two. It is calculated that the net revenue received by the city under this arrangement will be \$150,000.

Under this novel arrangement, which it may be noted is entirely local, it is quite probable that there will be no disputes between the city and the company when the former wishes the system extended by building lines in new territory where the traffic does not justify the expenditure which question has been the cause of so much strife in European cities.

FENDERS AT WASHINGTON.

Through the courtesy of G. B. Coleman, general manager of the Metropolitan Railroad Co., of Washington, D. C., we are enabled to show the fenders and wheel guards adopted by that road. They have been adopted as a matter of economy as well as of safety and are very satisfactory in operation.

The fender is attached to the underside of the car platform and supported in bearings so that it can be dropped to



FENDER AND WHEEL GUARD, WASHINGTON, D. C.

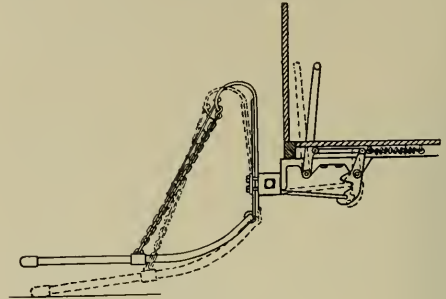
to the road bed when occasion requires. In its normal position it is carried about 6 in. above the rail and when used is dropped to the rail so that a person when prostrate on the rail can be picked up. In its normal position a person standing would be tripped up but is protected from the dash board and bumper by a galvanized fabric suspended from springs and running to the basket of the fender.

It is operated by a knee lever which is directly in front of the motorman, entirely out of his way while running his car, but is always ready for action. This lever is in the form of a T and a quick movement of the knee will always find it. It can be shifted from one end of the car to the other so as to be entirely out of the way of the conductor or passengers getting on or off the car.

The fender can be folded against the dash or transferred from one end to the other. To guard against its being caught in the paving or in a switch, it is supplied with egg-shaped rollers which will prevent it from catching. The fender is not in any way attached to the dash board thus it

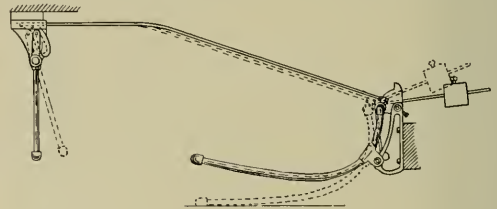
causes no stress on it. On cars having considerable oscillation it is supplied with a non-oscillating rod connected to the truck frame, which reduces the oscillation to a minimum.

The photographic view shows the general appearance and



FENDER.

the line drawing illustrates the mechanism. The wheel guard shown on the same car is counterbalanced so as to be held normally about 6 in. above the rail and is entirely automatic. A gate or tripper is suspended from the underside of the car platform and is connected to the guard by rods. The moment an object strikes this gate it starts the



WHEEL GUARD.

guard to the rail and at the same time an automatic lock follows the guard and it is locked to the road bed. The guard is attached to the pilot board or truck frame thus preventing any oscillation. The movement of the guard is positive and does not depend upon gravity. To reset the guard when down it is only necessary to release the lock and the counterbalance brings the guard to its normal position.

COST OF TRACK IN KANSAS CITY.

The following is an itemized estimate of the cost of construction of the track recently laid by the Metropolitan Street Railway Company of Kansas City, Mo., (described in the REVIEW for March, page 140).

COST PER MILE OF SINGLE TRACK.

Rails 161 tons at \$35.....	\$ 5,635.00
Joints 174 (cast weld) at \$4.....	696.00
Cost of excavating at \$1 per yard.....	3,000.00
Track laying, lifting and lining 15 cents per lineal foot.....	1,581.00
Cost of oak blocks, tie rods and bonds.....	500.00
Cost of concrete for beam at \$6 per cu. yd.....	6,000.00
Cost of renewing pavement over beam at \$2 per sq. yd.....	2,000.00
	<b>\$19,415.00</b>
Labor of putting in concrete and pavement included in above.....	

Anticipating a vestibule law in Massachusetts, the Springfield companies are experimenting with vestibules.



## MUNICIPAL OWNERSHIP OF TRAMWAYS AT HUDDERSFIELD, ENGLAND.

Huddersfield was a pioneer in municipal ownership and its experience has not been such as to offer encouragement to other cities. Municipal ownership is a favorite plan in this city as all the principal public monopolies, such as water works, gas works, electric lighting station, markets, abattoir, depots, baths, hospitals, lodging houses, etc., belong to the municipality. The city has a population of about 100,000 spread out over a considerable area.

Early in the 80's after an unsuccessful negotiation with

engineers receive \$6.25 and conductors \$5.05 a week. During the past year there was a total of 423,564 car-miles run. The itemized expense in dollars per car-mile run is given in the table.

Locomotive power.....	.081
Traffic.....	.024
Maintenance of ways and works.....	.017
Repairs of engines and cars.....	.056
Management.....	.012
Rents, rates and taxes.....	.013
Compensation.....	.004
Miscellaneous.....	.006
Interest and sinking fund.....	.213
Depreciation.....	.0342
Total.....	.3158

With these advantages for economical operation there must be something wrong to get such a poor showing. If money talks it must cry out loudly in protest against municipal ownership in Huddersfield.

## AUTOMATIC STREET RAILWAY SWITCH.

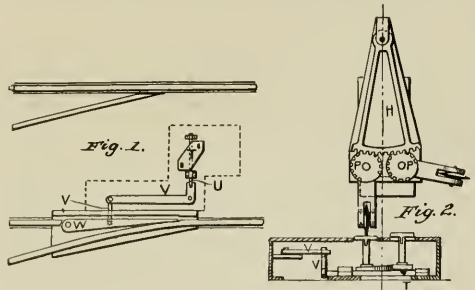
The illustrations represent an automatic street railway switch invented by Thomas Griffin. In Fig. 1 the main track and a part of a switch are shown, together with the switch mechanism enclosed in a casing under the surface. The plate T, is rigidly attached to the shaft underneath it as is also the lever U. Levers V and V are connected to each other and to the switch W, as shown. In Fig. 2 a section of the casing, with tilting plate, shaft and levers are shown. On either side of the shaft upon the tilting-plate are posts supporting plates R, which are above the surface. From



some tramway promoters the corporation decided to construct its own tramways for passenger and freight service, special permission having been secured from Parliament. The track, of standard gage, 4 ft. 8½ in. was constructed of 43-lb. rails fastened to metal chairs placed at intervals of 3 ft. The roadway was excavated to a depth of 6½ in. below the level of the rails for the paving and two trenches were cut, one under each rail 18 in. wide to receive two continuous beds of concrete 7 in. deep. Ten miles of such track were constructed and steam locomotives were purchased to operate the cars.

Heavier cars and engines were required and these proved too severe for the track construction. New 98-lb. rails were laid at great expense. New lines were built and extensions made until the length of track is a little over 22 miles, nearly all single track. The rolling stock consists of 26 locomotives and 26 double deck bogie cars. A map of the lines is shown in the cut.

The financial statements indicate that the city has not made a success of the system. Although, as Mr. Pogson, the general manager says, the grades on the lines are quite heavy and the districts are rather sparsely settled, yet it would seem that a city of 100,000 inhabitants should support a tramway system only 22 miles long especially with a considerable freight traffic. The capital expended has amounted to a little over £138,861. With the exception of 1897 there has been a deficit every year since 1882 amounting to as much as £16,626 in one year. The total operating expenses have been £395,327 and the total receipts £178,758, leaving a deficit of £126,569 for the tax payers to make up. Being public property there were no taxes or percentages of receipts to pay and wages are very low. The



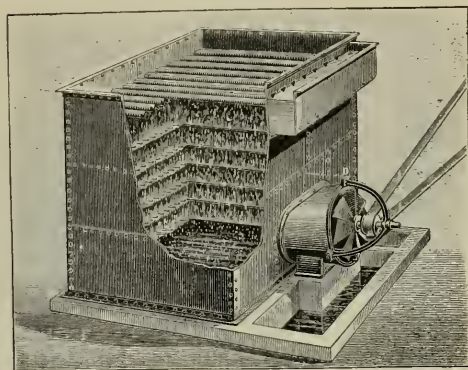
the car body the segment-gear H, is supported and connected by a shaft to a lever which the motorman operates from the front dash. This segment is normally held in proper position by a spring behind it and not shown in the cut. Fastened to the same yoke are the two segments P, P, and upon each is a projecting arm with a wheel at the end. The manner of operation is as follows: When a car is coming towards the switch the motorman turns the lever and the segment rotates one of the pinions until the wheel is in position next to the ground. This wheel strikes one of the surface plates, moving the tilting-plate which throws the switch by actuating the levers connected to it. The lever on the dash is moved to the left or right depending upon whether the switch is to be opened or closed.

# 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.

## Cooling Condensing Water.

The illustration from La Nature shows very clearly the apparatus for cooling condensing water for reuse, designed by Chalsgny & Co., which has met with much favor in France and is installed in a number of lighting stations and several of the government arsenals. The apparatus consists of a large steel box filled with perforated trays of the



COOLER FOR CONDENSING WATER.

form shown by means of which the water is broken up into drops and exposed to the cooling action of the air which is forced upward through the box. The fan or ventilator for circulating the air requires from one to two per cent of the total power of the principal engines. The loss of water by evaporation is but three or four per cent. The box is mounted on a masonry foundation so constructed as to serve as a reservoir for the water after its passage through the cooler. Before being withdrawn from the reservoir the water is passed through a number of compartments filled with coke and with sponges which thoroughly filter it.

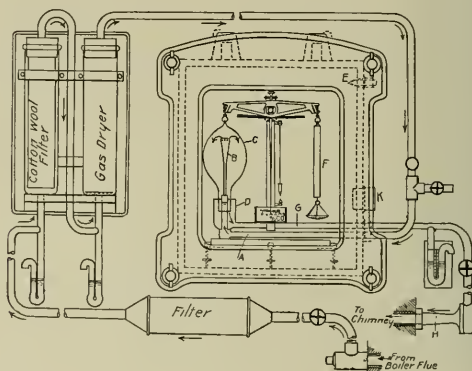
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## Arndt's Econometer.

The illustration of the "econometer," as the apparatus is called, is reproduced from the description furnished by the American manufacturer. This is a gas weighing balance which reads in percentage of carbon dioxide present instead of in ounces or grains, and gives a continuous indication of the composition of the gases passing through it. The method of operation is readily understood from an inspection of the sketch. The chimney or flue is tapped at a convenient point, and the gas led in the path indicated by the arrows through filters of excelsior and cotton wool and through a drier filled with calcium chloride, to a balance case

which is air tight except for an opening at E. The gases enter the balance case through the pipe A, and are carried up into the top of the bulb C, by the pipe B. The return to the stack is through the pipe G, a sufficient difference of pressure being maintained by an aspirator at H. In order that the bulb C, may be quite free to move the entrance to the exit pipe is enlarged at D; as any escape of the furnace gases from the bulb must be prevented to secure accurate weighings the opening at E is closed with cotton wool, which permits some air to enter, and the aspirator is adjusted so air from the case is drawn into the exit pipe at D, thus insuring the presence of atmospheric air only in the balance case.

The apparatus is erected in the boiler room where it will be in plain view of the fireman. In passing through the piping and filters the gases taken from the stack are cooled down to the temperature of the boiler room, so that in the balance case there is a simple operation of weighing a definite volume of the furnace gases in air of the same pressure and temperature. The bulb itself is balanced by suitable counter weights. The principal difference between the air within the bulb and the surrounding medium is in the carbon dioxide in the former, and it is evident that the position of the pointer when the balance is in equilibrium will vary as the proportion of this element varies in the gases to be weighed, and that the scale may readily be graduated to read in percentage of carbon dioxide present. The percentage of carbon diox-



ide present in turn depends upon the amount of air admitted to the furnace, and the reading of the econometer is a constant guide to the fireman in manipulating his dampers. This apparatus has met with favor abroad, and it is found that with good firing and damper regulation the percentage of carbon dioxide registered is as high as 10 or 15; the latter figure is that corresponding to an air supply 30 per cent in

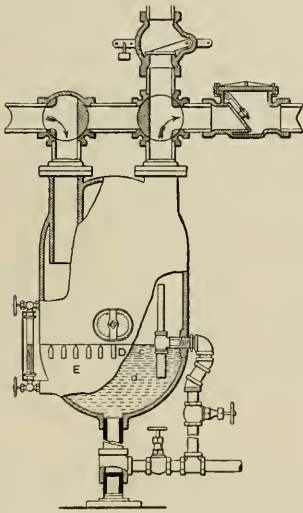
excess of the theoretical requirements and is as low as it can be reduced in practice. The counter weights are adjusted at intervals, usually once a week, access to the case being had through the opening at K, otherwise stopped by an air-tight cork.

The apparatus is also available for detecting leaks in the furnace setting and for determining the most economical size for the grate; if too much steam is generated when a high percentage of CO<sub>2</sub> is shown it means that the grate will bear shortening.

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#### Separation of Oil from Exhaust Steam.

In a paper on the separation of oil and grease from exhaust steam read before the American Society of Heating and Ventilating Engineers, William J. Baldwin states that his study of the question leads to the conclusion that it is useless to attempt this separation by what may be called mechanical means, such as straining or deflecting, or hanging so-called condensing or roughening surfaces within bulbs unless the



bulbs are so large as to make the separation take place by settlement; and that when the bulbs are of large size there is no need of any obstruction within the chamber except water to intercept the liquid oils. It is only necessary to change the direction of the steam by a simple elbow so that the entrained water and liquid oil shall be projected vertically downward against the surface of the water in the bottom of the receptacle, which will retain both the water and oil. It was found that the lighter oils could be caught and held in the apparatus by an arrangement of dams. For the use of these it is necessary that the separator have a constant water level. The arrangement of the dams is shown in the cut; the several dams at E are about 3 in. deep with the upper edges projecting slightly above the surface of the liquid, while that at D is set higher with the object of preventing the oil from flowing back over the surface of the grating formed by the low dams at E. In the preliminary experiments it was found that when a puff of exhaust steam

entered the bulb the oil receded to the sides of the chamber, leaving a clear space on the surface of the water for the reception of the oil; as the thickness of the oil film on the surface increased, the efficiency of the separator decreased, indicating that the oil adheres to water more readily than to oil and it was this fact that led to the design of the dams. In practice both the oil and the water flow under the dam D at each puff of the exhaust; the oil accumulates at the surface at c and the water flows back in an under current at d.

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#### Cost of Power.

The following extracts from a lecture on "The Electrical Transmission of Energy," delivered at the Reussleair Polytechnic Institute by Dr. Charles E. Emory are valuable as giving the latest estimates of costs made by that eminent authority.

"The accompanying table shows the cost of steam power under conditions differing as to type of engine and amount of power required. The calculations are based upon coal at \$3.00 per ton, which will apply to a large number of locations. The table shows that the cost per h. p. for a working year of 308 days (which excludes Sundays and holidays) and for 10 hours per day, is as shown in column 12 from \$75.46 down to \$21.38. The latter result can, however, be obtained under experimental conditions. For every hour in the year these prices would become \$213.00 and \$61.00 respectively. The cost per h. p. per hour given for the large engine is 0.69 cent. In ordinary practice with variable power such cost is about one cent per h. p. per hour, or \$30.80 per h. p. continued for 10 hours per day and 308 working days in the year. For small engines this cost will be increased to about 2.5 cents per h. p. per hour or \$77.00 per h. p. per year. For very small engines the prices will be still higher.

"At a number of points in different parts of the country, water power has been developed in considerable quantities at from \$8.00 to \$12.00 per h. p. per year, the cost being made up by allowing 5 per cent for interest, 2.5 per cent for sinking fund, 1.5 per cent for repairs, 1 per cent for insurance, or a total of 10 per cent on the cost, with 75 cents per h. p. for attendance, oil, etc. \* \* \* The full cost of the work at Niagara Falls has not been published, but estimating from general information it is thought that the hydraulic development for 80,000 to 100,000 h. p., to include head and tail races, head gates, wheel pits, wheels and mechanical means of transmission from the wheels to the dynamos, together with the necessary buildings, water rights, promotion expenses, should not cost more than \$30.00 per gross h. p., or \$42.75 per net h. p. delivered. It is probable, however, that to secure capital for such an enterprise the original cost, represented by the securities issued, would be considerably greater than stated. Moreover, it would not be practicable to develop at once the whole of such an enormous power, though the principal portion of the expense would necessarily be incurred at the outset. These considerations might raise the cost of plant to \$80.00 per net h. p. delivered.

"At present prices it is considered that the cost of local electrical transmission will not exceed \$10.00 per net h. p. The total cost of plant would then on this basis be \$120.00 per h. p. and allowing interest and fixed expenses as before, and \$1.50 per h. p. for running expenses, makes the yearly



cost \$13.50 per h. p. With the cost price as low as this, the power company should afford to sell at a profit power for \$15.00 to \$18.00 per net maximum h. p., and the advantages to consumers would be very apparent compared with 24-hour steam power every hour in the year for \$61.00 to \$88.00 per h. p. or even 10-hour working day steam power at \$30.80, or for coal at \$1.50 per ton, say, \$25.00 per h. p. per year.

“Long distance transmission in large units differs only from local transmission in requiring the employment of longer electrical lines and the use of step-up and step-down transformers previously referred to. The double set of transformers in large units will cost only about \$11.00 per h. p., and for transmission of 20 miles at 10,000 volts the copper in the line will cost about \$21.50 per h. p. The total cost of the hydraulic and electrical development should not exceed \$150.00 per h. p. delivered, so, calling the cost of attendance \$2.50 per h. p. and deducting the interest and fixed charges as before, the yearly cost would be only \$17.50 per h. p. Promotion expenses, the interest accumulating on bonds during construction, and other expenses incident to financing a large operation of this kind would probably increase the cost greatly, still it would appear that the transmitted power should be sold for \$20.00 or at least \$25.00 per net h. p. in large units along the high tension lines, which would still show an advantage over steam power developed with coal at \$3.00 per ton, and at the worst stand on an equal footing with 10-hour steam power developed in large units with coal at \$1.50 per ton above stated.

“Everything considered, it may be assumed that prices will be adjusted so as to make it advantageous for large consumers to use the power, and the high tension lines be run to their premises for that purpose. A large expense is necessary, however, to distribute such power to small consumers. Two methods of distribution are practicable, one to reach the power houses of companies already installed and utilize their lines, the other to transmit the power locally through lines at lower tensions, though much higher than have been employed until quite recently. If such distribu-

tion be attempted through companies already installed, as first assumed, their plants have already cost several times as much as we have estimated for the entire transmission plant, and interest and dividends must be paid on the whole capital invested, consequently a saving of \$5.00 or even \$10.00 per h. p., would not be such a proportion of the necessary total cost, including interest, as to make a great difference in the charges to small consumers.

“If the average powers during each hour be summed for the entire year, the total horse-powers per hour, for that time, will, in most cases, be found not greater than if the maximum power were continued for 10 hours per day during the working days of the year, or for 35.2 per cent of the total time. This 35.2 per cent is called the “power factor,” and is generally expressed as the relation between the average power and the maximum power, which would give the same result. It follows that if for each maximum horse-power, only 3.08 h. p.-hours were developed in the year, or the same as for a 10-hour day, the cost at one cent per h. p.-hour would be only \$30.80 per year, and therefore the charge for water power, although available every hour in the year, must be sufficiently less than \$30.80 per year to warrant the change, although the same user of steam power could afford to pay \$87.60 per h. p. per year if he used the power every hour in the year.

These considerations are well illustrated by the contract recently made by the Cataract Construction Company with the Buffalo Street Railway Company. The railway company is to be furnished 1,000 h. p. day and night, for \$40.00 per h. p. per year, and apparently pays \$45.00 per h. p. for apparatus, 10 per cent of which on basis stated in text, makes the total cost \$44.50 per h. p. per year. If 1,000 h. p. of steam were actually used every hour in the year, it would cost, at one cent per h. p. hour, as stated, \$87.60 per h. p. per year; so the railroad company has made a good bargain even if 1,000 h. p. are not used all the time. Additional power is to be furnished for \$36.00 per h. p., equivalent to \$40.50 with fixed charges added as above. The load of the railroad, less 1,000 h. p. must show a very low power factor;

COST OF STEAM POWER.

t	2	3	4	5	6	7	8	9	10	11	12	13												
													Cost per Net Horse-Power.											
													Kind of Engine	Net Horse Power	Per Hour for Coal at \$3.00 per ton*	Per Hour for Labor	Per Hour for Supplies and Repairs	Per Hour for Sinking Fund, Taxes and Insurance: 5% of total cost added to.		Per Hour for Coal, Labor and Supplies	Total per Hour		Total per Year of 360 Hours	
																		5% Interest and Dividends	10% Int'l and Dividends		Cents	Cents	Dolls.	Dolls.
		Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Dolls.	Dolls.													
A	Ordinary Non-Condensing	10	.9705	1.00	.28	.1948	.2921	2.25	2.45	2.54	\$75.46	\$78.31												
B	Automatic Cut-off Non-Condensing	75	.5556	.37	.19	.2110	.3165	1.11	1.33	1.43	40.96	44.04												
C	Automatic Cut-off Condensing	150	.4239	.25	.14	.1948	.2921	.814	1.01	1.11	31.11	34.19												
D	Compound Condensing	250	.3465	.17	.09	.2078	.3117	.607	.815	.919	25.18	28.40												
E	Triple Compound Condensing	500	.2697	.11	.08	.2338	.3507	.460	.694	.811	21.38	25.06												

\*As stated in the text, the coal per hour has been calculated on a conservative basis designed to represent average practice rather than the results possible with apparatus in perfect condition. The basis is 42 pounds of feed water per H. P. per hour for line A, 22 lbs. for line B, 18 lbs. for line C, 15 lbs. for line D, and 14 lbs. for line E, and evaporations per pound of coal of 7½ lbs. for line A, 8.25 lbs. for line B, and 8.5 lbs. for the remaining lines. With engines of the kind stated, proportioned for the work and in good condition, the water consumption should be 2 pounds less for each engine, and an evaporation of 9 pounds of water or better per pound of coal could frequently be obtained. As the costs are generally stated for the indicated horse-power, it should be noted that a friction of 10 per cent has been assumed to cover losses not only in the engine, but due to transmission to a jack shaft. For engines running 24 hours per day, the allowance of 10 per cent of the fuel for starting and stopping fires should be decreased. Engines generally keep up their economy for long periods, but the amount of coal is frequently increased by carelessness in connection with the selection of the fuel, the firing, care of boilers, &c.; so, even if the engines require 2 pounds less water than assumed, the coal required generally costs fully as much as stated.

but if it be as high as 35.2 per cent, this represents, as explained, a cost for steam power of only \$30.80 per year per maximum h. p., showing that 24-hour power can be furnished advantageously by transmitted power, but that questions arise for 10-hour power or variable power of an equivalent number of horse-power hours."

## THE STEAM END OF AN ELECTRIC PLANT.

BY A. M. WICKENS.

(From a paper read before the Canadian Electrical Association.)

Our friends, the manufacturers of dynamos, tell us with some considerable pride of the rapid advancement in this class of machinery, and claim to be able to make a generator that has an efficiency of 95 per cent. This statement, I believe, is reasonably borne out, and leaves us in the position that if we expect any further economy we must look to the prime movers or engines and boilers for it, unless our electrical engineers can approach the glow-worm in efficiency, which makes its light with about one three-hundredth part of the force used in our ordinary incandescent lighting plants—or should the electrical engineer reach, in the near future, vacuum illumination, without incandescence, we should have a light at  $\frac{1}{6}$  or less of the present cost for power. But during the time these inventions are being perfected we must do the best we can with our steam engine and boiler as prime movers in hundreds of our electrical plants. There are many engines running today that are running with an efficiency of from 70 to 80 per cent; notwithstanding this the waste between the coal pile and the dynamo pulley reaches  $\frac{7}{10}$  of the total heat in the coal. Our steam engine is only a heat engine, and is subject to many losses—in fact, in some of the old engines, with large cylinders, and slow piston speeds, the water consumption was as high as 60 lbs. per hour per h. p., while today, with our higher boiler pressures and faster piston-speeds, with early cut-offs, we reduce that to 12½ lbs. water per h. p. per hour.

The heavy cylinder losses in the old, slow-running engines caused engineers, as far back as 1825 to 1836, to look for higher pressures, and at the latter date Mr. Perkins in London succeeded in using pressures from 500 to 1,500 lbs. per sq. in. Some of the earlier engines gave 5,000,000 foot-lbs. per hundred lbs. of coal. Watt built engines that gave a duty of 100,000,000 to 120,000,000 foot-lbs., while some of the modern compounds give from 130,000,000 to 150,000,000 foot-lbs., thus showing a reduction in fuel from 12 lbs. per indicated h. p. to 1½ lbs. or even 1¼ lbs. for each h. p. The ratios of expansion have also materially increased—from two-fold to twenty-fold—and thermodynamic considerations say we should still increase the number of expansions. The engineer in striving after too many expansions may find himself over weighted with engine friction and internal wastes by using too many cylinders to accomplish his object. A recent engine built at Sibley College, with four cylinders, operated under 500 lbs. pressure, at high speed, is claimed to have developed a h. p. with less than 10 lbs. water per h. p. per hour. It is, of course, fitted with re-heaters between each of the cylinders, and is carefully covered to prevent loss of heat by radiation.

Our greatest loss is the loss of the latent heat in the

steam discharged into the atmosphere or condenser, and as far as known is unavoidable. The combustible in one pound of coal will give about 14,500 heat units. A well-designed and properly set boiler will deliver to the engine for work in the cylinder 70 per cent or 10,000 heat units for each pound of coal burned. If this were all utilized we would have a h. p. for 0.26 of a pound of coal per hour. But by the highest engine efficiency yet attained we use 1½ lbs. coal per h. p. hour, or only about 17 per cent of the energy delivered by the boiler is converted into mechanical work. It is safe to say the average engine of the best makers, running in the electrical plants in Canada, requires at least 3½ lbs. coal per h. p. per hour, thus discharging into the atmosphere over 90 per cent of the energy supplied by the boiler. There are cases where the coal consumption is even higher than 9 lbs. per h. p. per hour, but these are either the result of avarice or ignorance—avarice in men who are imbued with the idea that a cheap boiler and engine is an economical machine and that it can be operated by cheap labor; and ignorance on the part of men who claim to be engineers, but who are only dabblers in mechanics, slick salesmen or merely stoppers and starters in the engine room.

The evaporation of water per lb. of coal varies to an alarming extent, and goes from 5 or 6 lbs. to 10 or 11 lbs. of water per lb. of coal. Among the various causes for this, are the different calorific values of the coal itself, the difference in the construction of the boilers, the numerous different kinds of setting, and most of all the kind of a fireman who is shovelling the coal into the furnace. The average evaporation with ordinary return tubular boilers does not exceed 6 lbs. water per lb. of coal burned. If the boiler is well set and well fired an evaporation of 8 lbs. water can be obtained. This supplied to an engine giving a h. p. for 3½ lbs. coal per hour, would represent a water consumption, as per indicator card, of 28 lbs., and is called good practice. If we increase the evaporative capacity of the boiler and evaporate 9 or 10 lbs. water, we are making a great saving. Again, if we increase the efficiency of the engine until we only consume 15 lbs. of water, we have also made a saving that will look well at the end of the year's accounts. Even with our best arrangements our heat losses are great, and engineers are looking for further improvements.

Among the most recent is the superheating of the steam, a plan that was very fully tried and discarded about 30 years ago. The practical difficulties supposed to be prohibitory to the use of superheated steam, seem to have been overcome, later experience having shown that by purifying feed water the parts of the superheater do not show signs of scaling, burning or other injury, and with the improved lubricating oils no further difficulty need arise in the pistons or wearing parts of the cylinders. In a recent paper on superheated steam engine trials, read before the British Institution of Civil Engineers, by Prof. William Ripper, the author says: "The heat expended in superheating reduced the amount of heat employed in evaporation of water; but the heat so diverted for the purpose of superheating, was shown to be productive of a considerable gain in thermal efficiency. Thus an expenditure of 5, 10 and 15 per cent of the furnace heat to superheat gave a net gain of 12, 28 and 70 per cent respectively of the work done for the heat supplied. When the load on the engine was fairly constant very little regulation of the superheat was necessary, and the temperature of the superheated steam in the

coils remained remarkably steady. When the steam was superheated it was in a more stable condition than without superheat, and if the steam contained sufficient excess heat, the steam in the cylinder could be rendered dry at cut-off and release, thus removing all water in the cylinder, which is the great loss in the cylinder, also reducing the amount of heat exchange between the steam and the cylinder walls. One example shown was with steam at 120 lbs. pressure per sq. in. superheated to 674°F., which in use reduced the steam consumption from 38.5 lbs. to 17.05 lbs. per indicated h. p. per hour. The rate of decrease of steam consumption being approximately uniform within certain limits, the best results were obtained when the steam was supplied at about 650° F. at the engine. It is also important to cover cylinders and pipes with good non-conducting material to maintain the high temperature as long as possible."

This shows that engineers are looking for higher temperatures without increase of pressure as one means of improvement and economy.

For the larger electrical plants, that is those of one or two thousand horse power—we need hardly say very much, because they generally have some one at their head with sufficient engineering ability to make a fairly economical running plant—that is, if the board of directors will allow them to spend enough money for this purpose. These larger plants are usually in our cities, where ground is valuable, and oftentimes water for condensing purposes is not obtainable. To these plants a way is open for cheapening the cost of operation by adopting a water-cooling tower and circulating pump, the cost and operation of which was so carefully gone into last year by E. J. Philip in his paper on that subject.

The smaller stations—and their number is nine-tenths of all our electric plants—are in a somewhat different position; in fact, many of them are paying a very small return for the money invested. The problem for many of them is: What can I do to make ends meet? In many cases this is not surprising to the engineer. The plant perhaps consists of one, two or more engines, bought more with a view to saving first cost than anything else. The boilers are also the same—perhaps overrated as to capacity; the setting of each is poor, and their relative positions are bad; chimney drafts not good; boiler tops and domes uncovered; steam pipes bare, feed water pipes bare, and a few small leaks here and there of steam and water—the whole topped off with an engineer (?) at the munificent salary of \$1.00 to \$1.25 per day of 12 or 13 hours. No part of this plant is clean, and in engineering cleanliness is next to godliness; the man has neither time nor inclination for such work. The boilers are dirty, too, for want of cleaning out and the proper appliances to do it with.

Let us see what some of these things mean in coal. In the first place, a badly set boiler with a few small cracks here and there will not evaporate more than 4 or 5 lbs. of water with 1 lb. of coal, while a well set and well fired boiler of the same kind will most likely reach 7 or 9 lbs. water with 1 lb. coal. This is a loss of from 25 to 35 per cent. The main steam pipe is uncovered. What does that mean in coal? We will suppose the steam pipe is four inches diameter and 40 feet from boiler to stop valve at engine. Each square foot of this pipe will condense ½ lb. of steam per hour, and each foot in length represents one square foot of surface; we have 20 lbs. steam per hour lost. An all night run will average 11 hours per night, and the

steam lost per year is 80,300 lbs., and, with your poor evaporation, 8 to 10 tons of coal per year. If your steam pipe is large and longer than the above, it will cost correspondingly more. If your pump pipes and heater are bare, the loss from this will be from 30 to 40 degrees to your feed water, which means respectively 3 and 4 per cent of fuel. If you are burning 2½ tons coal per day, this means a ton of coal every 10 days. If the domes and boiler top are uncovered, and the boiler is 6 x 14 ft., you will have 90 sq. ft. exposed, and the loss in coal will be double the loss in your steam pipe—say 19 tons coal per year. The conducting power of scale is very low being to that of iron, according to D. Rogers, as 1 is to 37½. Nystrom tells us that with clean plates ¼ in. thick, steam at 75 lbs. pressure can be produced by heating the plates to about 325 degrees, while if ½ in. of scale intervenes, it will be necessary to heat the plates up to 700 degrees, very nearly a low red heat, and a heat at which the iron becomes granular and brittle; a scale 1/8 in. thick requires 15 per cent of fuel extra.

The troublesome substances in our feed waters are earth, clay, bicarbonates of lime, sulphate of lime, chloride or sulphate of magnesium, carbonate of soda, magnesia, dissolved carbonic acid and oxygen, iron and acid. These substances can all be treated in such a way that they will be removable. Some require caustic soda and lime, some need barium, others require chlorides; all organic matter needs alum or fessic, and should be filtered.

If boilers are kept clean and well fired, the saving in coal amply pays for the cost, leaving a good margin of profit for the proprietor. A small leak through the exhaust valve of the engine soon makes itself apparent in the coal pile. Badly set engine valves are often prolific sources of loss; I have corrected engine valves and made a saving in coal of 12 per cent.

To the owners of the smaller plants I would say, make the best of what you have got; stop all the small leaks and losses; get more of the heat in the coal into the engine, and and keep the engine right. If you are burning 1,000 tons of coal per year you can save at least 25 per cent or 250 tons, by keeping everything right; 250 tons of coal means in many places \$1,000. This in many places can be saved by expending 40 or 50 per cent of it the first year—after that it should all be saved. Get a thoroughly well posted engineer to look over your plant and advise you as to where savings can be made; don't go to a civil engineer or to an electrical engineer; consult a mechanical engineer. If you had a bad fever you would not go to a dentist for treatment. Go to the right kind of an engineer, pay him for his advice and follow it, and make an ordinary electric plant a reasonably good paying investment.

One of the most significant results of the opening of the Cleveland & Chagrin Falls line on May 1, was the reduction of rates on the Cleveland, Canton & Southern Railroad to meet the rates established by the trolley line. On the same date the Akron, Bedford & Cleveland pnt on half-hourly trains from 5:30 a. m. to 10 p. m.

The capitalists interested in the Richmond (Va.) Traction Company are elated over the failure of L. H. Hyer's attempt to have the organization of the company set aside, and the issue of \$300,000 of bonds and \$500,000 of stock canceled. The decision of the United States Court of Appeals will probably be reviewed by the Supreme Court.



## EUROPEAN STATISTICS.

The Sheffield Corporation has just published a most interesting document on electric tramways and some of the figures given are well worth quoting. It will be remembered that the decision of the Sheffield Corporation to adopt electric traction was only arrived at after a most exhaustive inquiry into the working of the various systems both in Great Britain and on the Continent. The figures unmistakably show the heavy first cost of the conduit system and will no doubt prove useful to those in England who advocate the system under all conditions.

Town.	Cost of construction per mile, overhead system.	Cost of construction per mile, conduit system.
Berlin (data by company)....	£2,300	£6,450
Berlin (data by Siemens & Halske).....		About £4,000 or £5,000 more per mile of double track than for the overhead line.
Berlin (data by the Union Electric Company).....		About four times as much as overhead.
Blackpool.....		£7,084 (single.)
Brussels (data by the Municipal Engineer).....	Line proper, £1,100 Electrical appliances... 1,150 Engines and cars, not buildings.. 2,860	
Budapest (data by one of the companies).....	£5,410	£19,600 (double.)
Dresden (by the company) (Does not include paving and rails, estimated at £4,500 per mile, single.)	With poles, £2,900 With rosettes, £2,624	£4,587 to £6,944 £7,040 to £7,020
Milan (data by the Union Company).....		About four times as much as for overhead.

The cost of laying cable lines, not including power station or cars was, per mile of single track, £11,000 at Birmingham and £10,000 to £11,000 at Edinburgh.

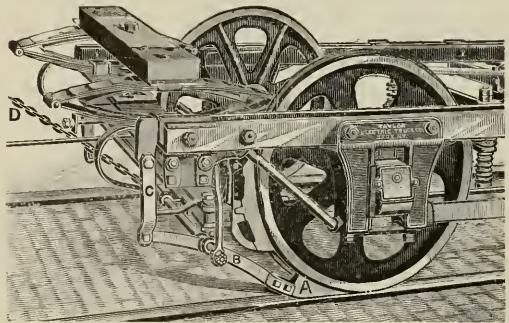
The following is a synopsis of the more important information as to the cost of operation and the receipts:

	Expenses per car-mile.	Receipts per car-mile.
Birmingham, cable.....	10.86 cents.	23.72 cents.
Birmingham, accumulator...	36.86	31.40
Blackpool, gas (including repairs, lighting and cleaning),	9.00	....
Bristol, electric.....	11.00	....
Bristol, horse.....	16.00	....
Dresden, electric and horse.....	12.00	21.60
Dresden, electric.....	7.72	....
Edinburgh, cable.....	11.00 to 12.00	21.06
Edinburgh, horse.....	20.78	30.00 to 32.00
Milan, electric.....	7.60	12.00
Milan, horse.....	9.00	12.00
Remscheid, electric.....	8.00	11.00
Rouen, electric.....	20.68	18.00
Sheffield, horse.....	....	27.76

One of the most remarkable figures is that showing the heavy cost of the accumulator system in Birmingham where, notwithstanding the large receipts of 31.40 cents per car-mile there is a loss of 5.16 cents on every car-mile run. It should be explained that in many Continental towns wages for labor are very low. In Budapest for instance the wage of a laborer is only about 1 cent per hour and that of a rail layer 6 to 7 cents.

## FLOOD EMERGENCY BRAKE.

The illustration shows the emergency brake invented by Patrick Flood of the mechanical department of the Albany Railway, and in use on the very heavy grades on this road since August, 1895. The construction is readily seen from the cut; the brake is simple and durable and can be placed on any truck. The lever which applies the brake is on the front dash where it is under the control of the motorman at all times. As soon as the lever is released the shoes are at



FLOOD EMERGENCY BRAKE.

once forced under the wheels by the spring attached to the cross bar; flat wheels are an impossibility as the shoes are forced under the wheels, lifting them from the rails. A car can be stopped on heavy grades in a very few feet and without injury to itself or to the passengers. As a service brake for use on grades it is very satisfactory in operation; when it is desired to stop, the motorman shuts off the current and applies the brake; when the momentum is lost the car slips back a few inches and comes to rest on the shoes.

## FIRE AT LOUISVILLE.

The repair shops of the Louisville Railway Company, located at 17th and Walnut streets were burned on May 23; the loss was approximately \$50,000, partially covered by insurance. Among the property totally destroyed were 100 new motors. An order to replace these has been given and arrangements made for a temporary repair shop, so that the patrons of the line will suffer but little inconvenience. Several firemen were severely injured by the falling walls of the building.

## WATER POWER IN SOUTHERN CALIFORNIA.

The Southern California Power Company has been very successful in securing purchasers for the power generated at the Santa Ana cañon and transmitted to Los Angeles and vicinity. Contracts have been closed with the West Side Lighting Company, of Los Angeles and with the Pasadena Electric Light & Power Company, and negotiations are pending with the Los Angeles and the Pasadena & Pacific Railway Companies for the use of power.

Gov. Black has signed the bill allowing the elevated roads of New York and Brooklyn to operate trains on the bridge.

## ELECTRIC RAILWAYS—HOW TO MAKE THEM A COMMERCIAL SUCCESS.

Extract of a Paper Read before the Canadian Electrical Association, by C. E. A. Carr.

For an electric railway to be a commercial success depends not only upon the economy and efficiency of its power house, and of the roadway upon which to operate the cars, but "How to make it a success" is the query that taxes the brains of general managers and superintendents throughout the country. How to increase the receipts, without materially increasing the operating expense, are the questions the directors ask at every meeting.

A certain degree of revenue is the reward of all street railways that run cars up and down the thickly populated streets of any of our larger cities, but is it the success, commercially, it might be? There is an old story told of a toad, that stood on the bank of a brook, with its mouth wide open, waiting contentedly for flies to come his way. It seems unnecessary to say that the toad died of hunger.

The attitude of many electric railways today, is not unlike the unfortunate toad, and while life may be sustained months, perhaps years, death, in the form of the receiver, comes too often.

It is not enough that we carry our regular customers. These come to us anyway, and it is to these that we look for a guarantee of our operating expense. The profit or success of the railway lies in the margin of how many we can induce to become patrons, and thereby increase the regular revenue. This may be accomplished by various means. The railway company, like any other business concern, has goods to sell, in the way of rides, and no doubt there are times in the day when the manager feels that he is overstocked, and is inclined to put on "Bargain Matinees" to get a full car. He should advertise and let the people know there is an electric railway in town; that its business is to carry people from place to place comfortably and quickly, and that they can't afford to walk; that the time saved in riding will more than pay the fare. There are various ways in which to do this, and methods may be adopted so that the cost is very slight.

One very good way is to issue annually a handsomely illustrated booklet, which contains cuts of all the interesting points touched by the cars, briefly telling how to get there. The different firms supplying the company with materials will advertise for the asking, and the cost to the company is practically nil. This style of advertising is particularly valuable to strangers and tourists. The railway company in London, Ont., issued just such a little booklet as I mention, about a year ago, and it was a daily occurrence to see a group of strangers taking a ride around the Belt Line with book in hand, pointing out the various public buildings, parks and squares, as the car went along.

A specially illuminated car for trolley parties is a profitable source of revenue, and the effect of the colored lights along the line, as the car passes, is very pleasing. It is a good way to advertise, and tends to popularize the service. Many electric railway companies establish parks at the end of one or more of their lines, and provide amusements in the way of hand concerts, etc. This brings considerable increased revenue, at a time of day when cars would otherwise be running light. To what extent a railway company should provide attractions for its patrons, must depend

largely upon local conditions. Some companies claim to have profited by this departure, while others have an adverse experience. It is more desirable to have the amusements provided by some one else who thoroughly understands it, the company making certain concessions in the way of issuing coupon tickets for admission. In this way, the railway runs no risk and profits pro rata on all increased business.

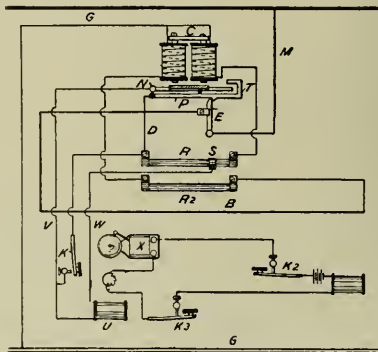
The selection of employes has more to do with the success of an electric railway than anything else. The idea that any one can run a street car, has, in many cases, resulted in the employment of incompetent, careless and ignorant men who, through these qualities, have brought the railway into public disfavor. Conductors, motormen, inspectors and shopmen have the power to earn or lose money; make the railway popular or odious with the public; keep claims for damages at a minimum or make them a burden, and very often their selection does not receive the care that is exercised in the purchase of ordinary supplies. Every employe should be considered an agent of the company, and should not only be sober and intelligent, but have good judgment and a cheerful disposition. Loyalty to the company he serves, should be his first motto.

With the whole army of employes, loyal, faithful and devoted to their duty, gross earnings will steadily increase and operating expenses be at a minimum, and the stockholders would no longer need to ask if the road was a success.

The growing demand of the public for better accommodation and luxury in the matter of travel and speed, must be met by giving them better cars, more comfortably furnished and more expensively fitted than heretofore. By supplying these demands the company will add largely to its revenue.

## IMPROVED SAFETY DEVICE FOR ELECTRIC CIRCUITS.

In a paper on this subject before the Franklin Institute, L. G. Rowland describes a safety system of his invention which is especially applicable to trolley lines. The purpose is to open the circuit as soon as the trolley is broken



or grounded. The connections for such a system are shown in the figure where A represents the feeder and B the trolley wire. The electro-magnet C, is differentially wound and when the currents are passing through the coils they neutralize each other and the magnet is not energized.

From the trolley wire one circuit extends through one resistance, R<sup>2</sup>, through one of the magnet coils and wire G, to the rail. The wire D, is also connected with the trunk line through a switch contact and to the other winding of the magnet C; the trolley B, and D having a common connection with the trunk line A, through the wire M. The feeder A is a common source of supply for the two circuits, which pass in opposite directions around the coils of the electro-magnet. In the common connection M, to both circuits is a switch, E, which is normally closed and controlled by the armature N, of the electro-magnet.

When the magnet becomes energized, it is but slightly so and not strong enough to trip the switch, which must, therefore, have a powerful spring to ensure opening it quickly. The lever P, has a projection T, in the line of the movement of one end of the lever N. Both levers, at this point, carry contact points normally out of contact with each other. A wire from one side of the resistance R, in circuit D, passes to the lever P, and from the sliding contact S, on resistance R, a wire passes to the lever N, through the signal magnet U. If the trolley is broken the magnet is energized by the current in circuit D, which attracts the armature N, so that the contact on it and that on the lever P, are brought together. This allows the current to pass to the magnet C, through wire V, magnet U, wire W, to the sliding contact S, and resistance R, wire D, and draws up the lever N. It acts on the projection T, draws up the lever which trips the catch and allows the switch E, to open the circuit. At the same time the current passes through the magnet U, of the signal device, releases the mechanism and signals the number of the box to the station or to the repair wagon. This signal passes over an independent circuit, preferably a closed metallic circuit.

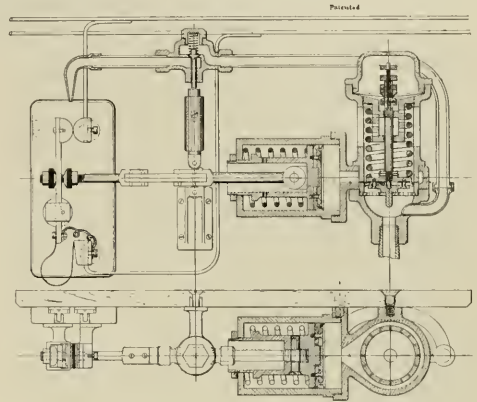
A telephone connection can be made in each box, permitting conversation between that point and the station. In each box there is a signal key, K, which when pressed, opens the switch and notifies the station at the same time. In case of a fire this would render that section of the trolley wire dead and subsequently there would be no cut wires to repair.

### AUTOMATIC CONTROLLING VALVE AND ELECTRIC GOVERNOR.

For convenience and safety it is better to have an automatic mechanism to control the pressure in the air reservoirs for the brakes on the elevated trains rather than have the motormen attend to it. The cut shows a device invented by J. B. Knudsen which has worked quite successfully on one of the cars on the Lake Street Elevated for some time past.

The upper part of the cut represents a plan view of the device with a cross section of the controlling valve. The vertical cylinder is connected at the bottom to the air reservoir. To get a differential spring action so as to give a maximum and minimum pressure a spring is behind the piston and fastened to the spindle between two nuts is a phosphor-bronze disc. In the horizontal cylinder is a piston and attached to it is a spring whose tension is a little less than that of the spring in the vertical cylinder. The piston rod is connected to the contact piece, but insulated with a block of fiber. This brass contact piece is pivoted to a porcelain plate and at the lower end is a spring which holds it in proper position. The connections to the mains are as shown. Just above the point of contact is an air nozzle which is at

the end of the pipe running from the base of the vertical cylinder. On the head at the end of the piston rod from the horizontal cylinder is a raised surface. When the piston



moves towards the left it causes the vertical spindle to rise and open the valve in the air pipe.

When the mechanism is in the position shown in the cut the circuit is closed and the motor and air pump are working with the pressure in the reservoir increasing. As soon as the air pressure reaches the designed maximum it overcomes the tension of the spring and diaphragm in the vertical cylinder and raises the piston which opens the ports and the air passes into the horizontal cylinder. This forces the piston of the horizontal cylinder to the left which breaks the contact and stops the motor. The air from the nozzle blows out the arc. For service on the elevated road the springs and diaphragm are set for a maximum of 60 lbs. and minimum pressure of 52 lbs.

### LOW OPERATING EXPENSES.

In regard to the operating expenses of the Calumet Electric Railway, Chicago, published in the March REVIEW, page 176, one of our readers requests information as to number of cars operated, miles of track in use, whether single or double, grades, distance between power house and the terminus of the road, price of coal, and length of time in operation.

This company operates 75 miles of track, all of it double except one mile. The number of cars in use varies from 37 in winter to 200 in summer. There are practically no grades on the line. The distance from the power house to the farthest terminal is 5½ miles. The coal used costs from \$1.15 to \$1.50 per ton. This road began operating in 1891 and has constantly extended its lines, having 10 miles in 1892, 23 miles in 1893, 53 miles in 1895 and 70 miles in 1896.

John Mac Fayden, general superintendent of the Chester Traction Company, Chester, Pa., advises us that on that road the operating expenses for the year 1896 averaged \$.0759 per car-mile. The company operates 28 miles of track, only two of which are double track; at the extreme end of one division which is 8 miles from the power house is a 6 per cent grade 1,500 ft. long; there are several other grades of from 8 to 10 per cent; the average number of cars operated is 28 per day.



## METROPOLITAN (N. Y.) WINS UNDERGROUND SUIT.

The suits brought by three taxpayers in New York City who sought to enjoin the Metropolitan Company from introducing the underground trolley system on 6th and 8th avenues has been decided in favor of the company by Justice Beach, of the New York Supreme Court. The contention that the change from horse to electric power could not be made without forfeiting the franchise, the original franchise having prescribed horse power only below 59th street, was decided adversely to the plaintiffs, it being held that the change of motive power is a part of the "regulation" of the railway and a matter within the control of the legislature and not of the local authorities. "The right to a change of motive power does not affect the original grant." The second question dealt with by Justice Beach was the jurisdiction of the Board of Electrical Control and he held that the board was organized for the purpose of regulating all electrical conductors for the transmission of "sound, heat and light," and that conduits for carrying electrical power for traction were not within the classes mentioned. The right of the city to purchase the road for the actual cost of construction plus 10 per cent, as set out in the original resolution of 1851 was held invalid; as all franchises granted by the city prior to 1854 are invalid, the reservation as to the purchase must share the same fate. The franchise was legalized by the laws of 1854, in which no purchase clause was incorporated.

The case will probably be taken to the Court of Appeals and the Metropolitan Company is not expected to proceed with the work of installation until the final decision is rendered.

## LITTELL ON LONDON TRANSPORTATION.

H. M. Littell, who is now traveling in Europe, was approached by a reporter for the London Mail, shortly after his arrival, and the following published interview was the result:

"If you care for my opinions," said Mr. Littell, "you may have them. They are perfectly unbiased, for I am in no way concerned with any English undertaking. It strikes me, as I presume it does every other American, that your system is crude and primitive. I am astonished that in an old rich city like this you have no better facilities for traveling between the places of residence and the places of business. Why have you no tram cars on the Strand?"

"Of course, you will say that traffic is so congested there that the thing is not to be thought of. So said the merchants on Broadway. They bitterly opposed our scheme for a cable railroad there; said it would interfere with their business, and made other frivolous objections. The company carried its point—and its railroad. What was the result? The congested traffic was relieved to an amazing extent, and the facilities for business, instead of being curtailed, were increased. Today I do not believe there is a single merchant who would not fight for a retention of the system, were any misguided person to attack it.

"Here you have a great many blockades—blocks, don't you call them? Three, four and five 'buses are abreast, hansom cabs fill up the rest of the space, and the traffic is stopped for a quarter of a mile back. Lay tram-lines along the Strand, Piccadilly and Regent street, and you would never find more than two cars abreast. And think of the vehicles of which you would rid the streets. Cabs and 'buses would go by the hundred. Then there is the greater speed of traveling. Cars only stop at street corners, and for such time as is sufficient to allow passengers to enter and leave. Your 'buses are rarely full. They hang along the curbstone, and stop, and stop, and stop, and very slow you travel. Such tram cars as you have do not bring

you to the center of the city. Do any trams run to Trafalgar square, and if not, why not?"

"Why, I repeat, have you no tram cars on the Strand and Piccadilly? I see many reasons why you should have, none why you should not. Your streets are broad, clean and in every way excellent. I do not know your tramway people here, but if they are of the same class as those in our country, they would be very ready to lay tracks if permission were given. You English say that there are hansoms everywhere, and that they cost next to nothing. My experience is that they cost a good deal. Your 'buses, also, I regard as very expensive. Some 'bus fares I find are fourpence, fivepence, or even sixpence. In New York, by the use of transfer tickets, you can ride half a day for five cents. The charge is uniform—five cents whatever the distance. Does it pay? Of course it does. It educates a man to the conveniences of riding. He rides short distances as well as long. And he is not going to waste half a day on a car for the fun of the thing."

Mr. Littell paused. Had he said his worst, or were there other criticisms? There were others. "Now in our cars," he continued, "You ride in comfort, and enjoy the view. What is the view from the inside of a London omnibus? Somebody's pills, and somebody else's soap. In New York you hire advertising 'buses for the day. Here the American sees a 'bus rumbling towards him, and has not the remotest notion whether it's a 'bus for Piccadilly circus or a 'bus for anti-billious pills. The place for advertisements is the newspaper.

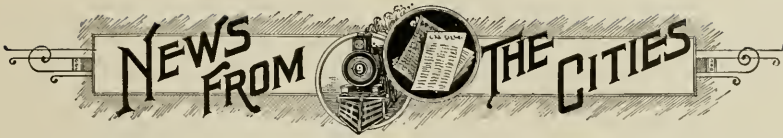
"The electric car would not be nearly so dangerous on your principal streets as your 'buses are. When the horses skid there is a pretty fair momentum on a 'bus. And coming to the worst, I would as soon be run over by a road car as a 'bus any day. In neither case should I take much interest in street traffic afterwards.

"And have we no advantages to bless ourselves with? What, for instance, of the fatal accidents in New York of which we hear?" "I have never yet heard of a man, woman or child, being killed by contact with the trolley wire. I find a strong prejudice in England against the overhead wire. If that is so much disliked you have the underground, the conduit system, as an alternative."

"Then it is not a fact that you allow as many people to ride on your cars as can hang on by the skin of their teeth?" "That is so," said Mr. Littell. "I admit you do not do it here. But labor is cheaper in England than in America, 'buses are not as dear as cars, and you have no expensive tracks to maintain. No, London is a great city, the most interesting I ever saw, but its transportation system is about the worst."

## LIVERPOOL PURCHASES THE TRAMWAYS.

The Liverpool Tramway & Omnibus Company has agreed to sell and the city to purchase all of the property and assets of the Company for the sum of £567,375 (\$2,758,000) the transfer to be made on August 31, 1897. The company operates 40 miles of routes with 67 miles of track, 201 cars and 76 omnibuses; the company owns 3,500 horses. Several of the provisions of the agreement are noteworthy: The present directors of the company are retained to manage the business for five years and are to receive the same compensation as at present. If at the end of this period, or before, the services of the directors are no longer required they are to receive the capitalized values of annuities equal to the present compensation and terminating in 1915. The directors are not to engage in any enterprise which shall compete with the city in the tramway or omnibus business. The present auditors of the company if not continued in their offices are to receive annuities equivalent to their present incomes, and the solicitors also. Every servant or officer of the company other than those mentioned shall, if he so desire, be taken over by the corporation on the same terms as to position and salary as those under which he was employed on March 16, 1897.



### Chicago.

CHICAGO.—A new management has taken hold of the disused Northern Electric Railway connecting Moreland with Hanson Park, and after making repairs will begin operation with five cars.

CHICAGO.—Receiver John C. McKeon, of the Calumet Electric Railway, petitions the federal court for leave to borrow \$185,000, of which \$30,000 is for a new car barn, \$14,000 for a new power house, \$4,000 for additional tracks, \$700 for general repairs and \$800 for motor equipments.

CHICAGO.—The Midland Transit Company's application for right to build a street railway in Wabash avenue from Lake to 23rd streets to supply a downtown terminus for the Chicago General Railway, the General Electric Railroad and other suburban lines, has been referred to a sub-committee of the council.

CHICAGO.—The county commissioners have granted the Chicago, Blue Island & Harvey Railway permission to build in Western avenue, between Blue Island & Harvey. The company is required to illuminate its right of way with arc lamps situated not more than 500 ft. apart. A. G. Spalding asks the Federal Court to assign to him the Harvey Transit Company's franchise, for which the Chicago & Englewood Electric Street Railroad Company agreed but failed to pay \$10,000.

### Colorado.

FLORENCE, COLO.—M. Bines, Andrew Ralston and others have incorporated the Arkansas Valley Railway, Light & Power Company with \$750,000 capital.

BOULDER, COLO.—The Western Electric Transit & Power Company has been incorporated to build railways. Capital, \$100,000; incorporators, Edward B. Goodwin, M. J. Danford and others.

CRIPPLE CREEK, COLO.—The city council has granted C. F. McBall and C. E. Rolley a franchise to build an electric or cable railway. Their deposit of \$500 will be forfeited if the road is not in operation by August 1, 1907.

DENVER, COLO.—The Denver, Cripple Creek & Southern Railroad Company has been incorporated to build a steam or electric road from Garo to Canyon City. Capital stock, \$1,000,000; incorporators, Charles T. Case and George S. Freeman of Colorado; Charles E. Funk of Chicago, and Frank W. Corrigan of St. Louis.

DENVER, COLO.—Six miles of track have been completed for the Golden Circle Electric Railroad, and cars are expected to be running very soon. The Colfax Electric Company asks right of way on Alabama street for three miles of road, and has drawn plans for an enlargement of its car barn. The Denver City Railroad Company contemplates purchasing grip cars. The Denver Tramway Company will purchase 36 ft. double track combination cars. Its Cook's Addition line will be equipped with electricity and operated with three cars.

### Connecticut.

BRIDGEPORT, CONN.—The Bridgeport Traction Company will begin at once the work of extending its lines from Southport to Westport.

### District of Columbia.

WASHINGTON, D. C.—The Capital Railway has nearly completed its line to Congress Heights.

WASHINGTON, D. C.—Stockholders of the proposed Washington, Woodside & Forest Glen Electric Railroad held a meeting, May 17, in the office of B. F. Leighton, corner of 4½ and D. streets, N. W.,

and decided to issue \$40,000 in bonds. This and other subscriptions will be handed over to Horace S. Cummings, president, and Charles P. Williams, general manager of the Brightwood Railroad Company, who will let the contracts for the construction of the line.

### Georgia.

SAVANNAH, GA.—Herman Myers and J. H. Fall have sold the properties of the Savannah Traction Company to the Savannah, Thunderbolt & Isle of Hope Railway Company, thus effecting a practical consolidation of all Savannah Street railways. The latter company will elect a new board of directors, and it is expected that George Parsons will be president, J. H. Fall of Nashville, vice-president, and Capt. J. H. Johnston, general manager.

### Illinois.

FULTON, ILL.—Kustes & Houghton have purchased C. W. Carroll's lease of the street lines and are now running cars.

SYCAMORE, ILL.—John B. Whalen, of Sycamore, is promoting an electric line from Streator to Geneva Lake via Marseilles, Sandwich, Hinckley and Sycamore, with power house at Hinckley.

EAST ST. LOUIS, ILL.—M. Harrold, superintendent of the East St. Louis Electric Street Railroad, plans extensions in two directions, and will ask the city council for permission to construct.

GALESBURG, ILL.—The Knoxville city council has granted the promoters of the railway right to run through the public square. After consulting the Galesburg company the promoters will begin work.

### Iowa.

BURLINGTON, IA.—The Burlington Electric Street Railroad is erecting a brick addition to its car house, 51 x 117 ft., costing \$5,000. Main street will be double-tracked and the rails replaced with 70-pound.

SIoux CITY, IA.—The county commissioners have granted the South Sioux City Traction Company right to construct an electric railway to Crystal Lake on condition that the road be in operation within six months.

CEDAR FALLS, IA.—C. W. McElyea has returned from his eastern trip convinced that compressed air is the motive power for street railways, and has accepted his franchise with the intention of using this power. He was especially pleased with the operation of the American Air Power Company's cars in New York and Washington.

### Kansas.

WICHITA, KAN.—The Wichita Electric Railway Company has leased its lighting plant, fixtures and franchises for ten years to the Wichita Gas, Electric Light & Power Company.

GALENA, KAN.—John M. Cooper, of Baxter Springs, is president and C. W. Daniels, of Baxter Springs, is secretary of the Southeast Kansas Electric Railway Company, which was recently incorporated to build between Galena and Baxter Springs.

### Kentucky.

COVINGTON, KY.—Directors of the recently incorporated Crescent Springs & Erlanger Street Railway Company have elected Monte L. Green, president; W. H. Baker, vice-president; J. J. Graf, secretary; and R. H. Crisler, treasurer.

ASHLAND, KY.—The Ashland & Catlettsburg Street Railway Company contemplates extending through Kenova, Central City, Ceredo and Huntington. Right of way has been obtained in Kenova and negotiations are pending with officials of Central City and Huntington. If the present plans are carried out there will be a continuous street railway from Hanging Rock, O., to Huntington, W. Va.

COVINGTON, KY.—The Crescent Springs & Erlanger Electric Street Railway Company has been incorporated to build seven miles of road from the eastern terminus of Ludlow, through Bromley and Crescent Springs to Erlanger. Capital stock, \$10,000; incorporators, R. H. Crisler of Ludlow, Jesse and Mount Green, John F. Walton, John Graf, J. C. Keck and J. A. Seissinger of Crescent Springs.

### Maine.

BANGOR, ME.—Stockholders of the Bangor, Orono & Oldtown Railway voted May 18 to build two more miles of road in Bangor.

BANGOR, ME.—It is said the Bangor Public Works Company will purchase the new Bangor, Hampden & Winterport Electric Railway.

WATERVILLE, ME.—I. C. Libby offers to rebuild, re-equip and extend the Waterville & Fairfield Electric Railway, which is in a bad way, financially and physically.

BANGOR, ME.—Work is to begin in two months on the electric road connecting Bangor with Glenburn, Kenduskeag, Corinth and Charleston. Surveys are being made over the line, which is to be 26 miles long. F. O. Bend of the Penobscot Central Railway is interested.

PORTLAND, ME.—The Westbrook, Windham & Harrison Railway Company, which was recently incorporated with \$300,000 capital stock, has elected the following directors; Arthur W. Merrill and William M. Bradley of Portland; and J. C. Scates, president; C. B. Woodman, vice-president; C. M. Waterhouse, treasurer, and J. H. Tolman, secretary, all of Westbrook.

### Maryland.

BALTIMORE, MD.—Mayor Hooper has signed the ordinance giving the Central Railway Company right to lay track in several streets.

BALTIMORE, MD.—The consolidation of the Baltimore Traction and the City & Suburban Companies is said to be practically settled, there remaining only the ratification by stockholders.

### Massachusetts.

MERRIMAC, MASS.—The Haverhill & Amesbury Street Railway is to be extended a distance of nine miles from Salisbury to Hampton.

AMHERST, MASS.—J. A. Noble will build a car house 66 x 26 ft. for the new electric road. O. A. Howard has been appointed superintendent.

WOBURN, MASS.—The larger of the two car barns of the North Woburn Street Railway Company was burned on the night of May 23 causing \$2,000 loss.

BROCKTON, MASS.—The East Bridgewater & Brockton Street Railway Company has given a check for \$10,000 as a forfeit if the road is not built within 18 months.

BROOKFIELD, MASS.—A pleasure resort will be established by the Warren, Brookfield & Spencer Electric Railway on the shores of a lake, where a site has been leased.

BOSTON, MASS.—With a view to extending its line the Wellesley & Boston Street Railway Company asks permission to increase its capital stock from \$30,000 to \$100,000.

AMHERST, MASS.—Directors of the Amherst & Sunderland Street Railway are considering the extension of their line to a pleasure resort, which they propose to establish.

MANSFIELD, MASS.—Frank Mead and D. A. Brooks, of Braintree, Mass., are interested in the Mansfield & Norton Electric Railway Company, which has applied for a franchise.

NATICK, MASS.—The Natick & Cochituate Street Railway Company has been granted the franchise to extend its track to Saxenville, and the location having been practically settled, work will be pushed as soon as material can be secured.

MILFORD, MASS.—The selectmen voted May 11, to grant the Milford & Upton Street Railway Company a location. W. D. Leahy, of Milford, says work may begin immediately if the terms of the franchise are satisfactory to the company, of which he is a director.

WESTFIELD, MASS.—The state railroad commissioners, having granted the Woronoco Street Railway permission to increase its capital stock from \$50,000 to \$100,000 and double the amount of bonds, the six miles of extensions will be constructed this summer.

BROCKTON, MASS.—The Brockton & East Bridgewater Street Railway Company has been incorporated to build a line between the two cities. Capital stock, \$50,000 incorporators, W. L. Douglas, John J. Whipple, William Jones, C. C. Merritt, George J. Morse, M. C. Hinds and Joshua Dean.

WHITMAN, MASS.—The selectmen have granted the Whitman & Rockland Street Railway Company right to lay tracks from the Bridgewater to the Abington lines, including the privilege of paralleling the Brockton Street Railway for over a mile, if the latter will not permit operation of cars over its tracks.

MILFORD, MASS.—The Milford, Hopkinton & Westboro Street Railway Company has been incorporated to build a road this summer between the towns. Right of way will be obtained and franchises asked for. Capital stock, \$120,000, most of which has been subscribed; incorporators, C. W. Shippee, J. Allen Rice, H. D. Bowker, C. L. Clafin, L. E. Coolidge and others.

WORCESTER, MASS.—The Worcester & Marlboro Street Railway Company has organized under its charter by electing the following officers and directors: President, J. Russel Marble; vice-president, Otis E. Putnam; secretary, Robert P. Clapp; directors, J. Russel Marble, Otis E. Putnam, John C. McInnes, and Rufus S. Woodward, of Worcester; C. O. Green, of Shrewsbury; George L. Smith, of Westboro, and S. Reed Anthony, of Boston.

### Michigan.

PORT HURON, MICH.—The City Electric Railway Company has been granted a new 30-year franchise.

ADRIAN, MICH.—No bids having been received May 25, the receiver's sale of the street railway has been postponed.

DETROIT, MICH.—Pontiac has finally granted a franchise to the Oakland Railway providing a 10 cent fare to Birmingham.

MUSKOGON, MICH.—The Muskegon Street Railway Company has given a mortgage for \$25,000 to the Portland (Me.) Trust Company.

HOLLAND, MICH.—Objectors to C. M. Humphrey's proposed electric road having been won over it is expected that work will soon begin.

SAGINAW, MICH.—A receiver has been appointed for the Consolidated Street Railway on petition of the Boston Safe Deposit & Trust Company.

SAGINAW, MICH.—The Union Street Railway Company has given the Union Trust Company of Detroit a chattel mortgage to secure \$42,000 of indebtedness.

ST. JOSEPH, MICH.—James Brooks, receiver of the St. Joseph & Lake Shore Street Railway, has been authorized to sell the rails, ties and planks at private sale. No offer of less than \$3.50 per ton as they lie will be accepted for the rails.

DETROIT, MICH.—Monguagon township has given a franchise to the Detroit & Toledo Electric Railway Company, notwithstanding the fact that an exclusive 30 year franchise has already been granted the Wyandotte & Detroit River Electric Railway.

FLINT, MICH.—The city council favors granting John E. Nolan a new franchise in place of the one which has just expired. Since receiving the franchise two years ago Mr. Nolan has not been able to interest capital for construction owing to the hard times.

ST. JOHNS, MICH.—Promoters of the electric road from Lansing to St. Louis have appointed the following committee to push the project: O. P. DeWitt, St. Johns; Senator Mudge, Maple Rapids; Editor McCall, Ithaca; Mr. Seaver, Pompeii, and Mark Woodruff.



**BENTON HARBOR, MICH.**—Cleveland capital is now said to be backing the Benton Harbor Electric Railway & Transit Company. J. W. Hamilton, of Chicago, is president; H. D. Deam, of Chicago, vice-president; W. H. Hollis, of Illinois, secretary, and C. G. Davis, of Cleveland, O., treasurer. Several hundred teams are at work on grading.

**DETROIT, MICH.**—John B. Dyar, chief promoter of the big Detroit-Port Huron Interurban Electric Railroad, on May 13, transferred property and securities valued at \$200,000 to a trustee for the benefit of creditors. For 20 years Mr. Dyar has been a successful business man of Detroit, and his embarrassment at this time is due to his connection with the electric railway scheme.

## Minnesota.

**STILLWATER, MINN.**—The city council has voted to give a bonus of \$5,000 to anyone who will purchase and operate the street railway.

**ST. PAUL, MINN.**—The Twin City Rapid Transit Company has practically consented to build a portion of the desired electric road to St. Anthony Park.

## Mississippi.

**MERIDIAN, MISS.**—John Kamper of Enterprise, has purchased the electric line of W. R. Hall, and will invest more capital in improvements, including a new corliss engine, rails for an extension and additional cars.

## Missouri.

**ST. LOUIS, MO.**—The Fourth Street & Arsenal Railroad will be sold June 29, under foreclosure of second mortgage.

**KANSAS CITY, MO.**—Rumor has it that a great interurban electric railroad is to be built between Kansas City and Leavenworth. Colonel D. A. McKibben, Major John M. Long, Harvey M. Rush and George W. Kirstead are said to be interested.

**ST. LOUIS, MO.**—The Lindell Railway is arranging with the Missouri Pacific Railroad to give a suburban service to Kirkwood. The steam road will put in service a number of light trains transferring passengers to the Lindell at Vandeventer avenue station, thus offering strong competition to the St. Louis Suburban, whose stockholders recently acquired the Houseman air line with a view to employ it as a feeder to their line.

**ST. LOUIS, MO.**—The House of Delegates has read a second time the bill authorizing the North End Electric Railway to construct a line from the river to Forest Park. A bill has been introduced authorizing the Southern Electric Railroad to extend its double track line from Seventh and Howard streets. The House has passed an ordinance authorizing the North & South Railway Company to construct and operate lines over certain streets in St. Louis.

**KANSAS CITY, MO.**—Robert Gillham, receiver of the Northeast Electric Railway has turned the property over to the Northeast Electric Street Railway Company. Mr. Gillham took charge of the road in October, 1895, and has rehabilitated the line, converting a burdensome "lawsuit" into a well equipped and paying property. On July 30 the road was sold under foreclosure of mortgage to the Jarvis Conklin Trust Company. Last November the reorganized company was incorporated with \$500,000 capital stock.

**ST. LOUIS, MO.**—The St. Louis, Clayton & Creve Coeur Lake Railroad Company has filed articles of incorporation with the secretary of state. Twelve miles of electric road will be built to carry passengers and light freight. Capital stock, \$120,000, of which \$12,000 has been subscribed and 5 per cent paid in. Incorporators, George W. Baumhoff, 50 shares; Charles Hodgman, 50; Samuel Barnes, 5; John L. Miers, 5; Luther S. Handy, 5, and Lon O. Hocker, 5, all of St. Louis. The St. Louis & Meramec River Railroad Company will ask the Kirkwood trustees for a more liberal franchise in place of the present one, which contains burdensome conditions. President Case says the road will undoubtedly be built through to Kirkwood.

**KANSAS CITY, MO.**—The Riverview power station of the Metropolitan Street Railway has been placed in operation. Cars are running on the new West Side line to Kosedale. The extension talked of by the residents of Bonner Springs has not yet been considered by

the directors, but will be in the future. It would be eight miles long. S. L. Conklin, of New York, has been in Kansas City to talk over various extensions of the Northeast Electric Railway, in which he is a large stockholder. Superintendent J. H. Pickering, of the Kansas City & Independence Air line, is watching the experiments in the East with compressed air with a view to adopting air motors to run the trains in place of steam. The change will not be made before next fall.

**ST. LOUIS, MO.**—Directors of the Southern Electric Railroad contemplate extensions, and will probably petition the municipal assembly for a franchise at an early date. The present terminus at Broadway and Howard is to be moved northward near Bellefontaine and Calvary Cemetery. The Northern Central Electric Road will get right of way and apply for a franchise to extend its line into St. Louis county. George W. Baumhoff, of the Lindell Railway, has received assurances from the St. Louis County Court that a franchise would be granted for a street railway from Delmar and Adelaide avenues to St. Charles rock road. A branch line will also extend from the Delmar boulevard and connect with the Cross County Railroad, for which a franchise was granted some time ago.

## Montana.

**ANACONDA, MONT.**—An extension of 15 miles will soon be made by the Anaconda Electric Railway, Light & Power Company. Some new cars have been ordered.

## Nebraska.

**NORFOLK, NEB.**—The franchise, cars, mules and all appurtenances of the Norfolk Street Railway were recently sold for \$55.

## New Hampshire.

**EXETER, N. H.**—John Giddings & Son, of Somerville, Mass., have the contract to construct the power station for the Exeter Street Railway.

**EXETER, N. H.**—The Exeter Electric Railway Company's petition to issue \$100,000 of bonds and an equal amount in stock to cover the cost of the new road was heard May 5 by the state railroad commissioners.

**PORTSMOUTH, N. H.**—Manager A. F. Gerald, of the Portsmouth, Kittery & York Beach Electric Railroad, says that work will immediately proceed, the supreme court having denied the petition of York Harbor residents for an injunction restraining construction.

**DERRY, N. H.**—The new Chester & Derry Electric Railway Company at its first annual meeting elected the following directors: Cassius S. Campbell, Frederick J. Shepard, Greenleaf K. Bartlett, Charles Bartlett, Arthur H. Wilcomb, George S. West and Watters W. Goldsmith.

**CHARLESTOWN, N. H.**—E. C. Crosby of Brattleboro, Vt., M. A. Coolidge of Fitchburg, Mass., and a third party, have acquired the Springfield & Charlestown Electric Railway. They will complete the road at an expense of \$40,000. At the start the road will be equipped with six cars, part freight and part passenger. Two generators will be put in the power house at Springfield, one for water power and one for steam. While Adna Brown has been elected president of the new company it is understood that Mr. Crosby will be the active manager.

## New Jersey.

**JERSEY CITY, N. J.**—The Consolidated Traction Company contemplates constructing a line through Greenville to Jackson avenue.

**CAMDEN, N. J.**—Work on the new car barn, machine shop and paint shop of the Camden & Suburban Railway, on Newton avenue is progressing.

**ELIZABETH, N. J.**—The Union County Board of Freeholders will present a bill to the Legislature authorizing them to construct and operate a street railroad on any of the county roads and to lease same for term of years.

## New York.

**COHOES, N. Y.**—The Cohoes City Railway Company contemplates erecting a power station of its own.

ALBANY, N. Y.—The Albany Railway has filed its acceptance of the franchise granted by the city of Rensselaer.

BUFFALO, N. Y.—The Buffalo Traction Company has filed a map of the first 15 miles of streets on which it proposes to build.

WESTFIELD, N. Y.—The Westfield, Mayville & Chautauqua Motor Railroad Company has accepted the franchise granted by Mayville.

RIVERHEAD, N. Y.—Consents are being obtained by President Solomon P. Brooks for the trolley line from Riverhead to Westhampton.

OLEAN, N. Y.—The car barns of the Olean & Bradford Electric Railway are fast nearing completion. The track work also has made great progress.

PENN YAN, N. Y.—William H. Tylee, of Penn Yan, has made a call on stockholders for 30 per cent of their subscriptions to the new electric railway.

PENN YAN, N. Y.—The Penn Yan & Keuka Park Street Railway Company has been granted an additional franchise to operate over Hamilton street.

NYACK, N. Y.—T. F. Odell, of the board of trade, is conferring with the Christian Alliance with a view to the construction of an electric road in Nyack.

MECHANICVILLE, N. Y.—The Stillwater & Mechanicville Street Railway Company has filed with the secretary of state a certificate of its proposed extension in Mechanicville.

PORT JERVIS, N. Y.—Franchises will be asked by the Port Jervis Electric Street Railway Company. Ex-Gov. Waller is president of the company which was recently incorporated.

ROCHESTER, N. Y.—An extension costing \$80,000, direct from Rochester to Manitou Beech is contemplated by the Rochester, Charlotte & Manitou Electric Railway Company.

BUFFALO, N. Y.—Engineer Nott, of Hamburg, has begun the final survey of the Buffalo, Hamburg & East Aurora Electric Railroad preparatory to advertising for bids for construction.

NIAGARA FALLS, N. Y.—James H. Rand, president of the Tonawanda Railway Company, has applied for right to build and operate an electric road on Portage road, Parkard road, Ferry, Main and Niagara streets to Riverway.

NEWBURGH, N. Y.—Judge Dykman has granted an injunction restraining the city from selling the Newburgh Electric Railroad. The road is in arrears for taxes and paving assessments and was advertised to be sold to satisfy the city's liens.

WAVERLY, N. Y.—The Waverly, Sayre & Athens Electric Railway Company has acquired a controlling interest in the electric light and power company. The two plants will be consolidated. Other important deals are being considered by the railway company.

SEA CLIFF, N. Y.—The North Side Construction Company has been incorporated to build electric and compressed air railroads, lighting and power plants, water works, etc. Capital stock, \$5,000; incorporators, C. E. Silkworth, John Graham, George Muller, of Sea Cliff, James Norton and William Schoelles, of Sea Cliff.

ONEONTA, N. Y.—The Oneonta & Otsego Valley Railroad Company has been incorporated to build ten miles of road, connecting Oneonta with the intersection of the stage road from Oneonta to Laurens. Capital stock, \$100,000; directors, Frank Gould, A. D. Getman, A. C. Lewis, Parker Wilson and others, of Oneonta.

NEW YORK, N. Y.—Justice Beach has dissolved the injunction restraining the Metropolitan Street Railway for installing electricity on the Eighth avenue horse line. Work will soon commence. It is said the Metropolitan has acquired control of the Central Crosstown line, thus shutting off the Third Avenue Railroad from valuable connections.

OSWEGO, N. Y.—Justice Wright has granted Receiver Tidman, of the Lake Ontario & Boulevard Railroad Company, authority to issue \$50,000 of receiver's certificates with which to build the extension to Minnetto, put in a power plant, buy fare registers, car fenders and everything needed to make the road a first class institution and a paying enterprise. Mr. Tidman has perfected arrangements for negotiating the certificates.

LYONS, N. Y.—The Lyons & Sodus Bay Electric Railroad Company has applied to the trustees for right to construct and operate a surface railway upon Geneva, Phelps, Broad and Water streets. The incorporators are George W. Knowles, William S. Gavitt, Daniel Moran, James W. Putnam, W. H. Baltzel, F. W. Chamberlain, H. F. Zimmerlin, Richard F. Forgham, A. L. Hoffman, O. F. Thomas, J. F. Guenther, W. H. Egan, George Rankert, G. W. Hattler, Charles T. Ennis, B. Hammond, E. W. Hamm, S. C. Redgrove, V. R. Howell, M. C. Taylor, W. Van Camp, George H. Baltzel, C. R. Sherwood, J. S. Jordan.

NEW YORK, N. Y.—The Union Railway Company is distributing rails for six miles of double track trolley line in Jerome avenue. The overhead material will be supported on center poles. An extension of its lines on the east side of the city directly west to connect with the Jerome avenue road is also planned. The work is expected to be finished by July 20. Henry J. Braker offers the city \$1,000,000 each for the franchises of the Sixth and Eighth Avenue Railroad Companies; but the sinking fund commissioners think they have no power to act and will not consider the offer without an opinion from the corporation counsel.

SARATOGA, N. Y.—Robert B. Smith, of Hackensack, N. J., Charles G. Farwell of Boston, Alfred B. Thatcher, C. Herckenrath, W. S. Jenks, Charles H. Davis and S. R. Berton of New York, and Theodore F. Hamilton of Saratoga, have incorporated two companies to construct surface roads in Saratoga. They are the Saratoga Traction Company, capital \$50,000, to build 2.5 miles of road from Broadway and Congress streets to the Kissingen, Geysler and Vichy springs, and the Saratoga Lake Railroad Company, capital \$150,000, to build a line from the same point in Saratoga to Moon's corners, on the west side of Saratoga Lake.

## Ohio.

LIMA, O.—The Lima Street Railway asks permission to extend its tracks on Wayne and Pine streets.

SPRINGFIELD, O.—R. B. Coover and C. S. Olinger have applied for right of way for an electric road to Vienna.

EAST LIVERPOOL, O.—The new owners of the East Liverpool & Wellsville Street Railway will make repairs and add new equipment at a cost of \$40,000.

DAYTON, O.—The Dayton & Western Traction Company has accepted its franchise from the county commissioners, giving a bond for \$10,000 to guarantee completion before July, 1898.

DAYTON, O.—Dr. J. E. <sup>1</sup>Lowes, president of the Dayton & Western Traction Company, states that work will begin shortly and will be completed November 1, if present arrangements are carried out.

CLEVELAND, O.—The Cleveland, Painesville & Eastern Railroad has been granted a franchise to run a loop down Lake road, connecting Willoughby and Nottingham, with privilege of carrying light freight.

SPRINGFIELD, O.—The Montgomery county commissioners have granted the Dayton & Springfield Interurban an extension of time from September 1 to October 1, in which to have the first mile of the road completed.

EAST LIVERPOOL, O.—Herbert Payson, trustee for bondholders, on May 5, bought the East Liverpool & Wellsville Street Railway for \$102,000 at sheriff's sale. The road had been appraised at \$151,000. Among those present were Tom L. Johnson, H. J. Davies and Charles Brooks, representing a Cleveland trust company.

BUCYRUS, O.—W. E. Haycox has closed arrangements for beginning work on the Bucyrus & Gallion Electric Railway, and expects that cars will be running before snow flies. Engineers E. B. Shifley

and H. V. Flickinger will have the route staked out within two weeks, when it is promised that material for construction will be on the ground. The power house is to be located in Bucyrus, on a site not yet selected.

## Pennsylvania.

UNIONTOWN, PA.—Operation has been resumed on the Uniontown Railway, which was recently sold by the sheriff.

READING, PA.—Stockholders of the East Reading Electric Railway have voted to increase the bonded debt \$25,000 to pay for the extension to Carsonia Park.

READING, PA.—The Reading & Boyertown Electric Railway Company will pay the Oley Turnpike Company \$25,000 for right of way from Black Bear to Jacksonwald.

PHILADELPHIA, PA.—The West End Traction Company has been incorporated. Capital stock, \$10,000; incorporators, William S. Carrigan, Harry S. Bottomley, Charles K. Chandler, Robert P. Cregar and H. C. Owen.

PITTSBURG, PA.—The Bellevernon & Eastside Street Railway Company has been incorporated to build and operate five miles of road. Directors, George D. Jenkins, president, H. R. Meyers, O. M. Hartley, N. E. Clark and O. M. Henderson.

MEADVILLE, PA.—The Meadville Traction Company has been incorporated to operate between Meadville and Cambridge Springs. Capital stock, \$350,000; incorporators, F. R. Shryock, Charles Fahr, George D. Trowen, H. H. Thompson, John J. Shryock and Cyrus See.

PHILADELPHIA, PA.—Stockholders of the East Penn Traction Company met recently at 1315 Arch street and voted to increase the capital stock from \$350,000 to \$416,000, and to issue an equal amount of bonds. About 200 men have been placed at work by the contractors.

PITTSBURG, PA.—The Central Traction Company asks the council for an extension of its tracks. The Beechwood Avenue Railway Company has applied for right of way. Franchises are also asked by the West End, Mt. Washington & Banksville Street Railway Company.

PITTSBURG, PA.—Suburban extensions will be carried out this summer by the Pittsburg & West End Passenger Railway Company, and the Second Avenue Traction Company. The Pittsburg, Allegheny & Manchester Traction Company will make a new mortgage for \$200,000 to fund its floating debt.

WEST NEWTON, PA.—The West Newton Passenger Railway Company has accepted the franchise granting right of way over Second street, giving a bond for \$10,000 to guarantee that work will be begun in six months and that cars will be running within a year. The line will connect with the Second Avenue Traction of Pittsburg, thus forming a direct route 33 miles long.

PITTSBURG, PA.—Three street railways were incorporated May 20, The West End, Mt. Washington & Banksville Street Railway Company, of Pittsburg, capital, \$12,000. This line begins at a point on Woodbine avenue in the Thirty-sixth ward, at the terminus of the track of the Pittsburg & West End railway, and runs to Virginia avenue and Kearsarge street. The president is John C. Reilly; directors, Thomas S. Bigelow, W. J. Burns, J. D. Callery, E. S. Reilly, W. J. Burns, Jr. The Carnegie, Heidelberg & Bridgeville Street Railway Company, of Carnegie, capital, \$30,000. This line runs from Washington avenue and Main street, in Carnegie, to Third and Main streets. The officers are the same as in the above company. The McKeesport, Monongahela & Finleyville Street Railway Company, the line of which runs along the river road near Dravosburg, through Midlin and Jefferson townships to Monongahela borough, with a branch to Finleyville; capital, \$10,000. The president is J. L. D. Speer; directors, Joseph H. Moore, M. M. Bunting, David Jenkins, William K. Rowe.

## Tennessee.

JOHNSON CITY, TENN.—J. E. Brading will lease the Johnson City & Carnegie Street Railway, of which he has been appointed receiver, and operate cars after June 1.

## Texas.

PALESTINE, TEX.—The Palestine Street Railway & Electric Light Company has petitioned for franchises.

BEAUMONT, TEX.—Fred Zoiner of South Dakota asks an electric railway franchise. Together with S. M. Peters, R. G. Jenkins and O. W. Putnam he has formed the Beaumont Electric Railroad Company.

## Vermont.

ST. ALBANS, VT.—Alfred A. Hall, George W. Crampton and W. Tracy Smith are interested in a proposed electric road to St. Albans Bay, 2.5 miles long.

## Virginia.

STAUNTON, VA. R. D. Apperson, general manager of the City Street Car Company, writes us: "We are in the market for 50, 56 or 60-lb. relaying rail 'I' for immediate delivery at this point, together with all the necessary fastenings. Prices and all information must be sent at once."

## Wisconsin.

MILWAUKEE, WIS.—Receiver J. W. Bingham has applied to the court for permission to sell the Milwaukee & Wauwatosa Motor Railway.

MILWAUKEE, WIS.—Right to build an extension on Jackson street has been granted the Milwaukee Electric Railway & Lighting Company.

OSHKOSH, WIS.—A bond for \$2,500 was given May 5 by the electric road to indemnify the city on account of tearing up the streets, and the Electric Installation Company was permitted to resume work.

EAU CLAIRE, WIS.—The Chippewa Valley Electric Railway Company has been incorporated to operate a street railway and lighting plant. Capital stock, \$100,000; incorporators, A. J. Keith, W. C. Donovan and C. E. Kelsey.

GREEN BAY, WIS.—The Fox River Electric Railway Company has taken an option on the plant of the Green Bay Gas & Electric Light Company. The option holds good until July 15, and will probably lead to the consolidation of the two interests.

OSHKOSH, WIS.—An ordinance has been introduced in the city council to declare the franchise granted James K. Tillotson in full force and effect. The franchise was assigned by Tillotson to the Citizens Traction Company, which is now building the road.

## Canada

LONDON, ONT.—About \$10,000 will be expended on extensions by the London Street Railway Company.

LONDON, ONT.—The London Street Railway Company is expected to build a line to Lucan, for which permission was granted by the Legislature.

WINDSOR, ONT.—The Windsor Electric Railway Company expects to go ahead with the contemplated extension to Chappels and the loop line in Walkerville.

HAMILTON, ONT.—The Hamilton & Dundas Railway has submitted plans to the city for the conversion of its dummy line to electricity in connection with the Radial Electric Railway.

HAMILTON, ONT.—The stock of the Hamilton, Chedoke & Ancaster Electric Railway has been placed in the hands of William Strong to be disposed of. About \$15,000 of the total \$100,000 has already been subscribed. The following directors have been elected: Edward A. Clifford, Ancaster, president; Edward Henderson, Ancaster, vice-president; Rev. W. R. Clark, Ancaster; F. Snider, Hamilton; B. W. Donnelly, Ancaster; W. F. Walker, Q. C., solicitor and secretary, Hamilton; T. S. Bell, engineer, Hamilton.



**RAILWAYS FOR GHENT.**

The city of Ghent has prepared specifications and invited proposals for the construction and operation of seven lines of street railways aggregating about 14 miles of single track, to be operated by electricity either with storage batteries alone or by a mixed system such as is employed in Hanover, as the overhead trolley will not be permitted in the central portion of the city. The concession will be granted to the successful bidder for a term of 50 years, the city retaining the privilege of purchasing the road at any time; if purchased before 20 years, the company will receive the capital invested plus 20 per cent; if after 20 years, the company will receive for the remainder of the term an annuity equal to the average net revenue for the 5 years preceding the sale, plus 10 per cent, or the capital of such annuity computed with interest at 4 per cent.

Bidders must submit proposals upon stamped paper not later than July 5, 1897, and must specify the system of operation proposed and the per centage of the receipts that they engage to pay the city (the minimum is fixed at 20,000 francs per annum), and deposit 200,000 francs with the National Bank of Belgium as a guarantee of good faith.

Those interested can procure copies of the specifications and the stamped paper for the proposals through the Belgian consuls.

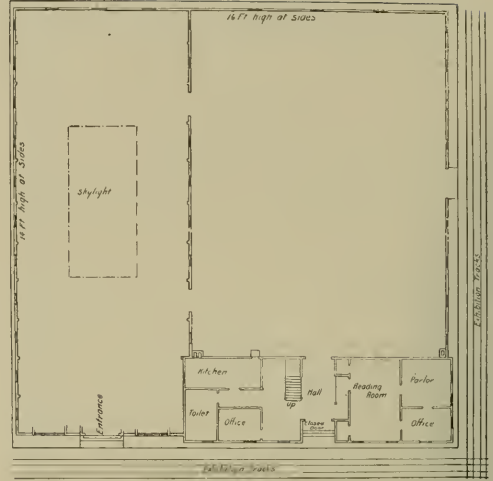
**BUILDING FOR EXHIBITS, A. S. R. A., AT NIAGARA.**

The local committee at Niagara Falls, which has in hand the furnishing of a home for the convention of the American Street Railway Association at its October meeting in that city, has abandoned the project of erecting a building for the purpose, and instead has bought an unused armory.



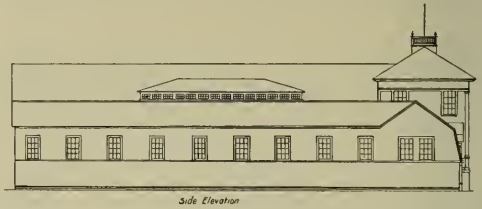
CONVENTION AND EXHIBIT HALL AT NIAGARA FALLS.

When enlarged as proposed the building will be 132 x 132 ft.; it is now 90 x 132 ft. It is within 10 minutes' walk of the hotels, and street and steam tracks will be brought into the building. Business sessions will be held in the room in second story, seating 300; entrance to this room is by stairs inside the building. The building is on Walnut avenue with fronts on two cross streets also. Temporary street car tracks will be laid at both sides and in front, or as as much as necessary to accommodate all cars, sweepers, etc. The portion of the building shown at the left has a sloping roof,



FLOOR PLAN EXHIBIT BUILDING.

14 ft. high at the sides, with a large skylight and side windows; the larger room is 16 ft. high at the sides and well

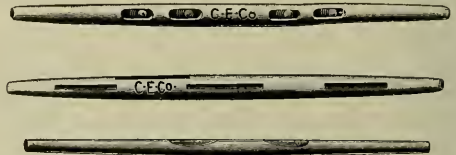


Side Elevation

lighted by side windows. The building is steam heated. We understand both exhibit rooms are free from posts, the roofs being trussed.

**CENTRAL ELECTRIC SPLICERS.**

The Central Electric Company, of Chicago, is laying special stress upon its trolley wire splicers, three forms of which are shown herewith. They are made of special drawn tubing and offer a very smooth passage to the trolley



wheel. The company is also offering to the trade some special wire splicers, made of drawn tubing, which are considered unique in design, and motor bearings which are very superior in finish and wearing qualities.

A systematic scheme for swindling the street railway company by means of bogus transfer tickets was unearthed by the police and the railway officials in Toronto.

THE SIMPLEX TELEPHONE.

Through the courtesy of A. A. Anderson, general manager of the Mahoning Valley Railway Company, Youngstown, O., we have received some views illustrating the telephone system installed for that company by the Simplex Interior Telephone Company, of Cincinnati, in 1896. This emergency telephone was briefly described on page 310 of the REVIEW for May. The distance from the Youngstown power house to the power station in Niles is about 9½ miles; 27 cut-in boxes and two terminal stations were put in on this line. In the city and suburbs where there are

NO SPITTING IN MINNEAPOLIS CARS.

The effort to stop the disgusting habit of spitting in street cars and public places is making most satisfactory and encouraging progress. Already in a large number of cities the nuisance is either abated or practically so. It will soon be considered so ill-mannered to spit in a car that few will do so for the shame of the thing and for others who apparently have no sense of decency, suitable laws are being enacted and what is better, enforced. The example of a wealthy but stubborn man in San Francisco, who upon being fined for the offense went out and deliberately committed a second offense in the first car he found, will have a big moral effect. He was as promptly arrested and given 24 hours in the county jail.

While the Minneapolis ordinance is not very delectable reading, we print it as a guide to any of our readers who contemplate securing similar legislation in their own city. It will be noticed the law is specifically for street cars when in service.

AN ORDINANCE

To Prohibit Spitting and Depositing Sputum, Spittle, Saliva, Phlegm or Mucus Upon the Inside or Platforms of Street Cars, When In Use on the Streets or Highways in the City of Minneapolis and Prohibiting the Defilement of Such Cars When So in Use:

The City Council of the City of Minneapolis do Ordain as follows:

Section 1. Any person who shall spit or expectorate or deposit, or place any sputum, spittle, saliva, phlegm or mucus upon the floor, or inside furnishings, or equipment, or in any place upon the inside, or upon any platform of any street car while the same is in use upon any of the streets or highways in the City of Minneapolis, after being requested by the conductor in charge of such car not so to do shall be deemed guilty of a misdemeanor.

Sec. 2. Any person who shall defile any street car while in use upon any street or highway in the City of Minneapolis, by spitting upon the floor or inside furnishings or equipment, or in any place upon the inside, or upon any platform of such car, or by any other means, or in any other manner shall defile such car so that the same shall be unclean for use as a street car, or so as to interfere with the comfort or well being of passengers thereon, shall be deemed guilty of a misdemeanor.

Sec. 3. Any person who shall violate any provision of any section of this ordinance shall, upon the conviction thereof before the Municipal Court of said city, be punished by a fine not to exceed ten dollars for each offense, and upon default in the payment of such fine, may be imprisoned until such fine is paid, but not to exceed ten days.

Sec. 4. This Ordinance shall take effect and be in force from and after its publication.

The two tons of copper wire stolen from the Hartford Street Railway, May 8, were recovered in Philadelphia.



REPORTING TROUBLE.

ordinary exchange telephones available for the use of the train crew in case of accident none of the emergency cut-in boxes are put up; on the rest of the line they are placed at intervals of about 1,500 ft. The Mahoning Valley Company advises us that the system has given excellent satisfaction and that it considers it indispensable to the operation of an interurban road. The illustrations are self-explanatory and show the receiver and transmitter, the cut-in box and the manner of using the system.

When it is desired to be able to signal both ways on such a system it is only necessary to put in a magneto at the central station and extension bells at the various sub-stations, the sub-station calling central with battery key the same as the emergency boxes.



CUT-IN BOX AND RECEIVER AND TRANSMITTER.

## AMERICAN WORKS OF THE FUEL ECONOMIZER COMPANY.

In designing the manufacturing plant of the Fuel Economizer Company of Matteawan, N. Y., and of which we present some illustrations, the general manager of the company, A. H. Blackburn, endeavored to so arrange the works, that receiving the raw material at one end, it should be passed along from shop to shop, and finally emerge as a finished product with the minimum possible amount of handling. With this object in view the foundry is placed directly behind the machine shop, and as the castings come from the foundry they go to the cleaning shop, and thence to the machine shop. Here they are machined and passed to the hydraulic presses, the sections there being pressed together, and after being tested are ready to be loaded on to cars for shipment.

The machine shop and foundry cover a space of 50x360 ft., and are so arranged that either or both can at any time be enlarged to double their present capacity, and the present convenient and economical plan of handling material preserved. The pattern shop and boiler house are in separate buildings, the latter having a switch to deliver coal into the boiler room. The draughting room is on the second floor of the well lighted office building. The shop buildings also were designed with a very large window space.

The works are located along the railroad, with a switch running into the yard. Taking advantage of a natural incline of the lot a gravity system of switching has been arranged inside of the yard, by means of which cars placed at the end of the yard by the switch engine may be loaded and switched from one track to another, thus allowing the loading and shifting of a number of cars during the day without requiring the engine. In addition to the railroad



THE FUEL ECONOMIZER COMPANY.

facilities afforded, the location on the Hudson river makes it possible to make many shipments by water, all the raw material being received by water.

In both the foundry and machine shop the latest improved machinery has been installed in order that the work may be turned out at a minimum cost. Air hoists are used throughout for handling material, and have proved very successful. The compressor was furnished by the Ingersoll-Sergeant

Drill Company, and the hoists by the Whiting Foundry Equipment Company, which also furnished one of the cupolas. Molding machines are used in the foundry. The shops are lighted by electricity, arc and incandescent lamps being used, and in case of a breakdown in the lighting plant the lights can be switched on to the street circuit.

The very general use in which the Green economizers

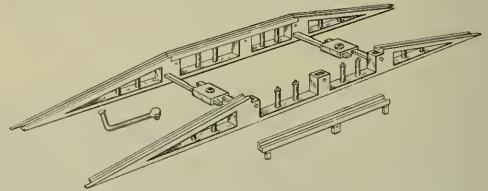


OFFICES OF THE FUEL ECONOMIZER COMPANY.

have come in England and Europe bids fair to be repeated here, where thousands of horse power are being installed each year. The company has a large number of sales offices, the western territory being in charge of Stanley Green, Chicago, who has made a fine record.

## NEW HOSE BRIDGE.

The accompanying cut illustrates a hose bridge which has been patented by Messrs. Flannery and Fromm, and which has been given a trial in the East. Both the management of the street railway company and the fire department speak highly of it as a successful device for preventing blockades, when it is necessary to carry lines of hose across railway



tracks. Little in the way of description is needed to make clear the manner of its application. By means of the racks and gears the bridge may be expanded laterally to fit any gage from 34 to 62 in. and when adjusted to the proper width it is locked in place by jam nuts. Being only 34 in. wide when closed up, it is readily handled on the repair wagon.

Mrs. Susan St. John was awarded \$25,000 for injuries from being thrown from a North Chicago electric car.



## PLEASURE RESORTS.

The opening of street railway pleasure resorts and park attractions has been a little late this year on account of the late spring in many portions of the North, but is now fairly under way, and the public are once more spending afternoons, Sundays and evenings at these popular places. In some instances, last year, the results from a financial standpoint were disappointing to managers, and several even closed the season with an actual loss. This can be explained by the industrial stagnation, the counter attractions of a political campaign, and to some extent by a lack of experience as to what were really the most profitable attractions. As a rule light opera or anything on an elaborate scale should not be attempted in any but large cities, and not there where other similar summer attractions are running at the usual play houses. A good variety program, including some instrumental music, has generally proved profitable, as the performance can be made continuous for several hours with a comparatively small number of not very expensive people. Fire works when they do succeed are very profitable, but the expense is considerable and the uncertainty of what the weather may be, always makes this attraction a doubtful one. Where the resort is a large one a wise plan is to rent out as many concessions as possible, thus relieving the company of a large amount of detail, and leaving it free to put all its energies and money into one or more chief attractions.

The Woronoco Street Railway Company has obtained control of the Woronoco Park at Westfield, Mass., and will turn it into a pleasure resort for its patrons. The pavilion has been leased, refreshments will be served and special attractions presented.

At the Coney Island terminus of the Nassau Electric Railroad a large passenger station is being erected with a frontage of 160 ft. on Surf avenue and two well lighted promenades, one leading from the cars to Surf avenue and the other from the avenue to the waiting room.

The Galveston City Railroad Company had made improvements to the Olympia beach resort by providing bathing facilities, refreshments, etc. This will be an especially attractive place during the warm weather when bathing is in favor.

In addition to the many amusement features at Ross park the Binghamton Street Railroad Company has purchased three new graphophones and a large kinoscope and appliances for operating the same. These instruments will be used both at the Casino and at the park afternoons and evenings and exhibitions will be given free of charge. The street railway company has issued 3,000 copies of a handsomely illustrated publication, descriptive of Binghamton and its attractions.

The Fairmount Park Transportation Company of Philadelphia has purchased an 18-acre tract of ground bordering on Fairmount Park, and will convert it into a pleasure resort for the patrons of the road. The park, which was opened the first of this month, will hereafter be known as "Woodside." A casino building is being erected, 100 x 200 ft., and on this will be a roof garden. Among the amusement features that are to be provided will be a scenic railway, carrouzels, Edison's novelties, bicycle track, public bath house and an artificial boating lake. A concert band has also been engaged for the season.

The Hamilton (Ont.) Radial Electric Railway Company has procured a strip of land 600 ft. long on the lake beach,

and will erect a large hotel and summer garden with a theater in connection. It is expected that this will make one of the finest resorts in Canada.

The Union Traction Company of Philadelphia has signed a contract with Walter Damrosch, the famous musical director, to furnish music at the new Willow Grove Park for the summer. It is proposed to erect an elephant 100 feet high within the park.

As a great drawing card at Lake Erie Park, near Toledo, the Casino Company will erect a scenic railway at a cost of \$20,000. The structure will be 800 ft. long and will afford a ride of 3,500 ft. The railway resembles the switch back, but is built on a far more elaborate plan. After one or two breath-taking ascents and descents the car shoots into a tunnel, dark as midnight, and then suddenly passes into a room brilliant with electric lights.

The Holyoke Street Railway Company recently purchased a large orchestrino which will be placed in the new



IN INEXPENSIVE PAVILION.

pavilion on Mt. Tom during the summer. The instrument is the finest ever imported into this country and has all the instrumentalities of a complete orchestra.

Hyde Park is a very attractive summer resort near Austin, Texas. The Rapid Transit Railroad has added many things to enhance its beauty, and the people of Austin show their appreciation by visiting it in large numbers. The park and lake are lighted by arc lamps, croquet and lawn tennis grounds are laid out and a zoo has been started at one end of the park.

Birmingham, Ala., is favored with several pleasure resorts, and the Birmingham Railway & Electric Company has given every facility to the citizens to enjoy these parks. Special rates and other inducements are offered to church, Sunday school, society and club picnics to Hawkins Springs, Avondale, Ensley Bridge and East Lake. Vitascope exhibitions, band and orchestra concerts are given free of charge. General Manager McClary distributed buttons with the inscription, "Go to East Lake" and a colored view of the lake and pavilion.

Dubuque, Ia., has in prospect a resort of unusual size and beauty. The Dubuque Street Railway Company is asking for an extension of its franchise and promises if its request is granted to at once build a summer park. This park, to be known as "Lakeside," will be located near Thompson's mill, a place well suited naturally for an ideal resort. A dam will be constructed forming a lake of 200 acres, electric

launches, bath houses and facilities for aquatic sports being provided. The overflow of water from the dam will be utilized for generating electricity to light the park and furnish any other power required. The lake will be stocked with fish. Driveways, an observatory and other improvements will be made.

An illustrated pamphlet on Cayuga Lake Park is distributed by the Geneva, Waterloo, Seneca Falls & Cayuga Traction Company. Cayuga Lake is in the western part of central New York and is a sheet of water of surpassing beauty. The trolley cars of the Traction Company can be boarded at Geneva, Waterloo or Seneca Falls and after a delightful ride through several towns and villages and along the Seneca river, the passengers are carried into the park. An opera house, toboggan slides, boat houses, a bicycle track and athletic grounds afford amusement and recreation for the visitors.

Early this spring the Utica Belt Line Street Railroad Company purchased a tract of 40 acres on the east bank of Oriskany pond, a few miles out from the city. Summit Park is the name of the new resort. The railway company has spared neither time nor money in making the park attractive in every way. An expanse of still water, a mile in length, affords excellent facilities for boating; refreshment booths, dancing hall, band stand, water tower, observatory, summer theater, bicycle and racing track all contribute to make the park very inviting.

The Columbus (O.) Street Railway Company has published a little booklet, profusely and handsomely illustrated. The views are of shady nooks, the walks and drives, and the river flows past Olentangy Park. A number of the photographs were taken by Secretary P. V. Burrington. Each picture is accompanied by an appropriate quotation of poetry. These attractive pictures would certainly inspire a visit to the park.

J. W. Gorman, the pioneer in furnishing outdoor summer amusements, and who now makes a specialty of furnishing high grade entertainments and strictly desirable and taking performances for street railway resorts, has issued his annual of summer attractions. The pamphlet, which is fully illustrated, presents a fine assortment from which to select, and offers a wide range of entertainments. The attractions are all of a really good grade, selected with care, and guaranteed by Mr. Gorman to be exactly as represented. A copy will be sent to any manager by addressing J. W. Gorman, 180 Tremont street, Boston.

One of the most attractive things to small children and which can be supplied at practically no expense, is a large pile of clean sand. In resorts where there are no sand beaches a space should be set aside for this, and the sand removed and replaced several times during the season in case it becomes dirty. In Golden Gate Park, San Francisco, this is done, and daily attracts a large number of children.

The universal verdict from managers has been that the largest revenue earner in a resort is the "merry-go-round," or riding gallery. The children and young people never seem to tire of this attraction, nor are older people averse to frequent rides. They are operated by a motor using little power, and as built by the Armitage-Herschell Company, North Tonawanda, N. Y., are attractive, elegant and durable. One manager informs us he paid for his installation in less than three months last season.

Music of almost any kind, vocal or instrumental, is always good, and indeed a necessity at park resorts. August Pallman, 70 Franklin street, New York, is a large importer of mechanical organs of every variety from the penny-in-the-slot machines up to the large orchestrons operated by steam or electric power, and representing a full brass band. His instruments are proving very successful money earners in numerous street railway parks.

Norman & Evans, Lockport, N. Y., are well known builders of riding galleries, which are best operated with a motor from the trolley circuit. These attractions are money makers and no resort is really complete without one.

A. Elhogen & Co., 39 Third avenue, New York, are in position to save the railway manager lots of annoyance in securing performance attractions, having 50 standard shows from which to draw, and several hundred high class, sensational attractions. They guarantee their work, and have been established nearly 20 years. A recent novelty which is making money is the criteriascope, charges for which are moderate.

## THE ALLEN LAW.

Sec. 1. Be it enacted by the people of the State of Illinois, represented in the general assembly. That the title of an act entitled "An act in regard to horse and dummy railroads," approved March 10, 1874, in force July 1, 1874, be and the same is hereby amended so as to read as follows, viz.: "An act in regard to street railroads."

Sec. 2. That sections 1 and 3 of said act be and the same are hereby amended to read as follows:

Sec. 1. Any company which has been or shall be incorporated under any special or general law of this state for the purpose of constructing, maintaining or operating any horse, dummy or street railroad or tramway, may enter upon and appropriate any property necessary for the construction, maintenance of its road, and all necessary siding, side tracks and appurtenances, and may, subject to the provisions contained in this act, locate and construct its road upon or over any street, alley, road or highway, or across or over or under any waters in this state, in such manner as not to unnecessarily obstruct the public use of said street, alley, road or highway, or interrupt the navigation of such waters.

Every corporation may operate its railroad for the transportation of passengers and the United States mail.

Every such street railway may be operated by animal, cable, electric or any other motive power that may have been or shall hereafter be granted to it by the proper public officers or authorities, except steam locomotive engines.

The tracks of such street railway shall be laid as near the center of the highway as practicable, except at curves, and when more than one track is laid the said tracks shall be laid parallel and in such manner as to leave a space of at least four feet between the said tracks, and no car shall be operated with an overhang of more than twenty-two inches outside of the outermost edge of the rail of the tracks upon which said car shall be operated.

No street railroad corporation shall have the right to enter upon, appropriate or use the whole or any part of the property or tracks of another street railroad owned or used by it in the operation of its road, except to cross the same at any necessary angle, without the consent of the corporation whose property or tracks it seeks to use.

All street railroad corporations shall have the right to contract with each other for the use of their respective tracks or to lease to each other or to purchase from each other any portion or the whole of their property or tracks upon such terms and conditions as they may agree upon for the purpose of operating the same. And every such corporation shall have the right and authority to consolidate its stock, property and franchises with any other like corporation; provided, however, that no such corporation shall consolidate with any other corporation running a parallel or competing line.

In case any such consolidation shall take place, sixty days' notice thereof shall be given in the manner and form as prescribed in sec-

tion 15, chapter 114, of the revised statutes, concerning the incorporation of railroad companies.

All contracts, leases or purchases heretofore made by or between such corporations shall be valid the same as if made subsequently to the passage of this act.

Sec. 3. No such company shall have the right to locate or construct its road upon or along any street or alley, or over any public grounds in any incorporated city, town or village, without the consent of the corporate authorities of such city town or village; nor upon or along any road or highway or upon any public ground without any incorporated city, town or village except with the consent of the county board.

Such consent may be granted for any period not longer than fifty years on the petition of the company upon such terms and conditions not inconsistent with the provisions of this act, as such corporate authorities or county board, as the case may be, shall deem for the best interests of the public.

Provided, that no such consent shall be granted except upon the petition of the owners of land representing more than one-half of the frontage of the street, or so much thereof as is sought to be used for street railroad purposes, and when the street, or part thereof, sought to be used shall be more than one mile in extent, no petition of land owners shall be valid unless the same shall be signed by the owners of the land representing more than one-half of the frontage of each mile and fractional part of a mile, if any, in excess of the whole miles, measuring from the initial point named in such petition of such street or of the part thereof sought to be used for street railroad purposes; nor unless at least ten days' public notice of the time and place of presenting such petitions shall have been first given by publication in some newspaper published in the city or county where such street railroad is to be constructed, and except upon the condition that the company will pay all damages to owners of property abutting upon the street, alley, road, highway or public ground upon or over which such street railroad is to be constructed which they may sustain by reason of the location or construction of the street railroad, the same to be ascertained and paid in the manner provided by law for the exercise of the right of eminent domain.

Every grant of authority which shall hereafter be made by ordinance to lay street railway tracks in any street or highway which shall be granted without a full and strict compliance with all of the requirements of the law shall be void, and any corporation acting or attempting to act under any ordinance hereafter granted, granting to such corporation authority to construct and operate a street railroad, where such corporation has not strictly complied with every requirement of the law pertaining to such grant, may be enjoined from exercising any rights or privileges under such void grant, at the suit of any abutting land owner.

Provided, that no owner of property fronting or abutting upon any street where it is proposed to construct or operate a street railway shall, after having petitioned the city council or other proper corporate authority, as the case may be, as required by law, be permitted to revoke or cancel such signature to such petition after the said petition shall have been filed with the said city council or city clerk or other corporate authorities, as the case may be.

The right to charge a fare of 5 cents given under any existing ordinance or grant of right to construct and operate a street railroad shall remain, and such rate of fare as is now charged shall not be lessened or increased during the life of or the remainder of the term of such ordinance or grant.

The city council or other proper corporate authorities, as the case may be, shall have the power, without said petition of said land owners, to extend any ordinance heretofore granted and now in force, granting the right to construct and operate a street railway in any street or highway at any time before its expiration, for a period of not longer than fifty years.

In every ordinance so extended for carrying passengers on the street railroad operated under such ordinance, and where an ordinance shall be extended, the rate of fare shall be 5 cents during the first twenty years of the period of such extension; provided, however, that the rate of fare shall not be fixed by said corporate authorities in any case for a period of longer than twenty years, and the fare so fixed shall in no case exceed 5 cents for a single ride within the limits of any city, town or village.

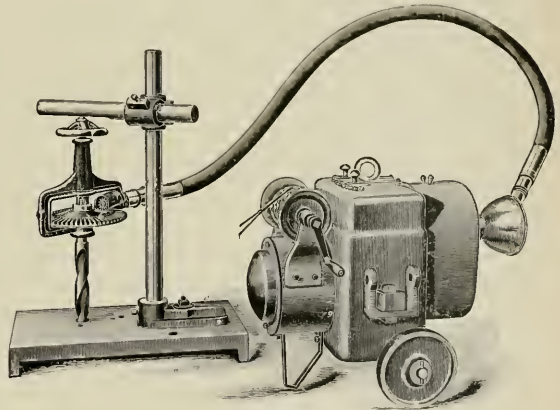
The city council or other proper corporate authorities shall have the power to fix the rate of fare to be charged in any ordinance hereafter granted, provided such rate shall not exceed 5 cents, and when

the rate is so fixed it shall not be lessened by the said city council or other corporate authorities, as the case may be, at any time during the period of twenty years after the passage of the said ordinance.

## MOTOR FOR STOW DRILL.

In previous issues we have published illustrated descriptions of the combination of electric motors and the Stow flexible shafting for portable machines for drilling, reaming, tapping, calking, etc., where access to an electric current may be had. The Stow Manufacturing Company, of Binghamton, N. Y., placed its apparatus on the market about four years ago, and while it has given the best of satisfaction, since that time a demand has developed for a dust and water proof motor which the company has met by the motor which is shown here.

The frame is in the form of a hollow cube with inwardly projecting poles. At each end is a circular opening over which is bolted the end plate supporting the bearing; by merely changing the end plates to bring the oil chambers into place, the motor may be run in almost any position. One of the end plates is extended into a short cylinder,



STOW IRON CLAD MOTOR AND DRILL.

forming a case for the commutator and brush holder. The field coils are protected by metallic cases, but can be easily moved. In sizes below 2 h. p. the motors have two and in the larger sizes four poles. The portable motors are fitted with truck wheels, leg, eye bolt, side brackets, reel, 20 yards of insulated wire and one set of reduction gears. Material and workmanship are of the best; mica insulation; rheostats protected by an iron case; gears covered. When desired, motors of this type for direct connection will be furnished. Selig, Sonnenthal & Co., 85 Queen Victoria street, London, are the European agents of this company.

The bill providing for free transfers on the West End road of Boston failed in the Massachusetts Senate by a vote of 25 to 11.

Judge Watson of the Supreme Court of Maine has ruled that a passenger standing on the platform of a street car may not recover damages by reason of being thrown off when going around a curve.



## PERSONAL.

O. A. Harlow of Miller's Falls, has been appointed superintendent of the new electric railway at Amherst, Mass.

C. K. King, secretary of the Ohio Brass Company, Mansfield, O., was a REVIEW caller when in the city a few days ago.

William Keutgen, secretary of the Staten Island Electric Railroad Company, is very ill; he was operated upon for appendicitis.

Jacob Mellinger, superintendent of the York (Pa.) Street Railway Company, was married to Miss Elmira Eyster at Lancaster.

J. R. Ledyard has been appointed superintendent of the tracks of the Cincinnati, Covington & Newport Street Railway Company.

W. H. Hansell, president of the Hansell Spring Company of Newark, N. J., was a caller on the REVIEW when in Chicago last week.

James G. Church has resigned as counsel for the Nassau Electric Railroad Company, of Brooklyn, and is succeeded by John F. Brennan, of Yonkers.

C. P. Holcomb has been elected general manager of the Holmsburg, (Pa.) Tacony & Frankford Electric Railway Company to succeed E. R. Gilbert who has resigned.

Superintendent Chambers, of the Erie Construction Company, is supervising the building of the Buffalo Traction Company's road, and after its completion will become general superintendent.

Lincoln Van Cott, formerly chief traveling auditor for the New York Central Railroad has left that road after 12 years service and on May 20 took the position of purchasing agent for the Brooklyn Heights Railroad.

T. Howard Atkinson, vice-president of the East Penn Traction Company, has been given the additional duties of general manager which include the construction of extensions to the railway and the operation of the entire road.

Frank S. Given, superintendent of the Columbia and the Donegal lines of the Pennsylvania Traction Company, was married to Mrs. Mary Gordon Schram. After a tour of the Western cities they will make their home in Columbia, Pa.

E. J. Wessels, general manager of the Standard Air-Brake Company, sailed for Europe on the Majestic on June 2, in the interest of the air-brake business which has greatly increased from the time he first went over the ground in person.

Maurice J. Hart, who some months ago was indicted for the alleged bribery of the New Orleans city council, by using \$100,000 to secure the passage of a franchise, has been acquitted. His accuser confessed to perjury when placed on the stand.

J. C. Hutchins, vice-president of the Citizens Street Railway, has been elected vice-president of the Detroit Electric Railway. It is expected that he will remove the offices of the new company to the foot of Woodward avenue and consolidate them with the offices of the Citizens Company.

Judson J. Coleman, who has been manager of the Allentown & Lehigh Valley Traction Company for many years, will sever his connection with the company July 1, but will continue in street railway work with another company. A. F. Walters will perform the duties of the office left vacant and in addition will attend to his present work as secretary. James Uhl of Brooklyn, is to be the new superintendent.

Frank X. Cicott has resigned his position with the Ansonia Brass & Copper Company to take effect July 1, and will organize a European company to handle American electrical apparatus abroad as general agent, an enterprise which he has been contemplating for some months past. Mr. Cicott has had several years of commercial and journalistic experience abroad and is familiar with European conditions, thus possessing exceptional facilities to make this project a success.

A. L. Mason, whose resignation as president of the Citizens' road, Indianapolis, was noted last month, has resumed his law practice. When he accepted the presidency four years ago the position required but a portion of his time, and was not expected to interfere seriously with his professional work. The duties increased until all his time was taken up with the road. When his resignation was offered the new board urged him to accept a re election which was declined. Mr. Mason has long enjoyed a lucrative law practice, in which he has been engaged for the past 18 years, and was formerly a partner of the late Senator Joseph E. McDonald and the late Hon. John E. Butler.

W. S. Jewell, general manager of the Toledo Traction Company, and recognized as one of the fast rising young men in railway operation, has presented his resignation to take effect July 1. The announcement will be learned with genuine regret by the fraternity, as it was by the company he leaves; but Mr. Jewell received such a flattering offer from another concern he was unable to decline it. He becomes the general superintendent of the Marsden Company, of Philadelphia, which is made up of many of the heaviest capitalists there. The company is working the Marsden process, which reduces corn stalks and produces cattle food and corn cellulose. The latter is made from the pith and is capable of almost endless utility. Among other uses it has been adopted as a cushion to the armour plate for war vessels.

## NEW PUBLICATIONS.

R. H. Derrah, clerk to the president of the West End road of Boston, has issued the second edition of the "Street Railway Guide for Eastern Massachusetts," compiled by him. Price 10 cents.

"Industrial Railways" is a handsomely illustrated pamphlet of 50 pages describing the light railways and rolling stock therefor manufactured by the C. W. Hunt Company, 45 Broadway, New York.

The University of Minnesota has sent out the annual catalog with announcements for the year 1897-98. An attendance of 2,647 indicates that the university is prosperous. The mechanical and electrical engineering courses are well patronized. Prof. Geo. D. Shepardson is in charge of the electrical department.

A very complete catalog has been issued by the University of Wisconsin. The schools of mechanical and electrical engineering are thorough and complete in theoretical and practical work. D. C. Jackson, professor of electrical engineering, has done much in late years to raise the standard of practical work in his department.

We are in receipt of the fifth publication of the Year Book of the Society of Engineers of the University of Wisconsin, which is issued by the society, being edited by a committee appointed from the various technical departments of the University. All the subjects in the present number are of interest to engineers. The price of the Year Book is 50 cents, 60 cents postpaid.

We acknowledge the receipt of Duncan's Manual for 1897, the twentieth annual issue of this publication, giving statistics of the tramway and omnibus companies of the United Kingdom and the foreign and colonial companies registered in England. The total tramway mileage open for traffic is given as 1,009 miles for 1896 as against 982 for 1895, which as stated is much smaller than the increase in population would warrant.

The Economist of Chicago, has published an "Investor's Supplement" which contains much valuable information for those interested in the operation and financial condition of leading Chicago corporations, including the street railway companies. The statistics of these corporations show the amount of capital stock, bond issues, dividends, ranges of quotations on all stocks that have been bought and sold on the Chicago Stock Exchange each year since 1891 and other information obtainable. Maps of the various street railway systems in Chicago are shown and in addition a double page map of the four elevated roads including the Union loop. This publication does great credit to the Economist and is an indication of the enterprise and progress of the paper.



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

The City Guide Book to Atlanta, mentioned last month was issued by the Atlanta Railway Company, of which F. M. Zimmerman is superintendent.

Mrs. Clifford Baldwin has recovered \$900 against the Fairhaven & Westville (Conn.) Railroad because the conductor failed to assist her to alight.

The Springfield Street Railway Company has placed an order for rails amounting to \$25,000. The reconstruction contemplated this summer will require an expenditure of \$50,000.

The Manhattan Elevated, New York city, has decided to adopt the third rail electric system, and will proceed at once to put the work under way. Estimated cost of construction, \$7,000,000.

The Oshkosh Electric Railway Company has received permission to lay T-rails in paved streets, on the condition that a timber will be laid alongside the rail as was done on the other paved streets of Oshkosh where T-rails are laid.

The Electric Car Sprinkling Company will sprinkle the streets of Springfield, Mass., during the coming season, and on May 20 closed a contract with the Springfield Street Railway Company to furnish the power. These sprinklers have been used in New Haven and give excellent results.

The Bridgton (N. J.) & Millville Traction Company has recently suffered the loss of over 2,300 ft. of its copper ground-return wire which was dug up from its tracks and carried off. Once before the company lost 13,000 ft. of its wire and the thieves are now serving terms in the penitentiary.

An amiable settlement has been reached between the bondholders and the unsecured creditors of the Mount Lowe (Cal.) Railway and the threatened litigation is averted. The creditors will scale their claims one-half and accept for the balance bonds in the new company which is to purchase the road at a foreclosure sale.

The power house, of the Union Traction Company, Philadelphia, which was destroyed by fire last March is being rapidly reconstructed. It was found that the boilers were not materially injured by the fire and that the engines can be repaired. A 1,500-k. w. generator and engine will be placed in the station on Delaware avenue.

Trolley lines connecting Newark and Paterson, N. J., have been in operation for several weeks but a change of cars was necessary; now through cars are run, the crews changing at division points however. The fare is 17 cents from any part of Newark to Paterson; 5 cents to Belleville; 7 cents to Passaic, and 5 cents to Paterson.

The Columbus (Ga.) Railroad Company operates the street railway system as well as the belt railroad around the

city. The street car tracks are of standard gage and are used by the company in transferring freight to the warehouses and factories. This work has been done by a dummy engine but the company contemplates using an electric motor for this purpose.

The Connecticut Senate has passed a bill providing that every person whose duty it shall be to collect fares or tickets on any street railroad car who shall intentionally neglect to register as soon as received by him any fares or tickets so received on the register provided for that purpose, shall be fined not more than \$50 or be imprisoned not more than three months or both.

According to the State Board of Assessors of New Jersey there are 613 miles of trolley lines in the state which have been built at a cost of \$80,011,559, an average of \$130,000 per mile of track. During the past year the total receipts were \$5,770,171, an increase over the preceding year of \$713,573. The expenditures were \$3,546,168 and the dividends amounted to \$124,220.

Another deadlock has been reached in the troubled career of the municipal lighting plant at Middleboro, Mass., and the town may have to go without light. Becoming discouraged because of the excessive cost of operating, the town recently appointed an investigating committee which recommended a number of changes; but as these changes could not be carried out for the estimates made by the committee, the manager called a halt. Two of the three members of the Lighting Board have resigned and as at least two are required to sign checks, the one who remains can do nothing.

The Walker motor which was installed in the 52nd street station of the Chicago City Railway in 1894 has been idle for about a year. For this reason it has been supposed that this experiment of driving a cable by an electric motor was a failure but such is not the case. The extensions to the electric lines have been so numerous that all the current from the old station was needed. Now that power is furnished from the new station this motor is again in operation and is satisfactory in every way. The current is supplied from the generators in the station across the alley from the cable plant. The saving in labor for station attendance is \$18 per day and more than compensates for loss incident to the several conversions of energy. The installation was fully described in the REVIEW of August, 1895.

The Citizens' Street Railroad of Indianapolis, has elected a new directory, as follows: Kennedy Crasson, W. W. Kurtz, R. H. Rushton, W. C. Huston, Joseph S. Neff, F. Dundore and W. J. Turner, all of Philadelphia. Mr. Crasson was chosen president; W. F. Milholland, secretary and treasurer, and Miller Elliott, superintendent. Of the old board, F. Dundore and W. J. Turner are the only ones remaining, Mr. Clay having died recently and Augustus L. Mason, H. Sellers McKee, Murray A. Verner and W. L. Elder having resigned. Mr. Mason was invited by the new board of directors to retain the presidency, but declined, as he desired to devote himself exclusively to the practice of law in the corporation branch of which he has, during the past 18 years, won a high reputation. Although retired, Mr. McKee continues to be the heaviest stockholder.

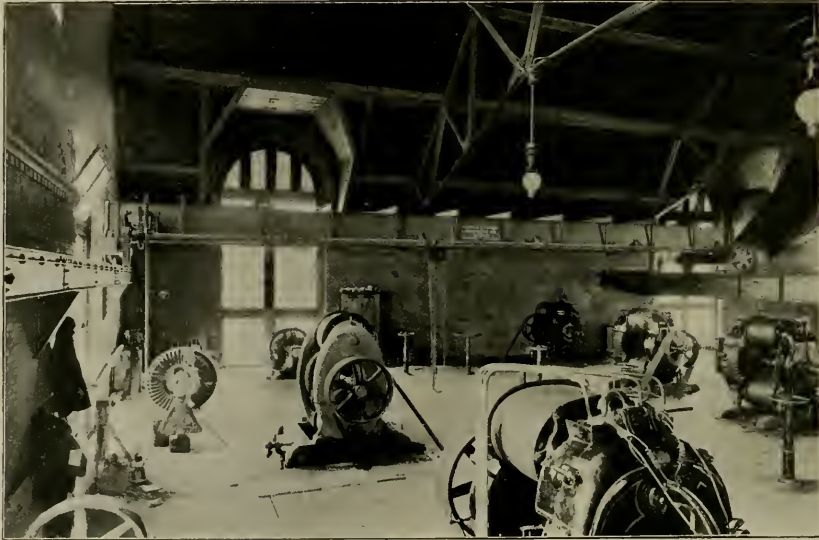
## SPEED OF CARS.

On May 25, the Supreme Court of Pennsylvania reversed the decision of the lower court in the case of Katie Kline, by her father, vs. the Electric Traction Company of Philadelphia on the ground that negligence on the part of the motorman had not been proved. Judge Williams, in discussing the question of speed said:

"We are not prepared to lay down any rule in regard to the rate of speed at which an electric car may be run between crossings. All that can be safely said upon this subject is that the car must be kept well in hand, and that the speed must not be so great as to make this impossible, or to endanger the safety of the public using the streets with responsible care. But these passenger railways are created to facilitate the movements of the general public, and to

## CRANE AT GARFIELD PARK

Traveling cranes have become a necessary appliance in the larger power and lighting plants. In handling the heavier parts of dynamos and engines the old style methods have become too slow and costly to be retained. The cut herewith illustrates a moderate capacity hand power traveler in the new lighting plant at Garfield Park, Chicago, one of the most modern plants of the kind in the country. The crane is of two tons capacity; 43-ft. span; all motions are operated by hand chains. It was manufactured and erected complete with tracks, by the Whiting Foundry Equipment Company of Chicago, with works at Harvey, Ill., which makes several types of hand power and electric cranes especially adapted to power house service, both for lighting and street railway plants.



GARFIELD PARK LIGHTING STATION, CHICAGO.

furnish rapid transit for citizens from their homes to the business centre of the city. They are practically indispensable in all great cities. The cars move upon a track from which they cannot turn, which is plainly visible, and which is prepared with a view to the rapid movement of cars upon it.

"Upon a careful examination of this record we are unable to find any evidence of negligence on the part of the defendant sufficient to justify the submission of the question to the jury. The injury was not inflicted at a crossing where the passage of pedestrians should be looked for. The child was upon the sidewalk, until it ran suddenly on the track and was struck on the instant of reaching it. The immediate cause of the injury was therefore her own thoughtless act for which the defendant is in no way responsible and no act of negligence on the part of the motorman being shown, there can be no recovery."

## SPRINGFIELD (VT.) ELECTRIC RAILWAY REVIVES.

The building of a trolley line was commenced last year in Springfield, Vt., a manufacturing town of 3,000 inhabitants, but from lack of funds the project was abandoned. Recently E. C. Crosby and M. A. Coolidge secured a controlling interest and will finish the line. Passengers, freight and mail will be carried and connection will be made with the Boston & Maine Railroad. Water power from the Black river will be utilized although this will have to be supplemented by a steam plant. The new officers are Adna Brown, president, and Messrs. Crosby and Coolidge, directors.

Concessions for a system of trolley lines will be granted in a short time by the municipal government of Jassy, Roumania.





J. M. Jones' Sons of West Troy, N. Y., have shipped 10 cars to the Syracuse Rapid Transit Railway, Syracuse, N. Y.

J. D. Murray, of New Brunswick, N. J., is constructing a 3-mile extension for the Bennington & Woodford Electric Railway, Bennington, Vt.

The Wheeler Rail Joint Company, of Marion, Ind., has secured the contract for joints to go on the Marion, Anderson & Indianapolis Railway.

The Mertes Manufacturing Company, of Allegheny, Pa., manufacturer of gears and pinions reports a steady increase in the number of orders booked.

Meaker stationary registers have been adopted by the Denver City Railroad, West End Street Railroad and the Colfax Electric Railroad, Denver, Colo.

The Laclède Car Company, of St Louis, has the contract to furnish 15 closed and 25 open cars for the new Falls Road Electric Railway at Baltimore, Md.

The Portsmouth Street Railway Company, Portsmouth Va., has contracted with the Virginia Electrical Engineering Company for the equipment of its line.

The Colfax Electric Railway, Denver, Colo., has equipped all of its motor cars with the United States electric heater made by the Ohio Brass Company, Mansfield, O.

Stanley Green, western sales manager for the Fuel Economizer Company of Matteawan, N. Y., has sold 3,000 h. p. of Green's economizers to the South Side Elevated Railroad, Chicago.

The steady trade in "Dermaglutine" pinions which A. Grotzinger & Sons of Allegheny, Pa., report is good evidence that their customers appreciate the general excellence of these goods.

The Peckham Motor Truck & Wheel Company of New York, has recently received several orders for trucks from Japan, and the company reports its general foreign trade as being very good.

C. W. Blakeslee & Sons, of New Haven, Conn., have been given the contract to construct eight miles of electric line for the Portland & Yarmouth Street Railroad Company, at Portland, Me.

The annual meeting of the General Electric Company was held May 11, at Schenectady, when the old board of directors was unanimously reelected. At the meeting 210,000 shares were represented.

William Sharp, lately the western representative of the McEwen Engine Company, has accepted the position of Chicago selling agent for the Weston Engine Company, with offices in the Fisher building.

For an interesting discussion of paints for exposed iron and wood work and carbon paints in particular, our readers are referred to "Nobrac," the pamphlet published by the Patterson-Sargent Company, Cleveland.

J. G. White & Co., of New York, are rushing the work on a contract which they took recently to lay track and erect overhead material on three miles of road for the Portsmouth & Port Norfolk Electric Railway at Portsmouth, Va.

The Case Manufacturing Company, Columbus, O., has recently shipped a 15-ton, 3-motor electrical crane to the Pratt & Cady Company, Hartford, Conn., and a 15-ton power crane to the Damascus Bronze Company, Pittsburg, Pa.

S. C. Strock, dealer in poles and ties, heretofore at 50 Broadway, New York, has removed to the new Bowling Green building, 11 Broadway. He reports that orders are larger and of a better nature than they have been for a long time.

The Crane Company of Chicago will furnish the high pressure valves and piping for the Cleveland & Lorain Street Railway and also the connections for the engines of the People's Railway, Dayton, O. G. A. Hurd secured the orders.

The E. P. Allis Company of Milwaukee reports the following among recent orders: Four 1,200-h. p. direct connected engines for the new electric railway in Sydney, N. S. W.; four 1,200-h. p. direct connected engines for the Alley L, Chicago.

The Central Railway of Baltimore has awarded the contract to lay rails and put up overhead work for the Belaire road extension to Josiah L. Blackwell and David E. Evans & Co. The rails will be supplied by the Pennsylvania Steel Company.

The Falk Manufacturing Company, which is making the special work for the Oshkosh electric road, has recently received a contract from the Madison City Railway Company, which is to extend its lines to University Heights and Wingra Park.

The Armitage-Herschell Company of North Tonawanda, N. Y., has sent out a large colored lithograph illustrating a steam driven gallery or merry-go-round on the grounds of a pleasure resort. Either steam or electricity can be used as motive power.

The Washburn & Moen Manufacturing Company, Worcester, Mass., has discontinued its Scranton office and will handle that business from Philadelphia. A branch has been opened in Boston in order to accommodate the increased business there.

Fred C. Wilson & Co., of Boston, Mass., have received the contract to build the Oxford Central Electrical Railroad between Rice's Junction and Norway, Me. Including branches to South Waterford and East Stonham, the distance is 21 miles.

Graphitoleo is a preparation of pure flake graphite and petrolatum manufactured by the Joseph Dixon Crucible Company, of Jersey City, N. J., and very highly recommended as a lubricant for bicycle chains. It is conveniently put up in collapsible tubes.

L. N. Walker & Son, of Philadelphia, have begun work on their contract to build the electric road between Meadville and Edinboro, Pa. This is a part of a big interurban, work on which was delayed owing to a misunderstanding with the original contractors.

The Dorner & Dutton Company has been incorporated at Cleveland, O., to manufacture and deal in electric street railway supplies. The capital stock is \$50,000, and the incorporators are J. H. Van Dorn, E. J. Leighton, H. H. Hodell, W. A. Dutton and H. A. Dorner.

The Mitchell Tempered Copper Company, Corry, Pa., reports that its pure copper commutator bars are giving perfect satisfaction. It has recently filled the third order within sixty days for a Michigan road, and a fourth order within a month for a New York concern.

The Morrin "Climax" boilers installed by the Clonbrock Steam Boiler Company, of Brooklyn, at the Tennessee Centennial Exposition at Nashville, are giving entire satisfaction and receiving much attention from visitors. This company, it may be remembered, was awarded the entire boiler contract by the Exposition Company.

The headquarters of William S. Reed & Co., who have the contract to build and equip the Milwaukee & Waukesha Electric Railway, are at 1610 Great Northern Office building, Chicago. Mr. Reed states that work will begin about May 27, or as soon as specifications can be prepared.

A. Elbogen & Co., 39 Third avenue, New York, theatrical booking agents, report a good business demand for summer attractions for summer pleasure resorts. They will be pleased to enter into correspondence with street railways and quote the terms of the artists whom they represent.

The Garton-Daniels Electric Company, Keokuk, Iowa, reports an exceptionally large and increasing business. The sales of lightning arresters for April were more than double the best month in the history of the company, while the foreign shipments have been particularly gratifying.

Brownlee & Co. of Detroit report an active demand for wooden trolley poles of their various patterns and for cross-arms. The firm has just closed a contract with the New York & New Jersey Telephone Company for 70,000 arms, the manufacture of which will require 800,000 ft. of lumber.

McIntosh, Seymour & Co., of Auburn, N. Y., have opened an office for sale of their products in New York City and contiguous territory in the Havemeyer building, room 1211, 26 Cortlandt street, the Pierce & Miller Engineering Company having ceased to handle their engines on May 20 last.

The St. Louis Iron & Machine Works of St. Louis, are building two rolling mill engines for the plant of the Consolidated Steel & Wire Company at Pittsburg, Pa. One is a tandem compound condensing corliss of 1,800 h. p. and one a cross compound condensing corliss of 2,200 h. p.; the shipment will weigh 300 tons and require 16 cars to transport it.

The Standard Air-Brake Company closed the month of May by securing an additional order from the Colonies for 28 air-brake outfits for electric motor and trail cars and an order for additional motor car air-brakes. These brakes have been in use in the Colonies for three years and the latest orders emphasize the success of the apparatus.

In the two years that the New York Switch & Crossing Company, of Hoboken, N. J., has had its automatic electric track switch on the market it has been tested and found practicable, durable and economical by many roads, among them the Brooklyn Heights and Brooklyn City & Newtown, Brooklyn and the North Hudson County of Hoboken.

The St. Louis and Chicago agencies of the Abendroth & Root Manufacturing Company, 28 Cliff street, New York, has recently sold boilers for installation as follows: Schwartzschild & Sulzberger, Kansas City, 1,500 h. p.; Cincinnati Street Railway Company, 1,300 h. p.; Danville Gas, Electric Light & Street Railway Company, 600-h. p., and the Green Wood Fiber Company, Chicago, 700 h. p.

The International Hotel, Niagara Falls, secured for the headquarters of the American Street Railway Association during the convention, was the headquarters for the National Electric Light Association and all speak very highly of the manager, S. A. Greenwood, and the accommodations. Mr. Greenwood has only recently taken the management but he has had a long experience and is well fitted for the position.

The New York Electro Vapor Motor Company has been incorporated to build and equip railroads. The capital stock is \$100,000 and the incorporators are Thomas D. Hoskins of Brooklyn, William H. Goff of Brooklyn and Christopher Longstreet of New York. Mr. Hoskins is already well known in the street railway field as the inventor of a gas motor which has been tried in California and Ohio.

Hirsch Bros. & Co., investment brokers of New York and Chicago, have placed the securities of the Waterloo & Cedar Falls Rapid Transit Company, Waterloo, Ia., and of the Mason City & Clear Lake Traction Company, Mason City, Ia., two new roads, notices of which have appeared in recent numbers of the REVIEW. Patrick Henry Hirsch is the resident member of the firm at New York, and Paul E. Hirsh at Chicago.

George H. Pugh and James P. Orr of Pittsburg have invented a combined annunciator and advertising cabinet for use on street cars. The device is set in motion by a push button or a bell rope connection and stops automatically as soon as a new card or leaf swings downward and displays the next stop. Two cards are displayed at the same time, the "stop" card and the back of the next one; the backs are utilized for advertising purposes.

We are in receipt of a handsomely illustrated catalog from Mayer & Englund, Philadelphia, manufacturers of electric railway materials and supplies. It is Part I of the General Catalog and is devoted to overhead insulation and construction material. The firm is furnishing to the railways doing business with it a cloth bound mechanical binder into which any subsequent catalogs can be inserted, and the literature thus accumulated in one volume.

The Hansell Spring Company reports that it has recently secured a large building in the rear of the present location, Nos. 7 to 13 Ward street, Newark, N. J., which increases the floor space of the plant by 25 per cent. Sales for May were larger than for any previous month and many orders were booked ahead. Recent orders have been received from the General Electric, the Walker, the Peckham and the Bemis Car Box companies, and from a number of railway companies direct.

We have received from the J. A. Fay & Egan Company, of Cincinnati, a copy of the new poster exhibiting the wood working machinery manufactured by the Egan Company. This is probably the most complete of its kind ever published and gives illustrations of 135 machines together with memoranda as to special features and capacity, and will prove most convenient for reference. These have been prepared for general distribution and the company will be very glad to send them to interested parties.

The Cambria Iron Company has been shipping for some time to the Metropolitan Street Railway, of New York City, rails and material on account of the new work, which we recently noticed in full. The Cambria Company has a contract to furnish about 3,300 tons of these rails, together with almost an equal amount of other material, consisting of slot rails, conductor bars, conduit plates, tie rods, bolts and nuts, wedges, washers, hook bolts, etc. The rail section, owing to its peculiar shape, resembling a foot when inverted, has been dubbed the "Tribly Section."

The Simonds Manufacturing Company, of Pittsburg, Pa., reports that it has a large number of orders on its books and contemplates putting in new gear cutters and turning lathes. The company asks the indulgence of all who have suffered delay in shipments because it has just completed moving its machinery and stock into its new shop, which is that formerly occupied by the Westinghouse Machine Company at 25th and Liberty streets. The new shop covers three times the floor space that was in the old one, and being equipped with large traveling cranes much larger work can be readily handled.

The New Haven Register Company, New Haven, has closed good orders as follows: for the Consolidated of Pittsburg, for all of the 230 new cars in addition to the New Haven machines already in use; for the Market Street road, San Francisco, 200 double registers, fare and transfers ordered by wire, making 550 in use by that system. General Sales Agent Loper has also closed contracts for double registers, 5-cent fares and school tickets for the entire system of the Louisville road, and for the entire equipment of the People's Railway and the Dayton Traction Company, both of Dayton, O.

A neat and handsome catalog has been sent by Warren Webster & Company describing the oil and steam separators made by this firm. In tests and in practise the steam separators have proven well adapted to furnish commercially dry steam under all the variable working conditions of any plant. When the exhaust steam is to be used for raising the temperature of water or for heating buildings the oil separator is designed to estrand the cylinder lubricant and any other oils that may be present in the steam, thus insuring clean tanks, radiators, etc., and furnishing relief from obnoxious odors incident to the presence of oil.

Edward P. Sharp, manufacturers' agent, 909 Morgan building, Buffalo, N. Y., advises that he has recently sold two 22-ft. second-hand Pullman car bodies to the Anaconda (Mont.) Street Railway Company, after repainting and equipping them with motors, and two from the same lot to the Metropolitan, of Toronto. Mr. Sharp has a number of Edison No. 6 and F-30 motors which were part of the equipment of the Syracuse Consolidated, some Westinghouse No. 3 motors and extra armatures and a large amount of material for old style motors, all of which is offered at very low prices. The Macallen sheet mica insulators can also be supplied at low rates.

After sharp competition the McGuire Manufacturing Company has been awarded the contract for the electric trucks which are to displace the steam trucks now in use on the 120 cars of the Alley Elevated of Chicago. The success of the McGuire truck on the Brooklyn Bridge, which is perhaps the severest service in the country, probably decided the award. The McGuire Company has also secured the contract for 102 trucks for the Consolidated Traction Company of Pittsburg. Orders for 100 or over equipments are rather scarce these days and that two such orders should go to the same company in one week is certainly complimentary.

H. W. Burgett, of Brookline, Mass., represents the syndicate which has taken the contract to build ten miles of standard gage electric road from Waterbury to Stowe, Vt., for the Mt. Mansfield Railroad Company, of which P. D. Pike is president, C. L. McNahon, vice-president; F. O. Burt, treasurer, and L. C. Moody, secretary, all of Stowe. The cars will be 42 ft. long, with a baggage compartment, and be equipped with two 40-h. p. motors. A freight car will be equipped with powerful motors to haul the freight or passenger cars of the Central Vermont Railroad over the line when necessary. The pleasure travel to Mt. Mansfield is expected to be very profitable.

The Automatic Circuit Breaker Company, of Newwayo, Mich., is advised by the Attica Electric Light Company, Attica, Ind., as follows: "We have one circuit that reaches so high above station that every storm touches it, and heretofore in the past nine years have lost four armatures through lightning, and before putting on your circuit breakers were practically worried to pieces by every flash of lightning for fear of damage to a costly armature. This last year we have got over our worry on that score, as our lines have been hit with lightning repeatedly in one night, and in one case 20 lamps in series smashed and circuit knocked out, but circuit was broken every time and armature saved."

Louis Enricht, 1413 Chamber of Commerce, Chicago, has been awarded the contract to completely construct the 39 miles of single track for the Indianapolis, Anderson & Marion Electric Railway, giving \$20,000 bond to have the road in operation by August 12, 1897, with the Fidelity & Deposit Company of Baltimore as surety. Mr. Enricht has let the following sub-contracts:—grading, Cochran & Ross, Chicago; tracklaying, Parker & McNair, Chicago; trolley and feed wire, American Electrical Works, Providence; overhead material, Ohio Brass Company, Mansfield; boilers, engines and steam fitting, Chandler & Taylor, Indianapolis, and generators, motors and car equipments, Westinghouse



Electric & Manufacturing Company. Frank A. Maus and other capitalists of Indianapolis have advanced Mr. Enricht about \$65,000 cash on his contract, the balance being notes of the company secured by first mortgage bonds of the railway. Said bonds are given only as collateral and revert back to the company when the notes are paid.

The Christensen Engineering Works, Milwaukee, are making very satisfactory progress in introducing their air brake for street cars. Catalog A, just issued, is an interesting pamphlet of 28 pages, fully illustrated, and is a practical discussion of the air brake problem in addition to a detailed description of the Christensen brake. Either axle or direct motor driven compression is furnished as desired, although for heavy cars running at speeds upwards of 25 miles per hour the motor compressor is advised. The pamphlet should be carefully studied by every manager. Among recent installations of this brake is an order for 14 motor and 10 trail cars for the Chicago Suburban, where the brakes are giving splendid service on high speed cars. The Chicago office is 1402 Fisher building.

The South Side Elevated Railroad Company of Chicago has let contracts. The 190 x 120-ft. power house at State and 40th streets will be equipped with four 1,200-h. p. cross-compound condensing engines, built by the Edward P. Allis Co., of Milwaukee, direct connected to four 800-k. w. generators supplied by the Westinghouse Electric & Manufacturing Company of Pittsburg. Chain grates, fuel economizers and cooling towers will be employed. The Johnson Company of Johnstown, Pa., will furnish the 40-lb. rail in 60-ft. lengths, and J. M. Atkinson & Co., of Chicago, their horseshoe rail bond. Cables of 500,000, 1,000,000 and 1,500,000 circular mils will be supplied by the Western Electric Company of Chicago. Frank J. Sprague, of New York, will equip six cars for an experiment with his system of train control.

The Standard Paint Company, 81 John street, New York, reports that the demand for the P & B products among electric railways was never better than at present. The tape for electric railway use is furnished in any width desired and is guaranteed free from rubber or anything that will carbonize or dry out; it is extensively used in connection with the P & B compound for re-insulating cables. The company is ready at all times to furnish gratis, express prepaid, a sufficient quantity of any of the materials manufactured by it to enable bona fide inquirers to make practical tests. A new specialty is the water paint called "magnite;" it is made in several shades as well as white and when in a liquid form flows freely and gives a smooth, even, water-proof finish. It is admirably adapted for the inside of car barns, power houses, walls, etc.

The Ball Engine Company, Erie, Pa., reports the following recent shipments of engines for electric purposes: Vulcan Coal Company, Treveskyn, Pa., one 225-h. p. engine, direct connected to generator; Queen City Electric Light & Power Company, Clarksville, Tenn., one 125-h. p. engine; Langhorne (Pa.) Electric Light & Power Company, third order, one 200-h. p. engine; Maxwell House, Nashville, Tenn., third order, 125-h. p. direct connected to dynamo; Rockville Water Works, Rockville, Md., one 80-h. p. engine; Wilmington Gas Light Company, Wilming-

ton, N. C., third order, one 500-h. p. cross compound engine; Pennsylvania Tube Works, Pittsburg, Pa., one 60-h. p. engine; Seaboard Air Line, Portsmouth, Va., one 70-h. p. d. c. to dynamo; Apollo Iron & Steel Works, Apollo, Pa., fourth order, one 150-h. p. vertical cross compound, direct connected to alternating machine; Kirk's Soap Factory, Chicago, one 50-h. p. engine, d. c. to dynamo; Lexington Hotel, Richmond, Va., one 40-h. p. engine; Congo Mining Company, Congo, O., one 175-h. p. engine; Wainwright Brewing Company, Pittsburg, Pa., one 80-h. p. engine; Fox Pressed Steel Company, Pittsburg, Pa., one 100-h. p. engine; F. O. Horton Cement Company, Binnewater, N. Y., 60-h. p. engine; Lakewood Hotel & Land Company, Lakewood, N. Y., 165-h. p. tandem compound engine.

The reputation which the Central Electric Company enjoys, is evidenced by the many large orders received for trolley bushings, bearings and overhead materials. It has lately made some very large shipments of overhead materials to Europe, and is continually receiving congratulatory information relative to shipments. The following is the substance of a letter received from one of its customers which shows the high esteem in which the Central Electric Company is held by those with whom it transacts business:

"Central Electric Co.—Gentlemen:—The 500 commutator bars ordered by us some time ago are received. They look so nice, and fit so well, that we herewith send you our order for 500 more, which we hope you will fill at your earliest convenience. They are the best looking bars we have ever had, and I do not believe there is any question about their efficiency. This order completes my promise of a thousand, but you will receive another order from us for more, before long.

Yours truly, President and General Manager."

The company feels very much gratified with its railway business and the marked success with which its several specialties have met. It is carrying in stock a complete line of Bound Brook trolley bushings and is prepared to furnish Bound Brook motor bearings which are of the highest grade. It is also western agent for the De Witt sand boxes, and has lately received some very large contracts for deliveries of these boxes. The changeable electric head light is manufactured by Crouse-Hinds of Syracuse, N. Y., for which it is the western agent, and it is constantly equipping entire roads, with this head light. Samples are sent on trial to responsible parties, and it claims that thus far it has never sent out a sample with any other result than that of receiving the order for the complete equipment of the road. Among the foremost of its specialties are the Billings & Spencer products, the drop forged copper commutator bars manufactured under the Billings patent. It has lately received some very fine contracts for commutator bars, and from the orders which are now on hand for future deliveries of overhead materials, supply parts and commutator bars, the outlook is encouraging. It is very anxious to secure specifications, and requests for prices, as it claims it is in a position to offer inducements.

Joseph A. Rhomberg, president of the Dubuque Street Railway, died suddenly of heart disease on May 17. He had been prominently identified with various interests in that city for many years and practically owned the road. He had resided in Dubuque since 1850, and was a man of remarkable energy and persistency.

# Removal Notice.

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We beg to announce that we have removed from the Betz Building, to 10 So. Tenth Street, Philadelphia, where we have established a large and commodious warehouse. We now have in stock a full line of material manufactured by the well-known Companies we represent, together with a Full and Complete Stock of Electric Railway Material and Supplies for immediate shipment. Our facilities for handling our rapidly increasing business are now strictly first-class.

MAYER & ENGLUND,

10 South Tenth St.

Philadelphia, Pa.

WRITE FOR LATEST PRICES. IMMEDIATE SHIPMENT FROM STOCK.

## 3-CENT FARE WINS IN INDIANA.

State Supreme Court Upholds Constitutionality of the  
3-Cent Fare Law.

In the May REVIEW the history of the Indianapolis case was brought down to the point where a test case on the 3-cent fare in Indianapolis had been carried into the supreme court of the state. This court, on June 11, handed down its opinion sustaining the law. We quote from the ruling as follows:

"It is insisted by appellant (the City of Indianapolis) that the act of 1897 is unconstitutional because it impairs the obligation of a contract. Counsel for appellant do not point out any contract the obligation of which is impaired by said act.

"If it is the contract under which the street railway company took possession of the streets of Indianapolis and constructed its tracks, it is sufficient to say that the city was not authorized to enter into any contract which would prevent the legislature from legislating upon the subject of fares. It is settled law that the legislature has the power to reasonably regulate the rates of fares for transportation of passengers within the state on street railways. (Hockett vs. State, 105.)

"The right of the legislature, however, to regulate the fare upon street railroads organized under the act of 1861 does not depend upon the reservation of the right to amend or repeal the act in section 11 of the act. That power would exist even if the right to amend or repeal the act had not been reserved. In order to exempt a common carrier from legislative control over its rates of fare it must appear that the exemption was made in its charter by clear and unmistakable language, inconsistent with the exercise of such power of the legislature.

"Appellant had the power to prescribe the terms upon which and the time for which a street railroad company organized under said

act of 1861 should occupy the streets of said city, but such contract when made was subject to the right of the legislature to amend or repeal said act at its discretion; and no contract made by the city with a street railroad company could prevent the exercise of such power by the legislature.

"It is clear, therefore, that said act of 1897 does not impair the obligation of any valid contract of either the state or appellant."

On the question of special legislation the court says:

"It is next insisted by counsel for appellant that said amendment is a local and special act, and is therefore in conflict with section 13 of article 11 of the constitution, which provides that corporations other than banking shall not be created by special act, but may be formed under general laws.

"The power to declare a statute unconstitutional is one of the highest intrusted to a judicial tribunal, and is only to be exercised with the greatest care, and only when there is no doubt of the unconstitutionality of the law. If there is any doubt in the mind of the court as to the constitutionality of a law it must be resolved in favor of its validity. To doubt is to resolve in favor of the constitutionality of the law.

"It is not necessary, under the provisions of section 23 of article 4, declaring that all laws shall be general and uniform throughout the state, that legislation concerning cities should operate uniformly on all the cities in the state to make it general. A law which applies to cities having a population of 100,000 or more when there is but one such city, but is so framed as to operate on all other cities in the state as they acquire the necessary population, is a general law, because it operates upon all cities alike under the same circumstances.

"Neither is it necessary that a law concerning the fares to be collected by street railway companies shall operate uniformly on all street railroads in the state. It is sufficient if it operates alike upon all such companies under the same circumstances and conditions. Such a law is general with the meaning of the constitution.

"When, therefore, a local or special law is enacted upon a subject not enumerated in section 22, and it is the expressed opinion and

## ELECTRIC STATION MANAGERS:

**YOU CAN'T AFFORD TO WASTE YOUR EXHAUST STEAM,**  
which you are doing, when you can sell it at a large profit. Many Street Railway and Electric Light Companies are making handsome dividends from this source.

**YOUR COAL BILL WILL BE NO HIGHER.**

These are some of the street railway companies that have adopted our systems:

Springfield, (Ill.) Elec. Lt. & St. Ry. Co.  
Terre Haute Electric Railway Co.  
Danville Gas, Elec. Lt. & St. Ry. Co.  
St. Joseph Street Railway Co.  
Ottumwa Electric Railway Co.

If these are not near you, write us and we will send you addresses of users in your vicinity.

## ONE MANAGER SAYS:

"Have been operating the steam plant five years, warming between four and five million cubic feet of space. Income from steam heat over \$12,000 per annum, all from exhaust steam, except from \$200 to \$300 additional fuel in consequence of steam line. Carry five to ten pounds back pressure, according to temperature outside, and only need to increase boiler pressure same amount. Have already paid for the entire installment of the steam heating system out of the additional profits since we put it in. We have no trouble or expense from leaky joints, and we do not employ any additional help in operating the plant over what we formerly employed for our lighting and street railway service."

Get our New Catalogue containing many letters like this, and full of information.

**AMERICAN DISTRICT STEAM CO., Lockport, N. Y.**

judgment of the legislature that a general law cannot be made applicable, this judgment is not subject to be reviewed by the courts.

"The legislature of 1861, by passing the act for the incorporation of street railroad companies, could not and did not deprive any subsequent legislature of the right to determine whether a general law of fixing the maximum fare on street railroads could or could not be made applicable. If the act in controversy is not a general law, as insisted by appellant, then under the authorities the enactment of the same is the expressed opinion and judgment of the legislature that a general law could not be made applicable, and this judgment cannot be reviewed by the courts.

"It follows that the act approved March 8, 1867 (acts 1867, page 201), so far as involved in this case, is constitutional and valid. Said act rendered the ordinance regulating the payment of a fare of 5 cents invalid and of no effect. Appellee was entitled to be carried for the fare of 3 cents fixed by the act in controversy, and was not liable for a refusal to pay more than that, for the reason that the ordinance requiring the payment of a fare of 5 cents was rendered invalid by said act."

The company will at once apply to the federal court for further proceedings, which it can do by amending its complaint to show the enforcement of the law would reduce receipts below actual operating expenses. The attorney-general will apply to Judge Showalter for a modification of his decision in accordance with this decision and to dissolve the restraining order.

If the city wins it means a virtual confiscation of the road.

## OBITUARY.

Tobias Roach, for over 32 years connected with the street railways of Troy, N. Y., died on June 5 after a protracted illness.

Silvanus S. Riker died at the Hotel Buckingham, New York, on June 6 at the age of 75. Mr. Riker was president of the Washington & Georgetown Railroad in 1874.

J. D. Chandler, president of the Nashua Street Railway, Nashua, N. H., died June 3, at the age of sixty-seven, leaving a wife, two sons and a daughter. He was president of the Nashua Board of Trade, and for 26 years had been auditor of the New Hampshire Fire Insurance Company.

Charles R. Kellogg, manager of the Waterloo (Ia.) Street Car & Omnibus Manufacturing Company was found dead in his room at the St. James, in Minneapolis, on May 29.

Frederick M. Laughton, ex-mayor of Bangor and president and general manager of the Bangor Street Railway Company, the first trolley line in Maine, died on May 27 after a short illness at the age of 53.

John Radel, former owner of the Newark & South Orange Street Railway, died at his home in Newark on May 9, at the age of 74. Mr. Radel was a Bavarian by birth, but came to this country early in life; he entered the street railway field in 1876 and in addition to the line above mentioned was interested in street railways in New Brunswick and Bridgeport, Conn.

## ONLY \$25 TO SAN FRANCISCO.

From Chicago via the North-Western Line (Chicago & North Western Railway), the famous "California in 3 Days" Route, June 29 to July 3, inclusive. Choice of routes. No change of cars. Similar rates will be made eastbound. For full information apply to 216 Clark street, or ticket agents of connecting lines; or address W. B. Kniskern, Chicago, Ill.

It seems to be quite a fad in some places to turn the street cars over to some charitable organization of ladies and give the proceeds to some worthy cause. On Decoration day the G. A. R. ladies managed the cars on the West Penn Railroad between Creighton and Natrona. The money collected was added to the fund to erect a soldiers' monument in Tarentum cemetery. The regular motemen assisted the ladies in handling the cars, and no accidents happened. Much enthusiasm was stirred up in the community over the innovation, and every one took a trolley ride.

Peyton J. Clark, superintendent of the Tacoma Traction Company, was recently severely injured by being thrown from the top of a car.





WINDSOR & KENFIELD PUBLISHING COMPANY,  
 OLD COLONY BUILDING, - - CHICAGO.

TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN

Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.

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 subject 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. JULY 15, 1897 NO. 7

INTENDING exhibitors at the Niagara Falls convention in October are reminded that reservations for exhibit space and hotel accommodation should be made at once.

AS ONE reads of the immense crowds drawn to the Queen's Jubilee, he cannot refrain from a mental estimate of what the receipts of a big trolley system in London town would have been.

AN electrical contemporary in England on reading in an American journal of recent experiments with a so-called kinetic motor on a New Jersey line, is surprised and says: "It is not a little strange that in America, where electric traction has been so much developed, there should still be so many other motive powers tried on traction work."

It forgets we have a Keely motor also.

THE friends of "reform" and advocates of "local self government" having achieved their object in defeating the Humphrey bills and placing the Chicago city council in control of street railway franchises instead of a state commission, appear to have placed the city in a state similar to that of the frogs after Jupiter has granted their prayer and sent King Stork to reign in place of King Log.

SUCH people as were in hopes to see some electric conduit construction in Chicago, may have to postpone the realization of such expectations indefinitely. The General Electric

road which started out with a conduit ordinance of some 60 miles has been to the city council and in the end will probably be made happy by authority to use overhead wires instead. The storage battery road's turn will probably come one of these days, and then it will be all trolleys on the surface and third rails on the L's, in Chicago.

AT this writing Indianapolis does not yet know whether it has 3-cent fares or not. Judge Showalter went to that city and heard arguments and has the matter still under consideration. If the new law can be made to hold, there will shortly be one town without a street car service unless it can employ labor at about 75 cents per day. Not even a street railway can long keep up a 5-cent style on a 3-cent income. But perhaps a 3-cent service is what the people there want.

THE necessity for additional interurban lines is more and more forcing recognition from state legislatures, and will continue to do so until in every state suitable provision is made for country railways. In Wisconsin at the recent legislature positive provision was made for securing rights of way, and electric roads were specifically empowered with all the rights of eminent domain enjoyed by the steam roads. In Pennsylvania a bill which conferred condemnation powers upon electric lines, was defeated, undoubtedly through steam road influence. The matter, however, is by no means settled but will continue to come up at each succeeding legislature until electric roads are granted such rights.

ADDITIONAL evidence is at hand showing the declining interest in horseless carriages. The Engineer, London, a year ago offered prizes aggregating over \$5,000 to the contestants in a road race. Although there had been 72 entries during the year, only five competitors appeared at the appointed date, and the race was declared off. The Engineer says editorially: "Our essay . . . has placed the world in the possession of the facts concerning the motor car industry in this country. There is at present no such industry. There is no such thing as a thoroughly satisfactory self-propelled vehicle. . . . We have every reason to believe that the best England can do at present was shown at the Crystal Palace, and, in the opinion of three most competent engineers, the carriages shown were so imperfect, so unsuitable to the fulfillment of the purposes which a motor car ought to serve, that they would not submit them to further trial."

THE reports of the mercantile agencies continue week by week to show a steady increase in volume of business, and prices are strengthening in some lines of trade. The very noticeable advance in quotations of favorite railroad stocks, during the past 60 days, is specially significant. The advance ranges up to 14 points, and is not the result of manipulation or the London exchange. On the contrary it is the natural, healthy result of increased business carried and in sight. The price and demand for meats, both dressed and on the hoof are excellent, and the foreign shipments from Chicago are stronger than any time during several years past. The demand for provisions in the manufacturing states is also increasing, which is the result of increased employment of labor in mills and factories. Secretary Gage's speech was opportune, and even the interminable tariff bids fair to be fairly rounded up and settled. For all of which let us be devoutly thankful, and each add his word

of encouragement that will help drive back into oblivion the ghost of lost confidence.

The outlook for street railway enterprises is growing better, and by another spring we should see a very considerable amount of new work laid out and financed. It will be largely of an interurban character, but such lines are needed and in many places can be made successful.

There is one lesson the American people will do well to learn out of all the trials incident to the past four years, and that is the lesson of economy. As a nation, individuals and corporations had fallen into many forms of extravagance. During the hard times many went to the other extreme, and with the return of the pendulum it is well to profit by the experiences of the past. Brighter days are certainly here with the golden promise of brighter still to come.

In these days a manager is obliged to constantly study every possible means for increasing his traffic.

Street railways have not been exempt from the inroads which the bicycle has made on the livery business, and the competition thus afforded has drawn from what has always been the most profitable business of a road, that of pleasure riding. Obviously the thing to do is to make the best possible virtue of the necessity, by arranging to carry wheels for pay. In many cities the best wheeling grounds are some distance out, or reached only by riding over rough, unpleasant, or streets occupied by traffic teams. Where such are the conditions a good business can be done in providing facilities for carrying wheels either in a special car or on the dash. In Pittsburg one line runs a large number of bicycle cars, which have been provided by slight changes in old cars which otherwise would have gone out of service entirely. The demand for dash racks has already called out several manufacturers who offer to furnish the equipment at a reasonable price. Several roads have devised and built their own racks in the company's shops.

So far as we can learn the scheme has proved satisfactory alike to the company and the public, and the general adoption of the plan seems likely and desirable.

AMERICAN made electric railway apparatus is beyond any question the best in the world. The demand here has been so great, and the requirements insisted on by railway managers such that the standard has steadily and rapidly been advanced to a point of high perfection. The same statement applies with equal force to the great variety of smaller supplies which are less conspicuous but hardly less essential to the operation of a well operated line. In the point of manufacture we lead the world, and while the manufacturers of Germany are very good imitators, which some even insist is carried to the extent of actual piracy, and while they have the advantage of cheaper labor, the fact remains that ours is by long odds the best of all. Our manager friends across the water will find in buying for electric railway service, from a brake handle to a generator, it pays to buy the best. In many cases the difference in price between the foreign and American made supplies is very slight, but even when our prices are higher, time will undoubtedly prove the economy of using the American made article. America leads the world in electric railways; and naturally American manufacturers also lead the word in the excellence and superiority of their railway supplies.

The time will possibly come when "as good" will be made abroad but it will be a long time, for our American

manufacturers have already the advantage of 10 years' experience, and are quicker to see improvements and utilize them. In the meantime our best advice to new foreign roads is, use American apparatus and you will have the best on earth.

A SUBJECT which may well command the study of American managers, is that of a more permanent track construction, such as has been the practice in England and the continent for years, in which no easily perishable material is employed. In our own rapidly growing cities where the capacities of water and gas mains reach their limits with unexpected frequency, and a false idea of economy permits the construction of sewers altogether too small, there has been little encouragement to managers to warrant the more expensive, though more economical, if undisturbed, concrete construction. Our streets are no sooner paved than they are dug up to make room for some kind of a "main" and the expenditures to which our street railways have been put by these "improvements" which are seldom any improvement to the railway, has mounted into vast sums of money. On the other side it requires all kinds of "pulls" of the biggest kind to secure a permit to open up a street. Even so far back as when George Francis Train and Charles Hathaway built the first street railway in England the law was invoked and executed upon them for "tearing up the Queen's highway."

However, as we grow older it is to be hoped and expected that we too, will some day become reconciled to streets without the appearance of a recent cyclone, and as we do we may look forward to a track construction deserving of the name "permanent way."

MUNICIPAL ownership of lighting plants has now for some years been the popular demand, and at the present time the leaders in this movement are casting their eyes upon the street railways, and the promise is made that benefits without number will flow from their operation by municipalities. Inasmuch as there are no municipal street railways in this country, recourse is had to European cities for the necessary glowing statistics with which to dazzle the unsuspecting taxpayer. European statistics are without doubt of great interest, but the conditions obtaining there are so different that they are of little value as showing evidence of what we may expect in this country. This fact is, however, an advantage to those who quote them. The history of how the 3-cent fare bill was defeated in the Missouri legislature, which we publish in another column, shows that the honest supporters of measures inimical to the railways are glad to be convinced of their error, and it will only be necessary to place the truth before the man who has most to lose, the taxpayer, and he will put a quietus upon the scheme. Having no municipal railways here, we can not compare the actual results obtained with the promises which are held out to us, and it is in order to profit by the experience of the municipal lighting plants. We publish an abstract of the paper on municipal lighting read before the National Electric Light Association, by W. Worth Bean, president and general manager of the St. Joseph & Benton Harbor Electric Railway & Light Company, and recommend its perusal to the advocates of municipal railways. The same principles would apply to municipal ownership of railways, only to a vastly greater extent in proportion to the larger number of employes and investment involved in the latter. Mr. Bean ably demonstrates that all is not gold that glitters.

## DATA FROM POWER STATIONS.

The methods of keeping accounts for the steam roads have passed through an evolution until now nearly every spike and pound of coal have a record at the general office. A great deal of attention has been given to locomotive performance. Each engine of each division, each month has a complete record of the passenger, freight or switch mileage, the amount and cost of waste, oil, coal and other supplies, labor and material for repairs and the wages of the engineer and fireman. Then the cost per mile run for these separate items is figured out. A summation is made for the whole division and a comparative statement is prepared for the system. With such a record it is easy to tell whether or not the different divisions are being efficiently managed. These statements, which are on blanket sheets, are sent to each master mechanic and are also exchanged between the different roads. Although no two roads have exactly the same system of accounts yet the statements admit of quite accurate comparison.

Records for power house performance are analogous to those of locomotive performance and the street railway men have followed the practice of their steam railroad brethren in many particulars. There is one difference and that is the street railway managers treasure their reports and seldom permit the records to go outside of their own hands. Power house equipment, methods and appliances for keeping records and systems of accounts have changed so rapidly that comparisons were hardly fair or desirable. Occasionally a monthly or annual statement was given out but not much faith was placed in them. If the record was a good one it was generally believed that the manager took a particularly favorable time when repairs were light and fuel cheap to publish the figures. The output of the station was generally read in volts and amperes which is a tedious and unreliable method. In contrast to this, with wattmeters which are so common now, an absolutely correct reading can be taken once in 24 hours and the day's operation figured on the kilowatt-hour basis. In addition to this, coal scales, record blanks and graduated oil tanks add much to the reliability of the records.

Already some of the most progressive managers feel the need of comparing the records of their stations with those of other stations operating under similar conditions. This exchange of data is going on between a few managers although the statements are not so complete as those of the steam roads. The statement is generally itemized as follows:

|                                                   |          |
|---------------------------------------------------|----------|
| Cost of Electrical Output per Kilowatt-hour:      |          |
| Fuel .....                                        | \$ ..... |
| Labor .....                                       | .....    |
| Supplies (oil, waste, etc.) .....                 | .....    |
| Water .....                                       | .....    |
| Repairs .....                                     | .....    |
| Total .....                                       | \$ ..... |
| Output of station in Kilowatt-hours:              |          |
| Gals. of cylinder oil per 10,000 k. w. h. ....    | .....    |
| Gals. of lubricating oil per 10,000 k. w. h. .... | .....    |
| Lbs. of water per lb. of coal .....               | .....    |
| Lbs. of coal per k. w. h. ....                    | .....    |

Although there may be a different system of accounting for each company yet this blank could be filled out from any good record. The value of such a statement made at regular intervals, everyone in charge or interested in power house operation can appreciate.

## TRACK ELEVATION IN CHICAGO.

Many of the crossings of the 1,200 miles of steam railway tracks in Chicago with the city streets and the street railways have become very dangerous, as most of them are at surface grade. To alleviate this as many as 39 street viaducts were built, but this plan was found unsatisfactory on account of their difficult grades and damage to adjacent property. A different policy was adopted by the city and ordinances were passed requiring certain railroads to elevate their tracks at dangerous points. The climax of this legislation was the "O'Neill Ordinance," which provided for the elevation of all the railroad tracks within the city limits, but the provisions were so onerous and unreasonable that they have never been carried out. The railroads of their own volition have elevated about 42 miles of track at great expense, but traffic has been greatly facilitated and the expenses incident to grade crossings have been done away



WEST CHICAGO TRACKS AT ROCKWELL STREET.

with. The work of elevation is carried on without interfering with the regular traffic. Sand filling is used except at the intersection of streets where steel viaducts are built supported on stone abutments.

The street railways are interested in this elevation as well as the steam roads, for the city ordinances explicitly provide that the street railway companies shall make the grade of their tracks conform to that of the street and repave the street between tracks at their own expense.

When the work began on the track elevation of the Chicago & Northwestern and the Pittsburg, Cincinnati, Chicago & St. Louis railroads there was a conflict between these roads and the West Chicago Street Railroad. The city ordinance provided that the railroad tracks at the intersection of West Madison street should be 12 ft. 6 in. above the surface of the street, the tracks being elevated 9 ft. and the street depressed 3 ft. 6 in. The task of depressing the cable tracks to conform with the street grade was an expensive undertaking and required considerable time. It was proposed by the street railway officials that the railroad elevate temporarily the viaduct 3 ft. higher than required, and thus comply with the ordinance, until work in depressing the cable tracks could be completed, the street railway com-



pany being willing to bear all the necessary extra expense. For some unknown reason, or, perhaps, no reason at all the railroads refused to accept this offer, and without a word of warning placed a steel girder on abutments across Madison street. As the girder was only 9 ft. above the cable tracks the cars could not pass. To insure a complete blockade and forestall interference while putting the girders in place the railroads switched lines of freight cars loaded with stone on the steam tracks across the streets. The street railway company obtained a temporary injunction from Judge Gibbons, but the work had progressed so far that the railroad could not be restrained. One illustration shows the blockade on West Madison street and the passengers transferring from the cars on either side of the railroad. After a delay of two days a crossover switch was put in place just west of the railroad tracks and the cars on that section of the track continued running.

Underlying the crossing is a solid bed of masonry to give

built up to the bottom of the column or the column is lengthened. The elevation will soon be completed and as far as the work has progressed there has not been even a rivet loosened and no interference of traffic.

#### CLEARANCE CARDS.

The decision of the Appellate Court of Illinois in the case of Charles Jenkins against the Cleveland, Cincinnati, Chicago & St. Louis Railroad is of interest to street railways, as in all probability the same rule will be applied to them if a similar case should arise. Jenkins was a freight conductor and was discharged by the company which declined to give him a clearance card or letter of recommendation required by railroads of applicants for employment who have worked for other roads. Being unable to secure employment elsewhere he sued the company for damages. The finding of the lower court was in his favor, and the decision was sus-



RAISING METROPOLITAN ELEVATED AT ROCKWELL STREET.

rigidity to it, in fact, it is so unyielding that its maintenance has proved very expensive. The excavation has to be made into this solid stone and mortar. To give the proper grade, the tracks have to be depressed for about 100 ft. on either side of the crossing. The Rockwell street station of the street railway company is within this distance, and the lowering of the tracks will necessitate changes of the tracks and turnouts from the station.

Changes in the grade of the steam roads will also affect the tracks of the elevated roads. The second illustration shows the tracks of the Metropolitan West Side Elevated being raised. It is necessary for the bridge over Rockwell street to be lifted 6 ft. 4 $\frac{7}{8}$  in., and to give a uniform and easy grade the whole structure will be raised for a distance of 2,300 ft. The peculiar design, rigid connections being omitted every third span, and the substantial construction enable this work to proceed without interfering with the regular traffic. Around each pair of iron columns a heavy frame work is built; hydraulic jacks are used to raise each section 2 in. at a time, and it is then blocked up, the structure having enough flexibility to permit of a distortion of 2 in. When the section is at the required height the piers are

tained on appeal. The court held "that as it is the general custom among railroad companies to grant and demand these letters of clearance, there is an implied provision in the contracts between them and their employes, although no expressed provision be made therein concerning the matter, to grant their employes letters of recommendation for the purpose of enabling them to secure employment elsewhere."

#### CELLULOID DESTINATION SIGNS.

A destination sign that is very plain and easily read at a distance, both day and night, is employed on the Des Moines City Railway, of which W. G. Owens is superintendent. The letters are cut out of a wood board and this board painted black. For a suitable background white celoid is fastened against the back of the board to make the lettering stand out white and clear, both by day and by night. The sign is put up directly in front of the dome lights, and clear glass is put in the front of the dome in place of the colored glass usually employed. Thus a legible sign is secured without any changes in the lights on the car.

## MUNICIPAL LIGHTING.

From a paper read before the National Electric Light Association by W. Worth Bean.

The subject to which I would respectfully invite your attention is one of the most vital questions, and of the most momentous importance—not only to the profession to which we have the honor to belong, but also to various commonwealths of which it is our pride to be citizens—that has ever arisen in this advanced electrical era. Municipal ownership of electric lighting plants, the most discussed of all the questions of municipal polity, is the more insidious that it comes dressed in the sheep's woolly garb of a philanthropist, which to the uninitiated and ignorant has an alluring and plausible aspect, but to the experienced are plainly visible the wolf's deadly fangs, which have, in every instance, sooner or later lacerated the taxpayer. The authors and promoters of this alluring scheme are either visionary theorists, who have no practical knowledge of its manipulation, or unscrupulous politicians who, desiring to pose as benefactors to the municipality, hope to ingratiate themselves in the hearts of the voter and thus secure political plums for themselves and their henchmen. That there are many honest supporters of this political fad who, having been deceived by beautiful but false reports from cities which are experimenting with this question, are misled by political demagogues, is undeniable.

The tidal wave is sweeping over our land, and certain municipalities are now on the crest, but it will not need the average period of depreciation in a plant for the wave to subside and leave the wrecks stranded with increased burdens and depleted treasuries. Already cities have sold their plants, paying dearly for their experience, and others are looking for buyers, in order to unload their "white elephants." Municipal ownership is contrary to the spirit of republican institutions.

Government, whether national, state or municipal, was instituted for the purpose of protection and not production. It would be just as reasonable for the city to enter any pursuit, such as farming, or as a grocer, or keep a sawmill to saw its own material for sidewalks or paving, or manufacture shoes for its citizens, or run a saloon for the profit there is in it, as for it to enter the field of lighting. Just as sure as a nation becomes a commercial producer, competing against its own citizens, just so sure will the seeds of own disintegration be sown.

Municipal ownership is a source of danger to the commonwealth, in that it affords a great opportunity for fraud. Municipal corruption is so common and so well known that it needs no argument to prove the danger of opening a new avenue of power in the hands of unprincipled public officials. In this business there are a number of important, and ought to be well salaried, offices, which can be used to great advantage by political manipulators to further their own ends to the detriment of the city. In the State of Michigan one political party had been in power for 34 years until 1891. A member of the old party was elected to the Senate and introduced a bill to benefit Coldwater, Mich., and this has been the Mecca of the municipal advocates ever since. It has been the oasis in the desert where they could get sweet morsels to roll under their tongues to advocate the scheme of municipal ownership. I venture to say that more than a score of towns and cities have charged up expenses for the

examination of this delectable plant, and from their own printed statements I am willing to qualify that the figures are not as they should be made. Reports come from Grand Haven, Mich., that through political influence a competent electrical corps has been discharged to make room for inexperienced friends of the "powers that be." "To the victor belongs the spoils" is a policy followed with unswerving fidelity by a great many city officials. Scandals from our great cities in regard to employes, inspectors, officials and boodle aldermen, should teach us to avoid throwing this enterprise, involving hundreds of thousands of dollars, and positions of the utmost importance to the city, into the maelstrom of municipal politics.

Municipal ownership is unjust to the electrical plant now in the field. The central station man has, through his industry, ingenuity and executive ability, built up a large enterprise. The city has invited him to invest thousands of dollars, not only of his own money, but also the money of its own citizens, with no immediate show of dividends, and, in some cases, barely sufficient income to pay the running expenses and interest on the bonds during a period that will amount from one-half to the whole of the average amount of time allowed for depreciation of the plant. The central station man during this time has been harassed with the anxiety of meeting the fixed charges, maintaining the credit, providing a reserve fund to meet loss by fire, wind storms and burned-up apparatus, and cheering up despondent stockholders who have nothing to show for their money but the rosy-hued prospect that, at some time in the near future, there will be an adequate dividend to compensate them for their risk, and now, when these hopes are about to be realized, in a modest degree, they are confronted by municipal ownership. He must either compete with the city—which, through ignorance, will furnish lights below cost—or sell out. The latter proposition is impossible, for he cannot hope to dispose of a plant that has depreciated 50 or 75 per cent without great loss, therefore he is compelled to continue in business with his former heaviest consumer, now his strongest competitor, with the prospect of having to renew his plant within a very short time, at a heavy expense, and knowing full well that there is room for but one paying plant in a city of that size. Such conduct on the part of the city amounts to the indirect confiscation of property; obtaining a competent and effective service for years without profit, holding out the alluring representations of a future gain.

Municipal ownership is unjust to the taxpayer. That through ignorance or willful errors in keeping accounts it is certainly true, in most cases, that lights are furnished to the city and private patrons at a loss, and the deficits charged to some other accounts. Very few of its citizens are able to take the lights at the reduced price, for the great majority of its citizens are day laborers, who are paying for their homes, and cannot afford to take the lights even at any price, but who eventually must help to carry the burden of the ever-increasing loss, thus making the many help pay for the luxuries of the few. Municipal ownership has cost the city of Hamilton, Ohio, \$575,000. It is reported that an order has been made to discontinue the electric lights, on account of lack of funds. This has been a very expensive experience for Hamilton, and the taxpayer who has burned nothing but an oil lamp now helps to pay the bill.

The result, in most cases, will be less efficient service than under the competitive system. Central station men who

have been in the business for a long time, and who have had years of experience, are, without doubt, the most competent to give the best service of the times. He surrounds himself with expert electricians and a corps of able assistants who have been educated in the business and retain their position by the strictest attention to duty. He is continually devising means for improving his service, not only in employes, but also in the latest improved machinery. On the other hand, municipalities change their officials frequently, and new men take control. Councilmen who oftentimes are not even good business men, and have no knowledge of apparatus and electrical affairs, pass on the purchasing of supplies and the competency of electricians and engineers, deposing experienced incumbents and apportioning political plums to friends of but ordinary ability. The men now in control attempt to compete with electrical experts and competent engineers of long experience, and about the time when they are beginning to understand their plant and how to save loss—in a year, or possibly two—the council changes, and they must step down to make way for those of even less ability. Again, in smaller cities councilmen are often elected on the single issue of economy, and in order to fulfill the expectations of their constituents, they must cut expenses. The first attack is made on the official salaries, which results in filling responsible positions with inefficient men. Experts cannot afford to educate themselves for positions, commanding low salaries and subject to the vicissitudes of municipal politics, and we all know too well the cheap men in this business are the most expensive. Then, again, the economical councilmen will object to improving the plant, which will require vast sums in replacing that which has but lately cost so much, and for which they have not as yet finished paying. This is especially so if the improvements are demanded in a time of financial depression, and when taxes are already too high.

The glowing reports from cities that are experimenting with this question are unreliable and misleading, except to the electrical profession. In some cases, where the plant is new and there is no perceptible depreciation, and where they have providentially escaped accident or disaster, no doubt these statistics are honestly, though ignorantly, compiled, deceiving the taxpayers into the belief that their venture is a glorious success. The engineer's salary and the coal bill are often charged to the water department, and the water consumer helps pay the electric light bill.

In most instances the item of interest on the outstanding bonds is charged instead of interest on the entire plant, and 4 per cent depreciation is charged, whereas from 10 to 15 per cent, should be the rate. In some cases losses by fire are not accounted for; in others accidents are never charged. The loss to the city of the taxes that would be paid in by a private corporation is not computed, and in a great many cases the accounts are so mingled with other departments that it is impossible for even the officials themselves to tell how much the lights for street purposes cost the city.

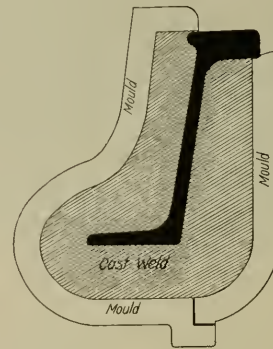
I have personally visited Niles, Kalamazoo and South Haven, Mich., and I know that these cities are paying more for their lights than their official reports show that they cost, and yet they are considered among the list of those who are successful with municipal lighting. The city of Detroit has probably the finest equipped plant in the State of Michigan, and operated under the most advantageous circumstances, and yet she pays \$100 in round numbers per lamp for 1,483 lamps, under municipal ownership, while St. Joseph

and Benton Harbor, under the relentless pressure of a private corporation, only pays \$90 on an average, for sixty-two lamps. Tipton, Ohio, and Marquette, Mich., had serious accidents, and the deluded taxpayer, with his eyes partly open, refuses to vote more money for such a hazardous enterprise.

At this present writing municipal lighting has not passed through its most dangerous period, and it is difficult to predict its final result. It is now but at the dawn of its existence, but a December day will be long in comparison with the life it has to run, for when bonds are to be redeemed, accidents befall the plant, and a depreciated plant is to be renewed, then comes the trying ordeal, and woe be to the city that has not provided against that day, but has wasted its substance in riotous living, for then it will be found to have nothing left for its existence but the husks of "Municipal Lighting."

### SLOT RAILS AS TRACK RAILS.

The slot rails used in cable track construction certainly has a very positive individuality, so much so in fact no one has been able heretofore to study up any other use to which they can be put. As the rolling of slot rails calls for special rolls and a special run, they are always made only to order and none kept in stock at the mills, hence in the early days of cable building roads frequently ordered a considerable tonnage in excess of present needs in order not to be left without a supply.



At that time also it was estimated the life of the slot rail would exceed that of the track rail, but no one expected they would practically never wear out. Such, however, has been the subsequent history of their use, and probably 98 per cent of

all the cable slot rail in Chicago is practically as good today as it was when laid 10 or 15 years ago.

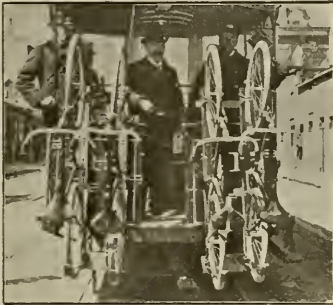
The Market Street road in San Francisco recently found itself in possession of a large tonnage of these slot rails which had never been used, and as its new lines are all on grades adapted to electricity, there will be no occasion to use this iron in new cable construction. Then the question arose what to do with them. Some one ingeniously conceived the idea of using them as track rails, something heretofore impossible from the form of the section. This has been accomplished by cast-welding at the joints, thus forming a wide base to support the slot rail, which is a Z section. The work is being done by the Falk Manufacturing Company, under the direction of its San Francisco office in charge of Ira Bishop.

The City Electric Railway of Port Huron, Mich., will henceforth issue no more passes. Last year the passes given away amounted to \$1,700.



## BICYCLE RACKS IN TORONTO.

The illustration shows the bicycle racks designed at the request of the Toronto Street Railway when that road decided to experiment with carrying wheels on its cars. The frame of the rack is of wood, there being two or three vertical pieces according as it is to carry two or three wheels. At the bottom of each vertical piece iron rods project with a block at the outer ends, which are supported by light chains. The rear wheel of the bicycle rests in this support and the front wheel is clamped to the vertical piece of the frame. Two of these racks are carried on the car, attached to sockets fixed to the dash at the rear end. In Toronto where trail cars are operated during the busy hours of the day, both the motor and trail cars are fitted with



TORONTO BICYCLE RACK.

sockets so that the racks may readily be transferred from one to the other when occasion demands. These racks have given satisfaction in service, carrying the wheels with perfect safety and without scratch or strain.

A Connecticut firm will manufacture the racks for this country.

## A PLEA FOR PERMANENT ROADBED.

### EDITOR REVIEW:

In your issue, under date of June 15, I notice the opinions of presidents, vice-presidents, railway managers and superintendents given upon the expenditures and costs of operating street railways. And by them all there seems to be a slight reference made to gross earnings; the opinions herein referred to will be found on page 375, under the title of "Cost per Car-Mile vs. Cost per Passenger."

This is a very broad subject which should be brought down to a more pointed and definite argument; simply showing cost of maintenance after construction and equipping a road. Here is where the money lender is looking for information, and as a money lender I ask for some information through the columns of your valuable REVIEW.

I will first quote a few facts, and ask of you is there not some way to overcome the great outlay for expense of constant repairing and re-construction of street railways. In Philadelphia, when the railway people do all the work themselves, it costs from ten to twelve thousand dollars per mile to construct their railway, without any equipments. Now, the writer holds some street railway securities, and I am perplexed to know, why it is that our roads, which have been

laid for less than two years, are now being torn up to repair the joints. Can this not, in some way, be prevented or overcome? Then I look into the near future, when there must be an entire reconstruction of the whole roadbed, simply because the rails are without a foundation, the wooden ties having all vanished through decay. And it is well known to all of us, who invest our money in this direction, that the cost of this reconstruction exceeds first, or original cost of construction; yet we are satisfied with the amount of interest which we receive from our investment, notwithstanding all of these disadvantages, which are so broad that they are undeniable. And again, I ask: Would it not be much better for the holders of bonds and stocks of street railways, if the above superintendents and managers would place themselves on record, in advocating and adopting some method of permanent roadbed for street railway construction, whereby the cost of maintenance would be a thing of the past.

Just here—to illustrate—I find it does not cost me very much to buy a team of horses for my family's use, but to keep them will cost me very much more. In talking with a friend, who is well versed in banking interest, upon this particular subject, he gave very freely his views, and said that he quoted the views of some strong banking houses, both of New York and Philadelphia; his remarks narrowed down to a very small space by saying: "Permanent road beds must be had, and when the street railway men attain them, their bonds will be much more valuable."

I hope to gain some information through the STREET RAILWAY REVIEW, of which I am a constant reader. There are very many millions of dollars invested in street railways, all of which are laid upon perishable foundations. Hence the subject matter of this letter is well worthy of immediate and careful consideration. I acknowledge that my investments in street railway securities are profitable, yet I fully realize that if the cost of maintenance were not so great, my securities would be much more valuable.

I should be very happy to take up the question of permanent roadbed with some of our railway managers, superintendents, presidents or engineers, and argue the matter from every standpoint, through the STREET RAILWAY REVIEW.

HUGH PHILLIPS.

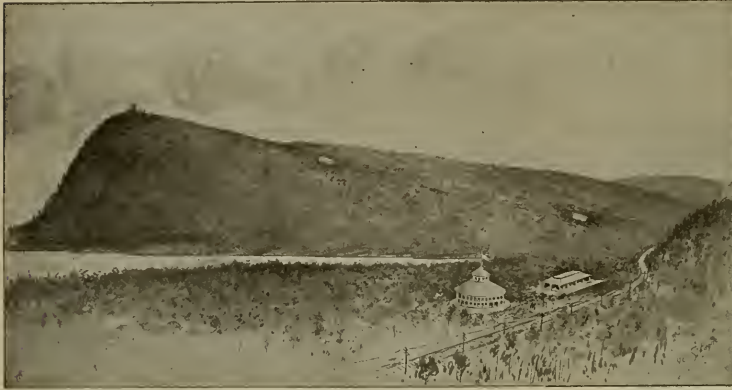
## STREET CAR LICENSE IN PHILADELPHIA.

The street car companies of Philadelphia are compelled to pay a license fee of \$50 for every car in service. The Union Traction Company owns 1,500 cars and pays a tax on 1,200, the remainder being held in reserve. On special occasions it is desirable to put on a large number of extra cars to accommodate the traffic. As an instance, on Memorial day 250 additional cars were needed, but the license was so excessive that the company did not feel justified in paying more than \$5,000, the amount required for 100 cars. As a consequence the cars on all the lines were greatly overcrowded and the passengers suffered great inconvenience.

To remedy this evil and not make the provisions of the ordinance so burdensome to the company a new ordinance has been introduced into the council providing that on holidays or at other times when a large number of cars is required, that a license of 25 cents a day shall be paid. This will be more just to the street railways and an encouragement to give ample facilities for the traffic.

## INCLINE RAILWAY UP MT. TOM.

Mt. Tom is the highest mountain of the Holyoke range, the summit being 1,218 ft. above sea level. From the top is an extensive view. On clear days the gilded dome of the state house at Hartford, 35 miles distant, is plainly visible. The inclined railway which was opened for service on June 26 is an addition to the extensive park, 600 acres, of the Holyoke Street Railway. The road was built by the Mt.



MT. TOM RAILROAD.

Tom Railroad Company, but this company has the same officers and, with one exception, the same directors as the former, and the road will be leased to the Holyoke Street Railway. The Mt. Tom company also has 365 acres in park. The Holyoke company operates electric cars from the city to Mountain Park, as it is called, where connection is made with the incline. Electric cars from Springfield and the smaller towns in the contiguous territory make good connections with the Holyoke line.

The road is operated on the balance system, but with two



MT. TOM PAVILION ON THE SUMMIT—1,218 FEET ABOVE SEA LEVEL.

cars instead of one car and a dummy. The two cars are attached to the ends of a cable, and the necessary power applied by the motors on the ascending car. The cable is

of steel,  $1\frac{1}{4}$  in. in diameter, composed of 6 strands of 20 wires each; at the top it passes over an 8-ft. sheave. Telephone wires connect with telephones in both cars in order that the motorman may operate them in unison. The two cars are named "Rowland Thomas" and "Elizur Holyoke," after the commanders of two surveying parties which tradition says made surveys of the mountain about 1650.

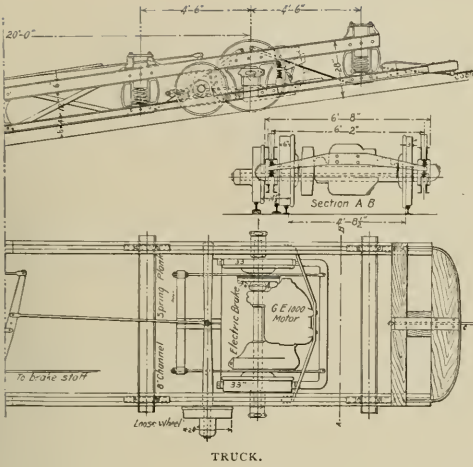
The cars were built by the Wason Manufacturing Company of Springfield, Mass., and excel in taste and finish other mountain cars in New England. Each has 12 benches and will seat 84 persons. Each car is lighted by 15 incandescent lamps. The cars are open on one side only; our illustration shows the closed side.

The trucks were also designed and built by the Wason company and in them and the turnout are embodied the most interesting mechanical features of the installation. The line drawing shows three views of the truck, which is symmetrical about the centre line except that the motor at each end is hung in front of the axle, and there is no cable attached at the rear end. The total length of the truck is 35 ft. 6 in. and the width from centre to centre of the truck sides 6 ft. 2 in. The truck sides are 22 in. deep with 6-in. channels at the top and 4-in. channels at the bottom. The wheel base is 20 ft. measured horizontally, and with a vertical distance between wheel centers of 33 in. when the tops of the spring planks are horizontal. This slope of the truck is 13.75 per cent, the average grade of the line. The four wheels are 33 in. in diameter, and those on the inner side (the side toward the other car when passing) have an exceptionally wide tread, 6 in. The object of this will be seen on examining the view of the turnout; the



TURNOUT—MT. TOM RAILROAD.

switch-rails are stationary and the car is thrown onto the proper track by the guard rail shown in the foreground of the illustration, which engages the outer edge of the tread



of the wide wheel and forces it over so that the flange catches the switch rail.

At the turnout short sections of the running rails are omitted to provide a way for the cable and allow the car to pass without injuring it. To carry the car a section of rail is laid  $1\frac{1}{2}$  in. outside of the switch rail and extra wheels provided on the truck. These wheels are 24 in. in diameter and run loose on fixed axles placed 2 ft. behind the axles, one at each end of the truck.

Each truck has two G. E. 1,000 motors, one to each axle. The speed is 800 feet per minute, 9 miles per hour. The greatest precautions have been taken to provide against accidents, and each car is equipped with hand brakes, electric brakes designed by the General Electric Company, and an automatic device similar to the Sprague safety brake for elevators. For this last a third rail is laid between the running rails, and when the speed of revolution of the car wheels exceeds the maximum allowed, the regulator releases a powerful clutch which grasps the third rail. In addition to these an automatic brake or retarder for braking the cable is placed at the summit. The weight of the car and truck is 25,000 lbs.

The road is 4,900 ft. long, with a total rise of 700 ft.; the

minimum grade is at the lower end, 7 per cent for 300 ft. and the maximum is 21 per cent. There is but one curve; it has a radius of 1,910 feet. The gage is 4 ft.  $8\frac{1}{2}$  in.

Nearly all of the embankments are of trap-rock and the cuts are through the same material. The track is laid with 56-lb. T-rail on 6 x 6-in. southern pine ties, 2 ft. between centers. These are bolted to 6 x 10-in southern pine stringers, which in turn rest on heavy chestnut mud sills.

At the summit the company has erected a pavilion securely anchored to the rock large enough to accommodate 500 guests. This building is 76 x 92 ft. on the ground, of two stories, with ample piazzas on both floors around the whole building, and a cupola 25 x 31 ft. On the first floor are the restaurant, dining room, parlors, etc., on the second a hall with stage, and two smaller rooms; the kitchen is in the basement. The cupola is used for an observatory and is provided with good telescopes.

At present water is carried to the summit in tanks but a pipe line is to be laid and a motor pump installed to furnish the supply.

The fare is vastly less than that usually charged on mountain railways, being 25 cents for the round trip including the freedom of the pavilion with its musical and other attractions.

The time occupied in building was five months and the cost nearly \$100,000.

We are greatly indebted to William S. Loomis, president and William R. Hill, treasurer, for data and courtesies extended, and to the Wason Manufacturing Company for views and description of the trucks.

### TO PROTECT PEDESTRIANS IN NEW ORLEANS.

In order to protect the pedestrians of New Orleans against their own carelessness an ordinance has been introduced in the city council which provides that it shall be "unlawful for any person to loiter or play on such parts of any neutral ground, levee or street on which steam or electric cars are operated." A fine of from two to ten dollars is provided as a penalty.

Cars of the Citizens' Railway are running on the lines of the Detroit Railway while the cars of the latter company are being overhauled.



SHEAVE AND BRAKE AT SUMMIT.



CAR.



## RECENT DEVELOPMENTS IN CHICAGO.

Street railway gossip has formed an unusually interesting subject of conversation in Chicago during the past month—not only among street railway men, but the general public as well. On the passage of the Allen bill local securities advanced, and many expected President Yerkes would at once apply for the 50 year extension which that law permits. He has not yet done so and appears to be in no great haste. A striking feature of the Allen bill was the provision made for leasing or consolidation of companies, and that this will eventually be availed of to bring all the city transportation lines into one organization there is no doubt, and Mr. Yerkes will be in control of such consolidation. This is expected to include all the surface and elevated lines within the city proper, and their suburban connections. With the North and West Chicago systems and their numerous suburban connections, and the Lake Street elevated, and the Union Loop elevated, there remain but three prominent properties to secure—the City Railway, and the Metropolitan and Alley L's. Both the latter are in receivers' hands.

There has been great curiosity as to what the General Electric road would do and who is behind it. The recent victory which this company won in the Supreme Court of the state, against the City Railway has put it a long way ahead in its possibilities. The company has for a long time given out that J. Pierpont Morgan stood ready to take its bonds and has for months stated it was about to begin construction. A permit was taken out but no work done beyond breaking ground. Probably it could legally maintain the point of having begun work. The numerous suits have, however, given it very reasonable excuse for the delay to date. The history of the scheme is interesting. The ordinance was secured by some well known politicians for the very apparent purpose of disposing of it. As the franchise brought its lines to the heart of the city and paralleled the City Railway's great system from Jackson street to 63rd street, that company was naturally the most likely buyer, as it was by all odds the most interested competitor. It is rumored on what is very good authority that the franchise was offered the City Railway at the outset for \$50,000. The company, however, refused to consider what it not improperly branded a species of blackmail, although the franchise ought to have been worth that to anybody as it will be no difficult matter to raise the necessary money to build the road when once it is out of the courts and perfects its title. This it now claims to have done. The effect of this possible competitor located between the great arteries of the State street cable and the Clark street electric lines of the City Railway was soon felt in the steady depression of the City Railway stock, which in spite of its big business steadily dropped until it had fallen off over 50 points and at one time was temporarily even lower. Before the dropping process had gone very far it is said the City Railway concluded to accept the \$50,000 offer only to discover the price had gone up to \$100,000. This was too much, and that deal failed. One or two other offers and refusals are reported but each time the price was raised over the previous one, until now it is understood the General Electric would not take less than a million.

In the meantime there are more than rumors that Mr. Yerkes is after the City Railway; just how far these negotiations have progressed is guarded as a state secret, and indignantly denied by City Railway stockholders who say

there is nothing in it. Nevertheless it seems more than likely that such will be the eventual outcome, and the time will not run into many years, either. The REVIEW has met with little encouragement among street railway people here in its belief that Yerkes controls the General Electric; and while we are confident he had nothing to do with its inception and early history we venture the prediction that eventually it will be seen that at the present time and from now on it will have to do as he says. One of the strongest proofs of this was the ease and rapidity with which the General Electric had its original franchise revised and changed to permit to use overhead wires in place of the conduit system, an ordinance the mayor vetoed and has now been placed on file for further action.

During the past week there have been lively times growing out of the suit brought by Henry Brandenburg, inventor of a conduit system which at one time he expected would be adopted by the General Electric. Later it was announced the Love system would be used. Brandenburg charges Lucius Clark, who is now one of the bright lights in the deal, with having swindled him out of his stock in the original company, which he states was to have been one-fourth. He also goes further and professes to reveal a boodle scheme by which the ordinance was secured, and makes some very pointed charges against certain aldermen. Clark replies with a threat to have Brandenburg prosecuted for alleged forgery, and further intimates that the City Railway is prodding Brandenburg on and furnishing him the sinews of war. At all events matters cannot go on this pace long before somebody will get in a tight place.

The Alley L has arranged for a sufficient amount of its \$750,000 reorganization bonds to warrant it in going vigorously ahead with its electric installation. Connection has not yet been made with the Union Loop, with which it will have to connect before it can do a profitable business.

Work has been pushed with great energy on the Union Loop, and the station building has progressed with astonishing rapidity. The feeders are in and connected and operation is promised in less than a month. There is every indication that the promise to have it running by August 1 will be fulfilled.

A rumor was industriously circulated by the daily papers that the City Railway was about to displace all its cables with electricity. Several of the directors who were seen by a REVIEW representative absolutely denied any such intention. Electric motors have for some time been used instead of engines in the 52nd street station, driving the cables on State from 39th to 63rd, but the other plants are hardly so situated as make an enlargement of this plan desirable as yet.

## TROLLEYS REDUCE RAILROAD FARES.

The passenger representatives of the Cincinnati railroad lines at a recent conference decided to reduce the rates on all their suburban trains to meet the increasing competition of the electric lines. This reduction of rates will be followed by a quickening of their schedules and increasing the train service. It is stated that if need be the railroads will carry passengers for less than cost and even up on freight rates to the suburbs. The electric cars seem to be preferred to the railroad coaches and the most effective way for the railroads to meet trolley competition is to give patrons the same kind of service.

BEHR MONORAIL SYSTEM.

The engineering feature of the Brussels International Exhibition, which serves as its Eiffel Tower or Ferris Wheel is the Behr monorail railway. Engineering of London has in recent issues given complete illustrated descriptions of this very interesting feature and we reproduce a few of the cuts and a short description. The inventor, F. B. Behr, became interested in the Lartigue monorail railway in 1885 and since that time has devoted himself to perfecting a monorail system which could be profitably applied for the transportation of passengers at high speed, and the outcome of the present extensive experiment which he has undertaken at great cost will be watched with much interest.

Mr. Behr has built a track having a total length of about three miles, consisting of two parallel straight portions connected at the ends by curves of 1,600 ft. radius which are joined to the straight track by transition curves. This track is erected in an inclosure adjoining Tervuren Park at Brussels. The construction of the permanent way is shown in Figs. 1 to 6.

Besides the single rail which is placed at the top, there are attached on each side of the trestle-work, at a, b, Figs. 1

supported on insulators secured to the sleeper by stud bolts, the conductor rail being held by two screws provided with spring washers. Copper strips form the connections between the conductor lengths. The cross ties are 1.524

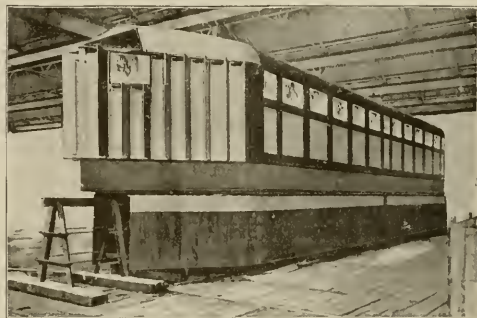
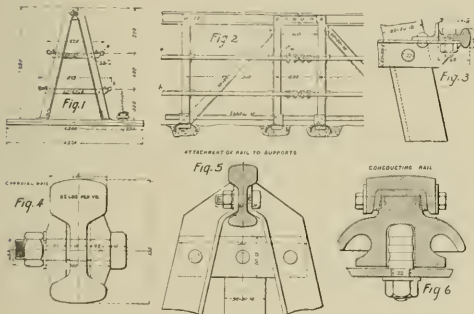


FIG. 7—CAR FOR BEHR RAILWAY.

meters long on the straight track and 2.059 meters on the curves.

Fig. 7 is an exterior view of the car which Mr. Behr expects to propel at 100 miles per hour. It is 58 ft. long and 11 ft. wide, framed entirely of steel. The bottom edge is 7 in. clear of the sleepers; the floor level is 5 ft., the bearing rail being 4 ft. 1½ in. above the sleepers. Fig. 8 shows the arrangement of the seats and disposition of the motors and guide wheels. The car seats 100 persons.

The car is supported by eight wheels, 4 ft. 6 in. in dia-



DETAILS OF TRACK—BEHR RAILWAY.

and 2, two rails of a special section, and laid flat with the heads outwards. These serve as guide rails, on which 16 pairs of small inclined wheels mounted on the carriage take a variable bearing as the train is in motion. The triangular members of the trestle are about 4 ft. high, the distance from the top of the sleeper to the bearing surface of the rail being 1.250 meters. The standards are placed at distances of 1 meter (39 in.) apart, except at rail joints, where the distance is made one-half. Fig. 2 shows the arrangement, and from this it will be seen that the joint standards are strutted back by angle-irons to the foot of each adjacent standard. Fig. 1 also shows the manner of attaching the lateral guide rails and the braces that stretch across from one leg of the standard to the other. Figs. 4 and 5 are enlarged views of the carrying rail, which is of ordinary section, and 82 lbs. to the yard. Fig. 5 shows the attachment between the rail and the head of the standard.

Fig. 3 is a view of the lower part of a standard; It will be seen that an angle-iron extends across the standard and is riveted to it; angle-irons, forming bearings for the foot of the guide rails, are also attached to the standards. The rails are bolted to the cross bar of the standard. The conductor is attached to the sleepers, as shown in Figs 1 and 6. It is

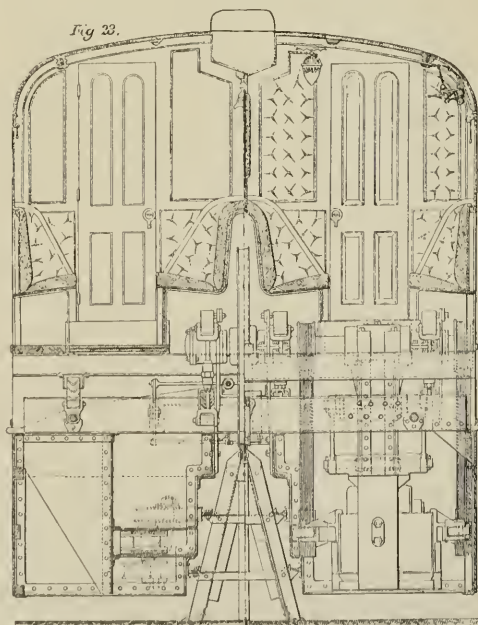


FIG. 8—CROSS SECTIONS OF CAR.

meter, mounted in two four-wheeled trucks which are coupled at the centre by means of a universal joint. The very short axles of the wheels run in boxes mounted on pedestals that are riveted to the main frame, and the carriage is hung on the boxes by means of cast steel curved hangers to springs, one on each side of the wheels, the springs being beneath the axles. Roller bearings are used throughout. There are four electric motors, placed in the hold of the carriage. Two wheels of each truck are driven, the two outer wheels running free. The motors are of the four-pole type, with toothed armatures wound with Eickmeyer's coils. Each motor is designed for developing 150 h. p. when furnished with a 700-volt current and running at a speed of 600 r. p. m. The motors are bolted to the lower deck of the carriage, and a rigid distance-piece connects the motor shaft with the axle of the driven wheel, the speeds of each being equal. Motion is transmitted to the axles from the motors by steel chains. The total weight of the car is 123,000 lbs.

Hand brakes only are used but when it is desired to stop the louvre plates at the front end are opened and the air resistance aids in reducing the speed.

### HOW SOME BAD LEGISLATION WAS DEFEATED IN MISSOURI.

The history of the introduction and consequent defeat on passage, of a legislative bill, usually is marked by many interesting circumstances, the story of which seldom reaches the public at all. Many a man has served his state or country well, without ever being known as the public benefactor he is.

The past winter was phenomenal in the number of legislative bills, throughout the country, which were aimed directly at and inimical to street railways. Missouri was no exception to the rule and brought out its fair quota. Among those were two bills, one known as the Dunn 3-cent fare bill; and the other taxing franchises. Fortunately alike for the companies and the public, both were defeated. The reduced fare bill explains itself; the franchise tax was intended to be an additional burden compelling the assessor to assess street railway properties at not less than 100 per cent (and as much more as they saw fit) whereas all other assessments were being made on a basis of not more than 40 per cent current value. This meant the street railways should pay tax on \$2.50, where everybody else paid on \$1.00. These were the startling conditions which the street railways of Missouri had to face; and the bill if passed, meant a practical confiscation of all the properties.

F. B. Brownell, president of the Brownell Car Company, and for years vice-chairman and treasurer of the State Republican Committee, is a man who thoroughly believes that our political parties will never be cleansed of the men who engage in politics from motives of personal gain, until they are displaced by honest, fair minded and just business men; and he has for years practised what he preaches, often at the sacrifice of his own personal interests. It was in this dilemma that some of the street railway managers turned to him to help save them from ruin. Mr. Brownell at once set to work at the unpromising undertaking. When he first took the matter up with Mr. Dunn the 3-cent fare bill had already been ordered to engrossment in the House. Mr. Dunn evidently was working in good faith, and the task of

proving to him his mistake was no easy matter. Mr. Brownell gathered data and presented it in such undeniable force, not only to Mr. Dunn, but others in the House, that it convinced them a gross wrong would result from the passage of the bill. This missionary work was so well performed that Mr. Dunn was converted and arose in the House and defeated his own bill. The local papers took advantage of the change to heap reproaches upon Mr. Dunn, asserting he had been bought off by the railways. In spite of all their insinuations and aspersions, however, he stood firm and was more pleased at its death than he had been when it was auspiciously christened.

When the case was first presented to Mr. Dunn, he wrote, "I honestly believe it is a right measure, but if I am mistaken in that judgment I shall regret introducing the matter." When the smoke of battle had all cleared away he again wrote Mr. Brownell a very frank and cordial letter, expressing appreciation of the latter's hard work, and which reads as follows:

ST. LOUIS, Mo., March 20, 1897.

Hon. F. B. Brownell, Dear Sir:

I am reminded that I owe you my personal thanks for the trouble you took this winter in getting me rightly informed regarding street car fares.

Your very exhaustive letter respecting my 3-cent bill, in reply to my inquiry, and your subsequent conversation a few days later, were the earliest as well as the most convincing arguments showing the inaccuracy of the figures and claims of the State Labor Report, a document which I had previously been led to regard as reasonably correct.

Your letter led me to further information which, I may say, was in the same line with yours but added nothing of importance to the ground covered by you, thus I was forced to candidly doubt my own bill, and when it came to final vote I so expressed myself to the House, and in the same connection I publicly impeached the Labor Report before the whole House, a somewhat notable fact, of which no St. Louis paper took any notice.

Of course I personally voted for the bill; first, because it was my bill, and second to give the lie to the Post Dispatch calumny.

Your letter and subsequent conversation guided me to the course I eventually pursued, and which I think was right, and I again express my obligations to you for the trouble you took.

Very sincerely yours,

EDW. J. DUNN.

The service rendered by Mr. Brownell is by no means confined to the limits of his own state, for had the bills become laws the precedent and example would have been used with strong effect in every other state.

### STEAM ROADS STILL ON TOP IN PENNSYLVANIA.

The bill pending in the Pennsylvania House to give trolley companies the right of eminent domain on rural roads was, on June 17, defeated by a vote of 103 to 58. The result of this is that all plans for many lines which were contemplated will be abandoned until at least two years hence, when it is to be hoped the legislature will incline more kindly to the trolley. With the present law the steam roads which own their rights of way in fee find but little difficulty in blocking all interurban electric roads which would offer competition.

The Electric Railway Company of the United States, office No. 1 Broadway, New York, has been dissolved by Judge Truax. Arthur Ingraham is made permanent receiver. The liabilities are \$28,250 and assets, \$5,041.



## THE EFFICIENT TRANSMISSION OF POWER TO STREET RAILWAY LINES.

BY R. W. CONANT.

No doubt there are some of the readers of this journal who glance from the heading to the array of formulæ and mathematics contained in this article and decide that they have not time to peruse the subject further. The table on page 443, however, has in it something that interests most of us, that is, the dollar sign. And to those who have had occasion to sign the bills for copper for a street railway, nothing more need be said regarding the importance of the subject.

The efficient transmission of power to street railway lines is a broad term and will here be limited to the system which is in use by the majority of street railways, that is, the medium voltage, direct current transmission. Efficient transmission implies first, that the cars should be operated, and second, that they be operated economically. Reliability of operation is greatly to be desired and experience has shown that cars may be operated in the most reliable manner when the lines are divided into insulated sections. As to whether the gain in this case warrants the additional feeders required, is a question that is governed by the conditions. It will be assumed that the line is sectioned, but the conclusions reached may, by slight modifications, be made to cover those which are not.

The economical transmission has usually been held to be incompatible with reliable or satisfactory car service. In the light of recent experience, this will be seen to be erroneous. How much copper shall be employed is the question to be solved. It is only those who have had this question practically before them, who know what its answer involves.

The amount of copper to place as feeders depends primarily on the number of cars at any one time in the section and their distance from the source of power. Return copper depends upon the nature of the rail return rather than on economical principles. What happens when we have too small an amount of copper in our feeders? Unsatisfactory service on account of low voltage at the cars, but more than this, increased expense to do the amount of work required on account of the loss of power. Suppose there is 20 per cent loss; this means a larger power station equipment, more expense for fuel, but less for copper. If we increase the copper, we diminish the cost but not proportionately, and soon the limit is reached beyond which it does not pay to spend more money for copper.

Various formulæ and curves have been published from time to time showing the relation between the per cent loss and cost of copper for feeders, but as a certain loss has to be assumed in order to use them, they are not in themselves sufficient for the proper design of a feeder line. The formulæ employed in this manner and the necessary calculations made, the user is deceived into the belief that he has figured the correct amount of copper. He might just as correctly have guessed that he would spend about so much for copper in the first place and have been much nearer right than in putting up all the copper required by the formulæ when worked out on an assumed loss which is much too small.

Other curves and formulæ have been constructed by a

mis-application of Thompson's law, making the cost of the lost power equal to the interest and depreciation on the copper. This gives a so-called economical drop per mile of a constant number of volts, say 50. That this method is incorrect may be seen by assuming a case of 500 volts initial potential with a line 10 miles long. Under such conditions  $10 \times 50 = 500$  volts, or the power all used up by the time it reaches the end of the line, which would hardly be called a paying investment. It is hoped in what follows, by a solution of a few special cases, to illustrate a method which may be useful to all engaged in this branch of street railway work. The assumptions made must be verified and changed if necessary, for each individual case. Those given are what the writer has used in certain instances and have been found to be correct for certain lines which have come within his experience. The mathematical derivation is given further on.

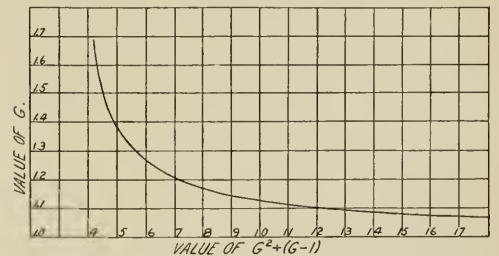
Formula No. 1.

$$c. m. = \frac{1.5 P A M G^2}{V^2 (G-1)} \dots \dots \dots (1)$$

where

- c. m. = cross section of feeder in circular mils,
- P = power delivered to cars in watts, nominal,
- A = specific resistance of copper per mile-mil,
- M = distance to center of load, miles,
- V = pressure at the power station in volts,
- G = economical constant,
- 1.5 = a constant representing the ratio between total drop and feeder drop.

The properties of G are somewhat peculiar and interesting. It may have any value between 1 and 2, not a very great range, but sufficient to make the expression  $\frac{G^2}{G-1}$  of a very considerable range.



The factors which enter to determine the value of G are as follows:

- M, the distance described above.
- C, the cost of copper in dollars per mile-mil. This cost does not include the cost of insulating or installing the copper, so that if a mile of 500,000-c. m. bare copper is worth \$900.

$$C = \frac{\$900}{500,000} = \$ .0018$$

The next quantity which enters into the value of G is the sum of the interest and depreciation in per cent on the above copper expense. Call this D. In arriving at a value for D, we must consider what the money is worth for uses other than purchasing copper. The supposing that we assume that it is 6 per cent and allow that the depreciation of copper is 1 per cent, making allowance for the possible fall in price, then  $D = 10$  per cent.

Next comes the question of insulating and installing the copper, which will be treated under two heads. First, when the line is overhead and second, when it is underground, these being the two cases which it is required to solve in street railway practice.

First, line overhead: We wish to ascertain what portion of the expense of insulating and installing is increased as we increase the cross section. As, in general in street railway practice, the tendency is to run one size of wire only, the insulation is directly proportional to the cross section, for with two 500 feeders there is twice as much insulation as with one, and we assume that no intermediate sizes are installed. Similarly the expense of stringing, including the labor, pins and insulators is proportionately increased, but the expense of poles is not so increased, and therefore should not be included. Assuming that \$500 will cover these expenses per mile of 500,000-c. m. overhead feeder, then

$$\frac{\$500}{500,000} = \$.0010 = E_o, \text{ which is the next quantity entering into } G.$$

Next the sum of the interest and depreciation on the above amount.

Interest = 6 per cent and depreciation = 9 per cent, a total of 15 per cent =  $F_v$ .

Second, line underground. For underground feeders, following above reasoning,  $\frac{\$2,500}{500,000} = \$.0050 = E_u$ .

In arriving at the sum of interest and depreciation on the above amount, we may consider \$2,500 made up of two parts, viz., \$1,500 for insulation and lead, with an interest and depreciation charge of 10.6 per cent and \$1,000, which is conduit expense proportional to cross section, with an interest and depreciation charge of 8 per cent so that 9.6 per cent is  $F_u$ , i. e., 9.6 per cent of \$2,500 = sum of 10.6 per cent of \$1,500 and 8 per cent of \$1,000.

The reason for taking only these expenses which are proportional to the increase of cross section, is that the formulae connecting the quantities have been derived on the assumption that the cross section is varied and fixed at such a point as will make the sum of the expenses a minimum.

$A$  = the resistance of a unit length and cross section of copper. This per mile-mil is 57,850 =  $A$  for commercial copper.

The next quantity entering into the value of  $G$  is the constant 2.25.

This appears on account of the fact that the rails are used as a return. It is arrived at in the following manner: Assume that the return drop is one-half of the feeder drop. This is true for a great many cases but will vary for different localities. Under these conditions the total drop is  $\frac{3}{2}$  of the feeder drop. Our economics are directed towards the feeder loss rather than the return loss, for the rails have such a low resistance when properly bonded, that, except in special cases, the placing of copper in parallel with them to return current is an idle expense, so far as the saving of power is concerned.

It would be far more profitable to place it on the feeding side of the line, but as we shall see, even this does not pay after a certain amount of copper has been installed. In obtaining the formulae, fixing the relation between the quantities discussed and  $G$ , the operation performed to obtain 2.25 is  $(\frac{3}{2})^2 = 2.25$  or in other words 2.25 is the square of the ratio of the total drop to the feeder drop.

$H$  is the time factor of the energy lost in the feeder and  $I$  is the cost per unit of time of a unit of this energy in coal, labor and supplies.

From the load curves for representative days throughout the year,  $H$  may be determined for any feeder. Assume that it has been found to be  $\frac{1}{3}$  of the number of hours in the year (8,760) and that  $I = \$.000007$  per watt-hour.

Assume that it costs \$.100 per watt installed =  $J$  for the necessary generating plant to produce the power lost in feeders.

$K$  = the interest and depreciation on this expenditure, which assume 15 per cent.

$V$  is the voltage at the bus bars at power station described above.

The complete formula for determining the value of economical constant  $G$  is

OVERHEAD LINES.

$$G = 1 + \sqrt{\frac{2.25 M^2 A (C D + E_o F_o)}{2.25 M^2 A (C D + E_o F_o) + V^2 (H I 8760 + J K)}}$$

UNDERGROUND LINES.

$$G = 1 + \sqrt{\frac{2.25 M^2 A (C D + E_u F_u)}{2.25 M^2 A (C D + E_u F_u) + V^2 (H I 8760 + J K)}}$$

These are somewhat formidable looking expressions so that it may not be amiss to solve them for one case to illustrate the method.

The only difference between the overhead and underground formulae is in one term, so that the overhead only will be carried through in detail. The letters in the formulae have been described above, but are tabulated below for reference.

- $G$  = economical constant required.
- $M$  = distance to centre of load (assume four miles).
- $A$  = specific resistance of copper per mile-mil = 57,850.
- $C$  = cost of copper in dollars per mile-mil = .0018.
- $D$  = interest and depreciation on above amount = .10.
- $E_o$  = cost of insulating and installing copper overhead per mile-mil = .0010.
- $E_u$  = cost of insulating and installing copper underground per mile-mil = .0050.
- $F_o$  = interest and depreciation on above amount for overhead lines = .15.
- $F_u$  = interest and depreciation on above amount for underground lines = .096.
- $V$  = voltage at bus bar (assume 550).
- $H$  = time factor of energy lost in feeder = .333.
- $I$  = cost of producing this energy per watt-hour = .000007.
- $J$  = cost of generating plant per watt installed = .100.
- $K$  = interest and depreciation on plant (assume .15).

Substituting the figures for the letters, we have for

OVERHEAD LINES.

$$G = 1 + \sqrt{\frac{\sqrt{2.25 (1)^2 57850 (.0018 \times .10 + .0010 \times .15)}}{2.25 (1)^2 57850 (.0018 \times .10 + .0010 \times .15) + (550)^2 (.333 \times .000007 \times 8760 + .1 \times 15)}}$$

Reducing,

$$G = 1 + \sqrt{\frac{2082600 \times .00033}{2082600 \times .00033 + 302500 \times .03542}}$$

$$G = 1 + \sqrt{\frac{687.258}{687.258 + 10714.55}}$$

$$G = 1 + \sqrt{\frac{687.258}{11401.808}} = 1 + \frac{26.21}{106.77} = 1.2455$$

UNDERGROUND LINES.

$$G = 1 + \sqrt{\frac{2082600 (.00018 + .0050 \times .096)}{2082600 (.00018 + .0050 \times .096) + 10714.55}}$$

$$G = 1.337.$$

Now having determined the economical constant, we are ready to find the cross section of the feeder. This will be worked out on a per car basis assuming that a car takes 15,000 watts = P. Substituting in the formula

$$c. m. = \frac{1.5 P A M G^2}{V^2 (G-1)}, \text{ we get for}$$

OVERHEAD LINES.

$$c. m. = \frac{1.5 \times 15000 \times 57850 \times 4 \times (1.2155)^2}{(550)^2 \times .2455} = 108760$$

UNDERGROUND LINES.

$$c. m. = \frac{1.5 \times 15000 \times 57850 \times 4 \times (1.337)^2}{(550)^2 \times .337} = 91318$$

Having the circular mils, we desire to know the voltage at the centre of the load under these circumstances. Let

X = feeder drop,

P, V, A, M, c. m., same significance as above,

Y = current,

Z = final voltage at center of load,

Then

$$X = \frac{Y A M}{c. m.} \dots \dots \dots (2)$$

$$YZ = 15000 = P \dots \dots \dots (3)$$

$$Z = V - \frac{3X}{2} \dots \dots \dots (4)$$

Three equations containing three unknown quantities, which by elimination give

$$Z = \frac{V}{2} + \sqrt{\frac{V^2}{4} - \frac{1.5 P A M}{c. m.}} \dots \dots \dots (5)$$

Substituting for OVERHEAD LINES.

$$Z = \frac{550}{2} + \sqrt{\frac{(550)^2}{4} - \frac{1.5 \times 15000 \times 57850 \times 4}{108760}} = 411 \text{ volts}$$

UNDERGROUND LINES.

$$Z = \frac{550}{2} + \sqrt{\frac{(550)^2}{4} - \frac{1.5 \times 15000 \times 57850 \times 4}{91318}} = 412 \text{ volts.}$$

The work of finding Z may be simplified as follows :

By solving equation (1) for G and combining with equation (4) we find that  $GZ = V$  or that G is also the ratio between the initial and final voltage. The short method then for calculation of Z is, for

OVERHEAD LINES,

$$Z = \frac{550}{1.2155} = 452 \text{ volts ;}$$

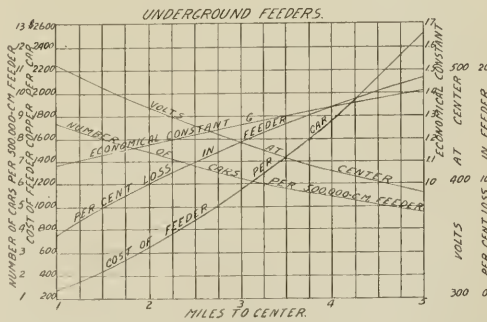
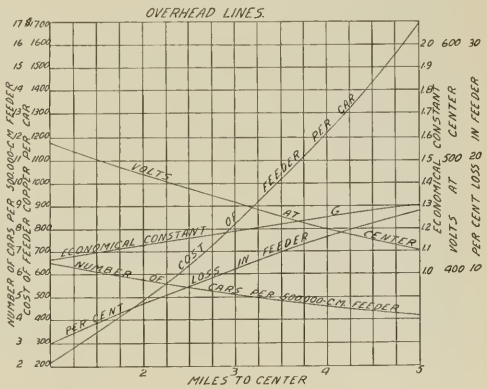
and for UNDERGROUND LINES,

$$Z = \frac{550}{1.337} = 412 \text{ volts.}$$

It is then apparent that under the conditions assumed one 500,000-c. m. feed wire will economically supply power for 4.6 cars at a distance of four miles from the power station with overhead lines and give satisfactory service so far as the voltage is concerned. The same c. m. underground will supply power economically for 5.5 cars at the same distance.

The following tables and the curves show for the overhead and underground lines the cost of feeding copper per car, the number of cars per 500,000-c. m. feeder, the economical constant G, the per cent loss in feeder, and the volts obtained at the center of load, for all distance from 1 to 5 miles.

| Dist. to Center of Load, Miles. | Economical Constant G. | Cir. mils in Feeders. | No. of Cars per 500,000 c. m. Feeder. | Cost of Feeder Copper not including Poles or Conduit. | Voltage at Center of Load. | Per cent Feeder Loss. |
|---------------------------------|------------------------|-----------------------|---------------------------------------|-------------------------------------------------------|----------------------------|-----------------------|
| <b>OVERHEAD LINES.</b>          |                        |                       |                                       |                                                       |                            |                       |
| 1                               | 1.0637                 | 76550                 | 6.53                                  | \$ 214.                                               | 516                        | 4.12                  |
| 2                               | 1.1269                 | 86050                 | 5.80                                  | 482                                                   | 488                        | 7.51                  |
| 3                               | 1.1888                 | 98000                 | 5.10                                  | 824                                                   | 464                        | 10.4                  |
| 4                               | 1.249                  | 108760                | 4.60                                  | 1219                                                  | 440                        | 13.3                  |
| 5                               | 1.304                  | 120500                | 4.15                                  | 1690                                                  | 421                        | 15.6                  |
| <b>UNDERGROUND LINES.</b>       |                        |                       |                                       |                                                       |                            |                       |
| 1                               | 1.0885                 | 57600                 | 8.67                                  | \$ 276                                                | 505                        | 5.45                  |
| 2                               | 1.176                  | 67100                 | 7.45                                  | 644                                                   | 468                        | 9.95                  |
| 3                               | 1.250                  | 80000                 | 6.25                                  | 1150                                                  | 437                        | 13.70                 |
| 4                               | 1.337                  | 91300                 | 5.48                                  | 1753                                                  | 412                        | 16.71                 |
| 5                               | 1.408                  | 105000                | 4.75                                  | 2520                                                  | 391                        | 19.30                 |



For the benefit of those who care to follow through the derivation of the formula, the following steps are given :

We require first an expression giving the annual expense of the power lost in the feeder.

VY is the power in watts at the power station end of feeder and P is that delivered at the car end of feeder, so that VY - P is the total power lost in transmission, and we assume in this particular case that 2/3 of it is lost in the



feeder and the rest in the return; so that

$$\frac{VY-P}{1.5} = \text{loss in feeder} \dots \dots \dots (6)$$

The expense of this is evidently given by the expression

$$\frac{VY-P}{1.5} (1118760 + JK) \dots \dots \dots (8)$$

Next we require an expression for that portion of the annual expense of the feeder line which is dependent upon the area of conductor employed.

This evidently is

$$c. m. M (CD + EF); \text{ but from equations (2), (3) and (4)}$$

$$c. m. \frac{1.5 Y^2 A M}{VY-P} \dots \dots \dots (7)$$

which substituted above gives for annual copper expense

$$1.5 Y^2 AM^2 (CD + EF) \dots \dots \dots (9)$$

To make the sum of (8) and (9) a minimum, differentiate with respect to Y, equate the derivative to zero and solve for Y, when the following results:

$$\frac{YV}{P} = 1 + \sqrt{\frac{2.25 AM^2 (CD + EF)}{2.25 AM^2 (CD + EF) + V^2 (1118760 + JK)}}$$

which is put equal to G.

Equation (7) may be reduced to

$$c. m. = \frac{1.5 P A M \frac{Y^2 V^2}{P^2}}{V^2 \left\{ \frac{YV}{P} - 1 \right\}}$$

and with G substituted for  $\frac{YV}{P}$  becomes Formula (1), giving most economical value for c. m.

**ELECTRICAL INTERESTS IN SIAM.**

Electricity is making steady, and even surprising advance in the far east, of which we are apt to think as slow and unprogressive. In a personal and entirely unofficial letter to the editor of the REVIEW, Hon. John Barrett, who so ably represents this country as United States Minister to Siam, writes from Bangkok; and the contents are so interesting we cannot refrain from sharing it in part with our readers.

Mr. Barrett states there is only one street railway in Siam. Its official name is "Bankok Tramways Company, Ltd." This is doing a very extensive business and runs from one end of this great city to the other. Although Siam may be regarded in America as an out of the way place, its capital, Bankok, was the first city in Asia to make a thorough test of electric street railways, which proved a decided success from the start.

This company is made up principally of Danish, Americans and Siamese stockholders. The road was put down, the power house erected and machinery installed, and rolling stock furnished originally by an American firm, who sent out an engineer to superintend the work. The present manager is a Dane, W. F. Jacobsen, and the chief engineer also a Dane, A. Hansen. The president of the board of directors is an American, T. Heyward Hays.

The company was originally organized with a capital stock of about 300,000 ticals (approximately 100,000 gold dollars.) Since organizing it has made one issue of 100,

000 ticals debentures and is planning to make another issue of 100,000 ticals debentures. These debentures are issued for the purpose of greatly improving the road, adding to the rolling stock and constructing new buildings and bridges.

The company as intimated above has been very successful from the beginning and has paid as high as 18 per cent per annum on the investment and not less than 10 per cent. All the new machinery, engines, and car trucks have been purchased in America, and it is probable that on account of the high standing of American manufactures in this line, future orders will be placed in the United States. Viewed as a whole he considers the company as well managed, representing a secure investment of capital, and has a favorable future before it, provided conservative men control it.

There are, of course, two classes of persons among the stockholders; one that wishes to pay as high dividends as possible, turning every cent into profits, creating no reserve fund, and generally neglecting those principles which govern successful companies in America and Europe; and the other that is perfectly satisfied with a legitimate income of 5 to 10 per cent, believes firmly in creating a reserve fund, and wishes to put a proper portion in excess of legitimate income into permanent improvements. It is probable that the latter element will have its way.

On fete days and special occasions the cars are as crowded as those in Chicago. The Siamese are different from the Chinese; the Siamese take to new systems of rapid transit at once and have no prejudice against them although they are lazy people; but the Chinese, as proved more than once in China, are prejudiced against these systems invented by "foreign devils." The Siamese government readily granted the concession for this electric street car line, and the king regards the enterprise with favor. The American, Dr. Hays, mentioned as president of the directorate, takes a great interest in the success of the line, and is one of the largest individual stockholders. The manager, W. F. Jacobsen, and the engineer, A. Hansen, are both capable men; the former being quite well known among electrical manufacturing establishments in America because of several visits there on business.

In this connection it may interest our readers to know that an American engineer, Lawrence E. Bennett, has secured the concession for the electric lighting of all Bankok, which is one of the most important rights that the Siamese government has given to a foreigner in many years.

In conclusion Mr. Barrett says: "Let me through your agency recommend American manufacturers to keep an attentive eye on this far Eastern field, this whole coast line from Vladivostock to Singapore; because it presents, in my opinion, one of the greatest opportunities for the advancement of American foreign commercial interests. In special reports and articles in various periodicals written by me by request, I have endeavored to awaken interest throughout the United States in this field. Whether these have come to your attention I do not know, but I trust that you will not fail to preach the 'gospel' of commercial conquest in the Asian Pacific until the exporters and manufacturers of the United States have succeeded in getting a fair share of the rapidly developing trade."

Tourists in Denver who wish to see the sights of that city without too much exertion have been met half way by one of the street railway companies which has fitted up a special car for their use; its name is "Seeing Denver."

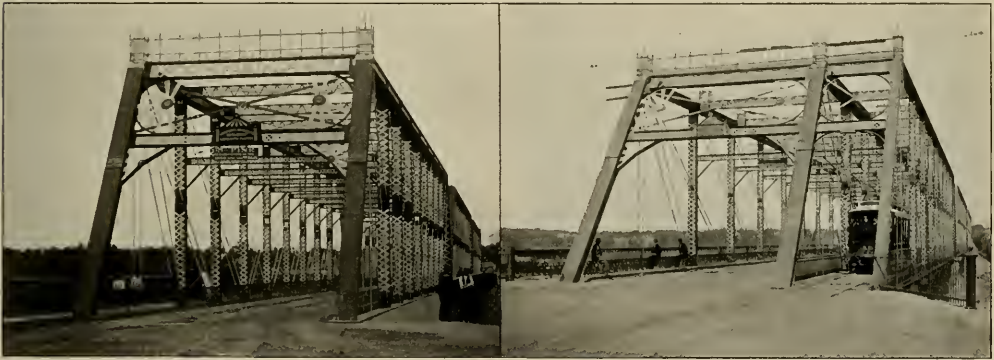
### SOME STREET RAILWAY BRIDGES.

With the development of suburban and interurban electric railways the question of bridges was added to the already large number of perplexing problems which the successful railway manager must solve. On strictly urban lines especially in the larger cities, the bridges over which the street cars run were, almost without exception, sufficiently strong to permit the use of even the heaviest electric cars with perfect safety, but on country roads where the general traffic is not so heavy it has in most instances been necessary to strengthen existing bridges or else to build new ones.

In large cities the bridge question arises where the city wishes the street railway to assume the maintenance of the bridges or perhaps to build other and larger ones. The North and West Chicago roads have expended several hundred thousand dollars for bridges in consideration of franchise grants from the city. When the electric line was laid across the Chicago river at Clark street, the old bridge at that point was moved to Dearborn street and a new one

design from the ordinary highway bridge for general traffic except that they are designed for heavier loads and have incorporated in the floor system the longitudinal beams for the support of the rails before mentioned. Where the bridges are for the sole use of the railway, they are more often plate or riveted girders than the pin connected. As before stated the interurban electric lines have tended to improve the highway bridges because they are usually in charge of competent engineers who see to it that the old bridges are strengthened in a proper and scientific manner or if new ones are to be built, they are in accordance with the best engineering practice and not left to the whims of county officials with no knowledge of bridge construction.

This subject of bridges has been the cause of a great many disputes between the railway companies and the municipal and county authorities with whom they have had to deal. The questions on which issue is taken are those regarding the manner in which the company is to occupy the bridge, that is, where the tracks are to be laid, the proper distribution of the cost of maintenance, and, where a new



MAIN STREET BRIDGE, LA FAYETTE, IND.

with wider drive ways erected at Clark at the cost of the railway.

Inquiries addressed to a number of the companies engaged in building bridges show that in their opinion the extension of trolley lines has had a very beneficial influence upon the character of the highway bridges built at the present time, as many of them are constructed with a view to their possible occupancy by trolley lines.

While there are some bridges in existence today which are so crudely constructed, either through the ignorance of the builders or because of their desire to furnish the least possible bridge for the money, that a reconstruction is a primary requisite to make them safe for the running of electric cars, the majority of them have been built under fairly good specifications and need but little in the way of strengthening. The trusses, as a rule, being heavy enough to carry the load, the alterations made consist in putting in heavier floor systems, and in almost every case it is necessary to provide longitudinal girders for the support of the rails so that the latter shall have the tops flush with the planking or pavement. When, however, the trusses are weak, the usual plan is to construct an additional truss.

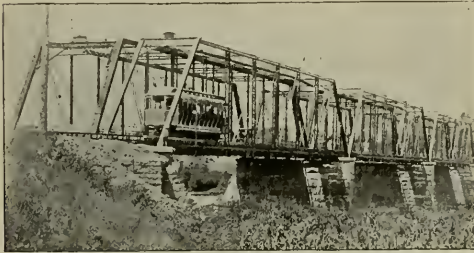
When new bridges are constructed they differ little in

structure is necessary which is to be used by the railway and for general traffic also, the division of the cost between the two parties. The arrangements which the companies are able to effect with the authorities depend largely upon how badly the public wants the service that the railway is to give. In most cases an equitable agreement can be made, the rule being that if the alterations or the new structures are necessary solely because of the use of the highway by the electric line the latter bears the cost thereof; where they are demanded by the public for general traffic purposes as well as for the railway a portion of the expense may be borne by the county or city.

The bridge over the Wabash river at La Fayette, Ind., is a good example of one to which a third truss was added. Two views are shown, one of the bridge as when first completed, and one showing the additional truss. As may be supposed the conditions were quite peculiar to make this addition to an entirely new structure necessary. A horse road, beginning nowhere and ending nowhere, was built in 1881; this was converted to electricity in 1887, an extension to West La Fayette and Purdue University being built at the same time. On the west side of the river the approach to the bridge is over an embankment half

a mile in length, and the railway only laid its track here after a strong opposition from the farmers was overcome. At that time there was a wooden bridge with the two wagon ways separated, so that double tracks over it were a necessity. This bridge was replaced by a new one of iron in 1891 and a second dispute ensued as to whether a street railway "corporation" was to be permitted to occupy the bridge "built by the people's money," a compromise being finally effected and the railway laid on one of the foot ways. As this foot way was outside of the trusses and the floor system had been designed for foot passengers and not electric cars, it was soon found that some other arrangement would have to be made. The county refused to allow the tracks in the wagon way and the company declined to strengthen the floor system at its own expense. After a deadlock for two years or more, during which time passengers were compelled to get out and walk over the bridge, the question was settled by lengthening the piers and erecting third trusses. The cost of this addition was equally divided between the county and the company.

Another illustration shows the bridge built over the



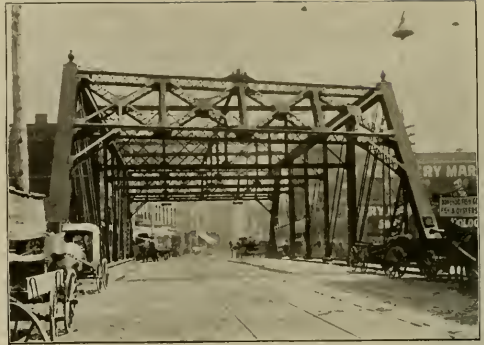
BRIDGE OF THE TOLEDO & MAUMEE VALLEY RAILWAY.

Maumee river at Maumee City by the Toledo & Maumee Valley Railway Company at a cost of \$20,000. The piers of the county bridge at that point were extended and the new structure erected thereon, it being otherwise independent of the former. This was done in order that there might be less danger from the ice gorges which form when the ice in the river breaks up each spring. This road, as probably most of our readers will remember, is a belt line 20 miles long running from Toledo on both sides of the river, to Maumee City on one side and to Perrysburg on the other, with an extension of 13 miles to Bowling Green.

The Sandusky, Milan & Norwalk Electric Railway was compelled to strengthen the floor of one iron bridge on its line by placing wooden stringers under each rail. They were built up of 2-in. planks 14 in. wide bolted together so as to break joints. When completed they formed continuous girders 10 x 14 in., extending the total length of the bridge, 175 ft.

On page 36 of the REVIEW for January, 1897, is view of a plate girder bridge built for the Aurora & Geneva Railway by the Wrought Iron Bridge Company of Canton, O. It is designed for a uniformly distributed load of 100 tons a concentrated load of 50 tons.

In reply to an inquiry the Second Avenue Traction Company, of Pittsburg, states that it has built one bridge, a double intersection through bridge designed for a live load of 1,800 lbs. per lineal foot together with two cars 25 ft.



BROAD STREET BRIDGE, ATLANTA, GA.

long, with 7-ft. wheel base and weighing 12 tons each. In old structures the trusses were generally found satisfactory, but the floor systems weak. The floor beams were strengthened and 9-in. girder rails laid thereon, these being used both as rails and as girders. The rails are always used in as long lengths as possible. Up to spans of 10 ft. the rails were used as girders without trussing. For spans of greater length the rails were trussed and when thus strengthened have been used for 17-ft. spans. The flooring was relaid with details of joists to suit the 9-in. girder rails. This company has found that these heavy and continuous 9-in. rails very materially reduced the vibrations even of apparently weak highway bridges, and with the new flooring put the bridge in condition to better resist the shocks from general traffic.

The Atlanta (Ga.) Consolidated Street Railway Company as a consideration for the privilege of equipping its lines electrically agreed to pay \$5,000 toward building a new bridge on Broad street when the city should decide to replace it. The bridge shown was built in 1895, the railway company fulfilling its agreement. It is 142 ft. long and 70 ft. wide; the weight is 300 tons; no new masonry was required and the cost was \$22,200. It was built by the Edgemoor Bridge Company and designed for a live load of 100 lbs. per sq. ft. The paving is vitrified brick laid in concrete on a buckle plate floor. The Consolidated owns the exclusive street railway privileges for this bridge and all except two of its lines cross it.



FORSYTH STREET BRIDGE, ATLANTA, GA.



Another illustration shows the Forsyth street bridge built by the Phoenix Bridge Company in 1892-3, and occupied by the Atlanta Railway Company which secures the privileges for an annual rental of \$750 paid to the city. This bridge has a buckle plate floor and is paved with vitrified brick laid in concrete; it is designed for a live load of 100 lbs. per sq. ft. It was built for the purpose of doing away with the grade crossing of Forsyth street with the railroad tracks leading to the Union Depot. The cost complete, including masonry, was \$1,30,000.

### THE HANOVER ELECTRIC RAILWAY.

The Electrical Review of London publishes the results and conclusions reached by F. Ross, who conducted some extensive experiments upon the Hanover Tramways; the report of Herr Ross was published in the *Elektrotechnische Zeitschrift*, Vol. 18, p. 178. The tests were made with the assistance of Professor Heim of the Technical High School, Hanover, and Herr Volkers of the Union Elektrizitäts-Gesellschaft.

The mixed system was introduced in the summer of 1895 when it was desired to extend the electrical working of the lines to the central part of the city. The municipal authorities refused to permit the overhead trolley, and storage battery cars with fixed charging stations were contemplated, but before the adoption of this system that of adding batteries to the cars and charging from the trolley when running on the suburban sections of the road was tried experimentally, and was so successful that the "mixed" system was adopted.

In January, 1897, there were 12.8 miles of track with overhead conductors and 10.6 miles worked by the accumulators. The batteries are charged during trips which vary from 1.7 to 1.8 miles and the discharging takes place on runs which vary from 3 to 7.2 miles. The power station equipment comprises four engines, each driving a 150-k. w. Siemens & Halske dynamo, and water tube boilers.

The cars for the mixed system have two longitudinal seats accommodating 20 passengers. Under the seats are 208 Tudor cells in vulcanite boxes; the total weight of the batteries is about 2½ tons. On the platform is a lever switch with two positions, charging and discharging, and a regulator with six contacts besides the zero position. On the overhead lines but five points are used, 1 to 1 with diminishing resistance, and 5 without resistance added. When the battery is switched in it is first applied in halves arranged in parallel, then the resistance in circuit is diminished as the controller handle is turned to 5, and finally on 6 the two halves of the battery are placed in series, which is also the arrangement when charging.

Experiments on the consumption of power gave results as follows: Average power for car with seven passengers and without batteries on the overhead section, 795 watt-hours per car-mile at a speed of 9.15 miles per hour; no stops. Same with weight equal to that of batteries added, 795 per car-mile at a speed of 8.15 miles per hour. With all stops made the power was about 900 watt-hours per car mile. On the accumulator section, with all stops made the mean value for the power required was 610 watt-hours per car-mile at a speed of 5.8 miles per hour. The smaller power on the accumulator section is partly attributed to the decreased speed, but principally to the greater efficiency of the arrangement.

The mean of eight charging and discharging runs placed the efficiency of the battery at 71 per cent, but as these were made under very favorable conditions it is thought that in practice it is not well to reckon on more than 70 per cent. When the tests were made two kinds of battery elements were used; in the older cars the nominal capacity was 20 ampere-hours, and the time of discharge 1 hour, and in the newer 25 ampere-hours. The weight was the same in both, the difference being in the extent of surface. Capacity tests showed the output of the old style batteries to vary between 20 and 25 amperes; experiments to ascertain whether the capacity of the battery is maintained after being in use for a considerable time are now under way.

Brake experiments placed the efficiency of the motor and reducing gears at 53.7 per cent with 50.4 volts and 65.2 per cent with 318 volts. The better efficiency with low voltage is supposed to be due to less loss in the gearing at low speeds.

The use of accumulators on the cars was found to exercise a very favorable influence on the utilization of the machinery at the central station. They acted, in fact, as equalizing batteries, and greatly reduced the variations of the load.

In January, 1896, the station output was 58,590 kilowatt-hours, and the watt-hours per kilogram of coal 321; the accumulator car-miles were 8.6 per cent of the total. In October the output was 136,821 kilowatt-hours, the watt-hours per kilogram of coal 181, and the accumulator car-miles ¼ of the total. From this the conclusion is drawn that the accumulators have a very beneficial effect on the station economy.

The cost of maintenance and attendance for the batteries has been found from an experience extending over several months to amount to .33 cent per accumulator-kilometer.

From the above data, Herr Ross considers he is justified in drawing the following conclusions: Taking 10 per cent as the rate for interest and depreciation, and adding the cost of attendance and maintenance, the cost works out as .63 cent per car-kilometer. Taking also into account the increased cost due to renewals and greater consumption of current, and allowing for the better utilization of the central station, the total cost per car-kilometer rises to 1.25 cents.

A comparison is then made with the estimated cost of a conduit system to replace the accumulator system. He finds that for interest and depreciation alone, with the conduit system, the cost per car-kilometer would amount to 5.5 cents, which, he remarks, would have made electric traction impossible.

Comparing, now, the Hanover mixed system with a system in which the overhead conductor is used throughout, he finds that interest and depreciation in the latter case will amount to .75 cent per car-kilometer. Subtracting this amount from the cost of the accumulator working, the difference is only .50 cent per car-kilometer; and if the cost is distributed over the total car-kilometers supplied, the difference is less than .25 cent.

No marked effect on the wear of the rails, owing to the greater weight of the cars, has been observed in Hanover.

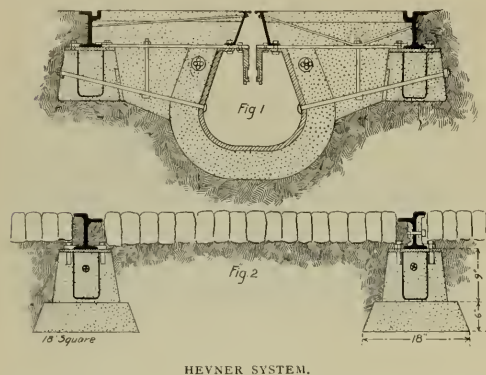
While we hesitate to criticise the work of Herr Ross without a full knowledge of the facts and conditions involved, we hesitate to believe that the increased station economy of 37 per cent was due to the increase in the accumulator car mileage instead of to the increase in the station output. The Metropolitan road of Washington, D. C.,

reduced its coal per h. p. per hour 30 per cent by increasing the total output from 3,400 to 13,400 electrical h. p.-hours per day and as the output of the Hanover station was more than doubled we are of the opinion that the effect noted is due in a greater part to this cause than to the action of the accumulators in acting as regulators for the station load.

The figures given for the interest charges for a conduit system, 5.5 cents per car-kilometer, being four times as much as the total cost of operation and maintenance of the accumulator system, we think require further explanation.

### HEVNER CONCRETE CONSTRUCTION.

The illustrations show the construction of the permanent roadways invented by Peter Hevner and known as the Hevner system. Fig. 1 is a cross section of the roadbed for an electric conduit system; concrete strengthened by tie rods



HEVNER SYSTEM.

and bars is used as a substitute for the iron yokes heretofore used in conduit construction. The concrete yokes are spaced just as the iron ones would be; concrete piers are provided to support the rails but the layer of concrete surrounding the metal lining is continuous. It is proposed to form conduits in the concrete to receive electric wires where it is not desired to place them in the larger conduit. The same

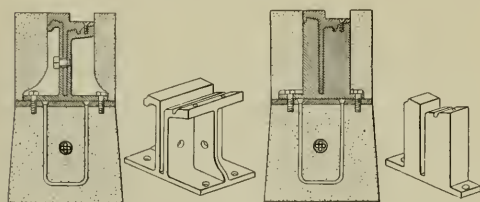


FIG. 3.—ADJUSTABLE RAIL.

construction is of course equally well adapted to a cable line.

Fig. 2 shows the construction of track in which the rails are supported on concrete piers spaced at intervals of 4 ft. Where this construction does not furnish sufficient support to the rail a continuous beam of concrete is placed under each. In

both cases the rails are held in place by  $\frac{3}{4}$ -in. bolts tapped into iron yokes which are molded into the piers, or into the beams at distances of every 5 ft. when that construction is used.

This roadbed has been tried in Rochester and Syracuse, N. Y., and is pronounced very satisfactory by both the city engineers and the street railways.

The inventor has also designed an adjustable rail, Fig. 3, which is supported in chairs and bolted to them, the chairs themselves being bolted to the yokes molded into the concrete beams. At the joints the chairs are of such form that no other fish plate is needed; between joints the chairs are solid castings.

### THIRD AVENUE, N. Y., LOSES.

On July 2, 1895, the Third Avenue Railroad Company of New York made application to the Common Council for the right to build certain extensions, aggregating 11 miles in length. The proposed lines were all connected except that from 125th street to 116th street on Manhattan avenue which was separated from the others, thus making two extensions for which, under the railroad law, franchises could not be sold at the same time. The company proposed to grant a perpetual right of way over its tracks in 125th and Manhattan streets so that the proposed extensions might be connected. This proposition was accepted by the city and the franchises granted in September, 1895.


Suit was brought by a lessee of some abutting property and an injunction granted against the company in December, 1896. The case was carried to the Court of Appeals where the decision was as follows:

1. The Common Council of New York cannot make valid a sale of more than one extension of an existing railroad at the same sale to be struck off upon one bid, when the extensions are separated from each other in such a way that they can only be operated together over the lines of an existing road.
2. A sale made in this way vested no right in the Third Avenue Railroad to build any of the extensions above 162d street, on Kingsbridge road.
3. The Common Council has no power to impose as a condition of consent to the sale of an extension that a railroad shall pay into the city treasury a sum of money in cash within a certain time, in addition to the percentage of gross receipts bid by it upon such sale.
4. The sale of the franchise to the Third Avenue Railroad was void, and vests no right to build such extensions.
5. The condition in the Common Council resolution that not more than five cents shall be charged for a continuous ride on the Third avenue line only to or from the extension is valid.
6. If the Common Council did not make such a distinction for fares on extended lines the grant would even then be invalid.

The Third Avenue Company had already spent over \$2,000,000 in view of the extension but the greater part of it was for railway property and real estate which will be valuable in any event.

It is stated that the Kings County Elevated Railroad Company has decided to supercede steam with electric traction. The Sprague unit system is favored, but nothing will be done until experience shows how successful this method is to be on the Alley "L" of Chicago.

The City & Suburban Railway Company of Baltimore has put four new mail cars in service. Two will run between Towson and Catonsville and make 20 round trips a day. The other two will run between Roland Park and St. Helena and will make, daily, 11 round trips.



# 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.

Another inventor, a Mr. Guattari, is in the field with the promise to save 50 per cent of the coal now used in the generation of steam. The method is to saturate the feed water with two or three times its own volume of a mixture of carbonic acid gas and ethylene chloride; when the water is so impregnated "the generation of pressure is rendered possible with an expenditure of heat energy much less than required with ordinary steam." It is apparently overlooked that the steam engine is a heat engine, and if but little heat is required to generate pressure but little will be there to be transformed into work.

\* \* \*

Considerable discussion has arisen in England because of the data published in regard to the Coathridge Electric Supply Station where three 120-h. p. gas engines were replaced by a steam plant after a trial of 16 months. The cost of fuel was reduced from 5 to 1.7 cents per kilowatt-hour and the cost for oil, waste and stores from 2.5 to .68 cent; the output however was much larger during the period when steam was used and this fact may have some bearing upon the poor showing made by gas. Notwithstanding the contemplated abandonment of gas engines at some other similar plants, there appears to be ample evidence that under suitable conditions well designed gas engines work economically and give satisfaction.

\* \* \*

A new method has been devised for utilizing waste mica, of which there is a considerable quantity wherever commutators are made or repaired. This scrap mica is finely subdivided and quilted between galvanized wire netting, making a flexible, fire-proof mat which is a good non-conductor of heat. These mats are made in comparatively small sections and attached by means of iron hooks to iron bands circling the boiler. They are secured to steam pipes by lacing round the boot hooks, which are rivited up the seams at convenient intervals and can be made to conform to any shape of fitting. One advantage of this kind of cover is that it can be easily and quickly removed and the shell of the boiler or the steam pipe can be examined and repaired, then the mats can be replaced.

\* \* \*

In discussing the "Generation of Electrical Energy for Tramways" before the Institution of Electrical Engineers, England, E. T. Carter called attention to a method of governing devised by him which has the advantage of keeping the point of cut-off within the economical range. In each individual engine there is a considerable range of power over which the steam consumption is very nearly constant per horse-power per hour, but above or below which a change of load causes a rapid increase in the steam consumption, due at one end to the reduced expansion and at

the other to the excessive temperature range in the cylinder. In the case of an engine cited by Mr. Carter this economical range was from 38 h. p. to 52 h. p., the maximum power being 80 h. p. Between the limits given the engine runs at normal speed; if the load increases above 52 h. p., the speed is increased and if the load decreases below 38 h. p. the speed is decreased to that extent necessary to keep the point of cut-off the same as at normal speed. This method of governing would only affect the speed of the engine when the variation was not transient or momentary in character. Sudden and temporary changes of load are dealt with by the governor changing the point of cut-off in the usual manner the speed being unaffected, but when the changes in load are for longer periods the governor alters the speed as described. At the same time, of course, the field excitation would be automatically controlled so that the change in armature speed would not change the voltage on the lines.

\* \* \*

The strictures passed upon the horse-power as a unit of power by W. H. Price in his "Watt Anniversary Lecture," appear to us to be well grounded in one particular only and that one fault is the result of applying a word in common use as the name of a definite thing as the name for a new thing which never was and never purported to be the same as the old one. Five kinds of horse-powers are quoted and electrical horse-power named as a sixth one; to these might have been added boiler horse-power as a seventh. If the watt is to supplant our present unit as a measure of the rate of doing work we shall be better off, only in that there is no animal of that name. There would be the same necessity for an indicated watt, a brake watt, an electrical watt and a boiler watt; we already have the actual watt and the nominal watt, as witness the 100-k. w. generator which will work constantly under an overload of 50 per cent. Whether we use the British horse-power defined as 33,000 foot-pounds per minute or the watt defined as 44.25 foot-pounds per minute as our unit of power is a matter of indifference except that the horse-power is not uniform throughout the world as is the watt; this is due only to the fact that the watt has been defined since scientific men have appreciated the advantages of uniformity. And even if we had a uniform power unit it would do us but little good until uniformity is secured for all units. This is one of the reasons urged for the adoption of the metric system by English speaking peoples, but the reasons against it are as weighty today as when John Quincy Adams made his report in 1821, (see paper by G. W. Colles, Transactions American Society of Mechanical Engineers Vol. XVIII, page 192,) and we hope that the time may be long deferred. The suggestion that the product of the power by the time be given a distinct name is well worthy of adoption; although kilowatt-hour is only another name for foot-pound, it is a more convenient one



and conveys a distinct and useful idea. In Glasgow it was proposed to call the Board of Trade unit, or kilowatt-hour, a "kelvin" which is certainly much to be preferred to the clumsy compound word; the even more clumsy horse-power-hour or horse-power per hour deserves a distinct name and for this perhaps "rankine" would be as appropriate and convenient as any.

\* \* \*

Perhaps it would be well to learn to correctly use the units that we already have before it is decided to adopt new ones. A notable example of the misuse of terms is to be found in a paper presented at the last meeting of the American Society of Mechanical Engineers advocating the heat unit as the basis for rating the performance of power plants, where the author used kilowatt and kilowatt-hour as synonymous, saying that the present way of stating performance is in "kilowatts per pound of coal, per cubic foot of gas, etc."

\* \* \*

A correspondent in Bay View, Wis., advises us of the good record made in the power house of the Fox River Electric Railway Company which he attributes to the absence of any "technical graduated college students." The company operates 14.5 miles of track; the rolling stock consists of 15 motor cars, two of them open cars, and eight open trailers. In the power house are two tubular boilers, 60 in. x 16 ft., one 250-h. p. Stirling boiler, two Ball & Wood tandem compound condensing engines, 11 and 18 x 16 in., two bipolar 50-k. w. and one G. E. 100-k. w. generators. The plant was started June 10, 1891, and it is stated that there has not been a single delay to cars which could be charged to the power house.

\* \* \*

#### Steam Turbines.

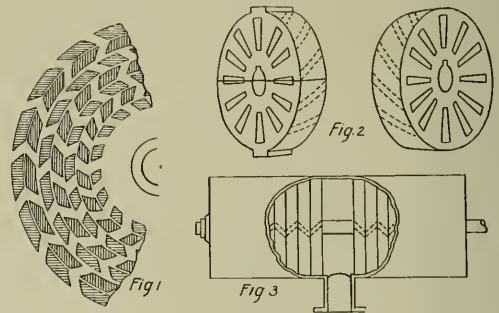
The success with which steam turbines have been used in England for driving electrical machinery makes it evident that this prime mover must receive more consideration in the future than has been given it in the past. There are three well known types of steam turbines on the market, two of which the Parsons and the Dow are quite similar in principle and differ from the De Laval. This last corresponds more nearly to the Pelton water wheel in its action, the steam being introduced into the turbine case through nozzles and directed to buckets placed on the circumference of a wheel; after the steam has passed through the buckets it is exhausted, to a condenser or to the atmosphere as the case may be. The other two types are called compound turbines because after passing through one turbine and giving motion to it with a consequent loss of velocity the steam is carried through a passage of larger cross section where it recovers its velocity by virtue of expansion and is then admitted to a second turbine with orifices enough larger than the first to accommodate the increased volume; after passing through succeeding turbines until the volume has reached the maximum allowed by the conditions of practice the steam is exhausted. By thus compounding, the steam is after a manner worked expansively.

In the Dow turbine the flow is radial from the center outwards. The moving disk has cut in it a number of concentric grooves and a number of spiral grooves along which the steam flows; the stationary disk has concentric projections and a set of spiral grooves. When placed face to face

the spirals run in opposite directions so that the passage for steam is a broken one and motion of the free disk results from the steam impinging upon it at an angle the same as motion results in a siren. Fig. 1 is a section through the two disks showing the passage ways. By placing two turbines on the same shaft the end thrust of one is made to neutralize that of the other.

The early forms of the Parsons turbine were "parallel flow" that is the flow of steam was parallel to the axis instead of being radial. There were a number of disks, half of them keyed to the shaft and half fastened to the casing of the motor; Fig. 2 will serve to show the disks and Fig. 3 the arrangement, the dotted lines in Fig. 3 indicate the path open for the flow of steam. By using two sets of disks with steam admission at the center the end thrust is neutralized. In later designs by Mr. Parsons of turbines of the parallel flow type there are more than one set of turbines placed one after the other on the same shaft; each set taking steam from the preceding one.

The steam entering by an inlet all around the shaft, passes through the successive turbines of gradually increasing area of passage-way, and is expanded by small incre-



ments of volume at each turbine, till it arrives at the next series of turbines; these are of larger diameter, and consequently greater peripheral speed and capacity, and they allow of further gradual expansion. The steam then flows to the last series of turbines, where, the expansion being completed, it passes to the exhaust-pipe. The rows of turbine blades are formed of hard brass, and accurately shaped; those keyed onto the shaft project outwardly, and nearly touch the case; those keyed into the case project inwardly between the moving rows and nearly touch the shaft. The turbines are so proportioned that the steam passes from one row to the next throughout the entire turbine with the most suitable velocity for economical working under the prescribed conditions. In the later designs the thrust is taken on rotating or dummy pistons and not neutralized by making the steam flow through two similar sets in opposite directions.

Mr. Parsons has also designed compound steam-turbine of the "radial flow type" in which the rows of turbine blades are keyed into and project from the faces of moving discs attached to the shaft and fixed discs attached to the casing. The course of the steam is outwards, through the rings of blades, then inwards, and again outwards through the blades on the succeeding disc, and so on, and the expansion is completed in passing outwards through rows of turbine blades on both sides of the large disc. The end pres-

sure is here, as in the case of the parallel-flow type, balanced by a revolving piston. The bearings are of special but simple construction. Around the bush in which the shaft revolves, are placed three concentric loosely-fitting tubes, truly bored and centered; the action of these tubes being to form concentric extremely thin layers of oil around the shaft, which acts as a cushion and prevents hammering or vibration of the shaft arising from any small errors of balance that may be present in the moving parts. The bearings are kept continually supplied with oil by a pump, and in the case of large plants, an oil-cooler is fitted, through which the pump forces the oil to the bearings. Generally the bearings are fed from open oil-boxes, but sometimes they are closed, and the oil forced in under considerable pressure.

The governor chiefly used has been one in which the steam-admission valve is worked by a steam relay, the valve of which is controlled by a solenoid, and the action has been rendered more sensitive, and the economy of the motor at light loads improved, by superimposing a reciprocating motion to the position of the relay valve, the action being to eliminate friction and stop hunting, as well as to admit the steam in blasts at full pressure, and of larger or shorter duration, according to the work required from the motor. In some cases the solenoid has been replaced by a centrifugal governor of ordinary type.

The first compound steam turbine direct connected to a dynamo was built in 1884; it ran at 18,000 r. p. m. and gave 6 electrical h. p. Within the last five years turbines developing from 500 to 700 h. p. have been installed. At present there are 30,000 h. p. of turbines in England.

Fig. 4 is reproduced from the Electrical Engineer, London, and shows one of four units in use at the Hotel Cecil, London. It is a 75-k. w. Parsons parallel flow turbine direct connected to a 75-k. w. direct current dynamo. There are 35 rows of blades and the speed is 1,000 r. p. m.

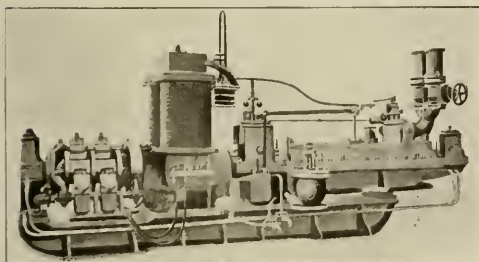


FIG. 4—75-K. W. UNIT PARSON'S STEAM TURBINE.

The supply of steam is not continuous but an impulse is given once in 21 revolutions. For the month of April, 1897, the output of the station was 58,016 kilowatt-hours with a load factor of .395; the costs are itemized as follows:

|                                |              |
|--------------------------------|--------------|
| Coal (\$5.00 per ton).....     | 1,124 cents. |
| Water.....                     | .118         |
| Oil and waste.....             | .106         |
| Wages.....                     | .711         |
| Supervision.....               | .270         |
| Repairs and maintenance.....   | .272         |
| Works cost.....                | 2.991        |
| Interest and depreciation..... | 1.022        |
| <b>Total</b> .....             | <b>3.926</b> |

It should be stated that the average cost per kilowatt-hour for repairs and maintenance for the six months preceding was but .130 cent. The units or kilowatt-hours are those used, not those generated.

Fig. 5 shows the consumption of a 200-k. w. turbo-generator, 1,000 amperes at 200 volts; the turbine is a Parsons parallel flow.

The latest field entered by the steam turbine is that of marine propulsion and the results obtained are extremely

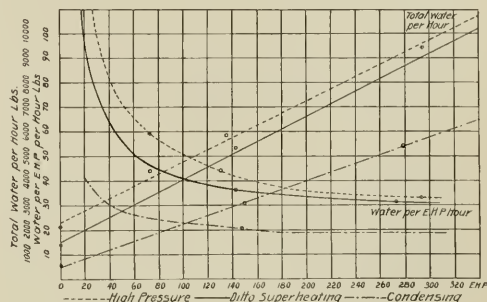


FIG. 5 WATER CONSUMPTION, 200-K. W. TURBINE.

interesting. The "Turbina" and the results of the tests made are described by the inventor of the turbines, Mr. Parsons, in a recent paper before the Institution of Naval Architects. The boat is 100 ft. in length, 9 ft. beam and 49.8 short tons displacement. The boiler is of the water tube type, designed for a working pressure of 225 lbs.; the heating surface is 1,100 and the grate surface 12 sq. ft. The condenser has 1,200 sq. ft. of cooling surface. The fresh water tank and hot-well contain 250 gals. The draught is forced by a fan.

When built a single motor designed to develop 1,500 h. p. at 2,500 r. p. m. was used but the loss due to "cavitation of the water" or the hollowing-out of vacuous spaces by the screw blade proved to be very great. After a series of very interesting experiments, it appeared that for all screws there is a limiting speed depending upon the slip ratio and the thickness of the blade, beyond which a large loss of power will occur, and the single engine was replaced by three, each driving a screw of reduced scantling and conditions of working closer to those of ordinary practice.

The approximate weights are given in short tons:

|                                                               |             |
|---------------------------------------------------------------|-------------|
| Main engine.....                                              | 4.1 tons.   |
| Metal of machinery, boiler, screws, shafting, tanks, etc..... | 24.6        |
| Hull complete.....                                            | 16.8        |
| Coal and water.....                                           | 8.4         |
| <b>Total displacement</b> .....                               | <b>49.8</b> |

Trials were made April 1, 1897, and the following data given:

|                                                              |             |
|--------------------------------------------------------------|-------------|
| Mean revolutions of engines.....                             | 2,100       |
| Steam pressure in boiler.....                                | 200 lb.     |
| Steam pressure at engines.....                               | 130 lb.     |
| Vacuum at exhaust of engines.....                            | 13 1/2 lb.  |
| Speed of boat.....                                           | 31.01 knots |
| Calculated thrust horse-power.....                           | 916         |
| Calculated indicated horse-power.....                        | 1,576       |
| Consumption of steam, reduced to basis of 31.01 knots.....   | 25,000 lb.  |
| Consumption of steam per indicated horse-power per hour..... | 15.86       |

On April 10 a speed of 32.75 knots, 37.75 miles per hour, was reached.

The three turbines are designed to give approximately the same power and are worked in series; each is a compound steam turbine and the final expansion of the steam is to 100 times its original volume. The thrust of the screw is balanced by the thrust in the turbine.

The "indicated" horse-power in these tests was found as follows: From experiments on a model the thrust h. p. required to give a speed of 31.01 knots was calculated to be 946 h. p. The thrust h. p. was assumed to be 60 per cent of the indicated h. p. giving for the latter 1,576.

### RESULTS WITH GAS STREET CAR MOTORS.

In a paper before the Society of Civil Engineers of France, A. Lavezzari presents some data regarding the tramways which use the Lubrig gas motor for traction. The author states that while experiments have been made with many different motors, the Lubrig system or, as it has now become, that of the Gas Traction Company, is the only one which has worked under actual conditions on railway lines. The first experiments with this motor were made in 1891 but none were put in service until July, 1894, at Dresden.

The system is now used in three cities: At Dresden are 2.1 miles of track and four cars so operated. At Dessau there are 3.7 miles of track, 13 motor and seven trail cars; the cars seat 16 passengers with standing room for 12 more. At Blackpool there are 7.8 miles of track; when first opened there were but two cars, each for 40 passengers, but recent additions to the rolling stock have been made and 16 of the new cars are larger, holding 52 persons. Illustrated descriptions of the gas motor cars at Dessau and Blackpool were published in the REVIEW February, 1896, page 67 and August, 1896, page 499.

In Paris one double-deck 42-place gas motor car has been given a trial.

The following data are quoted:

|                                                                             |                |
|-----------------------------------------------------------------------------|----------------|
| Weight empty.....                                                           | 15,432 lbs.    |
| Weight loaded.....                                                          | 22,046 lbs.    |
| Power of motors.....                                                        | 10 to 15 h. p. |
| Revolutions per minute, 100 when car is at rest, 250 when car is in motion. |                |
| Volume of reservoirs.....                                                   | 44.14 cu. ft.  |
| Pressure in reservoirs.....                                                 | 142.2 lbs.     |
| Capacity of water tanks.....                                                | 22.5 gals.     |
| Mean speed per hour.....                                                    | 9.9 mi.        |
| Gas consumption per car-mile.....                                           | 31.25 cu. ft.  |
| Distance without recharging.....                                            | 13.6 mi.       |

For the other systems the gas consumption is given as 36.37 cu. ft. per car-mile at Dresden and 28.98 at Dessau the figures in both cases including the gas used by the compressing engine at the central station, which at Dessau is said to be about 10 per cent of the total. For Blackpool the figure given is 30.12 cu. ft. per car-mile.

In conclusion Monsieur Lavezzari says:

"The data given indicate that gas traction merits an honorable place among other systems. It is easily operated everywhere, is not costly and is reliable. The central station and the personnel are of but little importance. Nearly all centers of population are supplied with gas works, but in the event that the tramway company could not purchase gas

at a reasonable rate it could manufacture the gas itself; the process is simple and cheap.

"However this system, which is yet young, like all others must be improved in order to arrive at perfection. For my part I only consider the present cars as a happy demonstration that the problem is worthy of being studied, and think that to make a really practical system there is much to be perfected. In practice an ordinary gas engine has been taken and with scarcely any modification has been mounted on a car; this is about the same as if one equipped a locomotive with a stationary engine; the requirements are not the same and it is necessary to design machines suited to the special conditions.

"The principal fault with this system is that the cars can not ascend heavy grades unless the motor is made too powerful for the ordinary working conditions. It would also be well to be able to stop the motor entirely when the car is stopped in order to avoid the vibration and noise that occur at present. And finally the machinery of transmission is open to several improvements; the noise made by clutches and gears when the car is in motion is very disagreeable; this perhaps might be remedied by using pinions with teeth of wood."

### ELECTRIC-STEAM COMBINATION IN ST. LOUIS.

An agreement has been reached between the Missouri Pacific Railroad and the Lindell Railway Company of St. Louis, whereby the passengers between the city and the towns along the Missouri Pacific as far as Meramec Highlands, 15 miles from the Union station, will be given a better service at a lower cost than formerly. Short steam trains will be run at frequent intervals from Meramec Highlands to Vandeventer station, three miles within the city limits and three and one-half miles from the business center. The advantage of having the trains stop at this point is that they will thereby be kept out of the crowded yards at the Union station. At Vandeventer station passengers will take the Chouteau avenue division of the Lindell for downtown, or the Vandeventer avenue division for West End points. There are 15 stops on the steam road and the run is to be made in 25 minutes; the street car portion of the route will be covered in the same time. The time from Meramec Highlands to the downtown terminus by electric car alone is 1 hour and 45 minutes, and it is expected that the saving in time effected and the low fare (25 cents for the round trip from Meramec Highlands and 20 cents for the round trip from Webster and nearer points) will give the combined roads nearly all the through business. In addition to that from the resident population of 50,000 served by the lines, considerable traffic is expected from the pleasure riding to the hotel, park and picnic grounds at Meramec Highlands.

When the St. Louis & Suburban Railway was completed about two years ago, the Missouri Pacific and the St. Louis & San Francisco Railroads, which it paralleled, were both compelled to abandon over one-half of their suburban trains, and the Missouri Pacific welcomes this arrangement, as it will enable it to recover some of its lost business.

The Consolidated lines in Pittsburg carried 40,000,000 passengers last year.





calorimetric tests shows the interesting fact that the total calorimetric values of coals vary but little, and that a decrease of fixed carbon does not reduce the heating power of the coal in proportion to the increase of volatile combustible matter, while on the other hand repeated tests prove that the industrial value of coals decreases almost in the same proportion that volatile combustible increases. The extensive tests of European coals made by Schurer-Kestner in 1868, and afterwards collated by Grüner, gives us most interesting and valuable information on this point.

For industrial purposes Grüner divided these coals into five distinct classes, according to the quantity of fixed carbon contained in the combustible of each.

Class 1: When the total combustible of the coal was composed of 50-60 per cent fixed carbon.

Class 2: 60-68 per cent " "

Class 3: 68-74 per cent " "

Class 4: 74-82 per cent " "

Class 5: 82-95 per cent " "

Taking the lowest of each of these classes, he gives the elementary analysis and percentage of total combustible in each class as follows:

TABLE OF INDUSTRIAL VALUE OF COALS,  
as per Grüner's classification.

| CLASS. | Fixed Carbon,<br>Per Cent Total<br>Combustible. | Volatile Combustible<br>Total Comb. | Hydrogen Per Cent<br>Total Comb. | Oxygen and<br>Nitrogen Per Cent<br>Total Comb. | Actual Value<br>in B. T. U. | Industrial<br>Value in<br>B. T. U. | Industrial<br>Value Per Cwt.<br>Actual. |
|--------|-------------------------------------------------|-------------------------------------|----------------------------------|------------------------------------------------|-----------------------------|------------------------------------|-----------------------------------------|
| 5      | 82.                                             | 8.                                  | 4.5                              | 5.5                                            | 16,560                      | 10,368                             | 62.6                                    |
| 4      | 74.                                             | 14.                                 | 5.5                              | 6.5                                            | 16,740                      | 10,506                             | 63.3                                    |
| 3      | 68.                                             | 16.                                 | 5.0                              | 11.                                            | 15,840                      | 9,676                              | 61.                                     |
| 2      | 60.                                             | 20.                                 | 5.8                              | 14.2                                           | 15,300                      | 8,756                              | 57.2                                    |
| 1      | 50.                                             | 22.                                 | 8.5                              | 19.5                                           | 14,400                      | 7,716                              | 53.6                                    |

We can safely take it as an established fact that the heating power of fixed carbon will remain constant. The same can be said of hydrogen in the absence of oxygen in the combustible, and the heating value of the hydrogen in the combustible will decrease in proportion to the increased percentage of oxygen within the combustible. Both Dulong and Mahler recognize this fact, and construct their formulas accordingly. It will be observed that both the calorimetric and industrial value of Grüner's class 4 is higher than class 5, although the percentage of fixed carbon has decreased 8 per cent. The industrial heating value, however, has not increased in proportion to the increase of hydrogen in the fuel, while actual heating value by calorimeter fully accounts for such an increase. Although the difference is but slight in this particular case, it points to a very significant fact, which is more clearly exemplified in the following three samples of coal; that is, that the actual calorific value of coals decreases in nearly the same proportion as the neutralizing effect of the oxygen on the hydrogen increases, and that the industrial heating value of the coals under the boiler decreases as the proportion of volatile carbon increases.

We have this strongly exemplified in our daily practice. It requires but ordinary observation for us to readily see that anthracite coals produce practically no smoke, semi-bituminous coals very little, while bituminous coals produce dense, black clouds of smoke varying in density and volume according to the quantity and composition of the volatile combustible matter in our fuel. An examination of the

sooty deposit formed by the condensation of the smoky products proves it to be largely composed of minute particles of carbon which is combustible, proving to us pretty conclusively that the cause of the decrease in industrial heating value is loss of heat from the carbon of our coal, due to the extremely volatile nature of the carbon in combination with hydrogen as hydrocarbons.

It has been said that the industrial value of a coal for steam-making purposes is practically fixed by the percentage of fixed carbon in the fuel. A review and close examination of Grüner's tables of the results of tests on European coals, and verified as being practically correct by similar tests made by Johnston on American coals at a more recent date, shows us we cannot take this method of determination as a permanent basis for calculation with any degree of accuracy. In Grüner's anthracite class 5, industrial heating value of coal only equals 83.3 per cent of the heating value of the fixed carbon, with Berthelot's determination as a standard.

In semi-bituminous class 4, industrial value equals 97.7 per cent of heating value of fixed carbon; in bituminous classes 2 and 3, 97.1 per cent and 99.6 per cent—showing us that if we undertake to fix industrial value of coals without reference to volatile combustible matter, we are liable to rate anthracite varieties too high.

Bearing in mind these facts relative to the heating value of the volatile combustible, it becomes markedly difficult to construct a formula applicable to a proximate analysis.

It has been established fairly satisfactorily, however, that volatile matter of similar composition will give off like quantities of heat. Goutal kept this fact prominently before him, as also the fact relating to fixed carbon, and consequently gives in his formula a series of constants for the determination of the heating power of the volatile combustible. While these constants might be improved upon by division into shorter sections, the results are nevertheless near enough the theoretical value for ordinary purposes.

The adoption of the principles underlying Goutal's formula, and multiplying by the average percentage of efficiency of the various classes of coals for industrial steam-making purposes as determined by Schurer-Kestner on European coals and Johnston on American coals, leads me to the belief that a formula constructed as follows will be of especial benefit in enabling engineers to arrive at the steam-making capacity of their coals.

$$Q = 14,652 f. c. + A \times \text{volatile matter} \times B,$$

Where A equals 23,400 when volatile combustible is equal to from 2 to 15 per cent of total combustible,

A equals 20,000 when volatile combustible equals from 15-30 per cent of total combustible,

A equals 17,100 when volatile combustible equals from 30-35 per cent of total combustible,

A equals 16,200 when volatile combustible equals from 35-40 per cent of total combustible,

Where Q equals industrial value of coal for steam-making purposes, and where

B equals .61 when fixed carbon equals 82-90 per cent of total combustible,

B equals .65 when fixed carbon equals 74-82 per cent of total combustible,

B equals .662 when fixed carbon equals 68-74 per cent of total combustible,

B equals .588 when fixed carbon equals 60-68 per cent of total combustible,

It equals .551 when fixed carbon equals 50-60 per cent of the total combustible.

In reviewing this formula I may say I was guided in its construction by the fact that the heating value of the volatile combustible is a constantly changing quantity, but remains constant in accordance with its composition of the elements, and that these elements occur in practically fixed proportions, determined by the total volatile combustible matter in the coal.

With this formula and the proximate analysis before us, we are readily enabled to determine, which of two coals is likely to be the most economical and best suited to the conditions under which combustion must take place, and will, I hope, be found useful in arriving at the real value of a coal submitted for inspection.

## LEGALITY OF CITY CAR LICENSES.

The question as to whether a city may legally assess and collect a license tax on street cars when no provision for such a tax was made in the ordinance granting a franchise to the railway company is one of so much importance to street railways that we quote in full one of the latest decisions on this subject. The title of the case is *City of Springfield vs. Frank Smith* (secretary and manager of the Metropolitan Street Railway), decided at the April term of the Supreme Court of Missouri. The opinion by Theodore Brace, J., is as follows:

The plaintiff is a city of the third class, with express power, by ordinance, to grant the right to any person or corporation to buy and construct street railroads in any street in said city, and to regulate and control the use thereof. R. S., 1880, Sec. 1576. To levy and collect a license tax on "street railroad cars" operated by any corporation, lb. 1506, and to levy and collect taxes for general revenue purposes on all mixed, personal and real property within the limits of the city taxable according to the laws of the State, lb. Sec. 1405.

The defendant is the general manager and secretary of the Metropolitan Street Railway Company, which by assignment succeeded to all the rights, privileges and franchises granted, by the city, to the Citizens' Railway Company, and the Woodland Heights Rapid Transit & Improvement Company, and under the direction and management of the defendant, was operating its street cars in said city at the time the complaint herein was filed; without license, as required by the ordinance of said city, approved April 5, 1892, (Chap. 15, Art. 1 R. O., 1892), Sec. 7 of which provides inter alia that "No person, corporation or company shall use, run or drive or cause to be used, run or driven for hire, pay, profit or compensation any street car \* \* \* without a license therefor from the City the charges for such license shall be for each street railroad car or coach of whatever kind ten dollars per year." \* \* \* and Section 21 of which imposes, a fine of not less than five nor more than \$100 for the violation of the requirements of Sec. 7.

The defendant was arrested upon a complaint for the violation of this ordinance; fined \$100 in the Recorder's Court from which he appealed to the Greene County Criminal Court, where, upon a trial de novo, he was again found guilty and his punishment assessed at a fine of \$50. From the judgment of which court he appealed to the St. Louis Court of Appeals, by which Court the cause was transferred to this Court on the ground "that the questions arising for decision involve the construction of certain provisions of the constitution of this State."

The only defense made to the action is a claim of exemption by the Metropolitan Street Railway Company from the operation of this ordinance by reason of the acceptance by it, and its assignors of two prior ordinances of the City, approved October 3, 1886, the conditions of which have been duly performed by them. These ordinances were of like tenor and effect, one relating to the Citizens' Street Railway Company, and the other to the said Transit & Improvement Company. The former is as follows

"Be it ordained by the City Council of the City of Springfield as follows:

"Sec. 1. That the Citizens' Street Railway Company be and is hereby permitted to change its motive power from horse and mule power to electricity motor power as provided for in the acts of the General Assembly of the State of Missouri, approved March 18, 1887.

"Sec. 2. Said Citizens' Street Railway Company shall in the change of its said motive power, do and perform all work upon its superstructure and tracks in a way and manner so as not to stop or materially interrupt ordinary traffic and travel upon the streets occupied by it until the grades of the streets are established; in all cases where improvements are provided for or contemplated, and all places of change, erection of poles and work necessary for such change of motive power shall be done under the supervision of the street committee of the city, to the end that said railway may be operated when said motive power is changed without damage to person or property, and in a way to impede ordinary traffic and travel on the streets as little as possible. Provided, that said street railroad company shall keep the street between its tracks and for two feet outside of the outside rail thereof in the same condition as the remainder of the street is kept by the city.

"Sec. 3. The said street railroad company shall charge not more than 5 cents for a single trip one way, or \$1 for 25 trip tickets, and not more than one half the regular fare for children under 12 years of age, and nothing for children under 3 years of age.

"Sec. 4. That inasmuch as the contemplated change of motive power will be attended with expense, it is further provided that this privilege to operate said electric motor power on the streets now occupied by said Citizens' Street Railway Company shall continue for 35 years from the publication of this ordinance. And said Citizens' Railway Company shall have the right and privilege within the present and future corporate limits of the city of Springfield, Missouri, and the additions thereto, of building, erecting, laying, operating, maintaining, repairing and using electric apparatus and appliances, electric machines, engines and apparatus, towers, masts, lamp posts, lamps, posts, poles, wires, pipes and all other machinery, apparatus and appliances necessary and convenient for the use and application of electricity for the purpose of lighting and of using, operating, renting and applying such electric machines, electric apparatus and appliances, towers, masts, lamp posts, poles, wires, pipes and apparatus and appliances for the purpose of conveying and supplying electric currents for light and power for hire and use in any and every capacity for which electricity is now or may hereafter be used; and of so using and occupying the streets and alleys of said city of Springfield for said purpose, and for the erection of towers, masts, posts, lamps, poles, etc., thereon and the laying of wires and pipes therein, and for repairing the same without injury or detriment to private rights or property of individuals or corporations or without public detriment, except temporary inconvenience caused by the erection of such towers, masts, lamp posts, poles, and the laying and running of such wires and pipes and repairing of same—all to be done under the police regulations of the city. Provided, that such change of motive power shall be made within one year after the street improvements on the streets are completed by the city, otherwise the city reserves the right to repeal this ordinance as to the streets occupied by said company upon which such motive power has not been so changed."

It is contended that these ordinances granting powers and franchises to the said two companies, the benefits of which passed to the Metropolitan Street Railway Company, constitute contracts between the city and these companies, as to which, the said provisions of Secs. 7 and 21, of Art. 1, Chap. 15 of the ordinance of 1892, are void, under Art. 1, Sec. 10 of the constitution of the U. S. prohibiting laws impairing the obligation of contracts.

It seems to be conceded in the argument of the learned counsel for the defendant that if the right to levy the tax in question is a reasonable exercise of the police power of the city, then the ordinances of 1886 can afford no defense to the action; since it was not within the power of the legislative authority of the city to exempt the franchise thereby granted from the operation of the governmental power of the city, to regulate the use thereof. But it is contended that the ordinance in question is an exercise of the taxing power of the city, for the purposes of revenue, and not of the police power for the purpose of regulation, hence was the subject of contract, and was in fact contracted away so far as the Metropolitan Street Railway Company



is concerned by the ordinances of 1889, which it is contended constitute a contract for that purpose within the protection of the provision aforesaid of the Federal Constitution. In support of this contention we are cited to a line of cases of which *Mayor, etc., vs. Second Av. R. R.* 32 N. Y. 261, is the leading one. But in the view we take of this case, a review and discussion of those cases in which express power to levy and collect a license tax was not given, is deemed unnecessary. It is beyond question, that by the sections of the statute cited, the plaintiff city was invested with express power not only to tax the property of street railway companies for revenue purposes (Sec. 1495) but to tax, license and regulate the business of running street railroad cars in the city (Secs. 1506 and 1576). That the state may collect an ad valorem tax on property used in a calling, and at the same time impose a license tax upon the pursuit of that calling, and may delegate such power to a municipal corporation, is well settled law in this state. *Aurora vs. McCannon* (decided March 9, 1897) and cases cited. Express power having been granted to the city in this instance by Sec. 1506 to levy and collect a license tax on the running of street railroad cars for hire in the streets of the city, there is no necessity of deducing such right from the general police power of the city. It may be exercised as granted, either as a police regulation or for the purpose of raising revenue within constitutional limitations. Conceding, for the sake of argument, that the tax imposed by the ordinance is for revenue purposes, and not simply for the purpose of police regulation, and conceding further that the ordinances of 1879 constitute a contract quoad the matters therein treated. If such contract, when properly construed, is an agreement on the part of the city not to levy and collect such tax thereafter, then such contract might to that extent be held to be ultra vires and void, upon the authority of *State vs. Han. & St. Joe R. R. Co.*, 75 Mo. 208, and not within the protection of the Federal Constitution. There is no necessity however for so ruling in this case, for the reason, that the so-called contract when properly construed cannot be so interpreted. The principle upon which such contracts are to be construed with reference to the taxing power, are well settled, they are to be liberally construed, in favor of the public—"grants of this class are not to be extended by construction beyond the plain terms in which they are conferred but should be strictly construed against the corporation or those claiming under the grant." *City of Wyandotte vs. Corrigan* 35 Kansas 21. They are special privileges, as to which "Nothing is to be taken as conceded but what is given in unmistakable terms, or by an implication equally clear. The affirmative must be shown, silence is negation and doubt is fatal to the claim." *Fertilizing Co. vs. Hyde Park* 97 U. S. 650; *Newton vs. Commissioners* 100 U. S. 561; *Rice vs. M. & N. R. R. Co.* 1 Black, U. S. 358; "Exemptions of this kind are to be strictly construed, the rule being that the right of taxation exists unless the exemption is expressed in clear and unambiguous terms." *Railway Co. vs. Philadelphia* 101 U. S. 528; *Delaware Railroad Tax*, 18 Wal. 206. Illustrating the application of these principles, in *Wyandotte vs. Corrigan*, 35 Kansas 21, a case quite analogous to the one in hand, it was held that where an ordinance granting a street railway franchise for 21 years providing how and when the road shall be constructed, how it shall connect, that the tracks and the street between the tracks shall be kept in repair and up to grade, and regulating the price to be charged for fare of passengers; such ordinance will not exempt the corporation from reasonable regulation by the city in the operation of the road, nor will it prevent the city from levying and collecting a license tax thereon, by ordinance subsequently passed, in this case was \$100 per annum. In the city of *New Orleans vs. Railroad Company*, 40 La. Ann. 587. It was held that "a contract conferring the right to lay and operate a street railway without dispensing with the payment of a license, is not impaired by the exaction of such license;" and in that case a license tax of \$2,500 per annum was sustained, and going further in the same direction it was held by the same court, in the city of *New Orleans vs. Railroad*, 42 La. Ann. 4, that "A contract between a municipal corporation and a railroad company by which the latter pays a bonus for the franchise therein conferred by the city, cannot be construed as conferring an immunity from the payment of license on its business by the company, in the absence of an express stipulation to that effect in the contract." In *Railway Co. vs. Philadelphia*, 101 U. S. 528, it was held that when the charter of a railway company provided that it should pay a license fee of \$30 per car per annum required by the ordinances of the city, its charter rights were not impaired by a subsequent statute and ordinance requiring the payment of a license fee of \$50 per car per

annum. In a recent work on street railway law, Booth, Sec. 281, the following rule is deduced from the authorities: "In construing the charter of a company conferring authority to construct and operate a street railway, the right to exact license fees will not be denied because it has not been expressly reserved in the grant; and when the contract between the city and the company does not in terms dispense with the payment of a license the rights of the latter are not impaired by a subsequent ordinance requiring such payment." The ordinance under which the defendant claims exemption in this case has been set out in full, and applying to it these principles of construction, no argument is required to demonstrate that it does not by the terms used, nor by any fair implication therefrom, exempt the street railway company from the license tax which the city was expressly authorized to impose, and subject to which power the company took the franchise therein granted. The cases of the *State ex rel vs. Corrigan Street Railway Company*, 85 Mo. 263, and *City of Kansas vs. Corrigan*, 86 Mo. 67, in neither of which was the question of the power of taxation involved, are not in point in this case. The ordinance imposing the tax being valid, it became the duty of the company to take out the license required thereby, in order to protect its employes from the penalty imposed for the violation thereof, and the defendant having been guilty of such violation by running its cars without such license, was properly fined. *Wyandotte vs. Corrigan*, 35 Kansas 26.

The judgment of the Criminal Court of Green County is therefore affirmed. All concur.

## ELECTRIC RAILWAY IN SIBERIA.

Up to the present there has not been even a horse street railway in Siberia, but an electric line is now building in Vladivostok. The manager is Madame Zehof, whose portrait we publish. She is a woman of business ability, a good purchasing agent and although surrounded by a staff of clerks keeps a close watch on details. The superintendent is E. Jouravliov.



MADAME ZEHOF.

Vladivostok which is thus to be the pioneer in street railroading in Siberia is the chief naval station of Russia on the Pacific coast.

The name is vlad, to have, and vostok, the orient; that is, to have the orient, a name which must have an ominous sound to Japanese and Chinese ears. It was founded in 1861, on the northwest coast of Muraviev peninsula, on the Golden Horn bay, Gulf of Peter the Great, Sea of Japan. It is to be the terminus of the trans-Siberian railway now building. The present population is about 16,000, nearly half of which is military.



E. JOURAVLIOV.

Like all towns in Russia and Siberia the houses are built far apart as a protection against fire (houses being for the most part of logs, a fire would be very disastrous, especially in winter), and covers a large territory in proportion to its population, and thus offers an inviting field for street railways.

PRIMITIVE RAILWAY APPLIANCES.

BY C. B. FAIRCHILD.

(Concluded.)

In the early history of surface roads numerous devices were proposed to combine animal and mechanical power to the propelling of vehicles. These were generally called mechanical travelers. Fig. 13 illustrates such a device which was patented in 1819, the design being an attempt to imitate the action of the legs of a horse in walking. Fig. 14 shows another, which curiously contained the germ of

tube, and causes the carriage to advance at about four times the velocity of the horse, or at ten miles an hour." With the advent of steam, mechanical travelers or rather designs for the same became quite common. The supposed necessity for some form of propulsion was based upon the then prevalent idea that locomotive wheels could not take hold of a smooth rail with sufficient friction to draw or propel a vehicle. To show how firm a hold this idea had on the public mind at that time we quote the following from a prominent publication:

"It appears that notwithstanding the great exertions on the part of the inventor, Mr. Stevenson, to bring his locomotive into use on the different railroads now either constructing or in agitation, it has been the opinion of several

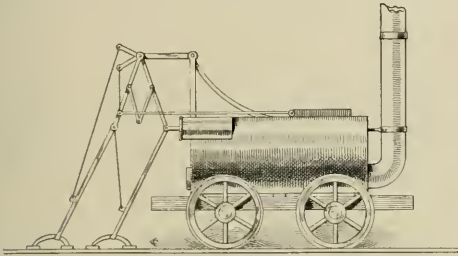


FIG. 13—MECHANICAL TRAVELER, 1819.

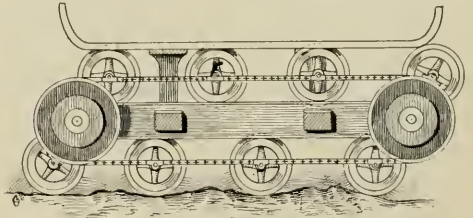


FIG. 15—PORTABLE TRACK, 1821.

several modern practical devices. Here is shown the first tube or conduit, also a combined freight and passenger car, a double deck car, and a sleeping car, for the enclosed portion on the upper deck contained sleeping berths. This device was the subject of a patent granted William Frances Snowden of Oxford street, London, in December, 1824, and is described as a new invented wheel way and its carriage. "The carriage consists of two stories, the upper one for passengers, containing both inside and outside berths, and the lower one for merchandise, which is deposited on a circular floor around which two horses are made to walk, being yoked to the opposite extremities of a horizontal lever that turns a vertical axis, to which is connected multiplying gear

engineers that they do not possess those advantages which the inventor had anticipated; indeed, there cannot be a better proof of the doubt entertained regarding their utility than the fact that it has been determined that no locomotive engines shall be used in the projected road between Newcastle and Carlisle, since, had their advantages been very apparent, the persons living immediately on the spot in which they are used, viz., Newcastle, would have been acquainted therewith. The principal objection appears to be the difficulty of surmounting even the slightest ascent, for it has been found that a rise of only  $\frac{1}{8}$  in. in a yard, or 18 ft. in a mile, retards the speed of one of these engines in a very great degree, so much so indeed that it has been con-

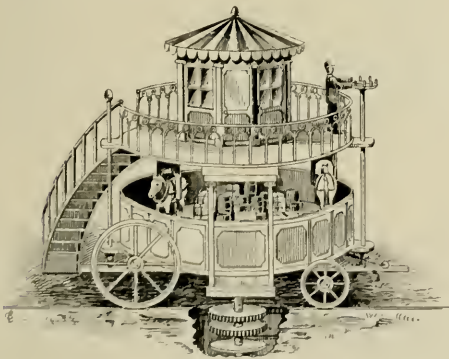


FIG. 14—MECHANICAL TRAVELER, 1824.

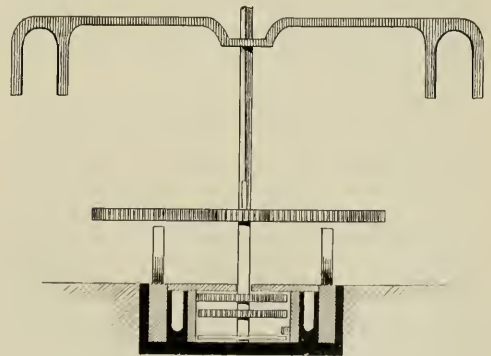


FIG. 14 A—FIRST CONDUIT, 1821.

that causes the mechanical horse in the hollow trough and the carriage above to move at any predetermined velocity. The toothed wheel 'takes' into the rack on the side of the

sidered necessary in some parts where they are used, to aid their ascent with their load by fixed engines which drag them forward by means of ropes coiled around a drum."

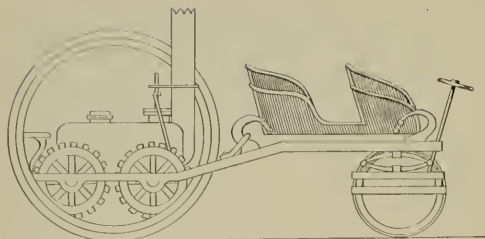


FIG. 16—GORDAN CARRIAGE, 1822.

Following the introduction of mechanical travelers, various designs were presented for a carriage that should carry its own track, and so facilitate its passage over rough ground. It is interesting to know that this line of work is still a favorite line with some so-called inventors, and only recently a trial was made of a similar device. Fig. 15 illustrates the first of these machines, which was patented in 1821 by John Richard Barry of London.

The carriage is provided with an endless pitched chain, carrying anti-friction wheels attached to the same axle as the running wheels. Under the carriage are arms so bent

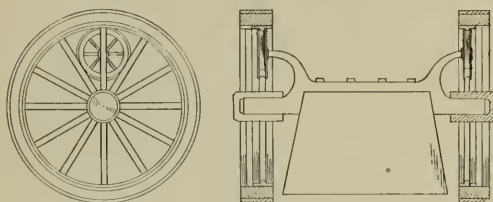


FIG. 17—"PERPETUAL RAILWAY," 1830.

or curved as to be clear of the wheels in their revolution. There are also large wheels at each end of the carriage for the link chain to pass over. A horse or other power being applied to the rails of the carriage, each pair of wheels passes under the carriage by the action of the chain. When the wheel strikes an impediment, instead of being propelled over it, it stops against it while the carriage proceeds as though the road were level, until the chain in its revolution lifts up the opposed wheel, and the object is passed without violence and without extra power, so claimed.

Fig. 16 illustrates a similar device by David Gordon in 1822. The main wheel of the machine consists of a large hollow cylinder about 9 ft. in diameter and 5 ft. long, having its interior circumference provided with a continuous

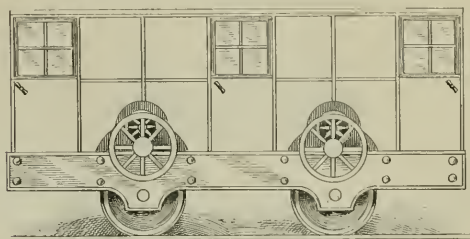


FIG. 18—ANTI-FRICTION ROLLERS.

series of cogs in which are made to work the cogged running wheels of a locomotive. The power being communicated to the small wheels, causes them to revolve and to climb up the internal rack of the large cylinder, compelling the latter to roll forward and propel the vehicle.

In 1825 George Cayley of Brompton, proposed the use of an endless chain with small rollers at right angles to the running wheels. The rollers form a continuous series on both sides of the carriage and come successively in contact with the ground and step over the obstacles that may lie in their path. The small rollers were placed at right angles to the carriage so that it could move sideways.

In 1830 an American inventor received the great seal on

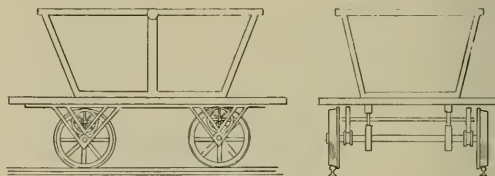


FIG. 19—ANTI-FRICTION ROLLERS, 1825.

an English patent for a device similar to that of Mr. Gordon described above, and described as a perpetual railway (Fig. 17). The wheels were formed with a circular rib placed round the interior of the felloes upon which small wheels with grooved peripherys were intended to run. The small wheel, it was claimed, would bear its portion of the weight of the carriage and run upon a smooth surface, while the large wheel is passing over uneven ground.

Anti-friction rollers were first introduced in 1825 by a Mr. Brandreth of Liverpool, Figs. 18 and 19. Many other modifications of this plan soon followed. The next type was that of wheelless carriages, a kind of sledge. One known as Rangle's safety rotation railway is illustrated in

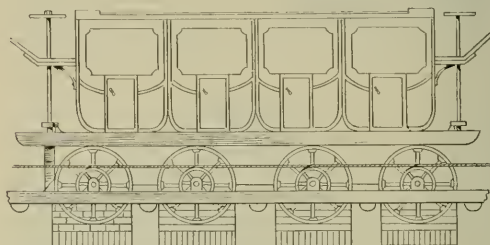


FIG. 20—SAFETY ROTATION RAILWAY, 1840.

Fig. 20. This consists of two lines of fixed wheels along the roadway. The wheels were placed twelve feet apart and were formed like a double pulley having the same bearing. These were connected by belts and moved by power communicated at one end. The car being placed on the upper periphery of the wheels, was carried from one end to the other, and was stopped by raising the body far from the wheels by means of a brake mechanism.

A cyclopede, Fig. 21, was devised by Mr. Brandreth probably about 1825. This is another form of mechanical traveler, and is probably the origin of the modern tread power now so extensively used. It consists of a chain plat-



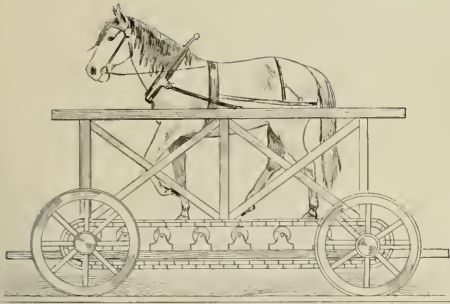


FIG. 21—CYCLOPEDE, 1825.

form having a series of friction rollers, from which through the medium of a spur wheel, power was transmitted to the wheels of the carriage. The horse being yoked to the frame, communicated the power by treading the movable platform. As first designed, this device was intended to run upon a track, so that it comes under the head of primitive railway appliances. It is interesting to note that the attempt to introduce travelers of this kind brought out from a prominent contemporary writer a disapproval of all attempts at horse locomotion, except the use of his legs, "experience having proved 'in his opinion', the utter vanity if not impiety of all propositions of the kind." He instances the velocipede as the most promising of all and yet a failure. He deduces "that the inexplicable vital principle bestowed by the omnipotent God upon his creatures cannot be surpassed by man's utmost knowledge in mechanical science."

The first proposition to employ compressed air for locomotive as well as in stationary engines is found in a patent granted George Medhurst in 1799. He employed windmills for compressing the air so as to make it from ten to twenty times more dense than it is in its natural state, and then conducted it to a cylinder. Other similar schemes soon followed.

An atmospheric railway on another plan was built at Norwood Scrubbs, on a line belonging to the West London Railway Company. The line was about half a mile long. The plan employed a 9-in. iron tube placed in the roadbed in which was a close fitting piston, which was moved by exhausting the air from one end of the tube, and to which

the car was attached. The tube had a grooved slot along its upper surface through which the shank of the piston passed. The slot was closed by means of a valve of leather strengthened by plates of iron flat on the outside and forming the segment of a circle on the inside. The valve being treated with a composition of bees wax and tallow rendered the tube comparatively air tight. It was claimed that a half vacuum could easily be obtained and that the car was moved at a good rate of speed. A second line on the same principle was constructed in Dublin, Ireland, in 1843, and several others followed. Prominent engineers at the time gave the scheme favorable reports.

Elevated roads appear to have been first patented in 1821 by H. R. Palmer, an engineer of the London Dock Company. He proposed a single track structure on which the wagons were placed in pairs, Fig. 22, on the opposite sides of the rail. It is amusing to note that the inventor proposed to employ both animal and wind power, the latter by means of sails, which could be spread should a favorable wind spring up, "and the horse put into one of the cars, where over his bag of corn he might regale and invigorate himself for fresh exertion, should the wind fall off." (Fig. 23.)

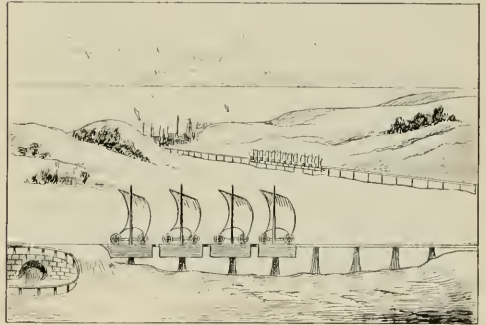


FIG. 23—ELEVATED SINGLE TRACK ROAD.

A means for removing snow from the rails was described in a patent granted in 1831 to a Mr. Grim of Bury. He proposed to dissolve the snow by making the rails hollow and causing hot water or steam or hot air to pass through them so as to keep them at a temperature above freezing. Boilers for generating the steam were to be placed two or three miles apart. The ends of the rails were to be joined by close fitting copper tubes with means for expansion. Instead of hollow rails, the inventor also proposed iron pipes laid alongside the rail through which the steam should pass.

Fig. 24 illustrates a design for a fire escape, being a modified form of a device patented in 1813 by Thomas Roberts. This principle might possibly be employed in the construction tower or trolley repair wagons. As will be seen, the device is constructed on the principle of the lazy-tongs and is mounted on a four-wheel carriage. At the top is a platform with a folding bridge or gangway. The platform is raised by means of a pinion meshing into a pair of toothed quadrants which have arms welded to the lowest lever bars. Motion being given to the pinion by the winch the two quadrants are moved in opposite directions, and the series of levers are opened or closed like so many pair of shears. A counterpart could be provided to one side and

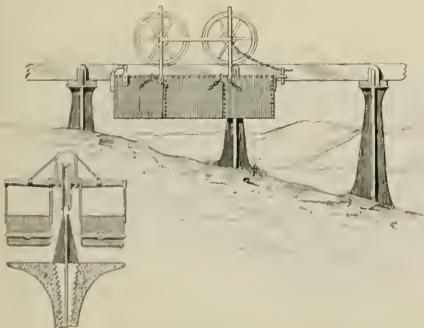


FIG. 22—ELEVATED SINGLE TRACK ROAD, 1821.

connected by cross bars and the pinions actuated by a common axle.

While disappointment has been the bitter fruit of many pioneers in this interesting branch of mechanical science,

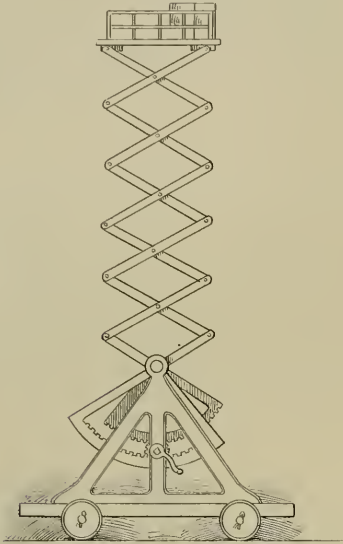


FIG. 24—TOWER WAGON, 1813.

who shall say that the devices here illustrated have not been stepping stones in the process of evolution, which has brought modern transit facilities to their present advanced state, or that they may not yet figure in the progress which is yet to be made, for the development is yet going on with rapid strides.

### A PROTECTED THIRD RAIL SYSTEM.

The illustrations represent the K. A. K. third rail system for elevated railways and lines operating under steam road conditions. One shows the track rail, guard rail outside and the covered third rail, also the contact shoe in position. The third rail is a steel angle and is mounted on fiber or other insulating material. The posts are supported on iron chairs at the outer ends of the ties and the rail is bolted to

the posts, the bolt heads being counter-sunk so as not to interfere with the contact shoe.

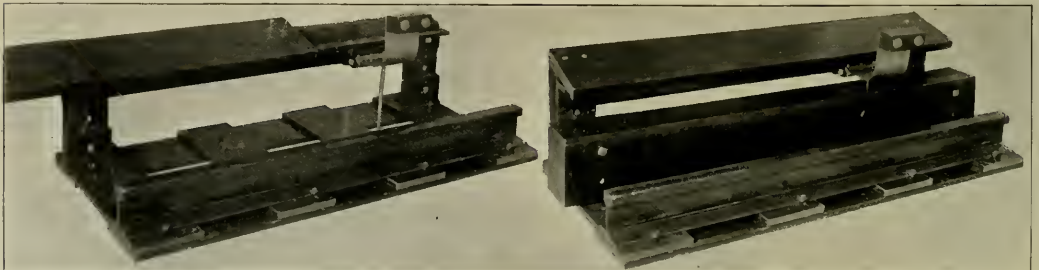
The other is a similar construction for the application of the third rail to steam roads. The wooden cover to the third rail is partially removed so that the form and fastenings of the rail may be shown. The wooden cover serves the purpose of preventing persons from coming in contact with the rail, keeping the rail dry and also the posts which act as insulators. The rail is supported on the ends of the ties outside the track so that it can be erected and fitted complete ready for operation along any line of track using steam without interfering with traffic during construction. At crossings and other points where the third rail could not extend copper cables are carried underground and the train coasts over the break.

The contact shoe is shown in the cut. It is connected to the car truck by a spring and is in contact with the under and inner surfaces of the angle of the third rail. Messrs Krotz, Allen and Kelly are the promoters of the system.

### ROLLER BEARINGS.

The theoretical advantages of substituting rolling for sliding friction in bearings of all kinds are so apparent that it is rather surprising that it has not been found practicable to extend their application to the rolling stock of railways to a greater degree than has been the case. W. B. Marshall before the Institute of Civil Engineers states that the experiments with tram cars using roller bearings show that on a grade of 1 in 20, 23 per cent less power was required starting than with the ordinary type; on a grade of 1 in 40, 50, and on a grade of 1 in 80, 60.4 per cent less. The Corporation of Blackpool has equipped some of its cars with roller bearings and the consulting engineer certifies to a saving of 30 per cent in the work of axle friction. The Liverpool Overhead Railway began experimenting in 1895 and is gradually placing the bearings on all its rolling stock. The Waterloo & City Railway has specified roller bearings for all the stock ordered by it. On steam roads the record appears to be equally good, as the Brighton & Kemp Town reports that an experimental train of six carriages which has been running for two years shows a saving of from 12.5 to 15 per cent in coal consumption under disadvantageous circumstances.

The question of whether the wages of street car conductors are subject to garnishment is to be tested in the courts of Georgia.



K. A. K. THIRD RAIL—FOR STEAM ROADS—FOR ELEVATED TRACKS.

## THE BIRMINGHAM TRAMWAY REPORT.

The sub-committee on tramway traction, consisting of two aldermen and two councillors of Birmingham, has submitted a report on the tramway systems of Bristol, Blackpool, Paris, Rouen, Brussels, Vienna, Budapest, Dresden, Berlin, Hamburg and Bremen, which is in a terse but lucid style.

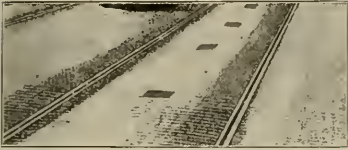


FIG. 1—CLARET-VUILLEUMIER SYSTEM.

Although some of the matter has already been published in the REVIEW yet a part of the information and the ideas of the

committee deserve further attention, and the following is extracted from the report:

At Blackpool in addition to the electric conduit system the Gas Traction Company is operating two gas motor cars. During the few months these cars have been running the cost of gas, repairs, etc. has been at the rate of 9 cents per car-mile. Ordinary coal gas is used, reservoirs in the cars receiving the gas from the storage cylinders at the station at 135 lbs. pressure. Each car is fitted with a double cylinder gas engine, which is under the car seat, the fly-wheel being enclosed in a recess formed in one side of the car. The engine rotates constantly even when the car is standing still, and the motion is communicated to the car wheels by gearing thrown in and out. In ascending a grade a supplemental set of gearing is thrown in, giving greater tractive effort and less speed. However the committee does not recommend this system for Birmingham on account of the limited storage capacity of the cars.

In Paris the fireless locomotives attracted attention. The reservoir corresponds to the boiler on an ordinary locomotive and is charged with water at a very high temperature and pressure, enough energy being stored to run about 10 miles. The emission of great volumes of steam was an objectionable feature.

The Mekarski compressed air cars are in operation in Paris on a line six miles in length. Two charging stations

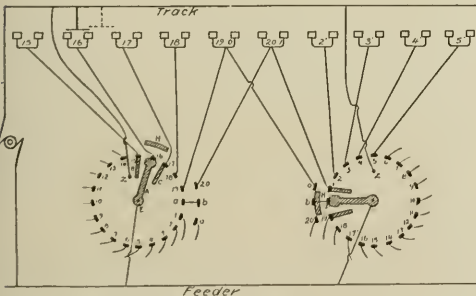


FIG. 3—CLARET-VUILLEUMIER DISTRIBUTOR.

equipped with compressing machinery, keep the 11 cars supplied with air. The storage capacity of the reservoirs in each car is about 100 cu. ft., the air having an initial pres-

sure of 850 lbs. which drops to 250 lbs. per sq. in. at the end of the trip. The cars are very heavy weighing 33,600 lbs. loaded and are expensive in construction and operation, making the system entirely unsuited for heavy traffic in a large city.

The storage battery cars received some attention and it was found that this form of traction had never been used with marked success. Recently a new form of battery, designed by M. Pescatore, has been introduced which promises to be slightly successful. It is a combination of the Planté and the pasted or grid plate and is capable of being charged with very heavy currents without danger. The

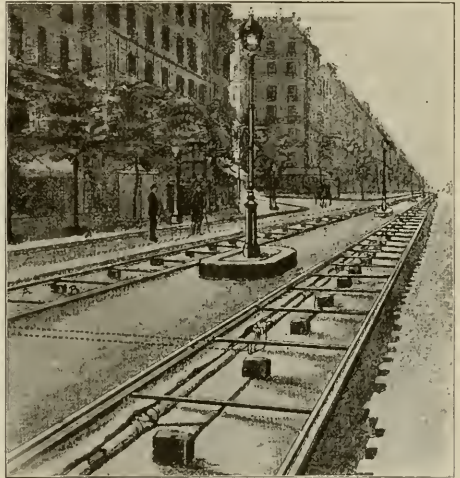


FIG. 2—CLARET-VUILLEUMIER SYSTEM.

cells are not removed from the cars for recharging as the process requires only 10 or 12 minutes and such a charge is sufficient to operate a motor and trailer, with 50 passengers, a distance of 10 miles. Four cars are now in use but others are being built. Each car is fitted with 200 cells arranged under the seats and at one end is small electric fan which draws the acid fumes out of the car. Two positive and three negative plates in an ebonite box constitute a cell. The battery of 200 cells weighs 7,800 lbs., has a capacity of 12 h. p. and the cost is about \$1,500 per car. It is stated that the cost for operating expenses and for repairs is six cents per car-mile. It is very doubtful if this battery is suited for heavy traction or on considerable grades.

The next method of traction described is the Claret-Vuilleumier surface contact system, the construction of which may be seen from Fig. 1 and Fig. 2. From the station current is conducted to distributing boxes which are at intervals of 110 yds. along the track. In each box is a ring, Fig. 3, consisting of 20 insulated copper contact surfaces, 19 of which are connected by small cables, each to one of the pairs of contact-plates in the street surface. The twentieth contact surface in the ring of the distributor is insulated except the moment when the car is passing out of one section into the next and then it serves to bridge over the gap between the two sections. There is movable arm pivoted at the center



of the ring and in permanent connection with the main feeders. The outer end of the arm makes connection with the 20 contact rings successively and in so doing puts the corresponding contact-plates in electrical connection with the mains. The iron contact shoe along the bottom of the car is of sufficient length to make connection with two of the plates at the same time. On the twentieth point the current passes on to the next distributor, ensuring the continuity of the service. On account of the current passing through one point of the distributor at a time and as each point connects with but two contact-plates, it follows that only one pair of contact-plates can be in the circuit from one distributor, consequently two cars cannot be on the same section at the same time. These sections can be made of any desired length but the shorter and more numerous they are the more costly the construction. The rails form the return circuit. The cost of construction is approximately \$11,500 per mile of double track. In a general way the system is satisfactory; the distributing mechanism seems to be durable and precautions taken to minimize the danger from live contact-plates assure safety. On the main lines where cars fol-

In Brussels there are 10 miles of trolley lines which are in successful operation. In the business streets the tracks are in the center, with span wires to hold the trolley. Recently a telephone wire grounded a trolley line and killed two horses. To prevent further accidents of this kind the overhead wires are being protected, by fixing on the upper sides of them strips of wood wherever they pass under the telephone or the telegraph wires. This increases greatly the unsightly appearance of many parts of the line. Two conduit systems are under construction, one five miles and the other one and a half miles. These are similar to the Budapest conduit in design, the conductor being under one of the rails and the slot forming a groove for the wheels. The conduit was built in one of three different ways; of concrete formed around molds, which are removed as the mass becomes hard; of concrete blocks formed in molds and brought to the line ready to be put in place, the conduit being formed of two blocks, one on each side; or of brick work; this last seems to be adopted around the recesses in the conduit in which the insulators are placed. The conductors, which weigh 20 lbs. to the yd., are carried on insulators suspended from the top of the conduit. Neither of the conduit systems are in operation.

With the exception of an experimental trolley line a mile and a half in length, all the tramcars in Vienna are worked by horses. The company's concession has a long time to run yet and no arrangements have been made for replacing horse by mechanical traction.

The conduit lines of Budapest have been fully and frequently described and it is well known that their operation has been successful since the construction in 1889. Fig. 4 is a view on one of the principal streets of Budapest representing the cars and tracks of the conduit system. The municipal authorities have fixed a zone, including the business and more populous districts, in which overhead construction is forbidden. On account of its cheapness and facility of building the company prefers trolley construction. Some difficulty has been experienced at times, owing to mud and dirt getting in the conduit, but better design and greater cleanliness will obviate these difficulties. On Andrassy street the city would not permit a surface railway and the company was forced to build a double underground line  $2\frac{1}{4}$  miles in length. A description of the construction may be found in the May REVIEW. The two conductors are suspended from the roof of the tunnel, contact being made by crossbars on the top of the car. At places where the conduit and the overhead construction join, the collectors are lifted out of the conduit by means of a winch handle inserted in the side of the car and the sliding trolley is released so as to bring it in contact with the trolley wire. As the conduit slot is  $1\frac{3}{8}$  in. wide the collector can be lifted out at any point. Sliding bar trolleys are used in place of trolley wheels which simplifies the overhead work. The tramway company is soon to change the remaining 57 miles of horse car lines to electric traction, 15 to be conduit and 42 trolley.

Of the 100 miles of tramways in Dresden, 32 are now operated by the trolley, a short section less than a mile in length by accumulators, and one-half mile by underground conduit. It has been determined that the storage batteries consume 20 per cent more current than do the same cars worked from the trolley or the conduit system. In the conduit construction the slot is outside the track, the outer edge of the rail forming one side of the slot. Cast iron yokes



FIG. 4.—BUDAPEST.

low one another closely the sections would have to be very short.

Paris seems to be a veritable museum of traction systems, gas, compressed air, surface contact, storage battery and steam being in use. Lastly the committee describes the Serpollet steam cars. The steam generator consists of a number of small flattened tubes, U shaped in section, exposing a large outer surface to the action of the fire but inclosing a very small space inside. When a small quantity of water is injected into these tubes it is immediately vaporized and the steam so formed strongly superheated. The regulation of the engine is accomplished by controlling the amount of water passing into the tubes. The steam generator only occupies a space 6 ft. 9 in x 2 ft. 3 in. and is 3 ft. 6 in. high. It contains no space for water, and as there is no chance for an explosion there is no provision for safety valves, pressure or water gauges or feed pumps, and it requires no attention on the part of the driver. The engines are under the car, and have been so constructed as to drive the car by a sprocket chain, but the new engines will be connected to cranks on the axles. The motor cars weigh about 29,000 lbs. At present there are 40 in service and 60 more in the course of construction. These cars with a trailer have no difficulty in ascending grades as great as 5 per cent.

are fixed 3 ft. 6 in. apart, the tops of them carrying cast iron troughs 9 in. wide and filled up with asphalt to the street level; these troughs form the top part of the tube conduit. The rails constitute the return circuit. Sliding bar trolleys are preferred to wheels. These are of three different kinds; one is a trough-shaped bar of aluminum alloy, the trough being filled with grease, some of which is left on the wire. The other two bars are of a soft alloy, one of them being designed so as to spread or scrape off the excess of grease that may be left by the first bar. These bars are used on alternate cars so as to keep the trolley wire in good condition. The bars last about six months and are very cheaply replaced. The shape and size of these trolley bars is shown in Fig. 5. Electro-magnetic as well as hand brakes are applied to these cars. Guard wires are required, three or four being placed side by side and about one foot apart and connected together by short cross wires. The tramway company has no station, the current being supplied from the municipal power plant.

In Berlin and suburbs there are 150 miles of tramways, mostly worked by horses. There a few miles of trolley lines, one route being supplemented by storage battery cars.



FIG. 5—CAR WITH BAR TROLLEY.

There are two or three lines of conduits but this form of electric traction is not favored by the authorities as it necessitates the asphalt streets being torn up for a considerable length of time. The trolley wire is divided into sections of 500 to 600 yds. in length, which are connected to the underground feeders. The fire department is provided with keys and at marked posts where the feeders are connected the current can be cut off at times of fire. The tramway company pays to the city eight per cent of its gross receipts or a sum approximately \$500,000 a year. In the agreement for an extension of its franchise the company agrees to pay the city eight per cent, and after six per cent on the capital has been paid to the shareholders, the balance of the profit is to be equally divided between the shareholders and the city.

Accumulators proved a failure at Hamburg and now the 90 miles of tramway are operated exclusively by trolley. The traffic amounts to 50,000,000 passengers per annum, the city receiving 9¼ per cent of the gross receipts or about \$115,000 a year. The current is supplied from the

power station of a separate company which has the concession for the supply of electricity throughout the city. There are 250 motor and 160 trail cars which were built by the tramway company. Repairs to the equipment and even the uniforms of the conductors are made at the company's works.

In Bremen 6½ miles of tramways are of the overhead system and the remaining 14 are worked by horses. One condition which is peculiar to Bremen is the excessively narrow streets, some not being more than 20 ft. wide from house to house. In such cases the rails are laid close up to the curb on one side of the road and in some parts two lines are laid but are so close that only one track can be used at a time. The span wires are fastened to rosettes fixed in the walls.

In the summary of its report the committee considers electric traction preferable to all others. All inquiries developed the fact that as storage batteries were not suited to operate on grades exceeding two or three per cent this system can not fulfill the conditions required in Birmingham. The choice practically narrows down between the trolley and conduit. The committee tried to ascertain the comparative cost of construction, but this could not be done, as one engineer estimated the cost of each to be about the same and another one said that the conduit would be from four to five times as expensive as the trolley. Except for first cost and a prolonged disturbance of the streets the committee favored the conduit. Considerable stress was laid on the disfigurement of the streets by the overhead construction, the danger of broken trolley wires and the electrolysis of gas and water pipes. The tenor of the report is that the conduit system is best suited to the needs of Birmingham.

The original proposition of the City of Birmingham Tramways Company was based upon the condition that eight miles only of the road were to be worked on the conduit system and 29 miles by overhead trolley, and it could not agree to build all conduit lines in accordance with the recommendation of the committee without greater concessions than the city council was willing to make. Also the company demanded that the road be built and maintained by it and not by the city as it declined to provide funds for some one else to spend. Being unable to agree the city directed the company to withdraw the bill pending in Parliament and the present status is the same as a year ago except that the present company has succeeded to the Birmingham Central Tramways Company.

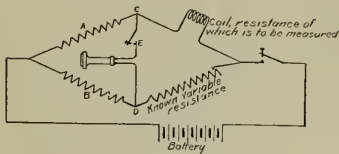
#### EAST OAKLAND (CAL.) ROAD TO BE SOLD.

Damage suits, a falling off in business and the very heavy expense of litigation in which the East Oakland Electric Railway Company has been involved have compelled the receiver who was appointed three years ago to issue receiver's certificate for \$18,000, which represents the excess of expenditures over receipts in that time. The California Safe Deposit & Trust Company recently foreclosed in behalf of the bondholders but the date of the sale has been deferred by mutual agreement of the interested parties.

W. G. Cummings, superintendent of the Newcastle (Pa.) Traction Company was arrested for "disorderly conduct" which consisted in posting bills in the interest of the company on the company's poles.

## THE TELEPHONE IN CONNECTION WITH WHEATSTONE BRIDGE FOR SHOP MEASUREMENTS.

Measurement of resistance of motor field and armature coils in electric railway shops has in the majority of cases in the last few years we believe been done by the drop of potential method by using a low reading voltmeter to measure the drop of voltage between the terminals of the coil to be measured and sending a heavy current through the coil. This method, employing as it does, nothing but portable instruments which can be handled by ordinary employes around the shop has found favor because it is the one most likely to give fairly accurate results under all circumstances. The laboratory method of using a Wheatstone bridge for resistance measurements has been used to some extent in electric railway shops but in general has been looked upon as less desirable than the voltmeter method because a galvanometer is commonly employed in connection with it and the magnetic disturbances around the plant make the action of a galvanometer anything but certain and not very conducive to the good temper of the operator. If however a telephone receiver be substituted for the galvanometer of a common Wheatstone bridge, the bridge



method becomes much more reliable for practical work. The principle of the Wheatstone bridge is well known and the accompanying

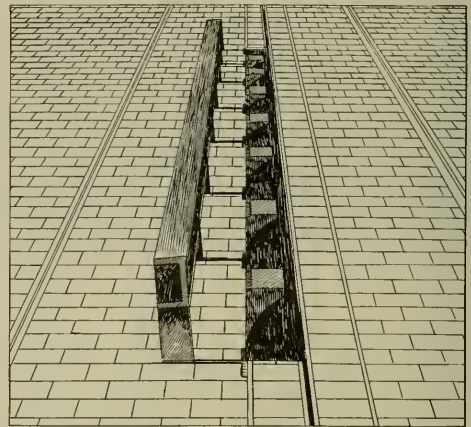
diagram will make it plain to those not familiar with it. A and B are two equal resistances. In series with A is the coil the resistance of which is to be measured. In series with B is a box of resistance coils of known resistance which can be varied at will. The current from the battery shown then has two available paths, one through A and the unknown resistance, the other through B and the known resistance. It is now evident that if the unknown resistance to be measured and the known resistance opposite to it are exactly equal the two circuits are in perfect balance and an equal current will flow through both of them. If when they are in such balance a delicate galvanometer or a telephone receiver be connected across between c and d no current will flow through such instrument. But if the resistances are unequal then the two circuits are out of balance and current will flow through the telephone receiver one way or the other because there will be a difference of potential between the points c d of the circuit. It is only necessary then when testing the resistance of a coil to change the variable known resistance until it is just equal to the unknown resistance. When this point has been reached it is made evident by the fact that no click is heard when the telephone circuit is closed at c indicating that no current flows through the telephone circuit. The resistance of the coil is then of course known to be just equal to that of the known resistance against which it is balanced.

As long as a galvanometer is used to determine when the electrical balance has been secured there is much uncertainty in its action around a shop where there are heavy currents and large magnets near by. Much of this uncertainty is eliminated by the substitution of a telephone receiver for the galvanometer as the receiver is not influenced by external

magnetism to any extent. The Wheatstone bridge is thus made a practical shop instrument, and in some cases it will probably be found more satisfactory than the voltmeter method which requires heavy currents—these heavy currents being usually obtained from a 500-volt circuit, which voltage is unpleasantly high for some classes of shop testing. The bridge involves the use of only a small battery, a telephone receiver and a box of calibrated resistance coils. Great care must be taken with the contacts, a care not so necessary with the voltmeter method. Each method has its proper place. The bridge with telephone is used in the shops of the Omaha & Council Bluffs Railway & Bridge Company of which W. S. Dimmock is general superintendent and Israel Lovett electrician.

## A HINGED CONDUIT.

In the construction of a conduit on an electric system the tendency is to make it considerably smaller than in the cable construction. This makes drainage, cleaning and repairs to the conductors difficult. The experience has been in some places that sand, dirt, snow and rubbish on the streets work into the conduit and in this is difficult to remove. The conduit system has been in operation for some time in Blackpool, England, and trouble resulted from the above causes. To obviate these difficulties the electrical engineer designed a conduit so that one of the slot rails could be hung on hinges. A short section of this style of construction was put down



SINGLE TRACK CONDUIT—HINGED COVER OPEN.

and is reported satisfactory in its operation. It is called the "Mapple" hinged conduit system, the designer giving his name to it.

The cut shows the manner in which the slot rail may be raised and the whole conduit exposed. One side of the slot rail is hinged to the the yokes and is divided up into convenient lengths, 6 ft. or more. When the conduit is closed the rail is keyed firmly in position so that there is no danger of its accidentally getting out of place.

Negotiations are pending for the consolidation of the People's Railway and the City Railway, of Dayton, O.



## STREET RAILWAY LAW.

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

*Rights of Electric Railway and Traveler in Street.*

An electric street railway has no right to the use of the street as a highway superior to that of a person driving on such highway.

The Court said in part:

In the defendant's argument there is one claimed rule of law underlying it, which runs all along through, and upon the correctness of which its claims upon both these classes of assigned errors must stand, if they can be sustained at all. The court had held that the plaintiff had the same right to drive his wagon in Congress street that the defendant had to propel its cars there; that the defendant had no right to the use of the street as a highway superior to that possessed by the plaintiff or any other traveler. To this rule the defendant objected, and in its brief the objection is stated in this way: "We complain that the court, in weighing the conflicting evidence in this case, denied to us the benefit that arises out of the proposition that the defendant's right to the use of that portion of the highway occupied by its tracks was superior to that of Laufer's at the time he turned over upon the east-bound track." All the assignments of error in the two classes which we are now considering are framed upon the theory that the proposition so stated is correct in the law. If, on the other hand, the rule applied by the court is the right one, then the defendant has nothing in this part of the case of which it can justly complain. In its argument the defendant has sought to enforce the correctness of its proposition in various ways, and to strengthen it by the citation of authorities. In some parts of the argument it is stated as though the defendant, as a corporation, had a superior right to the highway over other travelers. This claim cannot be supported, as the charter of the defendant gives it no such superior rights. Its charter authorizes it to lay its tracks in the streets, and to run its cars over them for the carrying of passengers, but gives no rights in the streets greater than an omnibus company engaged in the same business would have. The streets of Bridgeport are public highways. They have been made such by appropriate proceedings. Every traveler has an equal right therein, and to every part thereof, with any other traveler. The legislature could not give to the defendant any right superior to that of other travelers in any part of a public highway, even if it should make the attempt, without providing that such superior right be taken by condemnation, and the payment of damages to the land owner. It is sufficient for the present purpose to say that it is not claimed the legislature has attempted to do any such thing. In other parts of the argument the claim is stated as though a car of the defendant, while passing along a street, had a right upon its tracks superior or paramount (the latter word being used in the sense of the former) to that of other travelers. But if the defendant, as a corporation, has no right in the street superior to that of any other traveler, it is certain that one of its cars has no such superior right. Congress street, in the city of Bridgeport, is a public highway. It is such a highway, because, and only because, every traveler has an equal right in it with every other traveler. If a car of the defendant has in that street any right superior to the right of the humblest person who has occasion to travel in it, then it is not a highway. A highway is a public way

open and free to any one who has occasion to pass along it on foot, or with any kind of vehicle. In every highway the king and his subjects may pass and repass at pleasure. 3 Bac. Abr. 494; Holt, C. J., in *Reg. vs. Saintiff*, 6 Mod. 255; 4 Vin. Abr. tit. "Chimin Common"; 1 Swift, Dig. 106; 3 Kent, Comm. \*132; Ang. High. Sec. 1, 2; *Harding v. Medway*, 10 Metc. (Mass.) 469; *State v. Harden*, 11 S. C. 360, 368. The late Chief Justice Butler, in a case tried a few years before his death, where a collision in a highway between a heavily loaded team and a light wagon was the subject of inquiry, charged the jury in this way: "In the actual use of a common and public highway, every person has an equal right to use it for his own best advantage, to suit his own convenience or pleasure, but at all times with a just regard to the like rights of every other person. So far as rendering himself liable to damages is concerned, a man may drive fast or slow, with a light wagon or with a loaded team, with a well-broken horse or with an ill-broken one, along a crowded thoroughfare as well as a vacant street, provided he does not interfere with the just rights of any other person. If a man wishes to drive fast, he must do so with respect to the rights of those who drive slow. If he desires to drive slow, he must do so with respect to those who desire to drive fast. The loaded team and the light wagon must each pay a due regard to the rights of the other. If one drives in a crowded street, he must exercise care not to endanger other travelers. If he drives an ill-broken horse, he must keep it so well in hand as not to expose others to unreasonable hazard." This is an accurate statement of the law, when applied to the different forms which travel in a highway may take. At that time electric street cars were not known. But the rule so given has only to be extended a little to include such cars. They have a common right in the highway with every other traveler, and they must be so managed as not to interfere unreasonably with the like rights of others. Every person, in the use of a highway, is bound to use it with reasonable care. A traveler and a railroad company, when using a public highway in common, must each look out for the presence of the other,—the one, to avoid being injured; the other, to avoid inflicting injury. *Hanlon v. Railway Co.*, 104 Mo. 382, 16 S. W. 233. The strongest case cited by the defendant on this part of its argument is *Ehrisman v. Railway Co.*, 150 Pa. St. 180, 24 Atl. 596, where it is said that the electric car in the street has a superior right over that of the traveling public. But in what the superior right consists is explained in another part of the opinion, i. e. that it is the duty of a foot passenger, or of one using a horse and wagon, to afford the car an undisturbed passage along its track; that is to say, that the car should be allowed the preference, in passing along on its track, over other travelers. This duty is no more than the application of the rule of reasonable care. In the exercise of reasonable care, it would be the duty of a foot passenger or of the light wagon to turn out of the way of the car with all reasonable quickness, so that the car would have an unobstructed passage. The car, from its weight, size, and the character of the track on which it runs, cannot turn out; and so reasonable care requires the traveler, who can readily turn out, to do so, and

that the car, which cannot turn out, shall be so managed as to afford such traveler a reasonable opportunity for that purpose. An electric car has no paramount right to the street, if "paramount" means that it has a greater right than others who are in the street. "Whenever a wagon or other vehicle is on the track in advance of a car, it is bound to get out of the way, and not obstruct the passage of the car." *Railway Co. v. Whitcomb*, 66 Fed. 915, 920. "The public have the right to use these tracks (the street railway tracks) in common with the railway companies, and \* \* \* it is the duty of passenger railway companies to exercise such watchful care as will prevent accidents or injuries to persons who without negligence upon their own part, may not at the moment be able to get out of the way of a passing car." *Gilmore v. Railway Co.*, 153 Pa. St. 31, 33, 25 Atl. 651. "The citizen has the same privilege to use the street for travel that the street railway company has for propelling its cars thereon, and the railway company has apart from its franchise to lay its rails, no right to the use of the street as a highway superior in any degree to that possessed by the humblest individual. The franchise to lay its rails upon the bed of a public street gives to the company no right to the exclusive use of that street, and in no respect exempts it from an imperative obligation to exercise due and proper care to avoid injuring persons who have an equal right to use the same thoroughfare. It is bound to take notice of, recognize, and respect the rights of every pedestrian or other traveler; and if, by adopting a motive power which had increased the speed of its cars, it has thereby increased, as common observation demonstrates, the risks and hazards of accident to others, it must, as a reciprocal duty, enlarge to a commensurate extent the degree of vigilance and care necessary to avoid injuries which its own appliances have made more imminent." *Cooke v. Traction Co.*, 80 Md. 551, 554, 31 Atl. 327. "The right of the railway in the street is only an easement to use the highway in common with the public. It has no exclusive right of travel upon its track, and it is bound to use the same care in preventing a collision as is the driver of a wagon or other vehicle." *Rascher v. Railway Co.*, 90 Mich. 413, 51 N. W. 463. "Although, as has been seen, the public have a right to use the whole of the street for travel, and the fact that a portion of it is occupied by the tracks of a street railway company does not deprive them of this right, and they can exercise it in common with the street railways, yet there is this exception: that, as the street railway car cannot leave its track to turn out, it has a paramount right to use that portion of the streets covered by its tracks, but only in so far as that it is the duty of the other teams or travelers to turn out in reasonable time to allow the electric car to pass and avoid accident. The motorman of a car, however, if he sees that the traveler is not turning out, must, on his part, do what he can in the way of stopping the car to avoid collision." *Crow. Electricity*, Sec. 741; *McGee v. Railway Co.*, 102 Mich. 107, 112, 60 N. W. 293; *Montgomery v. Railway Co.*, 103 Mich. 46, 61 N. W. 543; *Beach, Contrib. Neg.*, Sec. 89; *Adolph v. Railroad Co.*, 65 N. Y. 554; *Barker v. Savage*, 45 N. Y. 191; *Belton v. Baxter*, 51 N. Y. 245; *Quinn v. Railroad Co.*, 134 N. Y. 611, 31 N. E. 629; *Carr v. Railway Co.*, 163 Mass. 360, 40 N. E. 185; *Railroad Co. v. Hanlon*, 53 Ala. 70, 81; *Shea v. Railroad Co.*, 44 Cal. 414, 428.

We think the word "superior" or "paramount" when used in the cases cited by the defendant as descriptive of

the rights which an electric car has in a street, means no more than is said in the quotation from *Croswell on Electricity*; that is, that the right which such a car has in a street is only that other travelers shall turn off from its track in reasonable time to allow it to pass, but that the car itself must be so managed as not to do any unreasonable injury to other travelers, and must be stopped if it appears that the other traveler is not turning out. And then the difference between those cases and the cases cited by the plaintiff is in the form of expression and not of real meaning. All the cases then mean the same thing; that is, that the right which an electric car has in a highway is not in its nature higher than the right with the others, in the exercise of which the electric car and the other traveler shall so conduct themselves as not to interfere unreasonably with the just rights of each. *Butler, C. J.*, in the passage above quoted, said that, in the exercise of their common right in a highway, "the loaded team and the light wagon must each pay a due regard to the rights of the other." So the electric car and the other traveler must each pay a due regard to the rights of the other in the exercise of their common right to use the highway. We are very clear that the defendant's argument in this behalf cannot be sustained, and that the court committed no error in holding that the right of the defendant in Congress street at the time of the accident was, in contemplation of the law, no greater than the right of the plaintiff.

(*Supreme Court of Connecticut, Laufer v. Bridgeport Traction Co.*, 37 Atlantic Reporter, 379.)

#### *Motorman Confronted with Sudden Emergency.—Error of Judgment.*

A railway company is not responsible for an accident resulting from an error of judgment on the part of a motorman during an emergency brought about by the carelessness of the plaintiff's intestate. In such a case, where the negligence of the deceased, in the first instance, is fully established, and the subsequent carelessness of the motorman, resulting in the accident, depends upon doubtful and conflicting evidence, the defendant is entitled to have the jury fully and explicitly instructed as to the rule of liability above stated; and failure on the part of the trial judge to give such instruction upon request is reversible error.

(*New York Court of Appeals, Bettenger vs. Cross Town Street Ry. Co.*, 17 New York Law Journal 491.)

#### *Erection of Trolley Poles—Effect of Ordinance Requiring All Wires to Be Underground.*

Acts 1890, c. 271, amending the charter of the Baltimore City Passenger Railway Company, and authorizing it to use improved methods of traction, and any system of propulsion which the mayor and council may authorize other corporations to use within the city, when supplemented by Acts 1892, cc. 210, 232, authorizing other companies to use the trolley system, authorizes such company to erect trolley poles in streets, since they are a necessary part of such a system.

Acts 1890, c. 370, giving the mayor and council of Baltimore power to require all wires to be placed underground, does not authorize the erecting trolley poles in the streets under a charter power to use the trolley system, where the city council has taken no action under such act as to trolley wires.

(*Court of Appeals of Maryland, Hooper, Mayor v. Baltimore City Passenger Ry.* 37 Atlantic Reporter, 359.)

## ADVERTISEMENTS IN STREET CARS.

It is presumable that the value of space in and on street cars for advertising was first thought of in connection with the signs and placards which envelop the old omnibuses especially those in London. The street cars in the United States were not extensively used as a medium of advertising until the last six or eight years. At first this privilege was let to advertising firms at a ridiculously low sum but the street railway companies soon realized the possibilities of such a source of revenue. As soon as the first contracts expired a great many of the companies in the large cities managed the advertising in their own cars. Advertisers were not slow to recognize the value of this medium. Thousands of persons were on the cars each day and as a rule there was nothing to hold their attention. Anything that would catch the eye was sure to make an impression on the minds of those going to and from work or on business and especially women on marketing and shopping tours.

Then the question came up, where to place the advertisements and where they should be forbidden as it would not do to make the handsomely painted and decorated cars unsightly by putting signs promiscuously on the inside and outside. It was found that the most conspicuous and convenient place in the cars is in front of the panels between the side windows and the ventilating windows of the cars. Strips are so fastened to permit cards, upon which are printed the advertising matter, to be held in front of panels. The cards average 11 x 21 in. although in some of the newer and more commodious cars there is room for placards 16 x 24 in. The length is not arbitrary but a standard is adopted probably to give uniform rates in advertising and perhaps to make the arrangement more pleasing to the eye. In the largest cities the rate for such sized cards is about 1½ cents per day per car and a contract is signed for three, six or 12 months. Hand bills are sometimes hung up so that each passenger may tear one off and read it at his leisure. Placards are also hung on the strap rail. On the outside of the cars banners may be fastened to the roof, hangers attached to the dashboard and tin signs tacked to the step risers and illuminated signs are sometimes hung on the trolley cars at night. When a circus or other great attraction comes to a town for a day or two not unfrequently whole cars are rented, gorgeously decorated and run over the whole system without accepting passengers. For such concessions as these street railways often receive fancy prices.

### CAR ADVERTISING ABROAD.

Information has been available from numerous tramway companies in Europe in regard to their advertising. W. Berghaff, of the Berner (Switzerland) Tramway-Gesellschaft, says that an advertising agency attends to the letting of space and placing the signs. The size of the signs is regulated by the manager of the railway company but the construction and material of the signs which are made of wood, pasteboard, glass engraving, etc. are left to the agency. The places available for signs are the rectangular panels above the windows, the panels above the doors, the ceilings except the space occupied by the time tables, the ceilings of the platform roofs, the window panes and the roofs of the cars. The system was inaugurated seven years ago and while there was some adverse criticism in the papers

yet the patrons soon became accustomed to the signs and no objection is now made.

In the future there will be no more signs on the tram-cars in Barcelona, Spain, for in the opinion of General Manager Morris such advertising does not pay.

Quite in contrast to this opinion is that of the secretary of the Dublin United Tramways Company who thinks that advertising is most remunerative and causes little trouble or expense, and this company has had an experience of 20 years in this line. The company deals with the advertisers direct through a separate department of its staff. On the inside of the cars cards are affixed to the roofs on frames and transparent labels are fastened to the window panes; on the exterior, boards are attached to the hand-rails and on the risers of the roof stairs. The outside advertisements are painted on boards supplied and fixed by the company and the inside cards and transparencies are supplied by advertisers, subject to the company's approval. The rates vary slightly, averaging for outside boards about £4 per annum each and for cards, labels, etc. 10s. per car. The contracts are generally for a term of three years.

The Allgemeine Lokal- und Strassenbahn-Gesellschaft,



ADVERTISING ABROAD.

Chemnitz, Germany, has permitted placards on and in the cars since the lines were started in 1880. On the inside the roof is covered with advertising and in two windows on each side of the car ground glass signs are hung. On the outside the doors are available and on exceptional occasions, such as horse races, shows, etc., special posters are carried under the windows. The advertisements must be well printed and neat in appearance and must not contain anything indecent or illegal. The contracts are usually made for one year. Advertisements which do not look well or show age the company has a right to remove by the terms of the contract. The advertisements are printed paper mounted on card board, enameled metal plates and painted metal signs.

The Hamburg-Altonaer Trambahn-Gesellschaft does all its advertising through an advertising agency and this plan has been in operation since 1887. Cards and signs of paper board are permitted on the inside and on the rear end of the outside of the cars. The contracts hold for five years.

On the municipal tram-cars of Glasgow no advertisements are permitted.



The London Street Tramway Company lets the advertising privilege to an agency for a lump sum per year which amounts to about 15 per cent of the net advertising receipts. Medical signs are not allowed nor anything which is objectional to public morality although no interference has ever been necessary in this respect. The inside panels of the roof, the outside of the cars and the tops of the windows are occupied by transparencies. For 25 years this system has been in practice and has given satisfaction.

The Liverpool Overhead Railway Company, ever since its opening in 1893, has granted the advertising franchise to an agency. Signs of galvanized iron and card board are permitted on the inside panels of second class cars only and in no case are the windows covered. General Manager Cottrell considers that all advertising inside the cars should be reduced to a minimum as at best it is objectionable.

The City of Birmingham Tramways Company turns its advertising business over to an agency for a fixed rental per annum. This one advertising firm in Birmingham holds such rights on cars and omnibuses in 30 cities in England which indicates that the transportation companies do not as a rule conduct this part of their business for themselves. In Birmingham the advertising cards and signs are placed both on the inside and on the outside and vary in size and material. The rates depend on the position, size and artistic taste of the signs and the districts through which the cars run.

The cut represents a London car with advertisements on the outside. All the advertising of this line of cars, as well as that of nearly every other system in London is handled by an agency. The entire cost of preparing, painting and maintaining advertisements is borne by the company except preparing cards, bills, glass and enamel plates. Any gold leaf work or illustration is charged at actual cost. For a sign board, 22 in. by 14 ft., the charge would be \$80 a year. Painted staircase bands, 12 in. by 4 ft., cost \$40 per annum; step risers, 7 by 15 in., \$1.25, and cards on the inside, 8 by 25 in. or thereabouts, \$3.50 per year. Special terms are quoted in proportion to the amount and length of contract.

Although advertising has not been successful everywhere yet it can hardly be questioned that in a prosperous and populous community it is a valuable medium to the advertisers and can be made a source of considerable revenue to the street railway companies.

### CONSOLIDATION IN BALTIMORE.

After discussing consolidation for several years a satisfactory arrangement between the Baltimore Traction Company and the City & Suburban Railway Company was reached and the deal completed on June 17. The new company, which is known as the Baltimore Consolidated Railway Company, has an authorized capital of \$10,000,000, and a mortgage has been executed to secure an issue of \$12,000,000 of bonds which will be exchanged for the obligations of the old companies as the latter become due. The total mileage of the Consolidated is 184.34 miles. The officers are Nelson Perin (president of the City & Suburban), president; William A. House (president of the Traction), vice-president and general manager; F. S. Hambleton, treasurer; T. C. Jenkins, secretary.

One of the first changes made by the Consolidated was to abolish the sale of six tickets for 25 cents; this rate was established by the City & Suburban before the fares to out-

lying points were reduced from 10 to 5 cents and it was found that the burden was too heavy and constantly increasing. Transfers will also be limited to a single transfer for each fare, and the routes rearranged so that all portions of the city may be reached with the one transfer. This step was necessary because of the abuses to which the old system was subjected by passengers who took advantage of busy hours to give the conductor old tickets.

### J. E. GRIST.

James Edward Grist, mechanical engineer and superintendent of the Pennsylvania Iron Works Company, Philadelphia, died on May 23, of Bright's disease.

Mr. Grist was born in Wolverton, England, in October, 1854, and was the son of B. W. Grist, vice-president and general manager of the Pennsylvania Iron Works Company. He came to this country with his father at an early age. After a preparatory education and studies under private tuition, he entered the shops of his father at Reading, Pa., where he remained until he had served his apprenticeship. Developing marked ability in this direction, he



JAMES E. GRIST.

rose rapidly until he obtained the position of the superintendent of the shops. In 1887 the firm of B. W. Grist & Co. was consolidated into the Pennsylvania Iron Works Company, Philadelphia, and Mr. Grist was offered and accepted the position of superintendent of that company, which position he held with merited success until 1894 when he resigned to accept the position of mechanical engineer and superintendent of motive power and mechanical equipment of the Philadelphia

Traction Company which position he held for two years, when he resigned to accept the position of engineer-in-chief of the Pennsylvania Iron Works Company, which desired his services in the construction of several very large steam and power plants which it was erecting. He conducted this work up until the time of his death. Mr. Grist was a great student, having taken a special course in mechanical engineering and higher mathematics at the University of Pennsylvania under the tuition of Prof. Goodspeed.

His loss will be keenly felt by the many who knew him, as he was not only congenial but, having a fund of information at hand, a most interesting companion, and his death has caused a vacancy in the profession of his choice which it will be hard to fill.

The Pennsylvania Railroad Company made an effort to prevent the East Penn Traction Company from laying its tracks along Bridge street in Morrisville, Pa. The city authorities granted to the street railway company a franchise along this street, and the citizens are very desirous of having the line constructed. The Pennsylvania sent 200 Italians and yard men to interfere with the workmen of the Traction Company, but the street railway men held their ground and the work continued.

## SOME REMARKS ON STREET RAILWAY REPAIR SHOP MANAGEMENT.

BY FRANK B. PORTER.

In order to successfully operate street railway repair shops, all methods of procedure should be reduced to system, after it has been demonstrated that such methods are applicable, and effect a saving in time or labor. Let us consider a few of these methods which have been commended and adopted by some systems, but which, in the large majority of repair shops, have not been tried.

In nearly all shops the larger and more expensive tools used in setting up the motor, are kept in stock and furnished to the workmen, such as chain blocks, chain block stands, armature slings, special large wrenches, etc., but it is usually customary for the repair men to furnish individual tools, smaller tools that come into more frequent use, as pliers, hammer, screw driver, etc.

It has, however, been the writer's experience that many men when hired come to work with a very limited supply of tools, which is naturally to be expected, as extra men are employed when there is a rush of work, such as changing over from summer to winter cars, and vice versa, and a month afterwards, when the work is completed, discharged. This also happens at the close of a busy season, on the adoption of an improved motor with less wearing parts, on retrenchment by the management, etc., consequently an employe feels that he cannot afford to fully equip himself with tools. He borrows until he has some assurance as to the permanency of his position. The old hands, however, gradually acquire the needed supply, hence, when a crew (usually two men, one being in charge) is sent to repair a motor, or truck, change an armature, or put on new brakeshoes, there commences a hunting for a certain sized wrench they lack, a borrowing of this or that tool from some one else, which consumes time that might have been employed in doing the work. Twenty minutes is sometimes spent in this manner and the repairs made in ten, after what is wanted is found. There exist shops in which, without exaggeration, one-third of the working day is spent in the getting together of the tools and material required on the work of the other two-thirds. This is plainly a waste in efficiency of the working force. More men are employed under this condition of affairs than would be needed if each man's time was utilized in actual repairing, and consequently the expense of maintenance is largely increased.

I would suggest as the best remedy for this state of affairs, that the management keep in stock, boxes with their necessary equipment of tools, to be furnished and charged up to the repair men, when they are put to work. A number should be painted or stamped on each box, and every tool it contains should be stamped with the same and with the company's name. The shop foreman should inspect these equipments at stated times, say on the first and fifteenth of each month, and a man who was short of the equipment charged to him, if he could not produce the missing tool, or tools, after a reasonable time, should have their actual cost to the company deducted from his pay. Tools worn out, or broken in fair service, without abuse, to be renewed at the company's expense. This latter, however, would prove a very small item. If it is thought best to reduce the force at any time, the equipment of the men who are laid off can be examined, and if found complete, credited to them. They

may then be placed in the storehouse and issued again when necessary. These tool boxes need not be large, expensive affairs, indeed it is preferable to have hand boxes, that the men can take from car to car with them, as they complete repairs on one and are sent to another. They should, however, be provided with lock and key, otherwise the man has no assurance as to the safety of his tools.

As to the number and kind of tools to be furnished, the list here given, while being comparatively inexpensive, will fill the usual requirements. If tools of special design, for work on a certain class of motors are needed, they can be added.

### TOOL LIST.

|                                                        |                                |
|--------------------------------------------------------|--------------------------------|
| 1 Ball-peen hammer.                                    | 1 Screw driver 12-in.          |
| 1 Pair 8-in. side cutting pliers.                      | 1 " " 4-in.                    |
| 1 Monkey wrench 12-in.                                 | 1 Cold chisel 12x 5/8-in.      |
| 1 " " 5-in.                                            | 1 Cape chisel.                 |
| 1 Set double end steel S wrenches, 3/8 to 1 1/4-in.    | 1 Round nose chisel.           |
| 1 Drift punch 1/2-in. steel drawn to 3/8-in. on point. | 1 Key punch.                   |
| 1 Bearing scraper.                                     | 1 14-in. double cut flat file. |
| 1 Oil can, 1/2 pint.                                   | 1 14-in. half round file.      |
| 1 Ball insulating tape.                                | 1 14-in. Stills-n wrench.      |
| An assortment of cotter pins.                          | 4 Motor brush carbons.         |
|                                                        | 4 Two-way connectors.          |

The large tools before mentioned, known as shop tools should be supplied in sufficient quantity so that when several crews want, say a pair of chain blocks at the same time, one would not have to wait on another. Also these tools and appliances should be kept in a certain, suitable place, or places, to which they must be returned when finished with, and not left where last used, as is sometimes the case and which necessitates a hunt.

Again in the matter of material used, there is in most shops a chance for improvement. In many cases when something is wanted, as a gear, or bearing, a repair man goes to the foreman, who gives him an order on the storehouse, but should this foreman happen to be out on the road, trying a car, as is sometimes the case, there is a delay and two men may be idle until he returns.

Somewhere in the shop, in which the work is being done, there should be a room partitioned, or fenced off, supplied with the necessary shelves, racks, bins, etc., and used as a sub-storeroom. Let a man be put in charge of this whose business it is to see that the stock is kept up, drawing from the main storehouse. He should not leave this storeroom during the working day, unless someone be first called as a substitute. Here the repair man may come and receive what is needed, upon writing out an order, stating car and truck number for which it is wanted, and also returning the old material which it replaces. It is not good practice to have such a storeroom with no one in charge, allowing the men to go in and help themselves, as is sometimes done, for it is the writer's experience in such cases it is usually in admirable disorder, the hand cannot be laid upon what is wanted and the object of the sub-storeroom, that of speedy supply, largely frustrated. Again such a method is a direct temptation to a man who may want a few bolts or screws, to fix this or that at home, who would never go to the length of presenting a formal, fraudulent order for them.

The person in charge of the sub-storeroom, by means of the order, can also keep account of all material used on the cars, and each car separately, if so desired, and if the duties of his position are not sufficient to keep him fully employed,

he spare time can be utilized in checking up the men's time, etc.

Certainly the foreman of the repair shop should pass on the repairs of each motor and instruct the crew what parts to replace, but in the process of repair, as a bolt or screw may be needed, to chase off after an order from the foreman, whom it may take sometime to find, and then perhaps half a block to the main storehouse after the material, is nonsense and a waste of time that might be more usefully employed.

The practice of keeping a scrap pile of bolts, etc., and having the men hunt it over when in want of a certain sized bolt, or nut, is not to be commended, for the equivalent in money of the time spent in pawing over this pile, would purchase a dozen of the needed bolts. All old material should be taken to the sub-storeroom, as before mentioned, where it should be sorted over and that which may be used again, in case of emergency, placed in its respective rack, or bin, as second hand material, and the rest relegated to the scrap pile, which need never be hunted over, after this sorting. Damaged bolts, or nuts may be sent to the bolt cutter, and when cut over, returned to the sub-storeroom and put in their places in the bolt rack to be reissued upon order.

There should be absolutely no cause for a repair man to spend time in looking for anything, all material being kept at the sub-storeroom, himself having the smaller tools more frequently used, and the other or shop tools being kept in regular places.

By systematically following the above methods, a considerable saving in labor will result, in a few months more than compensating for the slight expense incurred upon introduction.

Another suggestion which the writer would like to make is in regard to personnel of the repair men employed in the erection or dismantling of the motor, such as occurs in changing armatures, fields, gears, etc. It has been before noted that they are usually divided into crews of two men each, one man being the master workman, and the other his helper. The master workman is generally one who has had considerable experience in motor repairing, but usually is not a machinist. The helper, also not a machinist, may have had experience, or may have lately seen a street railway motor for the first time.

When it is necessary to employ men for repairing, and experienced ones are not available, it will be found to the interest of the management to hire mechanics, preferably machinists, if possible. The repairs to street railway motors come largely within the machinist's trade, as the fitting of bearings, gears, keys, etc. The machinist is also conversant with the individual manufacture of each machine part, for he has turned bearings in the lathe, cut gears in the gear cutter, and planed the keys in the planer, or shaper. This preliminary training fits him to easily and intelligently grasp all of the principles of motor repair and turn out better work than the man who has come from other vocations.

It is true that the machinist must also serve a short apprenticeship, in order to learn somewhat of the electrical nature of the motor, the importance of insulation in certain places, an idea of the path of the current through the motor, the characteristic actions of a motor with burnt out armature coil, or short circuited field, etc. After this is obtained he should be advanced to a master workmanship as soon as practical. The electrical knowledge of the repair man in this department usually is and need not be other than meager, for the skilled electrical work does not come within

his sphere of usefulness, the winding of armatures and fields, car wiring, testing, etc., being done in other departments by specially trained men. Four-fifths of his work is that of the machinist. The increase in wages demanded by trained help would be more than compensated for in the ultimate improved character of the work turned out. A permanent master workman's helper, however, need not be a machinist, but a bright man with good mechanical ideas, and a fair amount of manual dexterity, and there is, or should be, a difference in the wages received by workman and helper.

In the round house of some street railway repair shops, where untrained men have been employed, it has been found expedient to employ a machinist as a fitter and inspector. Each crew summons him when something is to be fitted, as a gear or bearing. This is done by him, or under his direction, he also inspecting all work before it is pronounced completed. This method may commend itself to some.

Still another idea, which will be found advantageous in practice, is the carrying of an extra list of repair men, similar to the extra list of motormen and conductors, though certainly on a smaller scale, proportionate to the number of men employed on repairs. These extras to report to the master mechanic, or assistant, at a stated time, morning and night, then if there are vacancies in the shop force by reason of sickness, or otherwise, the place of the missing man can be supplied, and in this connection it may be stated that the writer has known of many instances where a repair man after working from 7 a. m. to 6 p. m. during the day, has been called upon to return and work 10 hours that same night, in place of a night man who was sick; he is aware of a case where a man was discharged for refusing to return. This is bad practice, and under proper management unnecessary. It is not to be supposed that a man who has worked 10 hours at fatiguing work during the day, can do justice to his work for another 10 hours the same night; it will necessarily be slighted. A fresh man should be available and the company is the gainer, the wages presumably being the same in each case.

In cases of severe storms, when many motors are crippled, the force of extras may be called upon if needed, also at times of special work, as the changing over from summer to winter equipment, before alluded to, and upon any permanent vacancy in the shop, there is a trained man ready for the place, the oldest extra receiving steady employment.

Again in many street railway repair shops, it is customary to have seven working days in the week. It is doubtful if this is necessary. If the work cannot be done in six days, by working all the extras Saturday it seems as if the shop might be closed on Sunday. This would also be a matter of economy, for the increased expense incurred by reason of a few extra men working Saturdays, would be more than counterbalanced by a saving of one-seventh in the shop pay roll, caused by stopping all work one day. That the men would return to work Monday morning in much better condition for another week's labor, it is needless to argue.

It might be found desirable to keep a wrecking crew in attendance Sundays, in case of a blockaded line, by reason of cars off of the track, etc., but it is not a necessity, for in some systems the wrecking car is placed in the car house Saturday eve, and if called out Sunday is manned by the foreman of the train crews and some of his assistants. The getting of a street car on the track requires but little training or experience. After a few trials the motorman, with



the proper equipment of jacks etc., contained in the wrecking car, is as expert as the shop hand.

Certainly if men are worked 10 hours at heavy, laborious work, they should have one day off in seven, and if the management requires the presence of all on Sundays, they should be granted a day off during the week, a systematic routine being followed. Here again is seen the convenience of having an extra list.

The improvement in methods of shop management here noted are practical and easily applied, and will be found to effect a saving, both in efficiency of the work of the men, and the cheerfulness and care with which the work is performed.

## MINERAL PRODUCTS OF THE U. S.

The Department of the Interior has recently published a table showing the quantity and the value of the minerals mined in the United States for the calendar years from 1887 to 1896, inclusive. A comparison between the present production and that of 10 years ago for a few of the more important products may be of interest.

|                                                     |             |                  |
|-----------------------------------------------------|-------------|------------------|
|                                                     | 1887.       | 1896.            |
| Pig iron, long tons,                                | 6,417,148   | 8,623,127        |
| Value, dollars,                                     | 121,625,800 | 90,250,000       |
| Per ton,                                            | 19.00       | 10.46            |
| Copper, pounds,                                     | 185,227,331 | 453,007,139      |
| Value at New York, dollars,                         | 21,115,916  | 48,698,267       |
| Per pound,                                          | .114        | .107             |
| Aluminum, pounds,                                   | 18,000      | 1,500,000        |
| Value at Pittsburg, dollars,                        | 59,000      | 520,000          |
| Per pound,                                          | 3.28        | .40              |
| Bituminous coal, short tons,                        | 87,887,360  | 136,868,069      |
| (Including brown coal and lignite<br>Pennsylvania.) |             | mined outside of |
| Value, dollars,                                     | 98,004,656  | 114,141,864      |
| Per ton,                                            | 1.115       | .834             |
| Pennsylvania anthracite, long tons,                 | 37,578,747  | 48,010,616       |
| Value, dollars,                                     | 84,542,181  | 81,415,785       |
| Per ton,                                            | 2.25        | 1.69             |

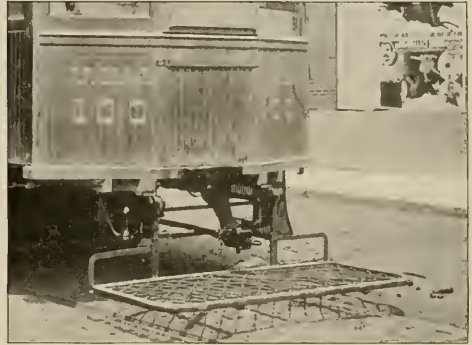
## BEVEL GEAR BRAKE HANDLES IN VESTIBULES.

The Des Moines City Railway has a bevel gear brake wheel and handle in its vestibuled cars that works so nicely as to almost be an improvement on the common lever brake. To avoid having the vestibules project out in front of the dash to provide for the brake handle as is usual when the dashboard is retained on cars provided with home made vestibules, the brake wheel and handle is placed close up against the vestibule wall with its axle horizontal and the brake staff is geared to it by a bevel gear. It is found by having the brake wheel in this position that it is easier to handle quickly than when worked in a horizontal plane. The bevel gear works very easily and each journal is provided with two bearings, one on each side of each gear wheel, so that the arrangement is thoroughly substantial. Of course the brake was put on in the first place to secure more room in the vestibule and to provide against the necessity of making a projection in the vestibule, but at the same time another desirable point seems to have been secured, viz., ease and rapidity of operation.

On June 5 the Rockford, Ill., street cars were turned over to the Ladies' Aid Society and the latter netted nearly \$1,000.

## FENDERS AT YOUNGSTOWN.

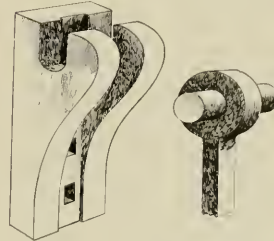
The half-tone illustration represents the type of fender which has been applied to the cars of the Youngstown (O.) Street Railroad Company. There is a great variety of platforms on the cars and it was necessary to so design the attach-



FENDER AT YOUNGSTOWN, O.

ment for the fender that it would be interchangeable from one car to another. The cars are not turned around at the ends of the lines and it is necessary for the motorman to change the fender from one end of the car to the other. The two cuts show in detail the malleable iron bracket and the wrought

iron head of the fender iron. From the design it is readily seen the fender can be easily and quickly removed. The fenders are carried from 6 to 8 in. above the rail and cannot be dropped any lower.



The fender proper is made of oak, iron clad at the corners, and the net work is of rope.

In service it seems to answer every requirement. General Manager Anderson wrote that one of the cars collided with a bicycle rider, and both the young man and the wheel were picked up by the fender without injury to either. Only the interurban road between Hazelton, Youngstown, Brier Hill, Girard and Niles is now equipped but the other lines will soon have this type of fenders.

## THE COLOR LINE IN GEORGIA.

It appears that the question of accommodating a mixed population on the street cars is still giving trouble in Georgia. The state law requiring that railroad companies shall provide separate cars or compartments and conductors to assign passengers to their respective cars, and conferring police powers upon them is applicable to street, electric and dummy roads; but apparently this law is not enforced on the street railways as rigorously as some desire and hence dissatisfaction has arisen.

## CIRCUS ADVERTISING AT MINNEAPOLIS.

Last month it so happened that two of the largest circus and menagerie aggregations in the country were billed for Minneapolis at the same time, and this circumstance was the means of bringing in a rather unexpected profit to the Twin City Rapid Transit Company. One circus secured before the other all the bill boards in the city and this forced the tardy one to seek some other form of advertising. Being shrewd advertising managers they naturally looked first to the street railway. It is safe to say that the result as it finally appeared on the streets was fully equal to stationary bill board advertising. Bill boards were made the exact length and height of some of the company's long double truck cars. These when done compared favorably as to size with an ordinary circus bill board and were fastened onto the sides of several long cars. These cars were run through the streets for advertising purposes only and carried no passengers. The bill boards being the full length and height of a car, the combination was a very imposing affair when in motion. The advertisements of the circus were also generously scattered through the regular passenger cars.

## FRANCHISES IN NEW YORK.

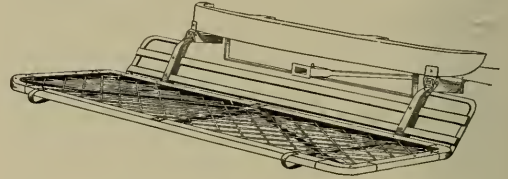
The charter of Greater New York provides that street railway franchises granted by the Municipal Assembly shall not be for a longer period than 25 years, with the proviso that the grant may contain provisions for a renewal at a fair revaluation for another period of 25 years. Grants may also provide that at the end of the term the property shall vest in the city either without compensation being made, or it may provide that the city shall purchase the property at a fair valuation.

If by virtue of the grant or contract the plant and property are to become the city's, without money payment therefor, the city shall have the option either to take and operate the property on its own account, or to renew the said grant for not exceeding 20 years upon a fair revaluation, or to lease the same to others for a term not exceeding 20 years. If the original grant shall provide that the city shall make payment for the plant and property, such payment shall be at a fair valuation of the same as property excluding any value derived from the franchise; and if the city shall make payment for such plant and property it shall in that event operate the plant and property on its own account for at least five years, after which it may determine either to continue such operation on its own account, or to lease the plant and property and the right to use the streets and public places in connection therewith for limited periods, in the same or similar manner as it leases its ferries and docks. Every grant shall make adequate provision, by way of forfeiture of the grant or otherwise, to secure efficiency of public service at reasonable rates, and the maintenance of the property in good condition throughout the full term of the grant. The grant or contract shall also specify the mode of determining the valuations and revaluations therein provided for.

It is claimed that by the terms of the charter the present Board of Aldermen is deprived of its power to grant franchises and that there can be no more grants until the Municipal Assembly goes into power on January 1, 1898, which is to the disadvantage of roads seeking extensions.

## THE BUFFALO FENDER.

The fender herewith described is one designed by R. Dunning, master mechanic of the Buffalo Street Railway Company and has a very creditable record. The cut shows the netting and the frame work which is 2 ft. 5 in. by 6 ft. 2½ in. The frame is made of second growth of hickory, 1½ x 1½ in., with light malleable iron corners. All parts of the frame work are sawed and tenoned to templates or gages so that all parts are interchangeable. The rope used as netting is known as ¼-in. ratline and is very cheap and durable. The support to which the netting frame is bolted



is made of crucible steel, ¾ in. x 2 in., the upper plate being 5 ft. 1 in. and the lower one 3 ft. 9 in. long. These plates are easily bent over a form and the two men are capable of turning out enough in a day for 50 guards. Along the front of the frame and extending 18 in. on each side is fastened a 1½-in. three ply rubber hose by fill bolts spaced 18 in. apart. The pockets which receive the guard are made of malleable iron and are arranged so that the guards are interchangeable on all the cars. On the Buffalo lines the guard is changed from one end to the other at each terminus. This is easily and quickly done and necessitates but one fender for each car. The guard is held about 6 in. above the track. Since the Buffalo cars have been so equipped 323 persons have been picked up safely.

## BACK PAY FOR ALLEY "L" EMPLOYES.

When the Chicago & South Side Rapid Transit Company commenced operation in January, 1893, a sliding scale of wages was agreed upon, the company signing individual contracts with the men. This agreement was not adhered to and in the controversy which followed some of the men surrendered their contracts. When, in 1896, the bondholders brought suit to foreclose, the employes who had retained their contracts petitioned the court to have their claims for back pay made a prior lien on the assets of the company. The decision of the master in chancery to whom the matter was referred is that all employes are entitled to pay for two hours extra per day and those who retained their contracts to extra compensation according to the sliding scale for the term of three years.

## STREET RAILWAY MAIL SERVICE JURISDICTION.

The postal authorities have decided to place all street car mail service employes under the direction of the postmaster of the city in which they are employed. The crews of street postal cars are detailed from the railway mail service but by virtue of this order they will report to the postmaster when so detailed.

THE USE OF ALTERNATING CURRENT.

Comparative Amount of Copper Required — European Dynamo Construction—Some Illustrations of American Dynamo Practice—Lightning Arresters—Types of Transformers—Transformer Losses.

PART II.

In transmitting electrical energy for power purposes single phase alternating currents are hardly to be considered, the choice lying between the two and three phase systems. The weight and cost of generators is nearly the same for each but the copper used in the lines is less for the three phase system as shown in the following table:

|                                         | A | B   |
|-----------------------------------------|---|-----|
| Single phase.....                       | 2 | 100 |
| Single phase.....                       | 3 | 32  |
| Two phase.....                          | 3 | 72  |
| Two phase.....                          | 4 | 100 |
| Three phase (Y connection).....         | 3 | 25  |
| Three phase ( $\Delta$ connection)..... | 3 | 75  |

In column A, the number of wires for the line is given and B indicates the per cent of copper used in the trans-

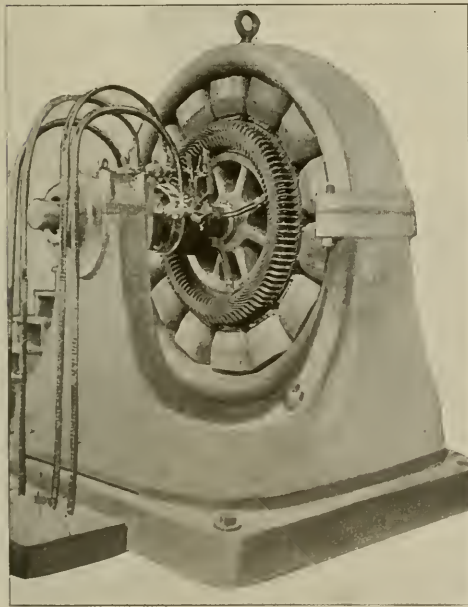


FIG. 8—WESTINGHOUSE GENERATOR.

mission lines, the copper required in the two wires of a single phase system being taken as 100 per cent. In actual practice allowance would be made for the loss due to self-induction and other causes which increase the amount of copper.

An alternating current generator or motor is composed of two principal parts, a stator and a rotor. In the United States the practice has been to make the armature the rotor, or the moving part while in Europe it has been the reverse.

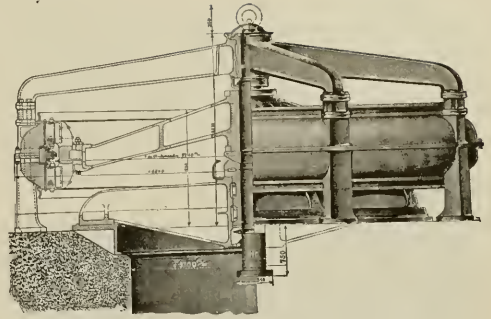


FIG. 9—SECTION AND ELEVATION OF GENERATOR.

At Niagara, however, the armature is the stationary part. The advantage of having the stator for the alternating circuit is that it can be safely insulated for very high voltages.

A Westinghouse type of two phase, steam driven generator is shown by Fig. 8. The laminated pole pieces are built up of steel punchings, riveted together and the yoke is cast solidly about them. The field current is supplied from a rotary transformer and passes through one winding on each pole piece. As can be seen in the cut the armature core is built up on a hub and spider, and contains 92 slots for the bar armature winding. The winding is divided into four parts and connections are made to the four collector rings. This machine has an efficiency of 95 per cent with an output of 400 amperes at 240 volts and a frequency of 50. For the larger sizes of alternators rotary converters are used to excite the fields.

Figs. 9, 10, 11 give a good idea of recent European practice in the construction of three phase generators. These

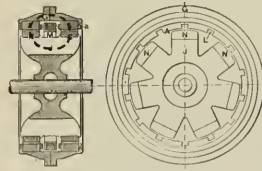


FIG. 10—DIAGRAM OF THREE-PHASE GENERATOR.

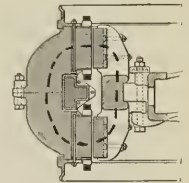


FIG. 11—VERTICAL SECTION.

dynamos are now being put in place at Rheinfelden on the Rhine, where a fall of from 8 to 16 ft. is to be utilized to generate about 11,000 h. p. This installation was recently described in the London Electrician. The current is to be used for lighting and power purposes, a large aluminum and calcium carbide works are now building and electric railways connecting Basle with Zurich and Constance are to be constructed. These different kinds of service had to be considered when designing the dynamos. A frequency of 50 was decided upon and a difference of potential of 3,900 volts for each phase or 6,800 between each pair of mains. The dynamos are of the inductor type and will give 61.5 amperes at that voltage, or 720 k. w. apparently, but with a power factor of .8 and an efficiency of about 92 per cent. No step-up transformers will be used. The 20 machines will be excited by three rotary converters. As shown in the cuts the fields form the rotor and are supported by the verti-



cal shaft running from the turbine. About the armature rings A A, are wound the coils which fill in the slots L L; the exciting coil M, is attached rigidly to the case. Thus the seven pole pieces revolve and the points of highest magnetic induction in the armature change periodically. The displacement of the coils with respect to the poles enables a polyphase current to be collected. The magnetic circuit is indicated by the dotted lines in Figs. 10 and 11.

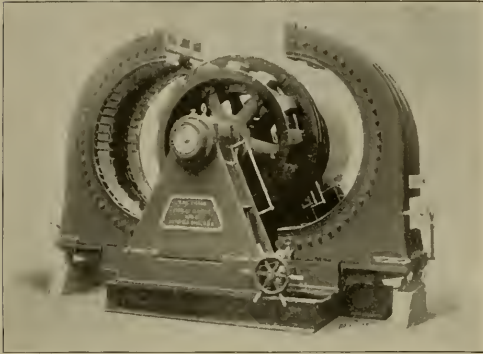


FIG. 12—S. K. C. GENERATOR.

Fig. 12 represents a 600-k. w. alternator made by the Stanley Electric Manufacturing Company with the armature drawn apart. The field coil is wound on a copper spool and is stationary in the center of the machine sur-

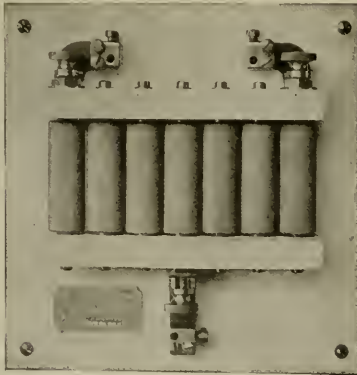


FIG. 13—NON-ARCING METAL LIGHTNING ARRESTER.

rounding the inductor. The stationary armature is made of iron laminae in which are grooves to hold the small coils. This construction permits thorough insulation and the generation of high voltage, as much as 10,000 when desired. By means of levers or wheels the armature may be drawn apart and all the coils made easily accessible. From half to full load these generators have an efficiency of from 80 to 95 per cent and regulate very closely.

Two or more alternate current generators of approximately the same frequency and voltage can be run in parallel and their currents will be added algebraically. They

can not be connected in series because the machine whose electromotive force is lagging will be retarded and fall farther behind until the phase is opposite and no current passes.

The generators in an alternate current system are usually of high efficiency and admirably suited to the work, but as soon as the current leaves the collector rings the serious problems arise for the electrician.

In deciding upon the voltage for the transmission line the additional cost of step-up and step-down transformers for high voltages should be balanced against the added cost of copper for a lower potential. For distances of 10 miles and over it is economical to use a voltage of 10,000 with step-down transformers. If a three phase system be adopted

for transmission the load should be distributed equally between the three branches, not only in size but in kind. A non-inductive load on one wire and an inductive load on the other will cause an unbalancing. However, for street railway work the load on each line would be the same and little trouble would be experienced from this source.

With transmission lines one serious problem has been the protection of the apparatus against lightning. Several arresters have been devised which answer the purpose very well. The Wurts arrester is shown in Fig. 13 and consists of parallel cylinders of "non-arcing" metals, such as combinations of zinc and antimony. When a static discharge takes place the flash is instantaneous and is not followed by an arc. The lightning discharge passes across these air gaps in preference to entering the coils of the machine for these possess great self-induction to a highly oscillatory discharge of lightning. Acting on this principle "choke-coils" are introduced into the line. These consist of a few circular turns in circuit

which have little self-induction with the normal current and frequency, but when a lightning discharge is passing over the line the self-induction becomes very great. Fig. 14 represents a lightning arrester made by the Siemens & Halske Company for alternating currents of high potential. The distance between the wires at the nearest point is about .04 in. for each 1,000 volts on the line. When an arc is formed an ascending current of warm air and the action of the current in the wire cause the arc to rise and break on account of the separation of the wires.

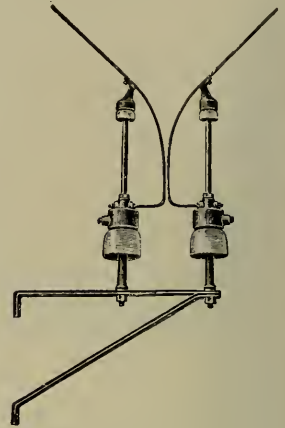


FIG. 14—S. & H. LIGHTNING ARRESTER.

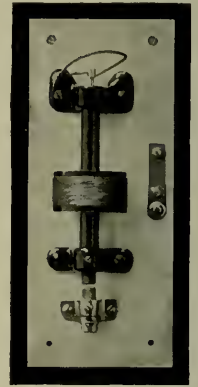


FIG. 15—GARTON ARRESTER.

The Garton lightning arrester is shown in Fig. 15. Its construction is such that it offers to the static discharge a non-inductive path to the earth. It is composed of a solenoid, plunger or armature, carbon discharge points, an air chamber and a non-inductive discharge path. When not in action the arrester carries no current and is alive at the

moment of operation only, when it requires about one-half an ampere for operation. These arresters are made for direct and alternating currents of high and low potential and also for different frequencies. The same principle is involved for the various currents and tensions, the difference in the arrester being only in the adjustment and resistance. A kicking coil is placed between the apparatus and the arrester, i. e. the coil is cut into the main circuit carrying the current, while the arrester is tapped to the feeder or line, on the line side



FIG. 16—G. E. TRANSFORMER COILS.

of the kicking coil, thus the inductive effect of the kicking coil tends to drive back the discharge to the arrester.

While arresters protect the apparatus yet it is desirable, if possible, to keep the discharge entirely off the line and this has been accomplished by running an iron wire on the top of the poles above the transmission lines and grounding it carefully at intervals. This practice has been successful on the Niagara, the Montmorency and other large transmission lines.

Although alternators are designed for voltages as high as 10,000 yet as a rule, step-up transformers are employed to raise the voltage from about 2,000 to 10,000 for the line. At the other end step-down transformers are used to lower the voltage to about 500 for rotary converters or for power purposes. The General Electric type of transformer for long distance work is represented by Fig. 16. This is known as the natural draft transformer and voltages are successfully reduced from 10,000 to 125 without intermediate apparatus. The eight coils are mounted firmly upon an iron base and covered with corrugated iron sheeting. The primary, or 10,000 volt circuit coils are well taped and bound and insulated from each other by thick layers of felt.

Figs. 17 and 18 show the Westinghouse type of self-cooling transformer in which oil is principally relied upon for insulation. The coils are wound with few turns per layer and many layers, being separately insulated and placed vertically in position which arrangement allows a ready circulation of oil at the end of the transformer. The high voltage coils are connected in series and divide the electromotive force among a number of coils, thus reducing the stress within each coil. There are many good features in the use of a first class oil, having a high fire test, as it permeates every crevice between the wires and coils and it does not break or

crack as do other insulators. In large transformers special provision must be made for radiating the heat generated, for the surfaces are quite small in proportion to the power transformed. Some are provided with an air blast or have natural ventilation. When oil is used with an open design of coils and the case is properly formed there will be a steady circulation and the oil will conduct the heat from the wires to the surface of the case.

In the primary circuit, the low voltage coil in a step-up transformer and the high voltage coil in a step-down transformer, energy is consumed, and in the secondary almost an equal amount of energy is produced, the power being transmitted in the form of magnetic lines through the iron core from the primary to the secondary. The transformer is a very efficient piece of mechanism; in the large types but two and sometimes as little as one per cent of the energy transformed being lost.

This is divided up between the  $C^2 R$  loss or the energy lost in heat in the circuit and the heating, resulting from the magnetic reversals in the iron.

The magnetic loss is due to the cross flux between the primary and secondary, surrounding one coil only, without being interlinked with the other. This is but a small por-

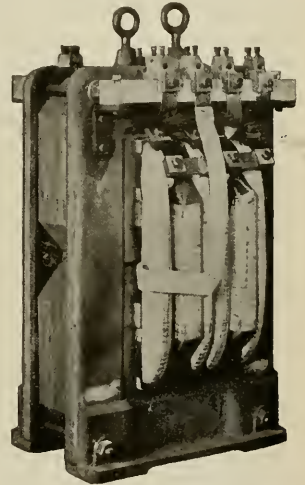


FIG. 17—WESTINGHOUSE TRANSFORMER COILS.

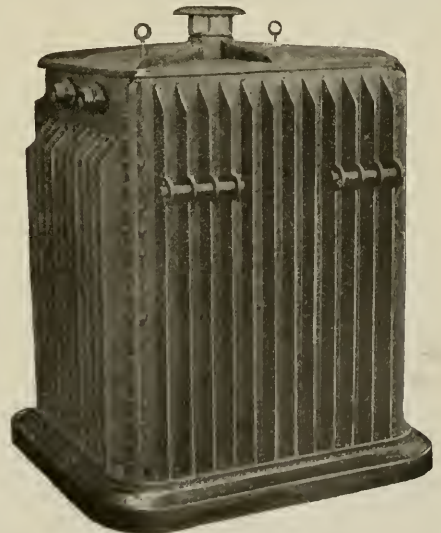
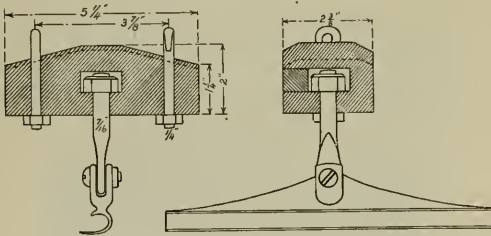


FIG. 18—WESTINGHOUSE TRANSFORMER.

tion of the total flux. The magnetic cross flux is proportional to the current flowing in the circuit and constitutes the so-called self-induction of the transformer. The loss in the iron is practically constant, regardless of the load, for the frequency remains the same but the heating effect in the circuit is proportional to the square of the current. Great care should be exercised in the selection of the iron for the laminated cores, for the core loss may become a considerable factor. Some iron when subjected to alternating magnetism becomes fatigued, magnetically, and after a short interval of service the core loss may increase 25 to 100 per cent. When properly designed, transformers require little attention few repairs, and form the strongest feature about the transmission system. They can be so insulated that enormous potentials, above anything now discussed, can be transformed with safety. Should it be desired to generate the current with two phase machines and have a three phase transmission, as is the case at Niagara Falls, transformers can be designed to receive the two-phase current at, say, 2,200 volts, and transform it into a three phase current of 11,000 volts.

### WOODEN TROLLEY WIRE HANGERS AT DES MOINES.

For about five years past the Des Moines City Railway has had some wooden trolley wire insulating hangers in service, and the results have been so satisfactory that this form of hanger is used on all new work and all repair work on that road. The hanger is the design of W. G. Owens, superintendent, by whose courtesy we are enabled to show the accompanying engraving of one of these hangers



It is made of selected oak and is painted for protection against the weather. A slot is cut in one side into which the nut which holds the clip bolt is inserted. This slot is filled with a tight fitting wood plug. The arrangement is shown by the sections herewith illustrated. A wooden strain insulator is also used by this road. It is surprising how well wood stands up under 500 volts. In some cases this combination of wood trolley wire hanger and wood strain insulator is used on iron bridges with success.

In a suit against the Third avenue road of New York for damages the plaintiff having lost an eye by being struck with a span wire which broke, the decision adverse to the company was reversed and a new trial ordered because of error in the charge of the trial judge. An electric light wire was carried on the same pole which supported the span wire, and it was not proved that the accident was due to any negligence of the railway company.

### KITE CAUSES A BLOCKADE.

About a year ago it was discovered that the cause of trouble which some western roads had with the brakes on their freight cars which did not release properly was due to wasps. The insects deposited their larvæ in the passage through which the air escaped from the cylinder. This was thought to be an extremely novel enemy to railroading, but the Chicago City Railway reports an equally unexpected cause of delay though it is not of the same nature. Recently the wreck wagon was called out to care for an electric car which was reported to "run all right once in a while and then stop altogether." The motors, controller and wiring were inspected and found all right and then the trolley wheel was examined and it was found to be wound about half full of soft cotton twine, part of a kite string that had been picked up. The car would run only when the trolley was pressed to one side so as to let the upper part of the flange of the wheel make the contact.

### MANAGERS EXCUSED FROM JURY DUTY.

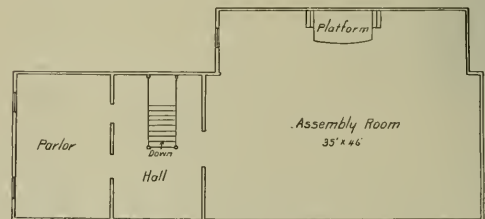
It has been discovered, and the discovery was in the nature of a surprise, that in California superintendents of street railways are exempt from serving as jurors. The statute was first brought to the attention of the court when invoked by E. P. Vining, general manager of the Market Street Railway Company.

### FRANCHISE FORFEITED.

All street railways do not pay and some times they cease operation. One that found the expense of operation too heavy is the Tower & Soudan Street Railway of Minnesota. The decision of the supreme court in the case of the city of Soudan against the receiver for the forfeiture of the franchises of the company was decided in favor of the city. The ordinance granting the franchise expressly provided that in the event of the company failing to operate the road for the period of one year all rights granted to it should revert to the city.

### ASSEMBLY HALL FOR THE CONVENTION.

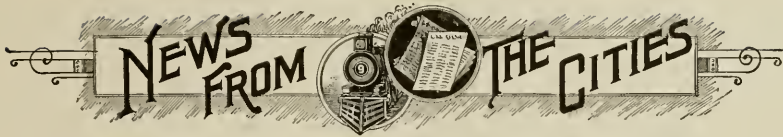
The illustration shows the arrangement and dimensions of the second floor of the building provided for the accommodation of the American Street Railway Association at the



SECOND FLOOR OF CONVENTION HALL.

coming convention in Niagara Falls. The assembly hall in which the business sessions will be held is 35x46 ft., and is reached only through the exhibit room.





# NEWS FROM THE CITIES

## California.

LOS ANGELES, CAL.—E. P. Clark has accepted his franchise for an electric railway over Daly street.

SALINAS, CAL.—The first assessment of 10 per cent has been paid on the stock of the electric car line from Salinas to the beet sugar factory.

VENTURA, CAL.—The Ventura Street Railroad has been purchased by Mr. Lloyd. The road is 1.25 miles long, and was built nine years ago at a cost of \$10,000.

LOS ANGELES, CAL.—E. J. Baldwin is said to contemplate constructing an electric railroad from the Santa Anita Canyon to the northern end of the San Gabriel Canyon.

BERKELEY, CAL.—Citizens of West Berkeley talk of forming a company to build a car line. One of those interested is Walter N. Heywood of the West Berkeley Improvement Club.

SAN FRANCISCO, CAL.—Nicholas Ohlandt and J. A. Buch have been given judgment against Behrend Joost for \$279,108, the amount borrowed by him to build the San Mateo Electric Railway.

LOS ANGELES, CAL.—The Los Angeles & Redondo Railway Company has not yet determined to electrify, but steps will be taken to this end at no far distant date. As yet no contracts have been entered into for electrical equipment.

OAKLAND, CAL.—A big central power house will be built to operate all the lines of the city, except the Haywards, which have been recently acquired by the Realty Syndicate Company, a corporation controlled by F. M. Smith, Frank Havens and others.

OAKLAND, CAL.—E. C. Harlow has been appointed commissioner for the sale under foreclosure of the East Oakland Street Railway. Judge Ogden awards the California Safe Deposit & Trust Company, which brought suit several months ago, \$240,641, and attorney's fee of \$7,000.

REDDING, CAL.—An electric road is to be built from Redding into Trinity county by the recently incorporated Cosmos Land & Water Company. Capitalists of San Francisco and Los Angeles will establish a water power electric plant at the confluence of the McCloud and Pitt rivers, to operate the proposed railway.

LOS ANGELES, CAL.—E. C. Webster says the work of extending the local electric lines will begin on the arrival of Col. C. W. Smith. The loop on North Los Robles avenue will be constructed and the other extensions will rapidly follow. A cargo of ties has already arrived in Los Angeles and the rails are on hand.

SAN FRANCISCO, CAL.—Engineers are running lines for the new road which the San Francisco & San Mateo Railway Company proposes to build. The entire system is to be reconstructed, beginning with the main line on Harrison and Guerrero streets. As soon as this is completed other routes will be looked after and franchises obtained for extensions. It is expected that a number of new cars will be constructed.

LOS ANGELES, CAL.—Stockholders of the Temple Street Cable Railway have handed the road over to the bondholders. The line is one of the oldest in the city, but for a considerable distance ran through a sparsely settled district, and the receipts constantly fell below operating expenses, low as these were. For a number of years the stockholders have kept the road in operation only by paying assessments of about \$10,000 a year.

## Chicago.

CHICAGO.—The Jefferson street line of the West Chicago Street Railroad is to be equipped with electricity.

CHICAGO.—The rumor extensively circulated that J. P. Morgan and C. T. Yerkes contemplate consolidating the Chicago lines is false.

CHICAGO.—Stockholders of the rehabilitated Northern Electric Railway have elected George M. Huss, 153 LaSalle street, president, and Paul Dickinson, secretary and treasurer.

CHICAGO.—Promoter Lucius Clark has worked out a scheme by which the Chicago Passenger Traction Company may build the road for which it was two years ago granted a franchise in the northwest-ern part of the city.

CHICAGO.—The General Electric Railway Company has been granted the right to install the overhead trolley in place of the Love conduit system, which was originally planned. Mayor Harrison has vetoed the ordinance granting extensions to the Chicago General Railway Company.

## Connecticut.

NEW HAVEN, CONN.—Permission to extend to Pond Lily has been given the New Haven Street Railroad Company.

TORRINGTON, CONN.—Car service has begun on the new Torrington & Winchester Street Railway. The branch to Highland Lake is not yet completed.

HARTFORD, CONN.—The Hartford Street Railway Company and the Central Railway & Electric Company of New Britain, have placed in operation their joint through line from Hartford to New Britain. The fare is 15 cents with privilege of transfer in either city.

HARTFORD, CONN.—The third rail electric road to New Britain is now being double-tracked by the New York, New Haven & Hartford Railroad. Extensions to Bristol and Plainville are contemplated, making 22 miles operated by this system, all paralleled by trolley lines.

NORWICH, CONN.—An electric power plant will be placed in the shops of the Norwich & Worcester Railroad to supply current for the 14 miles of third-rail road which the N. Y., N. H. & H. R. R. expects to build on the east side of the Thames River. This is to forestall the Montville Railroad Company, which has a charter for a trolley parallel between Norwich and New London.

HARTFORD, CONN.—A meeting was held June 15 at the office of the Hartford Street Railway to organize the Bloomfield, Tariffville & East Granby Tramway Company, recently chartered by the state. Connecting with the Hartford Street Railway at Albany avenue the line will run through West Hartford, Bloomfield Centre, Scotland, Tariffville, Spoonville, East Granby and Rainbow. The incorporators are Henry C. Douglass and S. B. Douglass of Windsor Locks, J. Cleveland Capen, George F. Capen and H. R. Mills of Bloomfield, Jeffrey O. Phelps, Jr., George D. Curtis and D. F. Keenan and John A. Crilly of Hartford, and Charles A. Griswold, Frank A. Strong and R. F. Way of West Hartford.

SUFFIELD, CONN.—The Selectmen having approved the plans of the Springfield & Southwestern Street Railway work is to begin immediately. The road must be in full operation between the Massachusetts State line and West Suffield, a distance of ten miles, on or before June 1, 1898. It is the plan of the company to eventually connect with the Hartford Street Railway; also to build from the Massachusetts line to a point opposite Springfield, from which point they hope to gain an entrance to that city. The temporary organization of the company was recently perfected, with a capital stock of \$100,-

000, about \$45,000 of which has been paid in. The temporary officers are: President, H. K. Ford, of Suffield; secretary, E. P. Bartholomew, of Springfield; treasurer, A. Lyon, of New York. The company will soon be reorganized, and it is understood New York and Philadelphia capitalists will have control.

### Colorado.

CRIPPLE CREEK, COLO.—Tracklaying and the erection of overhead material for the Cripple Creek District Railroad has begun. Two carloads of rails have arrived, and the generators have been erected in the plant of the Fremont Electric Light & Power Company. It is claimed that cars will be in operation before August 1.

### District of Columbia.

WASHINGTON, D. C.—The Capital Railway Company expects to build two branch lines this year, and has just filed a \$300,000 mortgage to raise the money.

WASHINGTON, D. C.—The Washington & University Railroad Company has applied for incorporation. The company contemplates building a system of street railways to carry freight and passengers and to be operated by any power other than steam. Incorporators, J. D. Croissant, Frederick C. Kennedy, A. O. Humphrey, David B. Stone, J. S. Pierson, J. L. Tait, John J. Flynn and Charles S. Lord.

### Florida.

PENSACOLA, FLA.—The railway and dummy line of the Pensacola Terminal Company was sold by auction June 8 for \$55,000, which will cover all debts except the bonds, which amount to nearly \$200,000. The road was bought by W. H. Bosley, banker, of Baltimore, who is the largest bondholder. The change to electricity which has been contemplated for many months will now be carried out.

### Georgia.

ATLANTA, GA.—The Atlanta & Douglasville Railway Company has been incorporated to build the line noted in the BULLETIN some time ago. Capital stock, \$375,000; incorporators, J. S. James, C. D. Camp, R. E. James and A. E. Watson, of Douglasville; Simon Baer and Charles Pratt, of Atlanta; George L. Bell, of Gainesville; T. L. Galloway, of Decatur; George F. Payne, William D. Gharkey and Charles G. Witter, of Philadelphia.

### Illinois.

AURORA, ILL.—The Aurora & Geneva Railway Company has certified to an increase of capital to \$100,000.

AURORA, ILL.—Aurora has granted a franchise to the Aurora, Yorkville & Morris Electric Railway Company.

AURORA, ILL.—Montgomery village council has granted a franchise to the Aurora, Yorkville & Morris Electric Railway Company. The petition for a franchise in Aurora is now in the hands of the council committee.

GALESBURG, ILL.—Surveyors have begun work on the electric road to Knoxville. Knoxville's council has accepted the bond given by the Galesburg Electric Motor & Power Company, and the line will be in operation by September 1.

KANKAKEE, ILL.—The Kankakee, Wilmington & Morris Electric Street Railway Company has been organized at Joliet to build 50 miles of road from Kankakee to Morris, passing through Bulhomias, Deselen, Richey, Wilmington, Braidwood, Braceville, Diamond, Sufferinville, Coal City and Carbonville. Right of way will be obtained without delay and work on the line will be commenced next spring. Capital stock, \$50,000; incorporators, Thomas J. Deven, Chicago; Frank B. Handwerker, Morris; August D. Ehrich, Kankakee; Jacob A. Henry, Joliet; P. J. Cromwell, J. L. Lewis, and C. L. Bennett, Wilmington.

### Indiana.

GOSHEN, IND.—Assurances have been given that the Goshen Street Railway will be extended to the lake before another season.

RICHMOND, IND.—Farmers have a scheme to build an electric road from Richmond through Webster, Economy and Losantville to Muncie.

VALPARAISO, IND.—Samuel Massey, of Kansas City, Mo., is said to represent capitalists who contemplate building an electric railroad to connect with Chesterton and Porter.

CROWN POINT, IND.—Among those interested in the proposed electric road to Hammond and Cedar Lake are M. T. Hart, John Brown, L. D. Wolf, J. G. Strabel and Robert I. Bates.

NEW ALBANY, IND.—Bondholders of the New Albany Street Railway Company are arranging to pool their bonds. During the three years in which it has been operated by Receiver McLeod the road has just about paid expenses.

MARION, IND.—Work has been resumed on the Indianapolis, Anderson & Marion Electric Railway, Engineer Louis Enrich having arrived with \$15,000 and paid off the men. The trouble is said to have been caused by a dispute with the contractor and will not occur again.

CROWN POINT, IND.—It is said the county commissioners have granted a franchise to Chicago capitalists for an electric road between Hammond, Crown Point and Cedar Lake, to share the summer traffic to the latter resort, which has hitherto been monopolized by the Monon Railway.

FORT WAYNE, IND.—The ordinance requiring fenders on street cars goes into effect July 1. As yet the company has done nothing toward placing them on the cars except to investigate several kinds. The receivers will soon take some action toward paying off claims of the local creditors.

INDIANAPOLIS, IND.—A second application was made, June 7, for a receiver for the Indianapolis & Broad Ripple Rapid Transit Company. It is alleged the company's indebtedness for running expenses is \$20,000, and that it has issued bonds for \$400,000, secured by a mortgage on all its property.

### Iowa.

BOONE, IA.—The council has passed over the mayor's veto the franchise granting the Boone Street Railway right to operate with electricity.

BOONE, IA.—President L. W. Reynolds, of the Boone Street Railway & Light Company, says the company is prepared to change the motive power from horse to electricity.

DUBUQUE, IA.—The ordinance extending the charter of the Dubuque Street Railway has passed its first reading. Its final passage will permit the company to establish a pleasure resort and enable it to float bonds with which to pay creditors and absorb a rival line.

### Kentucky.

FRANKFORT, KY.—Charles R. Crane, of Springfield, O., has purchased the Frankfort Street Railway at auction for \$10,000. The road is being repaired, equipped with new cars, etc., and will be placed in operation in July by the recently organized Frankfort & Suburban Street Railway Company, of which C. R. Crane is president; Patrick McDonald, vice-president, and J. T. Buckley, secretary and treasurer.

LOUISVILLE, KY.—Stockholders of the Louisville Railway meet June 10 to consider the conversion of \$500,000 common into preferred stock. The \$250,000 thus obtained will be expended for fifty new cars and the electrical equipment of the remaining mule lines.

### Louisiana.

NEW ORLEANS, LA.—The Orleans & Jefferson Railway Company has been incorporated to build an electric line on Napoleon avenue. Capital stock, \$250,000; incorporators, William R. Hall, president; Robert R. Zell, vice-president and Cyrus B. Buchanan, secretary.

NEW ORLEANS, LA.—The ordinance granting the Crescent City Railroad Company right to operate over some of the Carrollton Railroad Company's tracks has been defeated in the city council. Instead an ordinance was reported instructing the city attorney to bring suit to test the validity of the Crescent City Company's claims on Carrollton avenue.

**Maine.**

**WINDHAM, ME.**—Windham has voted against the proposition to lend its credit to the proposed electric road.

**KINEO, ME.**—O. A. Dennen, Kineo House, Moosehead Lake, is said to be interested in a project to build an electric road connecting the summer resorts on Moosehead and Cumberland Lakes.

**BANGOR, ME.**—A new company is to be formed to carry on the construction of the Bangor, Hampden & Winterport Electric Railway. Among those interested are James H. Cutler, of the Bangor Street Railway, and the Hon. Henry W. Mayo, of Hampden.

**BIDDEFORD, ME.**—Twenty miles of electric road will be built from Biddeford to Standish by way of Saco and Buxton, by a company recently incorporated with \$250,000 capital stock. Among the incorporators are Charles S. Hamilton and William A. Roberts, of Biddeford; James Bradbury Oliver and E. B. Loring, of Boston.

**NORWAY, ME.**—Parties interested in the proposed Oxford Central Electric Railroad have formed the Oxford & Welchville Electric Railroad Company to build three miles of road. Of the \$25,000 capital stock \$8,000 has been paid in. Incorporators, John B. Robinson, Charles L. Turgeon and George W. McFadden, of Auburn, and Fred C. Wilson, of Norway.

**Maryland.**

**BALTIMORE, MD.**—The new track to be laid on Paca street by the Consolidated Railway Company is to be completed August 1.

**BALTIMORE, MD.**—Permission to erect poles and wires within the city limits has been given the Falls Road Electric Railway, which is being constructed by J. G. White & Co., of New York.

**FREDERICK, MD.**—A power house will be built on the top of Catoctin Mountain by the Frederick & Middletown Electric Railroad. Engines and boilers of the Electric Light Company will be installed in the new power house.

**Massachusetts.**

**AMHERST, MASS.**—The Amherst & Sunderland Electric Railway was formally placed in operation June 16.

**FALL RIVER, MASS.**—Negotiations for the consolidation of the Fall River Street Railway and the Globe Street Railway have been resumed.

**WORCESTER, MASS.**—The Blackstone Valley Street Railway Company has changed its name to Worcester & Blackstone Street Railway Company.

**EAST BRIDGEWATER, MASS.**—The East Bridgewater Street Railway Company has just purchased a site on which a barn will be erected immediately.

**WORCESTER, MASS.**—Negotiations are pending for the sale of the Worcester & Blackstone Street Railway to the Worcester Suburban Street Railway Company.

**MILFORD, MASS.**—The Milford & Upton Street Railway Company is said to be negotiating for the purchase of the power plant of the old Milford & Hopedale Company.

**BRIDGEWATER, MASS.**—The Bridgewater, Whitman & Rockland Street Railway Company is taking steps toward incorporation. Ten per cent of the stock has been paid in.

**SPRINGFIELD, MASS.**—Directors of the Springfield Street Railway have authorized the president and treasurer to build the proposed car barn. The building will be 169 x 190 ft.

**BROCKTON, MASS.**—The Brockton, Bridgewater & Taunton Street Railway was formally opened June 14, thus completing a direct line of electric railway from Boston to Taunton.

**AMHERST, MASS.**—A pleasure resort has been established by the Amherst Electric Railway Company. The travel already exceeds the most sanguine expectations of the projectors.

**BOSTON, MASS.**—William A. Gaston, president of the Boston Elevated Railway, says construction will begin without delay, and that the West End Street Railway will be leased forthwith as permitted by the elevated road act which has been signed by the Governor.

**MILFORD, MASS.**—The selectmen will not require the Milford & Upton Street Railway Company to put up a cash forfeit of \$3,000 and will be satisfied with macadamizing in place of paving. Having received these concessions the promoters promise to have the road built by October 1.

**BROCKTON, MASS.**—The Brockton, Bridgewater & Taunton Street Railway Company will petition the railroad commission to approve the present issue of \$200,000 worth of stock and for an increase of \$50,000. A mortgage will be given the American Loan & Trust Company to secure an issue of \$200,000 bonds.

**MIDDLEBORO, MASS.**—The Taunton & Middleboro Street Railway Company has been incorporated to build 11 miles of electric road from Middleboro to Bridgewater, with connection with Brockton and Taunton. Capital stock, \$150,000; incorporators, Stephen F. O'Hara, of Middleboro, and Sidney T. Nelson, of Lakeville.

**ONSET, MASS.**—Stockholders of the East Wareham, Onset Bay & Point Independence Street Railway Company have refused the request of the directors for a receiver. At the request of the minority there was added to the directory, J. Q. A. Whittemore of Newton, Isaac B. Eldridge of East Wareham and Hardy Smith of Onset Bay.

**WINTHROP, MASS.**—The Winthrop Street Railway Company has been incorporated to build eight miles of road. Capital stock, \$80,000; directors, W. G. Wheildon, William W. Davis, Edward F. Draper and Aaron R. Sanderson of Boston; Samuel G. Erwin of Winthrop; George S. Forbush of Brookline, and Charles E. Folsom of Winchester.

**BRIDGEWATER, MASS.**—Stockholders of the Bridgewater, Whitman & Rockland Street Railway Company voted June 30 to pay up all the stock and to begin construction as soon as preparations could be completed. President, William A. Tucker, of Boston; secretary, George A. Butman, and treasurer, Charles A. Wilson. Directors, J. T. King, C. S. Stevens, R. W. Nutter, C. F. Allen, George J. Morse, C. H. Wilson, George A. Butman, William A. Tucker and Fred O. Hinds.

**Michigan.**

**JACKSON, MICH.**—Receiver W. A. Foote of the Jackson Street Railway, plans a thorough rebuilding of the system.

**SAGINAW, MICH.**—The council has passed the ordinance declaring the franchise of the Union Street Railway Company forfeited.

**DETROIT, MICH.**—Springwells township has granted the Detroit Electric Railway a 30-year franchise for an extension on Michigan avenue.

**SAGINAW, MICH.**—The Union Street Railway Company has applied to the supreme court for a temporary injunction to restrain the city from tearing up its tracks.

**BATTLE CREEK, MICH.**—E. E. Downs and F. N. Rowley are said have to sold their interest in the street railway to eastern capitalists, who are to build the interurban line.

**NILES, MICH.**—Peter English, of Benton Harbor, is said to have interested eastern capitalists in the proposed electric road from Niles to Buchana, Barren Lake and South Bend, Ind.

**PORT HURON, MICH.**—Judge Fred S. Wheat, of Caro, has obtained franchises in Lexington, Moore, Custer, Watertown and Elmer townships for the proposed electric road to Port Huron.

**HOLLAND, MICH.**—The Holland & Lake Michigan Electric Railway Company has been incorporated to build through to Macatawa Park. Capital stock, \$150,000. George E. Kollen is interested.



DETROIT, MICH.—Fred J. Blakeley, representing Pack & Everett of Detroit, has been looking into the construction of an electric railway from Detroit to Romeo via Utica.

BENTON HARBOR, MICH.—Stockholders Henry D. Deam, Andrew H. Deam and John Mears of the Benton Harbor & Eastern Electric Railway, have brought suit against President John W. Hamilton, Treasurer C. G. Davies and Secretary W. H. Hollis, charging them with making improper issues of stock for the alleged purpose of enriching themselves.

JACKSON, MICH.—William Foote has been appointed receiver of the Jackson Street Railway, the Fidelity Loan & Trust Company having commenced a foreclosure of \$150,000 mortgage bonds, on which \$4,000 interest is due and unpaid. The road has been running behind for three years and is in a dilapidated condition. The negotiations for its sale, which have been in progress for some time, have failed.

### Mississippi

JACKSON, MISS.—C. W. Howard, of Chattanooga, Tenn., has been granted a franchise to build an electric street railway. Northern capitalists are said to be interested with him.

### Missouri

SEDALIA, MO.—Lightning on June 18 burned out all the generators of the Electric Railway, Light & Power Company.

KANSAS CITY, MO.—The axles under the new cars of the Metropolitan Street Railway are being replaced by larger ones.

ST. LOUIS, MO.—The Lindell Railway has closed the deal for the purchase of the electric and cable lines of the Missouri Railroad Company.

ST. JOSEPH, MO.—It is expected that the contemplated improvements and extensions of the St. Joseph Street Railway will soon be carried out.

JEFFERSON CITY, MO.—Hon. S. W. Cox will submit a proposition for an electric railway to the council. If a liberal franchise is granted sufficient capital is promised by D. W. Cox of Harrisburg, Pa.

KANSAS CITY, MO.—Getty & Hutchings, attorneys of Kansas City, Kan., represent eastern capitalists who contemplate building 20 miles of electric road connecting Kansas City with Leavenworth and Fort Leavenworth.

KANSAS CITY, MO.—General Manager W. H. Holmes of the Metropolitan Street Railway, says that an extension of the Troost avenue cable line to Forest Hill is one of the improvements contemplated. It will probably be made this summer or fall.

ST. LOUIS, MO.—The St. Louis, Fenton & Southwestern Railroad Company has accepted the franchise granted three months ago for 44 miles of electric road between St. Louis and Morse's Mill. Construction must begin within six months and be completed within two years.

### New Jersey

CAMDEN, N. J.—The Camden & Suburban Railway will build a 4-mile extension from Collingswood to Haddonfield.

ELIZABETH, N. J.—Permission to extend its tracks through three streets is asked by the Westfield & Elizabeth Street Railway Company.

RED BANK, N. J.—The trolley company has accepted a franchise over the highway now occupied by its tracks. The company agrees to pay \$250 annually and to maintain 12 electric lights.

NEWARK, N. J.—The Consolidated Traction Company will extend its Clinton Township line to Elizabeth street, Irvington, before October 1, a franchise having been granted by the Irvington trustees.

JERSEY CITY, N. J.—Stockholders of the Consolidated Traction Company met June 17 to ratify the purchase of the line from Newark to Passaic, operated by the Passaic & Newark Traction Company.

NEW BRUNSWICK, N. J.—The ordinance for the extension of the Brunswick Traction Company's line through Raritan Township has passed its second reading. The line will be single track with turnouts.

ROSELLE, N. J.—The New York & New Orange Railroad Company has been incorporated to build between Roselle and New Orange. Capital stock, \$100,000. President, Robert Grimes, Elmira, N. Y.; vice-president, Dennis Long, Union; treasurer, W. S. McCord, Elmira, N. Y.; secretary, C. W. Manahan, East Orange.

PATERSON, N. J.—The Saddle River Traction Company has been incorporated with \$100,000 capital stock, of which \$25,000 has been paid in. The incorporators are Gen. Bird W. Spencer, Michael F. Burns and Gilbert S. Bogart. Gen. Spencer was president of the Passaic & Newark Electric Railway, which was recently sold to the Consolidated Traction Company.

### New York.

BUFFALO, N. Y.—Ground has been broken by the Buffalo Traction Company for its new system.

LYONS, N. Y.—The Lyons & Sodus Bay Electric Railroad Company asks right of way through Wayne also.

ALBANY, N. Y.—The Greenbush & Nassau Electric Railway Company has accepted its franchise and given bond.

BROOKLYN, N. Y.—The Brooklyn City & Newtown Railroad has filed a certificate showing its proposed extensions.

BROOKLYN, N. Y.—Southampton has granted the Riverhead, Quogue & Southampton Railway permission to build.

NEW BRIGHTON, N. Y.—The Staten Island Midland Railroad has received permission to double-track its line on Clove road.

GREENVILLE, N. Y.—The Greene County Traction Company has been reorganized, only one of the old directors remaining.

SYRACUSE, N. Y.—The Lakeside Railway franchise has been extended. Construction is now required to begin July 1, 1898.

BUFFALO, N. Y.—Control of the Buffalo, Bellevue & Lancaster Electric Railway has been acquired by the Buffalo Railway Company.

BUFFALO, N. Y.—Trustees of Depew village have voted to grant the Buffalo & Depew Railway Company a franchise for the proposed electric road.

POTSDAM, N. Y.—H. A. Odell, of New York, has been looking over the ground to determine whether an electric road to Colton would be a paying proposition.

AUBURN, N. Y.—The state railroad commission has denied the application of the Auburn & Western Railroad for right to build an electric line to Seneca Falls.

WHITE PLAINS, N. Y.—The White Plains & Elmsford Electric Railway Company has placed its line between White Plains and Tarrytown in successful operation.

HUDSON, N. Y.—E. S. Benedict, superintendent, says that the Hudson Electric Railway will ultimately be extended to Chatham. The extension to Claverack will probably be made very soon.

OSWEGO, N. Y.—Receiver Tidman finds himself unable to negotiate the certificates of the Lake Ontario & Riverside Railway except at a discount of 2 per cent, which he is unwilling to give.

BUFFALO, N. Y.—The state board of railroad commissioners on June 30 hear the application of the Buffalo, Hamburg & East Aurora Railway Company for a certificate of public convenience and necessity.

**NEW YORK, N. Y.**—The state railroad commission has granted the Metropolitan Street Railway Company right to change from horse power to the conduit electric system on its 4th and Madison avenue lines.

**ONEONTA, N. Y.**—E. A. Mathews, of Binghamton, who constructed the Binghamton, Lestershire & Union Electric Railway, is soliciting subscriptions to the stock of the proposed Oneonta & Otsego Valley Railroad.

**WELLSVILLE, N. Y.**—E. C. Bradley, James Macken and John McEwen, are a committee to solicit funds for the construction of the proposed electric railway from Wellsville to Bolivar. It is estimated that \$160,000 will be required.

**BROOKLYN, N. Y.**—D. O. Mills' purchase of \$1,000,000 of its bonds has supplied the Rapid Transit Company with funds for improvements, new cars and to pay the expense of equipping for the operation of through cars to New York.

**NEW YORK, N. Y.**—An issue of \$12,500,000 of 5 per cent bonds is announced by the Metropolitan Street Railway Company, the proceeds to be used in equipping the Fourth, Sixth and Eighth avenue roads with the conduit electric system.

**BUFFALO, N. Y.**—The town board of Tonawanda has granted a franchise to the Tonawanda Electric Railroad Company, thus completing George P. Smith's long-desired right of way between Niagara Falls and Buffalo. Work must begin at once and be finished in 10 months under penalty of forfeiting \$20,000.

**MARCELLUS, N. Y.**—The Marcellus Electric Street Railway Company has been incorporated to build 2.5 miles of road from the New York Central station at Camillus to Marcellus, Onondaga county. Capital stock, \$60,000; incorporators, Townsend K. Cheyney, Howard M. Fordham and L. J. Chase, of Buffalo; E. Moir, L. N. Mogg, J. M. Seymour, Charles Brown and Edmund Reed of Marcellus, and J. G. Stevens of Syracuse. Mr. Moir was chosen president, Mr. Mogg vice president, E. Reed secretary, and J. M. Seymour treasurer.

**BROOKLYN, N. Y.**—The DeKalb Avenue & North Beach Railroad Company has been incorporated to build an electric railway from the terminus of the DeKalb avenue line to North Beach on Flushing Bay, a distance of six miles. The road will be controlled by the Brooklyn City & Newtown Railroad Company. Capital stock, \$200,000; directors, Henry B. Hyde of Bay Shore, Louis Fitzgerald, Alfred Wagstaff, Duncan B. Cannon of New York City; John N. Partridge, John L. Heins, Thomas Clark, Jr.; Thomas Ennis and George W. Benton of Brooklyn.

**SARATOGA, N. Y.**—The Saratoga Northern Railway Company has been incorporated to construct 11 miles of standard gage electric railway from Saratoga Springs to the village of Winton and Mt. McGregor. Capital stock, \$1,000,000; incorporators, Charles E. Arnold, H. McGonegal, L. C. Jordan of New York; J. B. Hampton of Philadelphia; A. C. Kaufman, H. H. Schaff, Edward R. Manice of Pittsfield; J. B. Robertson of New Haven, Conn., and A. J. Voyer of Albany. This corporation is formed for the purpose of acquiring the property and franchises of the Mt. McGregor Railroad and of the Saratoga & Mt. McGregor Railroad Company. The Mt. McGregor is a narrow gage road, and has a charter authorizing the construction of a road from Saratoga to Lake George. Eventually it is proposed to rebuild this road by making it a standard gage and to extend it to South Glens Falls in Warren county.

## North Carolina.

**MORGANTON, N. C.**—T. K. Bruner of Raleigh is interested in a project to build 40 miles of electric road from Morganton to Blowing Rock. It is said capitalists of New York, Raleigh and Morganton are forming a company with \$300,000 capital stock.

## Ohio.

**COLUMBUS, O.**—The fender ordinance has been revived, in force the Columbus Central Railway to adopt life guards.

**CLEVELAND, O.**—The Cleveland & Southeastern Electric Railway Company has been granted an extension of 60 days time in which to begin construction.

**TOLDO, O.**—Receiver L. S. Baumgardner, of the Put-in-Bay Electric Railway, sold the lease of the line until October 1 to James S. Keith of Port Clinton.

**CINCINNATI, O.**—The Cincinnati & Miami Valley Traction Company has finished its power plant at Busenbark. The car barn at Trenton has been completed.

**DAYTON, O.**—Frank Turner, city engineer of Dayton, is president of a company of capitalists who propose to build an electric line from Dayton to West Milton and Greenville.

**CINCINNATI, O.**—A. Hickenlooper of the Cincinnati, Hamilton & Dayton Traction Company offers to build a road to carry passengers from Carthage to a connection with the Consolidated at Avondale.

**TUSCARAWAS, O.**—A consolidation of the Tuscarawas Street Railway, operating between New Philadelphia and Uhrichsville, and the Tuscarawas Electric Railroad, operating between Canal Dover and New Philadelphia, is pending.

**CLEVELAND, O.**—The county commissioners have granted the Cleveland & Eastern Electric Railroad Company a franchise to construct 51 miles of road through Cuyahoga County to Orwell, O., with the privilege of carrying barrel and package freight.

**CINCINNATI, O.**—Right of way from Hamilton to the county line has been given J. C. Hooven, president of the Cincinnati & Hamilton Electric Street Railway Company. He agrees to have the road finished within 16 months and in operation two months later.

**CLEVELAND, O.**—The Cleveland & Akron Suburban Electric Railway Company has been incorporated to build and operate a line between the two cities. Capital stock, \$500,000; incorporators, Harry C. Mason, William C. Gayer, Dr. J. C. Fritch, J. A. Spitzig and Frederick L. Taft.

**MANSFIELD, O.**—The Richland Railway Company has been incorporated to build between Mansfield and Shelby. Electricity or steam will be the motive power. Capital stock, \$10,000; incorporators, Charles W. French, A. W. French, L. Walker, V. A. Dehnel, and H. C. Workman.

**ASHLAND, O.**—The Tri-City Electric Interurban Railway Company has been incorporated to build between Loudonville, Ashland county, and New London, Huron county. Capital stock, \$10,000; incorporators, Bert J. Hank, Edwin J. Bert, G. A. Ullman, J. R. Swartz, E. F. Shelley, S. J. McCready, Thomas Brown, Thomas M. Beer, H. A. Thomas, O. S. Cartle, jr., S. C. Frank, E. J. Grossarp, J. W. Brinder, G. Hess, S. H. Grabill and J. F. Johnson.

**CLEVELAND, O.**—With the franchises recently granted and the rights of way obtained from private parties the Cleveland, Painesville & Eastern Electric Railroad will control the passenger and package freight traffic along the lake shore east of Cleveland. The privileges conferred by the last grant will be exercised by the immediate construction of the extension from Nottingham to the city, to connect with the St. Clair line of the Little Consolidated.

## Pennsylvania.

**LANCASTER, PA.**—The city council has passed an ordinance compelling the Pennsylvania Traction Company to adopt fenders.

**POTTSTOWN, PA.**—The Ringing Rocks Electrical Railway Company is meeting with success in getting right of way for the extension to Swamp.

**GETTYSBURG, PA.**—The Gettysburg Electric Railroad was sold by the receiver June 10 to the West End Trust Company of Philadelphia for \$50,000.

**PITTSBURG, PA.**—The Fidelity Title & Trust Company on June 11 was appointed receiver of the McKeesport, Duquesne & Wilmerding Street Railway.

**POTTSVILLE, PA.**—The old power house of the Schuylkill Electric Railway at Pottsville, was destroyed by fire on the evening of July 3. All traffic was suspended.

COLUMBIA, PA.—Receiver Given has authority from the circuit court to extend the Lancaster & Lititz Railway as soon as a satisfactory ordinance is passed by Lititz council.

PITTSBURG, PA.—The Braddock & Homestead Street Railway has been placed in operation. Mellon Brothers, bankers, own the line, which is three miles long. J. C. Ross is manager.

DOYLESTOWN, PA.—Wheeler & Boody, who have the contract to build the system of the East Pennsylvania Traction Company, have issued an execution against the company on a judgment for \$16,215.

WILLIAMSPORT, PA.—The Montoursville Passenger Railway Company has been incorporated to build from Williamsport to Montoursville via Loyalsock. Capital stock, \$75,000; president, William Massey.

TYLER, PA.—The Tylerdale Belt Line Railroad Company has been incorporated to operate 1.5 miles of electric road. Capital, \$15,000; incorporators, Samuel Hazlett, George L. Hayes and Samuel Workman.

PITTSBURG, PA.—Stockholders of the Pittsburg, Allegheny & Manchester Traction Company have accepted the offer of \$41 for their holdings, and the line will be consolidated with the United Traction Company.

PHILADELPHIA, PA.—J. L. Stadelman of Bala, Pa., and W. A. Stadelman of 26 Cortlandt street New York, are said to be interested in the Philadelphia & Merion Electric Railway Company, which is to build six miles of road.

EASTON, PA.—The Northampton Electric Railway Company has been incorporated with \$300,000 capital stock by James Kerr of Clearfield, George S. Good of Lock Haven, J. Frank Snider, A. O. Smith and G. S. Hues of Clearfield.

PHILADELPHIA, PA.—The ordinance granting the Moyamensing Avenue & Penrose Ferry Passenger Railway Company an extension of time to July, 1898, to complete its system, has been favorably reported by the council committee.

BEAVER, PA.—The Beaver & Vanport Electric Railway Company has been incorporated to build and operate two miles of road between the two towns. Capital stock, \$12,000; directors, J. M. Buchanan, W. A. McConnell, J. H. Wilson, A. T. Anderson, Beaver, and J. T. Taylor, Monaca.

EASTON, PA.—The Easton, Palmer & Bethlehem Street Railway Company has been incorporated to build 12 miles of road between Easton and Bethlehem. Incorporators, W. B. Ferguson, Boston, Mass., president; Charles F. Barnes, Plymouth, Mass., treasurer; Frank E. Lowe, Greenfield, Mass., Michael P. McGrath, George A. Murch, Wesley A. Kendall, and C. A. Richardson, Worcester, Mass., and N. S. Myric, Boston, Mass.

DANVILLE, PA.—J. M. Fitzgerald and Elias Nesbaum, representing the North Susquehanna Street Railway Company, are getting consents for a regrant of the franchise which has lapsed owing to failure to begin construction within a certain time. Starting at Riverside the line, after taking in the principal streets of Danville, will pass on to Bloomsburg and Espy, a branch diverging at Rupert for Catawissa. The cost is estimated at \$200,000.

### Tennessee.

CHATANOOGA, TENN.—Extensive repairs are being made on the Market street line of the Chatanooga Electric Street Railway Company.

CHATANOOGA, TENN.—M. F. Penfield is promoting a plan to buy and operate the Lookout Mountain Broad Gage Railroad. Sam W. Divine and associates are figuring on acquiring the road and equipping with electricity. It would then be operated in connection with his proposed line from the city to the Chickamauga Military Park.

CHATANOOGA, TENN.—The Chattanooga & Lookout Mountain Railroad was sold June 22, by the Union Trust Company of Philadelphia, to the Chattanooga & Lula Lake Railroad Company, which

operates the new incline to the mountain. The price was \$15,000. The road was built in 1888, and is ten miles in length. The new owners will equip and operate the road.

### Texas.

DALLAS, TEX.—C. H. Alexander and I. G. Randle are said to have purchased the track, rolling stock and good will of the Dallas Consolidated Street Railway. They pay \$145,000 and assume \$30,000 floating debt.

BEAUMONT, TEX.—The council will refuse the application of F. Zoiner and others for an electric railway franchise, and consider a petition from other parties who offer to begin work within 30 days, a much shorter time than that desired by Mr. Zoiner.

### West Virginia.

WHEELING, W. VA.—The Wheeling Railway Company's franchise ordinance has been rejected by the council.

CHARLESTON, W. VA.—Receiver C. B. Couch asks the court for authority to sell the Charleston Street Railway.

WHEELING, W. VA.—The Wheeling & Elm Grove Electric Railway ordinance has passed both branches of the city council.

### Wisconsin.

OSHKOSH, WIS.—The new street railway has been placed in operation by the Citizens' Traction Company.

FOND DU LAC, WIS.—Elihu Colman has filed an acceptance of the street railway franchise, but the capital for construction has not yet been obtained.

MILWAUKEE, WIS.—The purchase of the Milwaukee & Wauwatosa Motor Road by outsiders is a blow to the projected Milwaukee & Waukesha Railway.

MILWAUKEE, WIS.—C. F. Rosenkrantz, attorney, purchased the Milwaukee & Wauwatosa Motor Road, June 26, for \$43,500. His clients are not known.

RACINE, WIS.—Creditors and others interested in the Belle City Street Railway met in Chicago, recently, and arranged a reorganization which will be carried out July 1.

MILWAUKEE, WIS.—Henry C. Payne has concluded negotiations with Cleveland capitalists for the formation of a company to build an interurban electric railway in the Fox River Valley.

MILWAUKEE, WIS.—The Milwaukee Electric Railway & Light Company is said to have perfected plans for the construction of a line between Milwaukee and Waukesha, with subsequent extensions to Pewaukee and Oconomowoc.

NEENAH, WIS.—It is said that Henry C. Payne, of Milwaukee, has purchased the Menasha & Neenah Street Railway of Ferdinand Schumacher, the oatmeal miller of Akron, O., with the object of making it a part of his proposed interurban electric railway.

NEENAH, WIS.—Henry C. Payne of the Milwaukee Electric Railway and M. J. Degnon, railway builder of Cleveland, O., have spent two days inspecting the route of a proposed interurban railway from Neenah to Kaukauna. Mr. Payne says that if the council will grant a satisfactory franchise they will construct the road in 60 days.

RACINE, WIS.—Receiver Hiram F. Smith's petition for an order to sell the Belle City Electric Street Railway has been approved by Judge Fish. The bondholders will bid in the property, and will very soon make improvements costing \$20,000. In addition to the bonded debt of \$300,000 there are other debts aggregating \$32,000.

RACINE, WIS.—The Milwaukee, Racine & Kenosha Electric Railway announces the completion of its subway at South Milwaukee and the operation of its cars between Racine and the city hall in Milwaukee. The extension from Racine to Kenosha is being graded and is expected to be completed within 60 days. The distance is 12 miles and Matthew Slush, president, Racine, is in the market for ties, poles and other material.



## WATCH TOWER PARK.

Black Hawk's Watch Tower, situated at the junction of the Rock river with the Mississippi, is a place made famous by its association with the great Indian warrior. The natural beauty of the surrounding country, together with the historic associations, makes it an ideal place for a park. Amusement features of every kind have also been provided. One illustration shows the new Blackhawk Inn which is a fine building, 60 x 75 ft., encircled by verandas on both floors, and



BLACK HAWK INN.

replaces the one burned last year. The main dining room occupies the first floor and the ball room the second. There are also small dining rooms to accommodate 6 to 12 each, which are separated by folding doors, and these can be thrown open so that supper parties of 40 to 50 may be served. The 15-ft. verandas are covered with comfortable chairs and settees, where patrons may sit and listen to the concerts of the band in the music pavilion and enjoy the scenery of the Rock river. Then there are the "chutes," the toboggan slide, roller coaster, the merry-go-round, the



SCENES AT WATCH TOWER PARK.

shooting gallery, bowling alleys, museum, open air theatrical performances, swings, swimming, boating and bathing to delight the visitor.

This beautiful park is the property of the Tri-City Railway Company, Davenport, Ia., of which James F. Lardner is secretary and treasurer. The company has provided ample facilities for carrying passengers to and from the park. Cars leave the Tower every 10 minutes.

## MEETING OF OHIO STATE TRAMWAY ASSOCIATION.

The sixteenth annual meeting of the Ohio State Tramways Association was held at Columbus on June 14.

During the morning the visitors were entertained by the Columbus Street Railway at the hands of W. F. Kelly, the superintendent, and a trip was made to Olentangy Park, the summer resort operated by the company. After luncheon at the Hotel Chittenden, Fred N. Bendelari of the Columbus Central Railway escorted the party in the company's special car Minerva to Minerva Park, the resort of this company, where the afternoon was very pleasantly spent. The meeting was not largely attended but what was lacking in numbers was made up in quality. Quite a number of supply men were present and contributed their usual share to a good time.

The business meeting was held at the Chittenden in the evening and officers elected as follows: A. A. Anderson, Youngstown, president; T. R. Catlin, Canton, vice-president; F. J. J. Sloat, Akron, secretary and treasurer. As Columbus is centrally located and convenient from all points in the state it was decided to hold the next convention there on June 8, 1898. The new officers have not as yet outlined the plans for the next meeting but it is their intention to have some specially prepared papers read on that occasion.

## BOSTON TERMINAL BIG CONTRACT LET.

Westinghouse, Church, Kerr & Co. have received the contract to equip the great station of the Boston Terminal Railway Association with electric locomotives, electric light, heating and refrigerating apparatus and interlocking switches. The electrical apparatus will be supplied by the Westinghouse Electric & Manufacturing Company; heating and refrigerating equipment by the Westinghouse Machine Company, and the switching system by the Union Switch &

Signal Company, another Westinghouse interest. All of the steam railroads entering Boston have united to build one terminal station which is to be the finest in this country. No expense will be spared to make it a model of safety and convenience. The selection of their machinery reflects great credit on the Westinghouse companies, more especially as there was practically no one other competitor able to supply the whole equipment.



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

The Westinghouse Electric & Manufacturing Company on June 22, declared a quarterly dividend on its preferred stock of  $1\frac{1}{2}$  per cent.

The 20th convention of the National Electric Light Association was held at Niagara Falls, June 8, 9 and 10, the attendance being large, and the meeting a success.

At the annual meeting of the stockholders of the Barney & Smith Car Company, Dayton, O., the directors were all re-elected, as were also the officers of the company.

On July 7, a car on the Inter-Urban Electric Railway ran through the open draw of the iron bridge two miles south of Bay City, Mich., and seven persons were drowned; others were injured.

Among the entertainments in honor of the Mystic Shriners when at Detroit last month was a monster trolley party. There were 53 gayly decorated cars in line and the guests numbered 2,350.

I. D. Ralph, president of the Owosso & Corunna Traction Company, has sued J. H. Copas, an alderman of Owosso, for \$20,000 damages for slanderous epithets applied to him at a council meeting.

It is reported that Henry A. Butters, of Oakland, Cal., together with some other Americans, forming a syndicate, has received concessions for constructing a street railway system in Johannesburg, South Africa.

The street railway of Appleton, Wis., will establish, in conjunction with the firm of Dorst & Rutledge, a summer, outdoor theater at Garfield park near the end of its line, where vaudeville performances will be given nightly.

Last summer one of the cars of the Coney Island & Brooklyn Railroad company ran over the foot of a little girl. It was necessary to have four of her toes amputated and for this loss she was awarded \$1,631 by a New York jury.

The new directory of the Metropolitan of Kansas City is composed of Charles Francis Adams of Boston; S. B. Armour, P. A. Valentine, of Chicago; C. F. Morse, W. H. Holmes, C. F. Holmes, J. K. Burnham, Chester A. Snider, and Wallace Pratt.

The employes of the Citizens Street Railway Company, Muncie, Ind., made a request for an increase in wages and this was granted by Secretary Geo. F. McCulloch. The advance amounts to  $7\frac{1}{2}$  per cent. and was gratefully received by the men.

In Brooklyn open cars are not permitted when the temperature is below  $60^{\circ}$  F. and June 8 was cold enough to bar open cars. One train crew was prosecuted, but the case dismissed because the ordinance had not been properly advertised as required by law.

The Waverly (N. Y.) Electric Light & Power Company has passed into the hands of the Waverly, Sayre & Athens Railway Company. The officers of the new company are A. C. Wade, president; P. L. Lang, vice-president; A. N. Broadhead, secretary and treasurer.

D. K. Carter, one of the jury is a \$35,000 damage case against the Chicago City Railway, was charged by one of the company's attorneys with soliciting a bribe, offering to secure a disagreement or a small verdict for the plaintiff. He was sent to the county jail for six months.

The Passaic & Newark Electric Railway sprinkles the streets occupied by it in Passaic under a contract with the city which pays for the service. In order to distribute the water over the entire street each sprinkler is equipped with a motor pump to give the necessary pressure.

The Southern Electric Railway Company, St. Louis, reports a very gratifying increase in traffic during the past three months. This has been sufficient to justify the company in ordering 10 new double truck cars and to have the single truck cars rebuilt, lengthened and equipped with two trucks.

The street railways connecting Duluth and Superior, Minn., will henceforth issue free transfers at all times so that the fare from any point in Superior to any point in Duluth is 10 cents. A year ago the plan of giving free transfers between the hours of 6 and 8 in the morning was adopted.

The Connecticut Senate has passed the bill amending the railroad law so that no street railway is to be built between towns or so as to parallel existing steam or street railways without the consent of a judge of the superior court. The bill is said to be satisfactory to both the steam and electric interests.

Through his own carelessness a man in Portland, Ore., lost a leg and sued the street railway for big damages. In view of the facts the jury could not do otherwise than return a straight verdict for the defendant, but added the hope that the company would pay costs, buy a wooden leg and give him employment.

The Milwaukee, Racine & Kenosha Electric Railway Company has constructed a culvert under the Chicago & Northwestern Railroad tracks, and the first through car from Milwaukee to Racine was recently run over the line in 90 minutes. The cars hereafter will make hourly trips between the two cities.

The Connecticut Senate modified the vestibule bill reported by its committee and as passed, vestibules are not made compulsory for cities of less than 50,000, but left to the discretion of the railroad commissioners. It was pointed out that more accidents occurred with vestibuled cars than without and that in many places the use of vestibules would greatly increase the danger.

The lower court has decided against the Citizens Railway Company, of Knoxville, Tenn., and denied its right to lay a track in Depot street, for which it had received a franchise, on the ground that its charter from the state did not contemplate a

line in that street and consequently the franchise from the city was void. In other words a corporation must ask for all it wants and can not take more as a gift.

The tax assessment of the Des Moines City Railway Company has been more than trebled this year and the company has decided to collect more money to pay the taxes. Tickets, which have been sold six for 25 cents, are withdrawn and hereafter a straight five cent fair will be collected.

The Ohio Supreme Court has rendered a decision to the effect that the Main Street Line of Cincinnati is a trespasser and must cease operating south of Liberty street. This ends a 7-years' legal fight. The city and the Consolidated Street Railway are now free to arrange for various extensions of the latter's lines, including the Mt. Auburn line, upon which work will be commenced immediately.

The San Francisco & San Mateo Electric Railway Company has made considerable progress in the reconstruction of its entire system. The main line, running on Harrison and Guerrero streets, between the ferry and 13th street, will be the first to be completed. The branch lines will then be rebuilt and application for additional franchises will be made. A number of new cars will be added to the equipment.

The Hamilton (Ont.), Grimby & Beamsville Electric Railway Company has published a folder giving information regarding Hamilton and the towns and parks in that vicinity. A time and special rate table is also given. On the reverse side are some views of picturesque scenes along the route and a colored lithograph gives a good idea of the beautiful country and towns through which the line passes for 23 miles.

An ordinance was passed at Lansdowne, Pa., compelling the Delaware County Electric Railway company to stop its cars at each street crossing and imposing a fine of \$5 for each violation. A suit to sustain the ordinance was lost by the town and Judge Clayton said that such an ordinance was unheard of even in cities where the streets had many times the traffic in Lansdowne and hence burdensome and unnecessary.

The suit against the Nassau road of Brooklyn brought by one of its conductors who attempted to save himself from falling by holding to one of the route signs on the car and which gave way, has been dismissed. The company claimed that the sign was to tell the destination of the car and not to keep people from falling off, and that it was no negligence on the part of the company if it was not securely fastened, and the court took the same view.

It appears from data collected and published by Gilmore Brown, engineer, of Wheeling, W. Va., that of the 28 cities in the United States having a population in excess of 100,000 by the census of 1890, 19 have all street railway tracks of standard gage, 4 ft. 8½ in. St. Louis, New Orleans and Denver have three gages, 3 ft. 6 in., 4 ft. 10 in. and 5 ft. 3 in., the two former predominating. Philadelphia, Baltimore, Cincinnati and Pittsburg have the 5 ft. 2 in. gage exclusively.

The Alley "L," Chicago, is to make a trial of an open car for the elevated service. One of the regular cars was

damaged by fire and in repairing it some alterations are to be made in the arrangements of the windows. The windows will be considerably larger than those at present and can be let down behind the panels. Instead of having the seats extending along each side they will be arranged crosswise, except for a short space at each end. It is expected that this car will be very attractive to the passengers.

The government of Nicaragua has granted a concession to Messrs. Barling & Davis to build an electric road from Rama or some other point on the Escondido river to Lake Nicaragua. It is stated that the lines will pass through some rich sections of country and good mineral lands. It is expected that the power can be furnished by water falls which are within close proximity to the proposed line. Large land grants also are a part of the concession. Isham Sedgwick, of Richmond, Ind., is president of the company.

The experiment of placing ordinary street letter boxes on the street cars which was inaugurated at Des Moines, Ia., on April 19 has shown that this service is greatly appreciated by the public. Fifteen cars were equipped with the boxes and on the first day the total number of pieces of mail matter collected was 215; on May 28 the total was 1,434. In the outer districts where there are but two collections by carriers per day a gain of 24 hours is made on letters for the East deposited after 3 p. m. The department will extend this service as rapidly as possible.

Two St. Louis school lads, who were ambitious to become motormen, slipped into the car barn of the Mound City Railway Company and proceeded to operate a car within its narrow confines. The car was soon beyond control and butted into the wall. After rebounding the trolley came into contact with the wire and again lunged into the wall. After this maneuver was repeated once or twice the wall gave away and the car went through and into the alley. The boys have not been heard of since and the street railway company has to pay rather dearly for their experience.

The Metropolitan Street Railway Company of Kansas City has been confronted with a rather peculiar kind of trouble. Along some of the suburban lines the woodpeckers, which are numerous in that locality, bore into the trolley poles and build their nests. These holes are of considerable size, and permits water to accumulate at the heart of the poles. In a short time the poles rot and break off. Along the line between Kansas City and Independence the company sent out a man with a shot gun, and a large number of the birds were killed and the nuisance abated. This is the only remedy that has been found so far.

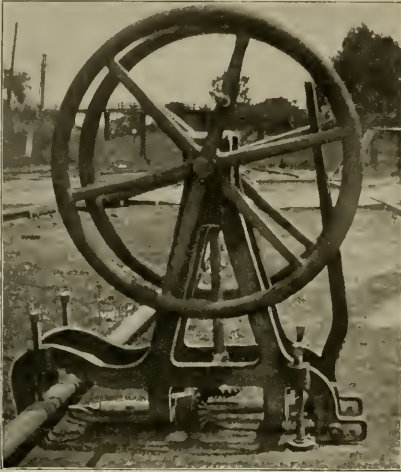
On account of an extended trip in Europe, contemplated for rest and the recuperation of his health, Alfred Hand, president of the Ithaca (N. Y.) Street Railway Company, has sold out his interest to E. G. Wyckoff and H. Berg-holtz of Ithaca. E. G. Wyckoff was chosen both as a director and president of the company. Congressman William Connell resigned as director and Chas. J. Rumsey of Ithaca was elected to fill the vacancy. Cornell University has invested \$62,000 in bonds of the company and this is considered a tribute to the good financial standing of the street railway, as the University authorities are very cautious about investments.



## THE SWEET RAIL DRILL.

## THE RATING OF BOILERS.

The illustration shows the rail drill invented by Arthur J. Sweet of Ann Arbor, Mich., and manufactured by the Michigan Manufacturing Company of Ypsilanti, Mich. The attachment and adjustment are controlled by the vertical lever; when the lever is dropped back the drill is withdrawn from the work. But three seconds are required for adjusting or releasing the drill. The frame is cast in one piece and the construction is very simple so that a common laborer can run them. To reduce friction a special ball bearing is placed at the rear of the drill shaft. There are  $\frac{1}{2}$  in. play between the drill point and the arms so that there is no difficulty in placing the drill in position on the largest gir-



SWEET RAIL DRILL.

der rails. The drills used are either No. 1 or No. 2 taper shank standard sizes from  $\frac{3}{8}$  in. to 1 in. in diameter. Allowing labor at 15 cents per hour it is quite possible to drill holes up to  $\frac{5}{8}$  in. diameter for less than  $\frac{1}{2}$  cent apiece, and 1-in. holes for a trifle more than that amount. These machines are made in two sizes, No. 1 being specially designed for T-rails and No. 2 for girders. Special designs for drilling structural iron and steel for buildings have given excellent satisfaction. The weight of this drill is about 150 lbs. When it is desired to move the machine it may be turned upside down and the balance wheels used as a truck.

## CONSOLIDATION OF LARGE COMPANIES.

The offer of the Pennsylvania Iron Works of Philadelphia to issue its preferred stock in exchange for the stock of the Siemens & Halske Company of America has been accepted by the holders of a majority of the stock of the latter company and the two companies will henceforth work in harmony with the prospect of a complete consolidation at an early date. The two companies will receive all the business for engines and electrical machinery for the roads controlled by the Philadelphia syndicate in which C. T. Yerkes is interested.

Recognized authorities on steam boilers recommend that in ordering a boiler the heating surface per rated horse power should be specified because of the fact that different builders rate their boilers differently, and the minimum is usually placed at  $11\frac{1}{2}$  sq. ft. per boiler h. p. or an evaporation of 3 lbs. of water from and at  $212^{\circ}$  F. per sq. ft. of heating surface per hour. At the same time and in connection with this recommendation the results of economy tests of boilers are quoted which show that one boiler may evaporate the same amount of water with a pound of coal and yet evaporate from two to three times as much per sq. ft. of heating surface.

The actual power in the engine cylinder which a given boiler develops depends upon the engine in which the steam is worked; the water which a given boiler will evaporate per sq. ft. depends upon the heating surface. A gentleman of an inquiring turn once asked the writer how long it would require for the Clark street tunnel under the Chicago river to fill with water if a hole were to be broken in it, and added that he meant an averaged sized hole. The rule of  $11\frac{1}{2}$  sq. ft. per h. p. may refer to average heating surfaces.

Power for July says editorially: "The capacity of a boiler is its ability to evaporate water into steam, and when a purchaser is stipulating for a boiler of given capacity he should lay more stress upon the evaporative capacity of the boiler which he chooses at a given rate of efficiency than upon the amount of surface furnished, giving due consideration to the fact that at the capacity stipulated the efficiency of the boiler has not commenced to fall off."

## LARGE ORDER FOR WESTINGHOUSE COMPANY.

The annual stockholders meeting of the Westinghouse Electric & Manufacturing Company was held at the company's works in East Pittsburg on June 23. After choosing directors, the old board was re-elected, the announcement was made that the company had on June 19 been awarded the contract for fifteen 5,000-h. p. generators which the St. Lawrence Construction Company is to install at its plant at Massena in northern New York. This is the largest single order for electrical apparatus ever placed and the amount directly involved is about \$750,000. This order together with that the Cataract Construction Company for five 5,000-h. p. generators for the Niagara Falls plant, which are now well under way, brings the aggregate capacity of the generators ordered of the company this year to 100,000 h. p.

These orders cover only the generators, and there will necessarily be required other apparatus of equal capacity for the utilization of the electrical energy produced by these great generators and the Westinghouse officials expect that a large proportion of the additional apparatus will be ordered from that company by reason of their having already secured the contract for the principal apparatus.

It is reported that the contractor who is working on the trolley road building between Morrisville and Doylestown, Pa., was kept a prisoner in his hotel by a mob of Italians who wanted money for work done.

FOREIGN FACTS.

Leads has completed the Kirkstall extension of its street railway.

Plans are being discussed to construct an electric railway from Salerno to Cava dei Terroni, Italy.

Derby council has voted in favor of the plan to construct a light electric railway from Derby to Ashbourne.

The proposal to build an electric railway from Bray to Glendolough is approved by the commissioners of Bray.

An English syndicate has obtained the concession to build 40 miles of electric railway in Barcelona and its suburbs.

Glasgow has appointed a sub-committee to arrange for the building of the new electric line between Springburn and Mitchell street.

Blackburn corporation has been recommended to accept the bid of Siemens Bros. & Co. for the construction of the electric railway.

The British Electric Traction Company has applied to the Dudley council for the right to construct a system of trolley lines in that district.

Vienna has authorized two lines of electric railway extending into the suburbs. The contract will probably be given to Siemens & Halske.

The city authorities of Cologne have asked for bids on the construction of 12 miles of electric railway, estimates to be in by September 3.

The Bristol Carriage & Tramways Company has applied for permission to build an electric line from Bristol to Hanham, a suburb.

The Halifax Corporation Tramways Act granting power to borrow £20,000 with which to install electric motive power, has passed Parliament.

Ratepayers of Ramsey, Isle of Man, have expressed themselves in favor of the proposition to build an electric railway from Ramsey Bay to Queen's Pier.

Permission to operate its Burslem lines with steam power has been granted the North Staffordshire Tramways Company, pending their equipment with electricity.

Trolley cars will soon be running on the island of Java. The Union Electrical Company of Berlin has the contract for the construction of 10 miles of electric line in Batavia.

Local authorities of the Dudley, Eng., district, where it is proposed to convert the steam railway to the overhead trolley system, made a visit of inspection recently to the Douglas & Lacey Electric Railway.

At Dublin a 4-mile extension of the United Tramway will be built to Sutton Cross Roads, there to connect with the electric railway around Howth, which is to be built by the Great Northern Railway Company.

Ramsgate council has approved the application of the Isle of Thanet Light Railways Company for authority to construct the proposed electric railway from Pegwell through Ramsgate, Broadstairs and Margate.

Birkenhead council has rejected the proposals of three firms to operate the street railway with electric power. The committee, however, favored the proposition of James Ross, of Birmingham, who wished to introduce the overhead trolley.

J. H. Madden, U. S. consul at Smyrna, Turkey, writes that there are but two street railways in that province, and these are both in the city of Smyrna. These lines are of small importance, as the Turks feel little need of rapid locomotion.

Arrangements are again being made to construct the underground electric railway in London, from Moorgate street to a junction with the Great Northern Railway near Finsbury Park. Parliament is asked an extension of time in which to complete the work.

Ghent, Belgium, has settled the details on which bids will be accepted for the construction and operation of an extensive street railway system. Storage battery cars will be operated in the center of the city, while in the outlying districts the overhead trolley will be permitted.

Plymouth, Eng., council has voted to equip immediately one section of the street railway for electricity at an expense of £7,500, of which £3,300 will be required for the overhead trolley construction, £3,750 for five cars and £450 for rail bonding. The question of equipping another section at an expense of £12,000 has been postponed.

To provide an adequate supply of water the municipal government of Cape Town has built a reservoir with a capacity of 225,000,000 gallons on the summit of Table Mountain. A water power plant has been constructed on the pipe line running from the mountain to the Molteno reservoir. Electricity will be supplied to light the city and to operate the street railway system.

The Karlsruhe Street Railway Company, of Karlsruhe, Germany, writes us that the conversion of its horse and steam railway into an electric line will be commenced in the fall of this year. Of the 9 miles of road one half will be equipped with the overhead trolley, the remainder with the conduit. Three engines, aggregating 450 h. p. will be installed in the power station to operate the 30 motor cars.

While excavating on a line of the Belt Railway Company, Lexington, Ky., one of the workmen struck what appeared to be a piece of pipe. It proved to be a 61-lb. dynamite cartridge and a terrific explosion followed, killing five of the negro workmen and fatally injuring the sixth. The police are inclined to think that the bomb was placed there by some one hostile to the railway company, but it might have been accidentally left there by the workmen of the Cincinnati Southern Railroad when previously excavating in the same neighborhood.

## THE CENTRAL LONDON RAILWAY.

It would be difficult to secure more satisfactory evidence of the high esteem in which American electrical machinery is held abroad than in the fact that the entire electrical equipment of the Central London Railway, the latest of the underground lines of London, is to be American. The contract with the exception of the elevators, has been taken by the British Thomson-Houston Company representing the General Electric Company, and the elevator contract by Frank J. Sprague.

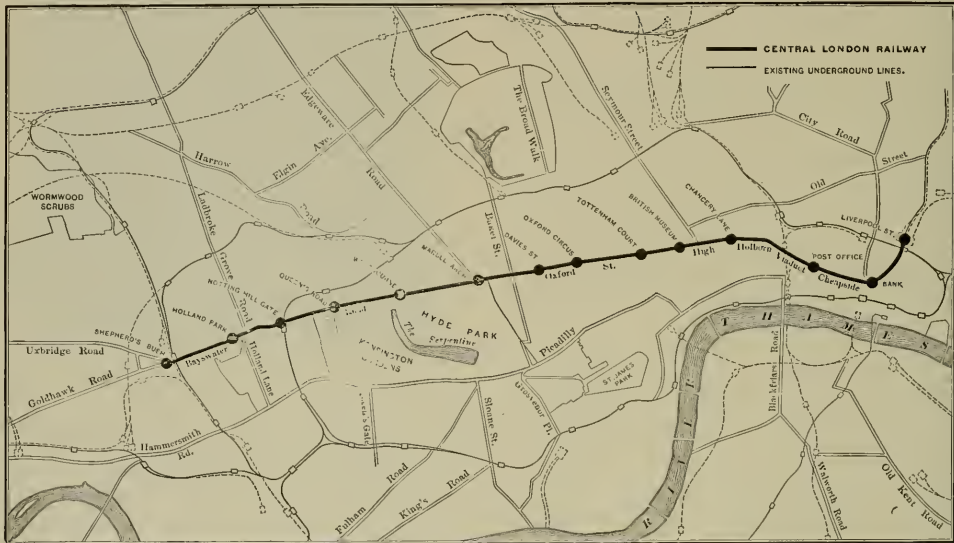
The road is  $6\frac{1}{2}$  miles long from Liverpool street to Shepherd's Bush, making 13 miles of single track. At the underground central station now building between the Bank of England and the Royal Exchange the road will receive passengers from three railroads and as the traffic at this point is very much congested the company is constructing a series of subways immediately below the surface for the convenience of its passengers in reaching the station.

The road is double track throughout, the two lines being

Locomotives instead of motor cars will be used. Each will consist of a sheet iron cab containing the controller, instruments, air-brake, sand boxes, etc., and mounted on a locomotive truck. There are to be four G. E. 56 motors one to each axle, giving a total drawbar pull of 14,000 lbs. The locomotives are to weigh 35 long tons and each train is to consist of seven cars seating 336 persons and weighing loaded, 105 long tons. It is estimated that the road will carry 43,000,000 passengers per annum at an average fare of four cents.

The generating station is to be located at Shepard's Bush. Six 1,300-h. p. Allis engines, each direct connected to an 850-k. w. G. E. dynamo, constitute the power station equipment. The dynamos run at 94 r. p. m. with a frequency of 25 and initial voltage of 5,000. There are to be four substations equipped with step-down transformers and rotary converters. The line voltage is to be 500.

The elevators, of which there are to be 49 will be of the double drum type and run at a speed of 150 ft. per minute. The capacity of each is 15,000 lbs.



MAP SHOWING ROUTE OF THE CENTRAL LONDON RAILWAY.

laid in separate tunnels of  $11\frac{1}{2}$  ft. internal diameter except at the stations where they are widened to 21 ft. for a distance of 375 ft. At each station are four vertical shafts, two 23 ft. in diameter and 87 ft. deep and two 18 ft. in diameter and 76 ft. deep; the larger contain two entrance and two exit elevators and the smaller ones spiral stairways. The route and location of the 14 stations are shown on the map.

The rails weigh 100 lbs. per yard and are laid on cross-ties. The third rail system of contact will be used, and the line sectioned and the feeder system controlled by signal boxes. In order to retard and accelerate the trains more easily at stops there is a 3 per cent grade on each side of each station; it is estimated that by this plan a saving of one-third of the power otherwise necessary for the acceleration of the trains will be made. The schedule speed will be  $14\frac{1}{2}$  miles per hour with stops of 20 seconds.

## X-RAYS AND DAMAGE SUITS.

During the trial of David Deatur vs. Minneapolis Street Railway Company, the plaintiff claimed that among other injuries, he had received a fracture of the bone at the hip joint. This was denied by Dr. Fitz-Gerald who made an examination for the company. The X-ray picture settled conclusively that there was no fracture but that a bullet, lodged near the hip joint, was the cause of the particular complaint on the part of Captain Deatur. He suffered from other injuries and damages sustained but his chief grievance seemed to be that his wooden leg had been broken.

The Metropolitan of Kansas City contributed \$10,000 to a fund for building a convention hall in that city.



FRANCHISES TO INDIVIDUALS IN ILLINOIS.

The question has been asked us whether Section 1 of the new Allen law is to be construed as limiting the granting of a franchise for a street or interurban railway exclusively to an incorporated company organized for that express purpose, or whether it was consistent for the proper authorities to grant a franchise to one or more individuals. In the section in question, which we quote, it will be noted no reference is made to "individuals" but only to a "company." The section reads:

Sec. 1. Any company which has been or shall be incorporated under any special or general law of this state for the purpose of constructing, maintaining or operating any horse, dummy or street railroad or tramway, may enter upon and appropriate any property necessary for the construction, maintenance of its road, and all necessary siding, side tracks and appurtenances, and may, subject to the provisions contained in this act, locate and construct its road upon or over any street, alley, road or highway, or across or over or under any waters in this state, in such manner as not to unnecessarily obstruct the public use of said street, alley, road or highway, or interrupt the navigation of such waters.

Undoubtedly one of the best authorities in the country on street railway law is Judge Egbert Jamieson of Chicago, who is the general counsel for the North and West Chicago Street Railroads. In answer to the above question he says:

"In reply to your question 'whether or not the Allen bill is to be construed as making it unlawful for county supervisors or city councils to grant a franchise for a street railway to one or more individuals,' I answer: In my opinion, the horse and dummy act as amended, (Allen bill), extends and applies to persons or individuals as well as to incorporated companies, and that the proper corporate authorities may now, as heretofore, lawfully license one or more individuals to construct and operate a street railroad.

"Every lawful business may be conducted by an individual or individuals, but it is not every such business that may be carried on by a corporation. The statute makes certain exceptions. A statute that prohibited any lawful business from being conducted except by an incorporated company would be clearly unconstitutional and void. The mere omission in the statute of the words 'person or persons' in connection with the use of the words 'corporation or company' does not limit the power to grant a license for a street railroad be incorporated companies only. The words 'corporation or company' would be construed as extending or applying to individuals as well as to corporate bodies."

In direct confirmation of this opinion Hon. Edward C. Aiken, attorney general, advises us under the same date, as follows:

"In determining the right of the common council in cities and of county boards to grant franchises to street railway companies on and over the streets and highways under their respective control, other provisions of the law than those contained in the so-called 'Allen bill' must be considered.

"Sec. 4 of Art. 11 of the Constitution of 1870, and clauses 9, 21, 25 and 90 of Sec. 63 of the General Incorporation Act all relate to the same subject matter and should be considered and construed together with the provisions of the so-called 'Allen bill.'

"I am of the opinion that the last named act does not deprive the common council of cities or the county board, of the right to grant street railway franchises to individuals

upon like terms, conditions and restrictions as if granted to incorporated companies."

PERSONAL.

H. M. Littell has returned from his European trip.

James H. Cronan has been appointed engineer and superintendent of power house of the Winsted & Barrington (Conn.) Street Railway.

W. D. Ray, general manager of the Everett (Wash.) Railway & Electric Company resigned July 1, and will shortly return to Chicago.

D. H. Goodrich, secretary of the Omaha Street Railway spent a week in Chicago visiting relatives and friends, the first vacation in three years.

Henry O. Rodgers, for many years division superintendent of all the horse lines of the Market Street system of San Francisco died last month at the age of 64.

James D. Parker, the new secretary and superintendent of the Sandusky, (O.) Milan & Norwalk Electric Railway has taken up his duties with the company.

John A. Brill, vice-president of the J. G. Brill Company, last month returned from a tour of Great Britain and the Continent; he was greatly benefited by the trip.

Columbus R. Cummings, of Chicago, owner of the Grand Rapids, Mich., Street Railway, and financial backer of the South Chicago, died on July 12, after an illness of several months.

H. R. Conklin, formerly superintendent on the Jefferson Avenue Railroad Company, St. Louis, has been appointed general manager of the Citizens' Traction Company, Oshkosh, Wis.

Wm. B. Walker resigned as director of the Chicago City Railway Company and E. G. Hamilton was chosen as his successor. Mr. Walker expects to make his home hereafter in Boston.

E. D. Dubois, who recently went from Chicago to Muncie, Ind., to take up the duties of superintendent of the Citizens' Street Railway Company was seriously prostrated by the heat last week.

William Keutgen, secretary of the Staten Island Rapid Transit Company, died on June 9, having failed to recover from an operation for appendicitis. Mr. Keutgen was 46 years of age and had been with the company ever since its organization.

E. E. Downs, formerly general manager of the electric street railways of Lansing, Kalamazoo and Battle Creek, Mich., has severed his connection with these companies and is now with the interurban road now building between Indianapolis, Anderson and Marion, Ind.

J. F. Heyward, formerly general manager of the City & Suburban of Baltimore, was elected secretary of the Consolidated when the former company was merged in the latter but resigned, asking to be relieved on July 1; the reason given by Mr. Heyward is that he preferred to continue in the operating branch of street railroading. Thomas C. Jenkins, the son of George C. Jenkins the superintendent of motive power, has been elected secretary of the Consolidated.

The many friends of Clemeat C. Smith, superintendent of the Falk Manufacturing Company, will learn with deep regret of the death of his brother, Walter C. Smith. He was in charge of the construction of a road at Norfolk, Va., and with a party of friends went bathing in the shallow water near Crane Island Light, in the Elizabeth river. While swimming he was taken with cramps and lost before help could reach him. The body was recovered five days later and brought to Milwaukee for interment. The deceased was a young man of much promise, and his sudden death lends unusual sadness to the termination of a bright future.



The Davis Rail Brake Company has been incorporated at Detroit, Mich., to manufacture street and steam car brakes.

The Pennsylvania Steel Company is supplying the 64-lb. T and the 88-lb. girder rail for the new Falls Road Electric Railway at Baltimore, Md.

Smethurst & Allen of Philadelphia have the contract for all the overhead work on the big interurban of the Meadville Traction Company at Meadville, Pa.

The Automatic Electric Traction Company has been incorporated at Chicago. The capital stock is \$30,000, and the incorporators are Zebulon Foster, Edward Foster, Stanton Foster and William G. Foster.

The Ball Engine Company, Erie, Pa., is building two 125-h. p. horizontal tandem compound engines which will be used for the electric transmission of power and light in a large works in the city of Moscow, Russia.

Macartney, McElroy & Co., of New York, have been awarded the contract to supply all of the material required and to construct eight miles of road for the Sherbrooke Street Railway Company, Sherbrooke, Que.

The Columbia Brake & Supply Company has been incorporated at Chicago to manufacture street car brakes. The capital stock is \$100,000, and the incorporators are William G. Price, John J. O'Keefe and Charles Atkinson.

The Western Gear Company of Milwaukee, Wis., has established an eastern office for the sale of its well known motor gears and pinions. George C. Ewing, 8 Oliver street, Boston, Mass., is the company's eastern representative.

The C. L. Pullman Car Company has been incorporated at Chicago to manufacture and sell street cars. The capital stock is \$5,000,000, and the incorporators are Charles L. Pullman, E. C. Pullman, G. E. Highley, H. J. Furber and George S. Steere.

The American Electrical Works of Providence, R. I., manufacturers of bare and insulated wire, always issue attractive advertisements and when the occasion offers patriotic ones. For the 4th of July their announcement is a copy of "The Star-Spangled Banner."

The Western Gear Company of Milwaukee, Wis., has quite a handsome souvenir for its patrons. It is a silver cigar holder and ash receiver which may be clamped on the edge of a desk. This token of esteem the company would be pleased to send to its friends on application.

The business of the Wenstrom Electric Company of Baltimore is being mismanaged and Christopher C. Shriver, a stock holder, has petitioned the Circuit Court to have a

receiver appointed. Judge Dennis signed an order to show cause why a receiver should not be appointed.

The Ohio Construction Company has acquired the Menasha & Neenah Street Railway, at Menasha, Wis., and within sixty days will build an interurban line through the city. Interested with Henry C. Payne in the project are M. J. Degnon, C. W. Collister and J. J. Hogan, of Cleveland.

Hayes & Arthur, agents for electrical supplies, Cleveland, O., have been appointed agents in the territory of New York west of Syracuse, and central and northern Ohio, for the sale of drop forged commutator segments, manufactured by the Van Wagoner & Williams Hardware Company of Cleveland.

Hirsch Bros., Chicago and New York, have taken the \$100,000 bonds of the line now under construction from Holland, Mich., to Macatawa Park, a distance of 7½ miles, which also includes a lighting plant. There is a resident population served of about 15,000 people and the summer visitors increase this number by 20,000.

The Brownell Car Company, St. Louis, reports an increasing number of inquiries for fare boxes, one of the most recent being from Nijmegen, Holland. The increasing number of interurban roads and the necessity of small roads dispensing with conductors, have combined to recall the many excellent advantages of a good fare box.

Hirsch Bros. & Co. have effected a consolidation of four of the five electric lighting companies doing business in the territory south of 39th street, Chicago. Bonds of the new company which are to be issued to meet maturing obligations of the old companies and to provide funds for extensions have been underwritten by an eastern syndicate.

The Partridge Carbon Company, Sandusky, O., in reply to our inquiry advises us its business during the month of June, and to date, is better than for two years past, with every indication of keeping up right along. Secretary Speer attributes this to the excellent results the Partridge goods are giving and that new customers are constantly finding out their good qualities.

The stockholders of the Consolidated Car Heating Company of Albany, N. Y., at the last meeting re-elected the old board of directors and declared a dividend of 1.5 per cent. The officers are R. C. Pruyne, president; Charles Tracey and D. P. Sewall, vice-presidents; E. A. Groesbeck, secretary; Charles A. Sheldon, general manager and treasurer; J. F. McElroy, consulting engineer.

A successful test of an air motor of the Hoadley-Knight design is reported on the Eckington & Soldiers Home Railway. The car started out with a pressure of 2,050 lbs., 50 passengers aboard and made the circuit including 32 stops within an hour. Stops were made on the grades and curves and there seem to be no difficulty in starting at any point. At the end of the run the pressure in the air reservoir was 350 lbs.

W. P. Woods is now the St. Louis representative of the Simmons Manufacturing Company of Pittsburg. Mr.

Woods has for a long time past been connected with the Missouri Car & Foundry Company, and leaves that concern to enter the railway supply business on his own account. The St. Louis office is at 1013 Chestnut street, where prompt attention will be given to orders for street railway supplies for all systems.

During the past six months some 50 street railways have been added to the long list of roads which have adopted new process raw hide pinions. The use of these pinions for general machinery purposes is also steadily increasing; and not only in this country, but abroad as well. The maker, (the New Process Raw Hide Company, Syracuse, N. Y.) reports shipments to England, Germany, France, Russia, Italy, Sweden, Australia, and South Africa and state that orders by cable are not unusual.

On June 26, J. H. Bass and C. T. Strawbridge were appointed receivers for the Bass Foundry & Machine Works of Ft. Wayne, Ind. The works will be operated without interruption by the receivers under the same management as heretofore and all orders given to or contracts made with the Works or with the receivers will be promptly and faithfully executed. The receivership is only temporary as the assets are greatly in excess of the liabilities; none of the other concerns in which Mr. Bass is interested are affected.

The Clayton Air Compressor Works, 26 Cortlandt street, New York, has a new catalog (No. 9) which is one of the most complete ever attempted. In addition to the illustrated description of the features of the Clayton compressor, and data regarding the Clayton air lift pumping system there is a descriptive article on the use of compressed air, showing the various applications which have been made of it and giving cuts and descriptions of compressed air tools. The catalog is issued for gratuitous distribution and will be sent on application.

The Detroit Steel & Spring Company states that there is a gradual improvement in its general business. However buyers are making their purchases very carefully. As an indication of this, the first six months of this year show an increase of from 15 to 18 per cent as compared with the same period last year yet the tonnage of the sales for this year is not as great as it was last. This will be more than offset by a comparison of the coming six months as it is safe to say that the business will be double what it was during the last six months of last year.

The R. D. Nuttall Company of Allegheny, Pa., has appointed new representatives for its northern states sales department, in the persons of Messrs. Hayes & Arthur, 302 Cuyahoga building, Cleveland, O. Mr. Hayes needs no introduction to many of our readers, being already well known in the electrical line, in which he has acquired considerable experience and made many friends. While not so well known, Mr. Arthur brings into the business an untiring energy and a pleasant personality that will commend him to all with whom he will come into contact.

The National Association of Manufacturers of the United States has secured a building in Caracas, Venezuela, which is to serve as a sample warehouse for American goods. The warehouse is intended for the display of American

goods with a view of bringing them before the public under favorable circumstances for both buyer and seller. It is designed to make the charges for space as low as possible and pay the necessary expenses. Applications for space or further information should be addressed to the National Association of Manufacturers, 1751 North 4th street, Philadelphia.

The American Institute Fair will be opened September 20 and continue until November 4 at Madison Square Garden, New York. Everything pertaining to railways and transportation by land and water will be included in the exposition. The institute has a system of awards for meritorious inventions and improvements which include the gold medal of honor, the special medal of silver, the medal of taste, bronze medals of excellence and merit, diplomas and special awards, which are of value in advertising and selling any article thus honored. Dr. P. H. Murphy is the chairman of the board of managers.

The extensive works of the Ball Engine Company, Erie, Pa., we are glad to learn, are full of work. This company is one of the pioneer builders of automatic engines for electric purposes, having been building the Ball automatic engine for 15 years. Under the present management the engine has reached a high degree of perfection, and is a strictly high grade automatic engine. These engines can be found in a large number of the electric light and electric railway central station plants in this country, and there are a great number of them that have been running from eight to 15 years that are today in constant and satisfactory use.

The Warrenton Woolen Company, manufacturers of high grade cloths for uniforms, is making very gratifying progress in introducing its goods to street railways, and the number of roads now adopting these woollens for exclusive use, is constantly increasing. Among the roads where a certain cloth is "stipulated" and which have named these goods, may be mentioned the Chicago City Railway, the North Chicago Street Railroad and some of the Brooklyn lines. Theo. A. H. Weinz, 57 Leonard street, New York, is the sole agent, and is an experienced uniform man, who has devoted many years to a study of the requirements of that special work.

The Albert & J. M. Anderson Manufacturing Company, 289 to 293 A street, Boston, has just circulated a neat catalog on switches, switch-boards and lightning arresters. A partial list of switch-boards, including those of the Buffalo Street Railway, Metropolitan Street Railway, the Union Traction and other street railway companies, made by this firm, is given. The Ajax car arrester is also illustrated and described. The company reports that the switch department is handling a large amount of work on storage battery switches for large plants. A new brass foundry, lately built and equipped, enables the company to manufacture copper castings of a high grade and every variety of switch and switch-board.

Frank J. Sprague, who received the contract for equipping the electric rolling stock of the Alley "L," Chicago, subject to the satisfactory operation of a six-car train has let contracts for the equipment of the six experimental cars, and a series of tests with the train will be made at Schenectady the latter part of July. The General Electric Company is



to furnish 12 motors; the McGuire Manufacturing Company, 12 trucks; the Standard Air Brake Company, six sets of independent electric motor air-brake equipments. Other contracts have also been let. Green economizers will be used in the power house, Atkinson and Roebbling rail bonds have been specified, copper will be furnished by the Western Electric Company, and the construction work has been let to the Electric Installation Company.

The Central Electric Company of Chicago, is well prepared to furnish all classes of material necessary for repairs and construction. It gives especial attention to the quick shipment of materials, and it has surprised many of its customers to know that their goods were delivered in so short a time after having been ordered. The Central Electric Company appreciates the necessity of quick deliveries, therefore its promptness. It is always abreast of the times, and in possession of the latest specialties, which possess merit. It does not always claim to furnish material at the lowest prices, but its aim is high, and it strives for the best. Quality is the standard, and satisfaction to customers the uppermost motive. The company is constantly inquiring of the trade, as to their needs and soliciting inquiries, and is pleased to be of service to all who desire to investigate its specialties or products.

The H. W. Johns Manufacturing Company, New York reports with gratification that its sales of trolley line and other insulating materials have been greater during the past six months than during any similar period heretofore. Shipments have in several instances been notably large and destined for all parts of the world. The toggle clamp feed wire insulator introduced some months ago, with its automatic, time-saving and economic features, has been quickly recognized as the first practical embodiment of valuable improvements over all other forms of insulators for supporting and insulating heavy cables. There has been some difficulty in keeping up with the orders for the toggle clamp and strain insulators. The company is enlarging its manufacturing facilities in order that there may not be the delay this year in furnishing the H. W. J. electric car heaters occasioned last year by an underestimation of the demand.

The Westinghouse Electric & Manufacturing Company's Chicago branch has during the past two months secured a big share of the electrical contracts let in its territory. In addition to the big equipment of the South Side Elevated Railroad, already noted in these columns, the Westinghouse Company has sold motors and generators to the Indianapolis, Anderson & Marion Electric Railway, Marion, and the Indiana Electric Railway, Goshen; a 150-k.w. generator and several motor equipments to J. C. Hubinger, Keokuk, and eight equipments to the Sioux City Traction Company, Sioux City, Ia.; equipments for the Oakland Railway, Detroit, and a 400-k. w. slow speed direct connected generator to the Dow Chemical Company, Midland, Mich. Among recent contracts for lighting and transmission plants is one with the Apple River Power Company of New Richmond, Wis., where a 6,000-volt inductor type generator will be installed, the first of this type installed by the Westinghouse Company in the western territory.

The first large underground work in St. Louis is now under way, and the Standard Underground Cable Company

of Pittsburg, New York, Chicago and St. Louis, has recently secured from the Bell Telephone Company of Missouri, and the Kinlock Telephone Company, (both of St. Louis) two of the largest contracts ever let in this country (and probably in the world) for telephone cables, these two orders comprising all the underground work in St. Louis yet contracted for, and constituting the complete cable equipment for both telephone companies. Both contracts were secured in the face of the most severe competition, and the well known excellence of the telephone cables manufactured by the Standard Underground Cable Company largely influenced the placing of the order with them, as the prices were exceedingly close. To fill these contracts there will be required more than 650,000 feet of cable, which in turn requires about 100,000,000 feet of No. 19, B. & S., copper wire, and 2,000,000 pounds of lead. To meet this extraordinary demand, the manufacturing facilities of the company in the paper covering department, have recently been doubled, which places it in a position to not only handle this enormous volume of business rapidly and easily, but at the same time to fill without any delay, the large, and constantly increasing orders for telephone cables, electric light and power cables, rubber insulated wire, etc., which are being daily entered. Considerably more than one-half of this cable will be installed by the Cable Company, it having contracted to turn the cable system of the Kinlock Company over to that company complete and ready for service. A large force of expert workmen will be employed for nearly a year in this work under the direct supervision of the St. Louis office.

#### NEW PUBLICATIONS.

A. A. Schantz, general passenger agent of the Detroit & Cleveland Steam Navigation Company, Detroit, has issued a charming little booklet written in verse, describing the lake trip to Mackinac. It is well worth sending for and reading.

"Illustrated Binghamton" is the annual souvenir issued by the Binghamton Railroad Company, of which J. P. E. Clark is the enterprising general manager. It is a book of 36 pages and as its name indicates is profusely illustrated with views of the public and private buildings of the city, and the pleasure resorts and parks which make Binghamton so attractive in summer.

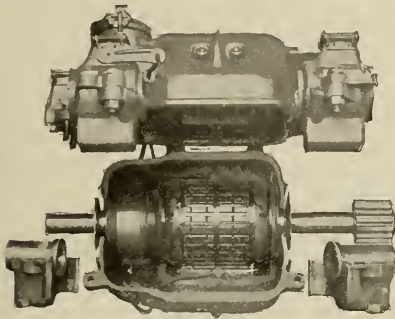
We have just received the report of the fifth annual meeting of the Pennsylvania Street Railway Association held in September, 1896. The papers read at the meeting have been published in the REVIEW, but the verbatim report contains in addition to these the discussions of the subjects, "Street Railway Law" and "Liability Insurance," which are very interesting. In its typography and presswork the report leaves nothing to be desired.

"The Street Railway System of Philadelphia," by Frederick Speirs, Ph. D., is the latest of the Johns Hopkins University studies in historical and political science and an interesting and instructive account of the subject, giving the process through which the different railways of the city have been combined in the hands of the Union Traction Company. Published by the Johns Hopkins Press, Baltimore, Md. Price \$1, bound in cloth.

We acknowledge the receipt of the 1897 edition of American Street Railway Investments, financial supplement of the Street Railway Journal. In addition to the data which has been incorporated in previous editions of the "Red Book" and the review of the year, making mention of the most important events bearing on street railway results, a table has been added in which are compared the gross receipts of 1895 and 1896 of all roads whose gross receipts are in excess of \$25,000 per annum. Companies are arranged according to the magnitude of operations in 1896, making the table convenient for comparing financial results.

## G. E. 52 MOTOR.

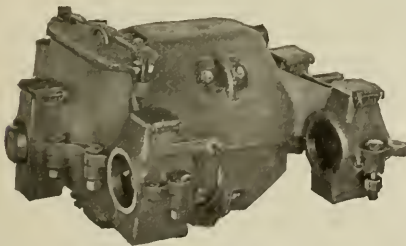
The General Electric Company offers a new street railway motor having a capacity of 28 h. p. which is intermediate between the G. E. 1,000 and the G. E. 800. The new motor is to be known as the G. E. 52 and is rated according to the G. E. standard, i. e., a maximum rise of 75° C. in the temperature of the windings after an hour's



NO. 52 MOTOR WITH CASE OPEN.

run at the rated load, the temperature of the air not exceeding 25° C. This motor is designed for ordinary street railway service and will accommodate electric brakes. The frame is of steel, cast in two bowl-shaped pieces and hinged and bolted so as to make it dust and water proof. The motor has four field pieces, each with its own coil. The pole pieces are bolted to the frame. The large bearing surface insures small expense for bearing linings. The armature bearings are designed for the use of both oil and grease. They are constructed on the "outboard" bearing plan and measure on the pinion end,  $7\frac{3}{4} \times 2\frac{3}{4}$  in. and on the commutator end,  $6\frac{3}{8} \times 2\frac{1}{2}$  in. The upper support for the lining is cast with the upper half of the motor frame and the space between the inner end of the lining and the motor frame is occupied by a thrust collar which also acts as an oil guard. The lower support for the lining is a cap bolted to the upper half but not inclosing the lower half of the oil guard. This allows free outlet to the oil and grease and makes it impossible for the lubricant to work into the motor.

The field coils are wound with asbestos-covered wire and are "mummified," each being held in place by a projection of



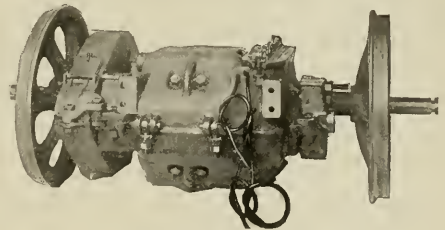
NO. 52 MOTOR CLOSED.

the pole piece. The connections between the upper and lower fields are made outside the motor and both the field and armature leads are brought out at the front.

The armature is the iron clad, hollow core type, 11 in. in diameter with a spread of 9 in. The laminated core is provided with three ventilating ducts. There are 29 slots on the armature periphery, each containing three coils, connected to 87 commutator bars. The small number of coils minimizes armature repairs and grouping them admits of good insulation. The small weight of the armature is a great advantage in car operation. The standard gear ratio is 4.78 with a taper bore pinion having 14 teeth and a cast iron gear with 67 teeth. The commutator segments are of hard drawn copper,  $1\frac{1}{8}$  in. deep allowing a wearing depth of 1 in. The brush-holders are standard and staggered to prevent wearing of ridges in the center of the commutator. Each holder contains two radial brushes,  $2\frac{1}{4}$  in. long,  $1\frac{1}{4}$  in. wide and  $\frac{1}{2}$  in. thick. The brush-holder yoke is treated with an insulating compound and is rubbed to an enamel finish, preventing the lodgment of carbon dust.

The suspension can be either the nose, the yoke or the sidebar; but the yoke suspension is especially recommended as the weight of the motor is then carried on springs, placed on the side frames of the car trucks. Lugs are cast on the upper half of the motor frame, to which the suspension bar is bolted, the motor being suspended from the top half. This permits easy access for inspection and repairs as the lower half can be swung down into the pit without disturbing the upper half, which remains suspended from the axle and yoke.

When mounted on 33-in wheels the clearance between the



END VIEW OF MOTOR.

bottom of the motor and the top of the rails is 5 $\frac{7}{8}$  in. and between the gear case and the rail it is 4 $\frac{5}{8}$  in. The motor without gear or case weighs 1,460 lbs. and complete with gear and case the weight is 1,725 lbs.

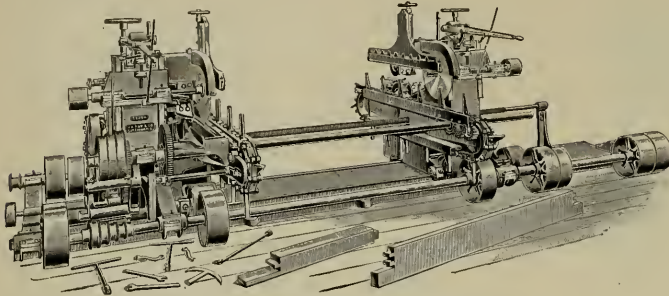
## OBITUARY.

Col. C. W. Frazer, formerly president of the Memphis Street Railway and a prominent lawyer, died July 10. Mr. Frazer was a well known attendant on the conventions of the American Street Railway Association in the ante-electric days, and was the object of much pleasantry from the fact that he was drawn into street railway work through taking an unimportant case for the road of which he afterwards became chief owner and president. He was a bright speaker and a successful manager, and was always one of the conspicuous delegates and warmly welcomed at conventions.

The water pumping station at Chatanooga, Tenn., was shut down for repairs on June 21 and the town was without water. The street railway could not run its cars.

### FAY TENONING MACHINE.

The illustration shows the No. 7 automatic double tenoning machine recently placed on the market by J. A. Fay & Co., 557 to 577 West Front street, Cincinnati. With this machine both ends of the material are cut off to the proper length, and either single or double tenoned; the pieces are fed through the machine on an automatic carriage, producing tenons that are square with each other, with a great saving of the labor and time otherwise necessary. There are



NO. 7 DOUBLE AUTOMATIC TENONING MACHINE—J. A. FAY & CO.

eight tenoning heads, two on each spindle, and each furnished with knives that will cut tenons 6 in. deep; by using two heads on each spindle a tenon 12 in. deep may be cut. The spindles are  $1\frac{1}{4}$  in. in diameter and gibbed to vertical guides where an adjustment of 12 in. may be had. The vertical spindles are of the same size and are fitted with special heads for working double tenons to the depth of 4 in. The capacity of the machine is for timber from 10 in. to 9 ft. between shoulders, and up to 24 in. wide and 8 in. thick; if the ends be first cut to the proper length it will cut tenons on stock 12 in. thick.

### GENERAL ELECTRIC OF CHICAGO MAY USE THE TROLLEY.

It appears that the rumors long current to the effect that the Love conduit system would be installed by the General Electric Railway Company of Chicago as soon as its legal battles were fought, were ill-founded. The city council graciously passed an ordinance permitting that company to use the overhead trolley, but this was vetoed by the mayor. Further action by the council is not to be expected until the factional fight among the promoters is settled.

Gradual improvement in traffic can be noticed on the Brooklyn street railway lines, as may be seen from the report of the Brooklyn Rapid Transit Company. For the month of June, 1895, the gross earnings of the Brooklyn Heights Railroad were \$416,611, and of the Brooklyn, Queens County & Suburban Railroad \$71,595, making a total for the system of \$488,206. In 1896 the receipts decreased on the two lines to \$407,496 and \$65,022, and the total to \$472,519. However an improvement is manifest in this year's figures, which are respectively \$427,312 and \$68,185, a total of \$495,497. For the 12 months ending June 30, the gross earnings amounted to \$5,345,688, an increase of \$206,560 over the last fiscal year.

### SANTA ANA - LOS ANGELES TRANSMISSION LINE.

A contract for the transmission of power from the river running through the Santa Ana cañon to Los Angeles and Pasadena, has been concluded between the Southern California Power Company and the General Electric Company. The amount of power to be transmitted at first is 4,000 h. p. The station will be located in the Santa Ana cañon, 12 miles from Redlands and about 80 miles from the towns in which the electric power will be utilized. The water will be taken from the river through canal, flume and tunnel along the side of the cañon. Here it will be led into a pipe line 2,200 ft. long, giving what will be equivalent to a vertical fall in the water of 750 ft. The wheels will be of the impact type, directly connected to the generators of which there will be four, each of 750 k. w. (1,000 h. p.) capacity. The maximum line potential will be 33,000 volts to which potential the initial voltage will be raised by twelve 250-k w. step-up transformers.

This transmission will be the longest commercial electrical power transmission as yet undertaken, as well as that using the highest voltage. At present the longest is that transmitting the power of the waters of the Ogden cañon in Utah to Salt Lake City, a distance of 36 miles. The Los Angeles transmission will, be over twice that distance, and three times the longest distance yet tried with the power of Niagara which up to the present has only been transmitted to Buffalo, a distance of 26 miles.

### BLACK SAND POOL YELLOWSTONE PARK.

"No person who visits the Upper Geyser Basin should fail to see Black Sand Pool. It lies on the south of the main Upper Basin, and is reached by a road leading past the beautiful Punch Bowl Spring. Black Sand Pool is an oval spring some 40 feet long by 20 or 25 feet wide. The water is of a light blue sapphire or turquoise color—it is not easy to name the precise tint in many instances—extremely beautiful, from whose surface the steam constantly rises. The great peculiarity about it is that the encircling sides, which are in places fifteen feet high or more, are composed of black probably decomposed obsidian, sand."

The above is taken from "Wonderland 97," a new book published by the Northern Pacific Railway. Send six cents to CHAS. S. FEE, Gen'l Pass. Agent, St. Paul, Minn., for it.

### NEW CROSSING LAW IN NEW YORK.

Among the amendments to the general railroad law of New York is the following section applying to the crossings of street with steam railways:

§ 68. All street surface roads hereafter constructed across a steam railroad shall be above, below or at the 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 road.



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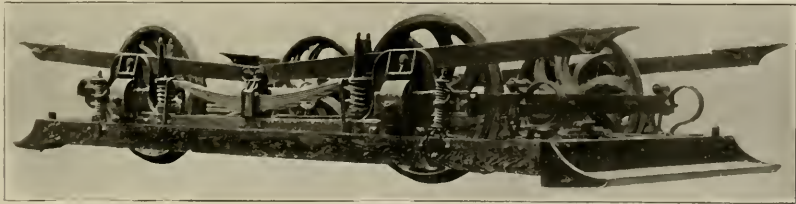
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**THE LOVEJOY TRUCK.**

The Calumet Electric Railway is now experimenting with a new type of non-oscillating truck which was built for the patentee, T. H. Lovejoy, by the Paige Iron Works of Chicago. The construction will readily be seen from the illustration; four levers are pivoted to the rectangular frame which supports the car body and to the upper part of the pedestals; the two levers on each side are connected to

when passing over a low joint, but this arrangement reduces the vibrations that occur with independent springs to a single one, and that one not so violent since the impact of the wheel must lift the whole instead of the half of the car to set up a vibration. The jaws of the bearings in which the supporting levers are mounted permit no lateral motion of the car body, and, as the trial on the Calumet demonstrated, this completely obviates the lateral vibration or "nosing" which is even more disagreeable than pitching.



THE LOVEJOY NON-OSCILLATING MOTOR TRUCK.

each other at the inner ends by the strap passing around a leaf spring which at the ends is connected to the truck side. When the manner in which the connections are made is considered it is evident that the car body and the truck side must be always parallel to each other and that there can be no oscillation of the car except a vertical motion of the whole car which is in itself a very good damper on "pitching." It is of course impossible to keep the car body level

**CONDUCTORLESS CARS AT LANSING.**

Judge Person declined to issue a writ of mandamus to compel the Lansing (Mich.) Street Railway Company to employ conductors on its cars, it being an uncontradicted fact that the company is not making enough money to pay conductors. The judge holds that the discretionary writ of mandamus will not be granted to compel an impossible thing.

## ELECTRIC STATION MANAGERS:

**YOU CAN'T AFFORD TO WASTE YOUR EXHAUST STEAM,** which you are doing, when you can sell it at a large profit. Many Street Railway and Electric Light Companies are making handsome dividends from this source.

**YOUR COAL BILL WILL BE NO HIGHER.**

These are some of the street railway companies that have adopted our systems:

Springfield, (Ill.) Elec. Lt. & St. Ry. Co.  
Terre Haute Electric Railway Co.  
Danville Gas, Elec. Lt. & St. Ry. Co.  
St. Joseph Street Railway Co.  
Ottumwa Electric Railway Co.

If these are not near you, write us and we will send you addresses of users in your vicinity.

Get our New Catalogue containing many letters like this, and full of information.

**AMERICAN DISTRICT STEAM CO., Lockport, N. Y.**

## ONE MANAGER SAYS:

"Have been operating the steam plant five years, warming between four and five million cubic feet of space. Income from steam heat over \$12,000 per annum, all from exhaust steam, except from \$300 to \$500 additional fuel in consequence of steam loss. Carry five to ten pounds back pressure, according to temperature outside, and only need to increase boiler pressure same amount. Have already paid for the entire installation of the steam heating system out of the additional profits since we put it in. We have no trouble or expense from leaky joints, and we do not employ any additional help in operating the plant over what we formerly employed for our lighting and street railway service."

## Directory of Street Railway Associations.

### American Street Railway Association.

President, R. McCULLOCH, St. Louis, Mo.; First Vice-President, C. S. SEROANT, Boston, Mass.; Second Vice-President, D. B. DYER, Augusta, Ga.; Third Vice-President, C. F. HOLMES, Kansas City, Mo.; Secretary and Treasurer, T. C. PENNINGTON, Chicago, Ill. Executive Committee, H. M. LITTELL, New York; H. P. BRADFORD, Cincinnati, O.; C. H. SMITH, Troy, N. Y.; H. SCULLIN, St. Louis, Mo.; G. B. HIPPEE, Des Moines, Ia.  
Next meeting, Niagara, N. Y., third Tuesday in October, 1897.

### The Street Railway Accountant's Association of America.

President, HENRY L. WILSON, Boston, Mass.; First Vice-President, C. M. DUFFY, St. Louis, Mo.; Second Vice-President, J. F. CALDERWOOD, St. Paul, Minn.; Third Vice-President, C. B. REAVIS, Augusta, Ga.; Secretary and Treasurer, W. B. BROCKWAY, Toledo, O.; Executive Committee: The OFFICERS and DANA STEVENS, Washington, D. C.; W. S. DIMMOCK, Council Bluffs, Ia.; W. G. ROSS, Montreal, Can.; E. R. L. THOR, Brooklyn, N. Y.

### New York State Street Railway Association.

President, G. TRACY ROGERS, Binghamton; First Vice-President, W. CARL ELK; Niagara Falls; Second Vice-President, JOHN N. BROKLEY, Rochester; Secretary and Treasurer, H. A. ROBINSON, New York. Executive Committee: H. H. VARELAND, New York City; JOHN W. McNAMARA, Albany; H. M. WATSON, Buffalo, C. L. ROSSITER, Brooklyn.  
Next meeting, Niagara Falls, first Tuesday, September, 1897.

### Ohio State Tramway Association.

President, A. A. ANDERSON, Youngstown; Vice-President, T. R. CATLIN, Canton. Secretary and Treasurer, F. J. SLOAT, Akron; Chairman Executive Committee, W. F. KELLEY, Columbus.  
Next meeting, Columbus, June 8, 1896.

### Pennsylvania State Street Railway Association.

President, JOHN LLOYD, Altoona; First Vice-President, ALBERT JOHNSON, Allentown; Second Vice-President, ROBT. E. WRIGHT, Allentown; Secretary, S. P. LEIGHT, Lebanon; Treasurer, W. H. LANUS, York. Executive Committee, JOHN LLOYD, B. F. MYERS, S. P. LEIGHT, JOHN A. RHOE and E. C. FELTON.  
Next meeting, Allentown, first Wednesday in September, 1897.

### Michigan Street Railway Association.

President, W. L. JENES, Port Huron; Vice-President, W. WORTH BEAN, St. Joseph; Secretary and Treasurer, B. S. HANCOCK, JR., Grand Rapids; Executive Committee, OFFICERS OF THE ASSOCIATION and CHAS. M. SWIFT, Detroit, and E. E. DOWNS, Kalamazoo.

Next meeting, first Wednesday in December, 1897.

### Massachusetts Street Railway Association.

President, PRENTISS CUMMINGS, Boston; First Vice-President, P. F. SULLIVAN, Lowell; Second Vice-President, JOHN R. GRAHAM, Quincy; Secretary, CHAS. S. CLARK, Boston; Treasurer, W. F. POPE, Boston. Executive Committee: E. P. SHAW, Newburyport; E. C. FOSTER, Lynn; CHAS. B. PRATT, Worcester; G. H. CAMPBELL, Lawrence, and S. M. THOMAS, Taunton. Auditing Committee, J. N. AARSMAN, Worcester; C. S. SEROANT, Boston, and ROBERT S. GOFF, Fall River.

Meetings are held every month.

### Connecticut Street Railway Association.

President, H. HOLTON WOOD, Derby; Vice-President, HENRY S. PARMLEE, New Haven; Secretary, E. E. BREED, New Britain; Treasurer, E. S. GOODRICH, New Britain. Executive Committee, A. L. YOUNG, Waterbury; E. ISRAEL KILBY and A. W. DODGE.

### Texas Street Railway Association.

President, CARL F. DRAKE, Austin; Vice-President, A. H. HATWARD, Houston; Secretary and Treasurer, C. L. WAKEFIELD, Dallas. Executive Committee: The OFFICERS and GEO. B. HENDRICKS, Fort Worth, and A. H. HATWARD, Houston.  
Next meeting, San Antonio, third Wednesday in March, 1896.

### The Maine Street Railway Association.

President, W. R. WOOD, Portland; Secretary and Treasurer, E. A. NEWMAN, Portland. Executive Committee, W. R. WOOD, Portland; H. TWITCHELL, Bath; A. F. GERALD, Waterville; J. HAYNES, Augusta; G. E. MACOMBER, Rockland; E. H. BANES, Biddeford; E. K. DAY, Sanford; F. N. LAUGHTON, Bangor; F. W. DANA, Lewiston.

### The California Street Railway Association.

President, CHAS. F. CROOKER, San Francisco; Vice-President, S. B. McLENEGAN, San Francisco; Secretary and Treasurer, J. E. MORRIS, Oakland. Executive Committee, E. P. VINING, San Francisco; F. W. WOOD, Los Angeles; L. WHEELER, Alameda.

## SUBURBAN COMMENCES OPERATION.

The Suburban Railroad of Chicago inaugurated its service between the West 48th street terminus of the Metropolitan elevated and La Grange on July 3. The headway is 20 minutes and the scheduled speed over 20 miles per hour including stops. All the company's cars were equipped with air brakes by the Christensen Engineering Company of Milwaukee, one with a motor-driven and the others with axle-driven compressors. The cars reach a speed of 30 miles and pick up passengers at any point. Both types of brakes have proved very satisfactory, placing the cars under perfect control.

## SUMMER TOURS.

### Rivers, Mountains and Seashore.

#### GRAND TRUNK RAILWAY SYSTEM.

The sale of Summer tourist tickets from Chicago to Eastern Tourist Resorts reached by the Lines of the Grand Trunk Railway System, embracing Niagara Falls, Muskoka Lakes, St. Lawrence River, White Mountains, Portland and Seacoast Resorts, commences June 1st, continuing to September 30th, inclusive.

Seaside and White Mountains Special. "The Finest Train in the World," making weekly trips between Chicago, Portland and Old Orchard Beach. First trip eastbound from Chicago, June 24th. The elegance and comfort of this train, combined with the ever-changing panorama of Nature's grand and beautiful scenery through which it passes, makes it the most desirable train between Chicago and the Sea Shore and Mountain Resorts of the East.

For further particulars, Excursion Folders, Time Tables, Berths in Sleepers, or Tickets, apply to L. R. Morrow, C. P. & T. A., 103 Clark St., Chicago.

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## BICYCLE CARS AT PITTSBURG.

The northern portion of Allegheny and the contiguous territory abound in good roads and pleasant resorts for wheelmen but they were almost inaccessible because of the steep hills leading to them. In order to accommodate wheelmen the Second Avenue Traction Company of Pittsburg placed a number of bicycle cars on the Perrysville avenue division. The bicycle cars are closed cars, which would not otherwise be used in summer, with seats at one side removed and racks substituted; the passenger may ride in the same car or in the other cars of the train. The schedule which we have received from J. M. Tate, Jr., general manager of the Northside Division, provides for bicycle cars every 15 or 16 minutes from 1 to 9 p. m. on Saturdays, from 7:30 a. m. to 9:30 p. m. on Sundays and other days from 6:30 to 9 p. m. The fare for wheel and rider is 15 cents.

The Iron Age Manufacturers Index, published as a supplement to the Iron Age of July 1, is an octavo volume of 146 pages, giving the names of manufacturers in the hardware, iron, metal and machinery trades, indexed under their products. For addresses reference is made to the advertising pages of the Iron Age.

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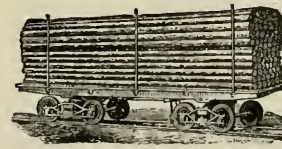
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## MUST SUE TO RECOVER.

A decision by Judge McAdams, of the Supreme Court of New York, defines the liabilities of street car companies when passengers are transferred without being given tickets, and a second fare is collected. In such a case John A. Stewart sued under the railroad act and secured a judgment against the company for \$50, which is the penalty for receiving more than the lawful rate of fare. The decision of the lower court was reversed, the judge holding that Stewart could have recovered in an action for a breach of contract, and would be entitled to compensation for his loss of time, the additional fare paid and the injury to his feelings, but instead of doing that he brought suit to recover a penalty.

"It is quite manifest that the statute was intended, not to afford a remedy for a breach of contract, but to punish an attempt to exact more than the legal fare from passengers in railroad cars or trains, and that it cannot be extended to cover the case of an attempt to collect what is supposed by the conductor to be the one fare which he is required to receive from a passenger."

## WHERE WILL YOU SPEND THE SUMMER?

It is not too early to begin to think of the best place to spend your summer vacation. Do not leave this matter until the last moment, make up your mind in a hurry and then—regret for the next six months that you did not take more time in making your decision. And while you are thinking of this matter it will pay you to investigate some of the many hundred beautiful resorts situated along the line of the New York Central & Hudson River Railroad. You cannot get a better list to choose from. If you want a gay social time, and can afford it, take the New York Central to Saratoga, Lake George, Lake Champlain, or the Thousand Islands. If you want a quiet, rustic time, you can find it in one of the many small villages scattered through the Adirondacks, the Catskills, or the Berkshire Hills. The New York Central lines will take you into the heart of these famous regions. If you want to spend your vacation in sight seeing, take this same railroad to Boston, Buffalo, Niagara Falls, Montreal, Toronto, Chicago, St. Louis or Cincinnati. In addition to simply taking you to these different places, the New York Central will take you in the best possible manner. It has the fastest and most perfect through train service in the world, with new and elegant sleeping, drawing room and dining cars made by the Wagner Palace Car Company. It has justly been said of this road that, "For the excellence of its tracks, the speed of its trains, the safety and comfort of its patrons, the loveliness and variety of its scenery, the trade and importance of its cities, and the uniformly correct character of its service, the New York Central & Hudson River Railroad is probably not surpassed by any similar institution on either side of the Atlantic."

For further information about any place along this road apply to George H. Daniels, General Passenger Agent, Grand Central Station, New York City.

## A SHORT DESCRIPTION.

A short description of the Lake Shore & Michigan Southern Railway will not be uninteresting to any one who is thinking of taking a business or pleasure trip from New York, Boston or Buffalo to Chicago.

This railroad is the only double track line between Buffalo and Chicago, and in connection with the New York Central and the Boston & Albany railroads, forms the only double track route between Chicago, New York City and Boston. It is the most interesting route between the East and West, traversing the richest and finest portion of the Middle States. In the opinion of those experienced in travel, it has no superior in perfectness of roadbed, punctuality and elegant service and the comfort and care of its patrons.

Leaving Buffalo the line traverses the picturesque south shore of Lake Erie through the Western Reserve, passing on its way a large number of very interesting points until it reaches Elyria, O., a city 25

miles west of Cleveland. Here the tracks diverge; the southern line passing by way of Oberlin, O., and the northern line going by way of Sandusky, O. The two lines meet a few miles east of Toledo, O., but make another divergence about 3 miles west of Toledo. One of the lines runs north through the most pleasing portion of Southern Michigan and the other turns south traversing Ohio and Indiana through northern parts. At Elkhart, Ind., the lines meet again and continue west through a rich farming country past South Bend, La Porte, with its lovely lakes, and traversing the south shore of Lake Michigan, terminate at Chicago.

Wagner vestibule sleeping cars, complete in every detail for comfort, pleasure and safety, are run through between the above mentioned cities. The meals and service of the dining cars are all that can be desired, equalling that at the leading hotels.

Detailed information about the various cars, connections and time tables, will be furnished on application to A. J. Smith, General Passenger and Ticket Agent, Cleveland, O.

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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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. AUGUST 15, 1897. NO. 8

THE pass question has been almost too effectually solved in Nebraska by the last legislature, and since July 11th any public official, including policemen, who is convicted of riding on a pass or reduced rate may be fined from \$200 to \$500 and have his office declared vacant.

THE Supreme Court of California has declared a forfeiture of the company's rights as to the tracks on Bush street, San Francisco. By reason of consolidation the line furnished practically no business and for some months but one trip per day has been made over the route in question. The company will be requested to remove the unused tracks.

OFFICIAL investigation of the unfortunate wreck on the Soho Hill line in Pittsburg shows conclusively that the accident was the result of overcrowding, which the employes and police did all they could, short of violence, to prevent. It was a rear end collision, in which one passenger was killed and several badly injured. Except in the extent of the results it was very like the Columbia accident a year ago. In both cases the front platform was crowded to such an extent that it was practically impossible for the motorman to work his brake. In both cases it was a pleasure crowd returning from a park entertainment, every person of which seemed imbued with a desperate desire to take the first car. While it may not be a practicable thing to do in either of the places named, it might not be a bad arrangement to load

through heavy turnstiles into inclosed stations, which would enable the starter to control the number who could get through to one or more cars. While the passengers are to blame for the overcrowding, having done so in spite of the efforts of the crew, still so long as people continue to use so little judgment as to their own safety it becomes a question of self-protection to the company to use every means possible to exercise judgment for those who seem utterly devoid of common sense in such matters.

THE consolidated road, Atlanta, has won a signal victory in the United States Circuit Court in defeating an ordinance passed by the city council to take effect last May, providing that passengers shall be carried from any point to any other point on company's lines for one fare. The case reached a hearing in the higher courts with unusual dispatch and this is one of the most important decisions as to transfers yet rendered. The company's franchise calls for one continuous ride for a certain fare, and the essence of the decision may be found in the words, "One continuous ride is one thing and two or more rides with the necessary stoppage and letting passengers off and taking them on is another and entirely different thing."

LAST month we directed attention to the great advisability of increasing revenue by furnishing facilities for the transportation of bicycles. Since then the information has come to us of what has been done in San Francisco. The Market Street road equipped one hill division with dash racks for wheels in February. That month 262 wheels were carried, which meant not only five cents for each wheel, but five cents more for the owner who rode inside the car. This meant \$26.20 for that one division, which otherwise the company could not have earned. The record shows a constant increase, and by May, three months later, the number of wheels carried on this division had increased to 962 for the month.

So promising were the results on the hill division it was decided to equip one of the level lines, which was done in April, carrying in that month 461 wheels. In May the business on that line had increased to 914 wheels, or nearly \$100. The company has now nearly finished equipping all the cars in its big system, placing a rack on both front and rear dash. The rack is easily detachable, weighs only 25 lbs., and when removed leaves no defacement.

We firmly believe almost every road in the country can successfully adopt the same plan to a greater or less extent. We are informed the placing or removing of wheels occupies but a moment and does not materially interfere with schedule time.

ON July 22nd Judge Showalter, sitting in United States Circuit Court for the district of Indiana, rendered his decision in the 3-cent fare case and ruled in favor of the company on all points at issue. It was argued that the Federal Courts must follow the decisions of the State Supreme Court on the constitutionality of State laws, but the judge points out that where in the past a federal question has been involved and the Federal Court ruled in accord with the State Court it was merely because the judges were of the same opinion and not because the Federal Court was in any way subservient to the other. Briefly stated, the reasons for holding the 3-cent fare law unconstitutional are, that in Indiana street railways must be incorporated under general

laws, and that the act of 1897 so altered the act of 1861 that it became special and local in its nature. Jurisdiction was given to the Federal Court both because the plaintiff was a citizen of New York and because the charter contract between the company and the state was involved. The text of the decision will be found on another page and constitutes a most important contribution to street railway legal literature. From the time occupied by the judge in reaching his decision it appears that he has given the case most careful study, and there is every reason to believe, after reading the opinion, that the Federal Supreme Court will sustain it.

Indianapolis has been one of the seats of war which it is the fashion to wage upon all corporations and street railways in particular, and, thanks to the efforts of demagogues and the daily press, it became necessary for all "friends of the people" to join in the attack and forced the republican legislature, for political reasons, to join the democratic city council in the attempt to prescribe 3-cent fares for Indianapolis and thus virtually confiscate the company's property. Political reasons also led the state officials to say a good many rather foolish things and to unnecessarily revile the Federal "interference in state affairs." It is only necessary to compare the arguments, or, for that matter, to read the two opinions, to see that populistic political economy, rather than law, was responsible for the remarkable view taken by the State Supreme Court.

THERE is nothing requiring more care on the part of a street railway electrician than the design of a reliable and efficient feeder system at minimum cost. Thompson's law is frequently quoted and used, but as shown in R. W. Conant's article on the Efficient Transmission of Power to Street Railway Lines, page 431, July REVIEW, its application to feeders is out of place and leads to incorrect results. Those who are designing feeder lines would do well to investigate the curves and formulæ deduced by Mr. Conant, as they are probably the most accurate and scientific published. His work is not purely theoretical, as he has tested every part of it in practice.

There is such a scarcity of data that a general theory has not been deduced, and the electrical engineer depends largely upon his experience and judgment. That there is a great variety in practice may be seen from the article on Feeder Lines in this issue. Some roads have adopted a rather high voltage, as is the case at Minneapolis where the current is generated at 625 volts, and others run the stations at 500 and no more. The latter practice may be justified. There was published in the February REVIEW an article by J. R. Chapman with data to demonstrate the greater economy in operating at 500 than at a higher voltage. The drop in potential generally governs the size of trolley wire and feeders, but as a rule a sectional area of 1,000 c. m. is allowed per ampere of current carried. It is to be remarked that on the system where the highest voltage is used an area of 3,000 c. m. per ampere is allowed. A very liberal allowance in feeder lines may be justified with the view of further extensions. With other companies a small initial cost is imperative, consequently there is a considerable loss in voltage, an inefficient operation of the car motors and a larger generating plant than would otherwise be required. In some instances a road may be operating under unusual conditions, as the City & Suburban at Portland, Ore., where fuel is obtained in greater quantities than desired at a fixed

price. It would not pay this company to make a large investment in feeders, as a considerable loss in transmission would be of no moment.

A careful supervision of the feeder and return circuits will often disclose great leaks. Sometimes the soldered joints become loose, and the contact is very poor. A return circuit with a few defects consumes a large amount of power. On one road in Chicago a copper return was strung direct from the station a few hundred yards to a point where there was some complicated special work, and connections were made to the different tracks branching from this place. The result was that the potentials on all these lines were raised 10 per cent. It often pays for the electrician to test the track joints with a low reading voltmeter and make some apparatus for reading the voltage on the trolley wire and feeders. The data given for the Toronto Railway Company show a marked improvement by connecting the feeders differently without an increase in voltage or of copper lines. This great saving is doubtless due to the fact that a competent electrician studied the system, saw the defects in the first construction and adopted a policy of gradual improvement.

#### STREET RAILWAY ACCOUNTANTS' CONVENTION.

The first annual meeting of the Street Railway Accountants' Association of America, will be held in Niagara Falls upon the same dates as the meeting of the American Street Railway Association. The program is well advanced, and the subjects will be taken from the following:

The Handling and Checking of Transfers from Printer to Furnace.  
The Care and Handling of Fares from Receipt to Bank.  
Materials and Supplies Accounts from Purchase to Use.  
Power House Accounts.  
Pay Rolls: Time Keeping and Method of Paying.  
Car Mileage: How Arrived at and its Use (Street Railway).  
Car Mileage: How Arrived at and its Use (Interurban).  
Statistics: Their Use and Abuse.

In addition to these there will be the report of the committee on standardization and the reports of the officers.

The secretary announces that President McCulloch of the American Street Railway Association has signified his intention of recommending the formal indorsement and approval of this Association by the American and will invite the members of Accountants' in a body to attend the meetings of the American. The president, Mr. Wilson, has been invited to address the American Association, and President McCulloch has accepted an invitation to appear at one of the meetings of the Accountants' Association. The members of the Accountants' Association will be provided with badges the same as those worn by the members of the A. S. R. A. with a designating ribbon added. In addition to the applications for membership which were noted in the REVIEW for June, applications have been received from the Richmond Traction Company, Richmond, Va., and the Campania de Tramvias de Merida, Merida, Mexico.

There is still opportunity to suggest one or two subjects for papers or discussion. Street railway men in the accounting departments who are puzzling their brains in the ineffectual effort to solve some particularly hard problem can undoubtedly get just the light they want by having the association take up the subject, and this can be done by addressing the secretary, W. B. Brockway, Toledo, O.



## DARING FRAUD SCHEME FRUSTRATED.

How William Webb and Wife Tried to Swindle the Memphis Street Railway Out of \$25,000—Clever Work on the Part of Company's Officers—  
Co-conspirators in Jail.

A daring scheme and carefully prepared plot was concocted by two persons giving the names of William Webb and wife, to swindle the Memphis Street Railway (formerly the Citizens) out of \$25,000. So complete were the arrangements, and with physical conditions to bear out the plot, it is a wonder the attempt was not successful. That it was not, redounds greatly to the credit of the officers of the road to whose vigilance the company is indebted for saving the expense of a costly law suit and the almost certain heavy damages. Street railways are constantly the victims of fraud claims; but not in a long time has one been shown up which was more deliberate, or planned with better prospects of success.

Through the courtesy of E. B. Moseley, chief of police of Memphis, we are enabled to publish portraits of the conspirators. They are described as follows: William Webb, carpenter; American, 30 years of age, 6 ft. 1½ in. tall, weight, 210 lbs., well built, sandy complexion, hazel eyes and light hair; one upper front tooth out. Emma Webb; 31 years of age, 5 ft. 1½ in. tall, weight, 145 lbs., heavily built, dark complexion and black hair.

The plot was for Mrs. Webb to board a street car, and when it started fall heavily to the floor, pretend to be seriously injured and subsequently bring suit against the company. As a matter of fact the woman is a sufferer from a disease of the spine, said to have been caused by the brutal treatment of her husband when he was intoxicated. She, of course, was to allege that her spine had been injured by the fall in the car, and a medical examination would establish the fact that injury actually existed.

The Webbs had come to Memphis from Nashville, and from St. Louis to that place. In St. Louis the scheme had been worked on the Lindell road with success, and so well did she play her part there, and so carefully was the affair planned that the company was glad to compromise the suit brought against it, before it reached trial.

The Memphis job was as carefully planned as at St. Louis, but the officers of the Memphis road, through secret sources discovered what was on foot and learned the names of the conspirators. When the information was received Webb and his wife were given no clew which would lead them to believe that their scheme had been discovered. The street car company hired competent detectives to watch the conspirators and one of the company's officers revealed the details of the plot to three of his personal friends. So well did he have the conspirators in hand that he told his friends not only the names and place of residence of the schemers, but he told them the day on which the woman was to fall in the car and the car line on which the job was to be done.

Thirteen will hereafter stand as an unlucky number in the Webb family; for it was upon the afternoon of that day in July that Mrs. Webb, accompanied by another woman, who was to be used by her as a witness, left the house. As they turned onto the sidewalk a man and woman followed close behind them; these were the witnesses for the company. All four boarded the same car on the Jackson Mound line, but for some reason the conditions did not suit and no backs were broken here. After riding a short distance the four left the

car and walked to the Main street line, a car of which was boarded. The car in question is one of the long cars, and also one of the smoothest riding on the road; nevertheless as the car started while Mrs. Webb was yet in the aisle, she fell heavily backward to the floor as if thrown from her feet. She was lifted to the seat, where the sympathy of the passengers was secured by a series of groans and cries which were simply heart rending. In response to the conductor's offer of help she managed to ask for a carriage, but as none was available at that point, she was carried in the car until



WILLIAM WEBB.



EMMA WEBB.

transferred to the first meeting car, going toward the city. It required the services of four men to make the transfer, during which operation she gave evidence of the most intense agony by continued cries and groans and indications of fainting.

From the car she was taken into a grocery store where a carriage was summoned and removal made to her home. When advised of the accident, her husband who was at work, flew into a great rage and declared if any of the company's men dared to come near him with an attempt to compromise the case he would kill them. His feelings so overcame him that he almost wept in speaking of the sufferings of his wife.

The woman had proved a fine actor, and when the company's surgeon was called in consultation with Webb's family physician, it was admitted that there was a spinal difficulty, and everything seemed to be working to perfection. From this on every move of the conspirators was watched, the police were let into the secret, the company's attorneys advised, and the foreman of the grand jury informed of the facts. Still the company did not have a case.

On July 18, three days after the "accident" the following advertisement appeared in the daily papers:

PERSONAL—Will young man or ladies who witnessed fleshy lady fall, Main st. car, near Market, last Tuesday, p. m., address Mr. Webb, 79 Linden st., immediately, and oblige?

All that now remained was for the Webbs to bring suit. This was done on July 27, claiming damages in the sum of \$25,000. As soon as the papers were filed the matter was laid before the grand jury, witnesses heard, and an indictment returned in two hours. One hour later the chief of police and a sheriff arrested Webb at the office of his attorney. Mrs. Webb was then gathered into the toils, complaining bitterly and refusing to be moved until accompanied by her physician and going to jail in a carriage.

Two days after their arrest the Webbs pleaded guilty and were each fined \$100 and sentenced to imprisonment in

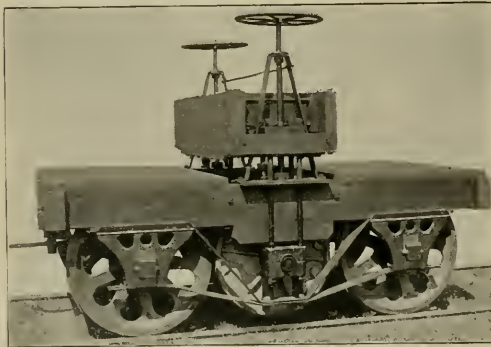
the work house for 11 months and 29 days; this is the maximum sentence allowed. The sentence was suspended in the case of the woman, as Webb claimed he coerced her.

The St. Louis case referred to appears to have been one of the early operations of the Webbs, for they did not work it very hard, and while they claimed a good round sum, did not hesitate to settle out of court for a small fraction of the claim. In fact the company settled for about one-fifth what it would have cost to defend if it had allowed proceedings to be brought. The company was deceived into paying this amount by the statement of the Webb's physician, who was supposed to be reliable, and in fact through whom the settlement was effected. They evidently were hard up or timid for the release cost less probably than the expense of tracing them up, although the case seemed so plain there was nothing to indicate fraud.

At Nashville no attempt was made on the street railways, but the Memphis scheme was well planned, and carried out in such a business like and methodical manner, they evidently had every confidence in the success of their plans.

**ROLLER FOR STREET RAILWAY WORK.**

The many extensions recently made and contemplated by the Springfield Street Railway Company of Springfield, Mass., into the outlying sections where macadam is used for road material induced the general manager of the company, Austin E. Smith, to make a special study of the construction of this class of work with a view of substituting machine hardening for the hand rammer commonly used. He had built for this purpose the machine shown in the accompany-



ROLLER FOR SPRINGFIELD STREET RAILWAY.

ing illustration, on the principle of the steam roller simplified, and adapted to track work.

It consists of a very strong wood-frame, four-wheel truck, carrying in the center a heavy iron roll 33 in. in diameter by 4 ft. 7 in. long. This roll is built up in sections so as to leave the road with the necessary crown. The several sections are pressed onto a 4½-in. steel axle. The ends are carried in self-oiling boxes, which are raised and lowered by means of screws; these are arranged so that the roll can be raised to a height of 4 in. above the top of the rail when the roller is transported on its own wheels over roads already built, or can be lowered 4 in. below top of rail, or held at any

intermediate point. However, if the roll meets with any obstruction means are provided by which the roll will pass over without lifting the truck wheels from the track. The total weight of the machine as shown is 11,000 lbs. Directly over the roll and connected with it by means of iron posts is a strong box designed to be filled with iron so as to give additional weight, if desirable.

The ends of the roll can be raised independently of each other so that the shape of the ground line can be varied. Should it be desirable to roll the bed outside the rails the adjustable screws will lift the four flanged wheels entirely from the rails, thus permitting the roller to go where guided.

The truck will be coupled to and receive its motive power from the construction motor car, and affords ample room for transporting men and tools to and from the place of work.

The roller is the work of the Wason Manufacturing Company of Springfield.

**EUROPEAN ELECTRIC RAILWAYS.**

The following table gives data concerning the electric railways now in operation in Europe. It is apparent that Germany is far ahead of any other European country both in the number and mileage of its lines.

|                           | Total Length of Lines in Miles. | Total Power in K. W. | Number of Motor Cars. | Lines with Str. Cond. | Lines with Undergr. Cond. | Lines with Centr. Rail. | Lines with Accum. | Total No. of Lines. |
|---------------------------|---------------------------------|----------------------|-----------------------|-----------------------|---------------------------|-------------------------|-------------------|---------------------|
| Germany . . . . .         | 642.69                          | 18,963               | 1,631                 | 45                    | 2                         |                         | 4                 | 51                  |
| England . . . . .         | 109.42                          | 4,670                | 168                   | 10                    | 1                         | 6                       | 1                 | 18                  |
| Austria-Hungary . . . . . | 83.89                           | 2,589                | 194                   | 7                     | 2                         |                         | 1                 | 10                  |
| Belgium . . . . .         | 34.90                           | 1,220                | 73                    | 4                     | 1                         |                         |                   | 5                   |
| Bosnia . . . . .          | 5.60                            | 75                   | 6                     | 1                     |                           |                         |                   | 1                   |
| Spain . . . . .           | 47.00                           | 600                  | 40                    | 3                     |                           |                         |                   | 3                   |
| France . . . . .          | 279.36                          | 8,756                | 432                   | 19                    | 1                         | 1                       | 5                 | 26                  |
| Holland . . . . .         | 3.20                            | 320                  | 14                    |                       |                           |                         |                   | 1                   |
| Ireland . . . . .         | 18.00                           | 486                  | 32                    | 1                     | 1                         |                         |                   | 2                   |
| Italy . . . . .           | 115.67                          | 5,970                | 289                   | 9                     |                           |                         |                   | 9                   |
| Sweden-Norway . . . . .   | 7.50                            | 225                  | 15                    | 1                     |                           |                         |                   | 1                   |
| Portugal . . . . .        | 2.80                            | 110                  | 3                     | 1                     |                           |                         |                   | 1                   |
| Roumania . . . . .        | 5.50                            | 140                  | 15                    | 1                     |                           |                         |                   | 1                   |
| Russia . . . . .          | 14.75                           | 870                  | 48                    | 2                     | 1                         |                         |                   | 3                   |
| Servia . . . . .          | 10.00                           | 200                  | 11                    | 1                     |                           |                         |                   | 1                   |
| Switzerland . . . . .     | 78.75                           | 2,622                | 129                   | 17                    |                           |                         |                   | 17                  |
| Totals . . . . .          | 1,459.03                        | 47,596               | 3,100                 | 122                   | 8                         | 8                       | 12                | 150                 |

**A GOOD COMPROMISE.**

In the fall of 1896 the city council of Punxsutawney, Pa., passed an ordinance imposing upon the street railway company the cost of paving between its tracks as is done in larger towns, but which in smaller towns is usually more than the road can bear. L. C. Meyers, superintendent of the company, advises us that after laying the matter before the citizens and explaining what the effect would be upon the road a new ordinance was secured, according to which the company, for the new paving to be laid this year, is to purchase new ties, spikes, etc., and in addition pay the difference in the cost of laying the pavement due to the presence of the track. This amounted to \$60, a saving to the company of about \$1,500. The city had laid 1,600 feet of new pavement before this new ordinance was passed, but the company hopes to secure a compromise as to that also.

THE UNION LOOP, CHICAGO.

The Union Elevated Railroad Company was incorporated in November, 1894, for the purpose of building a loop in the business heart of Chicago. It is capitalized for \$5,000,000 and has \$3,500,000 of bonds outstanding. The officers of the company are L. W. Perce, president; C. D. Hotchkiss, vice-president; Howard Abel, secretary and treasurer. The company agreed to pay the city from its receipts, after deducting \$250,000 per year for interest on its bonds, 5 per cent per annum during the five years from 1897 to 1901, inclusive; 10 per cent during the next five years; 15 per cent during the next 10 years; 20 per cent during the next 15 years; and 25 per cent during the remainder of the term, approximately 15 years.

The line is under lease to the four elevated roads which it is to connect; the lease provides that they shall have the exclusive use of the loop and pay therefor the cost of maintenance, operation and repair, all taxes levied against it and 1/2 cent per passenger carried on any part of their lines; the minimum revenue, however, is fixed at \$62,500 per annum.

The opposition of the abutting property owners to the construction of the loop was very bitter and involved the company in extensive litigation. The original franchise provided that the south side of the loop be built in Harrison street, and in order to effect the change to Van Buren street, which was desired, it was necessary to organize a new company known as the Union Consolidated Railway Company, which extended its proposed route as far west as Halsted street, and by securing the consent of nearly all the property owners on the West Side placed those east of the river in the minority. Suits were brought to enjoin construction, but the supreme court of Illinois decided that after an ordinance had been obtained, the property owners must wait

until the completion of the line, and if injured, sue for damages. The connection between the loop proper and the Metropolitan is a portion of the Union Consolidated.

Heretofore the three elevated roads now operating have been placed at a great disadvantage in competing with the surface lines because of the unfavorable location of their down town termini. With the loop completed any point north of Polk street and between the river and the lake is



FIG. 2.—STATION AT VAN BUREN AND DEARBORN STREETS.

within three squares of an elevated station. What the effect of the improved terminal facilities upon the traffic will be can only be estimated at the present time. In October, 1896, the Lake Street road began running south on Wabash avenue as far as Adams street, but no official statements have been made regarding the increase in traffic. During 1896 the average number of passengers carried daily was 30,200; it has been stated unofficially that the increase after running to Adams street was 4,000 per day.

The Union loop is a double track structure, 11,150 ft. in length, located as shown in Fig. 1, in which the 11 stations, the special work and the signal towers and levers are indicated. Work was begun in the winter of 1895, and with the exception of a few of the stations it is now completed. The loop will be worked left-handed, the inner track being used by the Metropolitan and Alley roads and the outer track by the Lake Street and Northwestern. Only two of these are now operating by electricity, and until the completion of the Union Loop power house each of these roads will furnish power from its own station. Feeders are led from the Metropolitan power station to supply the inner track and from the Hawthorne avenue power house of the North Chicago Street Railroad Company for the outer track. These connections are permanent and will be used for operating the loop at night and in the case of emergencies. The plans of the Union Loop station were published in the REVIEW for January, page 55.

The third or conductor rail is placed between the track, and the wooden box along the center of the structure in which the feeders are carried. The feeder box is covered and serves as a footpath for employees. The method of supporting and insulating the conductor rails and feeders does not differ from that employed on the Lake Street which was fully illustrated and described in the REVIEW, March, 1896, page 133. The insulators were made by the

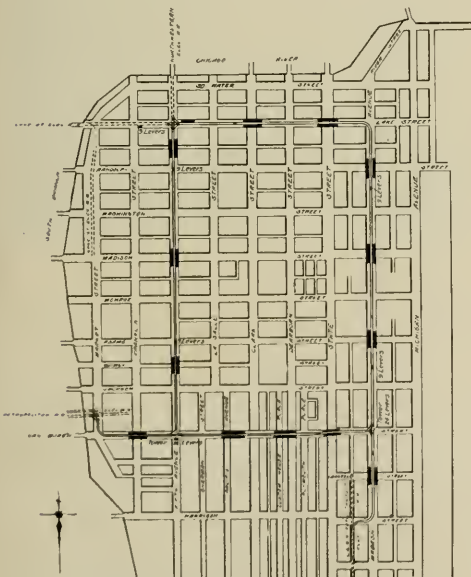


FIG. 1.—MAP OF UNION LOOP, CHICAGO.



Albert & J. M. Anderson Company of Boston, after the design of J. R. Chapman, the electrical engineer of the loop, who designed the electrical equipment. For feeding purposes the loop is divided into four sections, the north and west and the east and south sides of each track constituting the sections. There are 11 feeders carried from the power house to the structure through a conduit laid in Market street. Each of these feeders is of stranded copper and has an area of 1,500,000 c. m. At stations and special work the bare cables are replaced by insulated cables carried under the structure. While the feeder system in general outline is very simple, the detail drawings showing connections to the conductor rails at special work resemble geometrical puzzles. In spacing the contact rails at cross-overs and switches, the method of making the car bridge the two connections was adopted.

About 1,100 32-c. p. lamps are required for lighting purposes, and they are all on the same circuit, the cables being carried in the feeder box. A 30-pair telephone cable is carried around the structure and connected to switchboards in all the stations and signal towers.

Fig. 2 is a view of the station at Van Buren and Dearborn streets, showing the arrangement of entrance and exit stairways and the passageway connecting the landings on opposite sides of the street which permits passengers to cross from one platform to the other without descending to the street. Two roads are to use each platform, and trains on each of these two will stop at different ends of the platform; no tickets will be used, the passenger paying his fare when admitted to the end of the platform from which his train leaves.

In view of the large number of trains to be run on the loop, and the fact that each line crosses the other track of

torpedo machine with the same respect that he would have for a derail.

The special track work has all been made by the Paige Iron Works of Chicago. The most complicated portion of this is where the four tracks of the Metropolitan at present

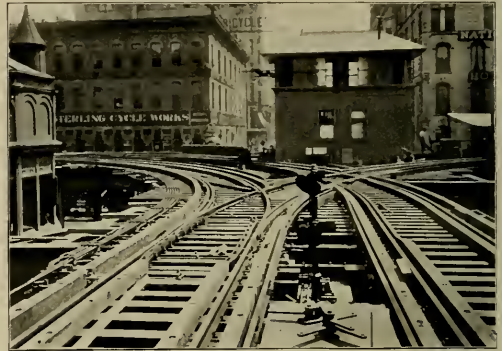


FIG. 4—Y AT VAN BUREN AND WABASH.

entering the Franklin street terminal (which will be abandoned) converge to two. This is, however, not yet completed. Fig. 3 is a view looking east from the new Franklin street station (this station will be used by the Metropolitan only) and shows the crossover at this point and the connections with the west side of the loop. The interlocking tower is at the right. In the foreground are seen the feeder box and the bare cables.

Fig. 4 shows the Y at the southeast corner of the loop; the track at the right runs south on Wabash avenue to connect with the Alley L in Harrison street. In the foreground is very clearly shown the guard rail construction which the Paige Iron Works have used throughout this work. It is a 50-lb. rail turned on its side, which arrangement imparts greater stiffness laterally and raises it from the ties so that clips for the switch may pass under it.

#### COLLEGEVILLE (PA.) ELECTRIC RAILWAY.

The citizens Passenger Railway, leased and operated by the Schuylkill Valley Traction Company, obtained franchises in Collegeville, Pa., and vicinity. The Philadelphia & Reading Railroad Company enjoined the railway company from crossing its tracks at Collegeville. It was contended that the right of way must be secured through all the territory mentioned in the charter before any part could be constructed. The railway company decided to abandon the franchises and grants, but the supervisors in Lower Providence demanded \$25,000 for a relinquishment. To circumvent these difficulties the railway company organized and chartered the Collegeville Electric Railway Company. The town council repealed the old ordinance and granted a franchise to the new company. B. M. Douglass, general manager of the Traction Company, deserves much credit for the able manner in which the matter was handled.

Two of the three men accused of robbing a trolley car in Chicago on July 4, were convicted on August 4 and sentenced to imprisonment in the penitentiary.



FIG. 3—LOOKING EAST FROM FRANKLIN STREET.

the loop in two places, the most complete plans have been made for signal and interlocking plants at all junctions and crossovers. Since it is not practicable to provide physical protection in the shape of a derail or skotch block, the torpedo machine will be installed and worked in the same manner as a derail. The moral effect of this torpedo signal is considered to be very valuable; the operator in charge of the plant is required to keep a complete record of each detonator supplied to him and is not likely to permit an engineer to run past a signal at danger and explode a detonator without reporting him for it, and the engineer on his part knowing that he will be reported will treat the



Melbourne, the "Queen City" of the far south has not only a very extensive system of most excellently operated street railways, but has also the largest cable system in the world.

The Melbourne Tramway & Omnibus Company has been in existence now 11 years and still has 19 years before the property passes into the possession of the municipality. The policy of the company in its operation has been such as to win the good will of the people. On its 87 miles of cable lines there were carried in each of the years 1895 and 1896 over 33,000,000 passengers. During the "boom" times in Australia the company enjoyed a most phenomenal business, paying as high as 72 per cent per annum, while shares, the par value of which was only \$5, sold up to \$45. During the succeeding panic the same shares sold down to as low as \$1.68, but have since largely recovered under the payment of yearly dividends of 5 per cent.



A BAD WRECK.

The officers and heads of departments of the road are as follows:

F. B. Clapp, (American), Managing Director.  
 W. G. Sprigg, (English), Secretary.  
 H. A. Wilcox, (American), Assistant Manager.  
 W. Don, (Scotch), Master Mechanic.  
 J. W. Duncan, (English), Superintendent.  
 S. H. Don, (American), Foreman Painter.  
 J. Rocheforte, (Irish), Foreman of Wood Shop.  
 J. Dahn, (Swede), Foreman in Iron Shop.  
 R. Allen, (Australian), Engineer.  
 P. Fargher, (English), Engineer.  
 F. Cleaverley, (English), Engineer.  
 (There are about 10 more engineers.)  
 J. W. Lynn, (American), Inspector.  
 S. Dorum, (American), Inspector.  
 W. P. Savage, (American), Inspector.

The driving plants include 11 power houses, containing 38 engines rated on an average at 275 h. p., but which indicate 375 h. p. each. Only one-half are in use, the others forming the reserve power. With the exception of four English engines they were built in Australia, and all the driving machinery is of Colonial manufacture. The cables, 25 in number, have an aggregate length of over 477,000 ft., or over 90 miles, the cost of which is \$200 per ton. The ropes and rails are of English make and the coal is nearly all Victorian.

The working time of the power house force is 9 hours per day, while those in the shops work 8 hours, which is the system here; but the law permits the men to work up to 60 hours per week if they so desire.

As already stated many of the chiefs of the departments have had long American experience and some are born Americans. The assistant manager, H. A. Wilcox, (to whose courtesy I am indebted for some of the information in these notes), is a native of Providence, R. I., and W. Don, who was born at Brechin, Forfarshire, Scotland, has had 20 years experience in street railway work in New York, and now 10 years in Melbourne, is much more of the new world than the old world. To this gentleman I am especially indebted for the illustrations here presented and for data.

When the company first started, all inspectors and gripmen were imported from the United States, as men having past experience of the street railways on the cable system. Some of the former have fulfilled their engagements and gone back to the United States. There are now only three American inspectors who still have time to serve before their engagements are finished. Upon sounding some of the imported workers I was informed by all that the company could not have done more for them, and a proof of this is the fact that the Melbourne Tramway Company has not experienced any marked accidents and has been extremely free from strikes.

The number of gripmen is about 500 and there are the same number of conductors, or say 1,000 men on the road; while the combined shops employ 160 men. About a score of women and girls are engaged for counting the checks every morning.

The rolling stock up to the present consists of 442 cars, 428 dummies and 22 pair horse omnibuses, which latter conveyances are now only run in the suburbs to meet the convenience of those living a good way off from the cable lines. The company is not at present adding to its rolling stock, simply repairing and replacing as the cars and dummies wear out. In the company's shops, situated at the north end of Nicholas street, Fitzroy (Melbourne), there has been built a combination electric street car for Brisbane (Queensland), and the Melbourne Street Railway Company expects to build more for the northern capital.



# Street Railway Review

In the Melbourne cable tracks there are some 32,000 pulleys placed at intervals of about 30 ft. The general line pulley is 10½ in. in diameter, 3 in. face, and weighs 12½ lbs., including a ¾-inch spindle that is driven in under 6 tons pressure. By this means the set screws are done away with. The estimated reduction of surplus metal by the adoption of the present pulley made from crucible steel is 120 tons.

The hours of running cars are :

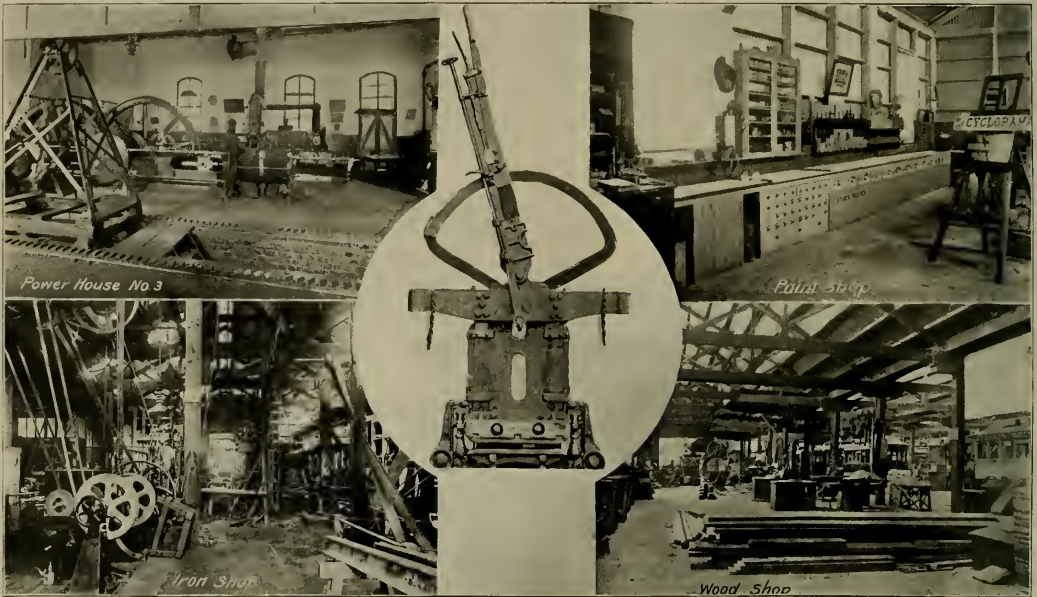
Week days, from 5:30 a. m. until 11:30 p. m.  
 Saturdays, " 5:30 a. m. " 12. p. m.  
 Sundays, " 1:25 p. m. " 11. p. m.

The cars are of uniform size and are thereby interchangeable. They are painted different colors for the various lines and show lights at night to match. The company has not equipped its fine conveyances with a correspondingly good

and boring machines were from J. A. Fay & Co., of Cincinnati, Ohio. A hydraulic lift raises or lowers the cars to various departments. The present U. S. imports are chiefly used in the wood department, as follows : white (bass) wood, perforated seating and rubber springs; in fact all rubber materials came from the United States. The steel gongs and bell punches are from America and also the car wheels.

The paint shop is also on the first floor, being separated from the wood shop by a partition. With ordinary care and re-varnishing at intervals of 18 months, cars will run for six years without repainting. Colors are ground in a steam paint mill, and many of the labor saving devices in car painting are used; for instance all the lettering and decorating are done with the rollers and stencils.

The blacksmith, machine and fitting shops are in the



SHOPS OF THE MELBOURNE TRAMWAY & OMNIBUS COMPANY.

light, the old system of lighting the cars with kerosene lamps being still employed. Each car has two inside lamps, one in a casement at each end of the car; each dummy is fitted with a large size lamp let in the middle of the roof or top, and after sunset carries a large square locomotive headlight. Each car is licensed to carry 34 passengers, 22 inside and 6 on each platform; the dummy holds about twenty persons without crowding.

It is the intention to put trucks under the dummies to keep the grip in a rigid position and to make it easier for passengers patronizing the dummy, as a rush in summer time is generally made for the front seats on the dummy where the riders can have a clear view of the road before them.

The company's shops or car and machine works occupy a space of 83 x 330 ft., consisting of basement and first floor. Most of the machinery in the wood shop, universal wood worker, surface planer, thickening machine, band saw, swing saw, circular saws, turning lathe, morticing, tenoning,

basement. There are 63 machines in these shops and 60 men employed. Among the machines are several of American make; the wheel boring and wheel pressing machines were made in New York and the Bryant metal saws by the Q. & C. Company. There are four pits for repairing the under gear of cars and dummies.

The average weekly wage (for 48 hours work) is as follows :

|                                                 |         |
|-------------------------------------------------|---------|
| Woodworkers .....                               | \$11.00 |
| Ironworkers (smiths, fitters and machinists)... | 12.00   |
| Painters .....                                  | 10.00   |
| Decorators.....                                 | 11.50   |

Most machinery pays an import duty of 10 per cent ad valorem, although some comes in at 5 per cent.

The fares on all lines except one (which is 2 pence) are 3 pence (6 cents). The longest line here is from Melbourne Town Hall to St. Kilda, a distance of some 5 miles, or from Hinders street to Brunswick.



The principal streets in Melbourne proper are one mile in length, 99 ft. wide and run at right angles to each other. The leading thoroughfares are named after prominent Australians—Flinders, Collins, Bourke, Lonsdale and Latrobe, running nearly east and west; and cross streets called Spencer, Kind, Williams, Queen, Elizabeth, Swanson, Russell, Stephen and Spring running nearly north and south. The whole city is well lighted by electricity and well paved with hard native woods. The blocks used in the street railway construction, part of the public causeways, are of Victorian (from Gippsland) red gum, a wood that is considered quite as durable as the Australian iron bark which hardens the more it is under water and the longer in the ground.

The price at which these red gum blocks are cut in the forests and delivered to the Melbourne street railway ranges from \$4 to \$5 per hundred square feet. The broad streets are illuminated by arc lights while the little cross streets are lit by incandescent lamps. In the main streets the arc lamps are on wooden pillars or posts placed in the center of the roadway, but where the street railway lines exist the lamps are suspended from iron brackets attached to the pillars erected on the sidewalks projecting some 8 ft. over the roadway.

Victoria's population in 1896 was 1,177,444

## ECONOMY IN CONTROLLER HANDLING.

BY J. R. CRAVATH.

Some discussion has been aroused lately as to whether a rapid or slow advancement of the controller handle in starting a car is the more economical in practice. In these discussions there has been a strong tendency on the part of those few who favor rapid turning on of current to theorize simply on a few of the factors that enter into the problem and leave out of account a number of elements which influence the results in practice. Thus it is argued that since it takes a given amount of energy to accelerate any body from a state of rest to a given speed it makes no difference whether we apply this energy fast or slow. In other words 50 horse-power applied for 10 seconds in starting a car is equivalent to 100 horse-power applied for 5 seconds. The horse-power-seconds in both cases equal 500, and the acceleration in the second case is accomplished twice as quickly and with twice the maximum horse-power required in the first case, the difference in power being balanced by the saving in time. Now this is a well known law of mechanics and cannot be disputed, but it goes only part way into the practical problem. In applying this power to a car in practice there are several very important processes which must be considered before we can arrive at the best coal pile economy. A manager does not care a rap as to the theory of what ought to take place at the car axle. He wants to know what actually will and does take place at the coal pile and how he can get the best results out of the plant from coal pile to car axle.

The first difficulty we encounter when we tell a motor-man to turn on current fast (there is no need to tell him; he will do it anyway) is that the increased accelerating efficiency that series-parallel control gives, as compared with the old multiple arrangement, is partly thrown away by such rapid handling. When motors are thrown from series to multiple the horizontal effort or torque per ampere of cur-

rent drawn from the line is reduced one-half. Now it is horizontal effort that is useful in accelerating a car. Therefore when the controller is thrown from series to multiple before the full benefit of the efficient acceleration afforded by the series combination has been obtained power is simply thrown away.

A second reason why rapid controller advancement does not give commercial results equal to what it should in theory is that unfortunately feeders and trolley wires must be used to conduct current from power station to motors and the line loss in these conductors as in every other electrical conductor is proportional to the square of the current. The line loss must therefore be greater with a high maximum current used in starting a car than with a lower maximum current used for a proportionately shorter time.

A third reason which sometimes holds why too rapid acceleration should not be attempted if economy of power is any object, is that when a field shunt is used this shunt is liable to be cut in too soon, thereby weakening the fields of the motors and lowering the accelerating efficiency or torque per ampere of the motors.

A fourth reason why rapid crowding on of power is not economical is that the maximum power house load (caused by the starting of a number of cars at once) is increased by so doing and so more generating machinery must be kept running to operate any given number of cars.

A fifth reason against attempts at very rapid acceleration is that when motormen are taught to get up to speed as quickly as possible, the practical result is that they will slip the wheels on nearly every start. That this is wasteful is evident. Many motormen will do this whether they are advised to accelerate as quickly as possible or not. There is no trouble about getting men to turn on current fast enough. The trouble is all in getting them to do it slowly enough.

Again and "sixthly," since the heating of the motors is according to the square of the current, the high maximum current that flows when current is thrown on fast heats the motors more than when the same amount of energy is used with a lower maximum current. The more a motor heats the lower becomes its electrical efficiency, because its resistance is increased. Motors are not usually very much too large for the work they have to perform, and consequently this heating often becomes a serious matter aside from any consideration of repairs, for it lowers the speed of the motors so that they cannot perform the same service that they can when cooler, even were the efficiency not to be considered.

Finally I may add that too rapid controller handling in starting a car is not to be recommended for every day practice, because actual tests and trials show it is not economical and this is perhaps the best argument of all.

The writer has in his possession facts and figures which amply sustain this assertion, and, though there are reasons why it would be out of place to publish them in an article of this kind, I am willing to furnish them to anyone who wants to look into the matter further. I have made no mention of the undoubted economy in repairs with slow acceleration of cars.

There is another way in which a saving can be made at the controller by letting the car drift with current shut off as much as possible, but that will not be discussed in this article, as it is merely my object to call attention to some facts relating to car starting that seem to have been overlooked in recent discussions.

### IT'S "MADAM" IN BOSTON.

The daily papers of the east are greatly exercised as to what term shall be used by conductors in addressing female passengers. This is no new thing, for it has come up every little while in every part of the country, and even invaded the sessions of the American Street Railway Association some years ago. It seemed in a fair way to settlement then until some member came in and rudely shattered the train of thought with the announcement of a new method of treating cracked hoofs of horses; and the question of etiquette never came back.

But now its settled, at least for the Lynn & Boston, for General Manager Foster concluded not to wait another 10 years for a solution and has issued the following bulletin:

On and after this date conductors and motormen in addressing women passengers shall substitute the word "Madam" for "Lady."

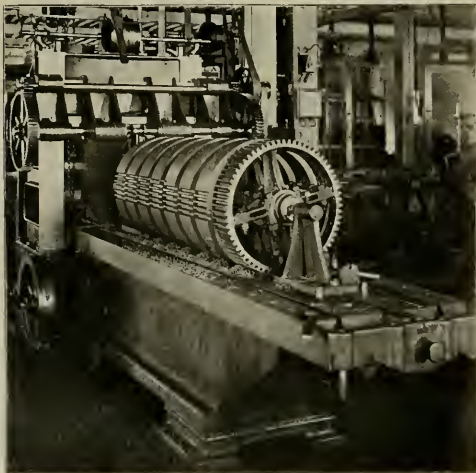
In arriving at the conclusion consideration was had of the terms "Lady," "Madam," "Mrs." and "Miss," but as it would have been somewhat perilous for the conductor to always make a straight guess as to the two latter, and as the "madam" seemed on the whole preferable to "lady," from this time on it is "madam."

It is positively necessary in many and much better in most cases, that some term should be used in connection with a remark addressed to a "madam." As a matter of fact, "lady" is now used by nine out of every 10 conductors the country over.

### GEAR CUTTING.

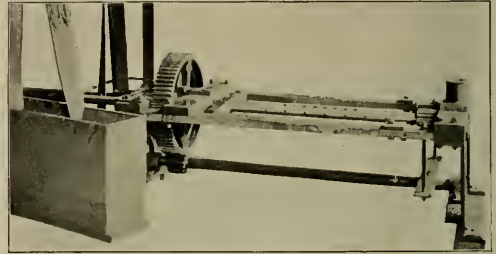
It is the opinion of J. M. Roach, general manager of the North Chicago Street Railroad Company, that gears and pinions can be made at the repair shop of the company at less cost than to purchase them. To carry out this work one machine was altered and another ingenious one designed by V. T. Lynch, superintendent of the repair shop.

The blank gears are purchased from a malleable iron works in the city, split in two, one piece being larger than the other on account of there being an odd number of teeth,



GEAR CUTTING MACHINE.

To provide a machine to cut the teeth the cutter head of a 32x32-in. planer was removed and brackets bolted to the frame to support one driving shaft and two cutter shafts. The four brackets were made from one pattern. A worm and gear were substituted for the regular feeding device so as to get a feed of 2 in. per minute. Each of the cutters revolves at the rate of 65 ft. per minute. As shown in the illustration seven gears are bolted to a shaft with a cut gear which serves as a division plate. Each gear has a face of 4½ in. The stocking cutter first cuts a groove which is enlarged to the proper form for the teeth by the involute gear cutter which is just behind the other. Two gears can



KEY-SEATING MACHINE.

be cut each day. The pinions are cut in the same manner. The machine requires little attention.

The key-seating machine was made entirely from old stock and at very small expense. The frame was made from two old side bars, one casting and some pieces forged in the shop. The gear and rawhide pinion were taken from an old motor and the cutter bars made of broken car axles turned down to proper size. The inside of the gear hub is threaded, three to the inch, and receives the shaft which actuates the cutter shaft. The bar contains holes for ten cutters, each of which is  $\frac{1}{8}$  in. higher than the preceding. One end of the bar is supported by a crosshead and the other passed through the hub of the gear or pinion. When a key seat is to be cut the pinion is bolted in place and the machine started. The counter shaft revolves at 800 r. p. m. and the gear draws the threaded shaft, forcing the cutter bar through the hub of the pinion. It requires 30 seconds to cut a key seat  $\frac{1}{8} \times \frac{3}{4} \times 6\frac{1}{2}$  in. and the same time to withdraw the bar. At present the machine is reversed by hand, but a clip will be bolted on the guide bars to automatically reverse. The work of this machine is perfectly accurate and is satisfactory in every way.

### DEATH OF E. M. G. EDDY.

E. M. G. Eddy, who for the last seven years has been chief commissioner of the New South Wales railways, died at Brisbane on June 21. Mr. Eddy was born 1853 and has all his life been in the railway service. He began his career as a clerk in the superintendent's office on the London & Northwestern and rose to be second in charge to the general superintendent. In 1887 he took a similar position with the Caledonian Railway, which he held for a year, and removed to Australia to accept the office of chief commissioner of railways in New South Wales. Mr. Eddy was familiar with the practice in Europe and America, and his administration of the system in Australia was very successful.

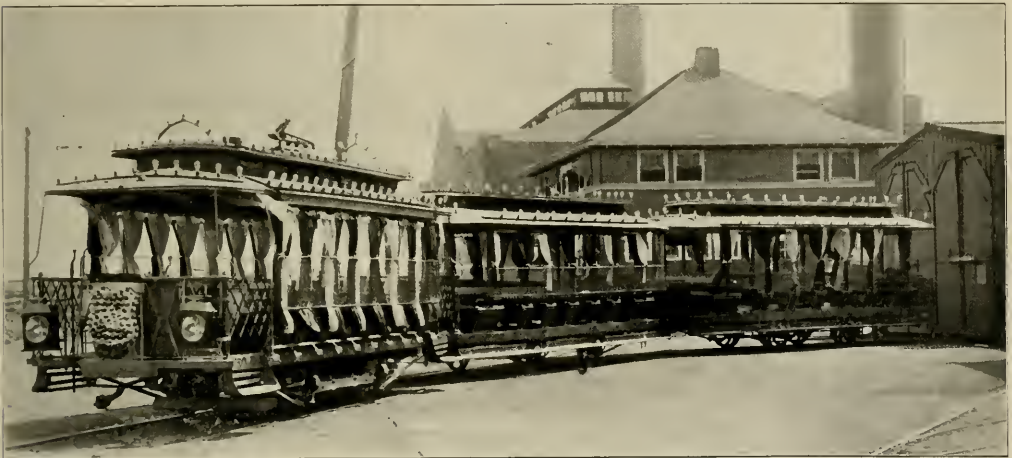
**EMPLOYEES GIVE BONDS.**

The Consolidated Street Railway Company of Grand Rapids, Mich., has for some time required bonds from the conductors, motormen and office employes, to protect the company from loss of money from any cause, and cost of repairs through accidents caused by the negligence or carelessness of any employe. The bonds are furnished by the American Security Company of New York at a reasonable cost to the men. The effect of this plan is to produce more care and watchfulness of the employes in performing their duties and will tend to supply the company with a better class of men than otherwise. The employes, knowing the conditions and the responsibilities upon them, have no occasion for discontent, and feel more secure of their positions. President Johnson is satisfied that this plan will result in better service, greater assurance to the company and work no hardship on the men.

**TROLLEY PARTIES ON THE CALUMET.**

The Calumet Electric Street Railway Company of Chicago owns what is probably the largest suburban system in the world. Its 80 miles of track extend through 27 suburban towns and villages in the southern part of Chicago. The routes pass several picnic grounds, touches Manhattan Beach, a resort on the lake front, and run through some sparsely settled and beautiful country. In every way this railway is suited naturally for pleasure riding. H. M. Sloan, general manager, realized the advantages such patronage would bring and every facility has been improved to handle the traffic.

In addition to this the merits of the road have been extensively advertised. Its cars are painted uniformly and it is now known as the "Yellow Line." Sign boards are placed along the routes connecting it with the center of the city and frequent use is made of illustrated posters. A



A PARTY TRAIN—CALUMET ELECTRIC STREET RAILWAY.

**MASSACHUSETTS STREET RAILWAY ASSOCIATION.**

The meeting of the Massachusetts Street Railway Association was a success socially as well as from a business standpoint. The 120 delegates were treated to a fine outing by the West End and the Quincy & Boston roads. The subway, loop and stations were visited, then they were taken to the Dorchester power house to inspect its superb equipment. At Neponset, the Quincy & Boston Street Railway Company received the delegates in three finely decorated cars and proceeded to the power house at Quincy Point. Dinner was served at Downer's Landing after which Nantasket Beach was visited and a trip taken on the bay. As a souvenir of the delightful outing each delegate received a polished disc of granite upon which was inscribed: "This souvenir was cut and polished 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. Compliments of the Quincy & Boston Street Railway Company."

handsomely illustrated pamphlet, describing the different points of interest along the lines together with a map of the system, has recently been printed. Over 100,000 of these were distributed. All this is attended to by the advertising agent, E. H. Fox, who makes arrangements for all trolley parties, parks and amusement features.

The company does not rest here but makes its cars attractive and comfortable for its patrons. As may be seen by the illustration, the party cars are especially decorated with rows, clusters and designs of incandescent lamps and with bunting artistically draped inside and outside the cars. These same cars are used for the ordinary traffic and all decorations must be removed, which has been a laborious undertaking, especially when calls for cars would come in a few hours previous to starting and the same ones be required for ordinary service immediately afterward. Through the efforts of W. A. Harding, the master mechanic, the decorating has been brought to a system which involves a minimum amount of trouble.

For the tops of the cars the lamps are screwed into the sockets, 10 of which are fastened to a long board, about 3





## THE SAGINAW BRIDGE ACCIDENT.

The accident which occurred on July 7, when a car on the Inter-Urban Electric Railway plunged through the open draw in the bridge over the Saginaw river below Zilwaukie, was most serious, and when it is considered that it happened in the day time and that the approach is perfectly straight for nearly 1,500 ft., there appears to be no excuse for such gross carelessness.

The car approached the bridge at a high speed and was not brought to a full stop at the signal post, 200 ft. distant, as is required by the state law. The bridge tender was opening the bridge for a sail boat, and states that it had swung through an angle of 20° before the car reached the

at one end; during the trip in one direction the motorman has it under his control, but on the return trip must rely upon the conductor, who frequently turns it off with the result that the motorman sometimes finds himself without air when he wishes to make a stop. In this particular case it is stated that the air was all right, but it is evident from the distance jumped that the brakes were not applied until the car was fairly going off the bridge, when nothing could have stopped it. When the danger was seen the motorman reversed the current suddenly and burned out the fuse, which was the first warning that the passengers had of anything being wrong.

There are conflicting statements as to why the car was not stopped in time, but the most probable explanation



SCENE OF THE BRIDGE ACCIDENT, NEAR SAGINAW, MICH.—DIVERS AT WORK.

draw. On reaching the opening the car shot forward into the river, landing squarely with the forward end 74 ft. 7 in. from the ends of the rails; the car is 42 ft. long, which makes the distance covered 32 ft. 7 in. in the clear. The water at this point is about 20 ft. deep, and the car landing squarely was completely submerged, only the trolley being above the surface as shown in the illustration.

There were 13 persons on board; six were drowned, one was rescued alive, but so severely injured that he died within a few hours, and five of the other six were injured more or less seriously.

The cars are equipped with air brakes, but even if they failed to work at the critical moment, it is no reflection upon the brakes, as the arrangement and management of them could scarcely be more careless than it is on the Inter-Urban. The cars were originally equipped with automatically governed air pumps, but they proved to be too small and an auxiliary pump was placed in each car, being located

which is supported by the testimony of competent witnesses is that the motorman was racing with a train on the Flint & Pere Marquette Railroad and did not see the open draw because he was watching the train. No reason is given for not stopping at the 200-ft. post.

Assuming the figures as to the distance that the car jumped are correct, it is evident that the velocity at the time of leaving the bridge was not less than 20 miles per hour, which is certainly a pretty high speed at which to cross a draw bridge. Such railroading as this is criminal and should be punished as such.

On three occasions lately trolley cars of the West Chicago Railroad have been held up and robbed. As an incentive to bring the highwaymen to justice Vice President and General Manager Roach has offered a reward of \$1,500 for the arrest and conviction of the persons who held up the company's cars on 12th, 16th and 43rd streets.



## FEEDER LINES

It is apparent to a street railway electrician that the feeder lines in most of the cities where extensive trolley systems are operated have been built up to suit the growing needs of the city. The copper in many of the lines represents fortunes expended by the street railway companies. With all this investment it is evident many of the feeder systems do not perform the functions expected of them, and the reason is that they are worked beyond the proper limits of application. When a short electric road is constructed it is not a difficult problem to string a feeder along to supplement the conductivity of the trolley wire and keep the voltage near the extremities of the line within 50 volts of what it is at the power station. But when the line is lengthened for two or three miles and branch lines are constructed to meet the demands of a growing city the difficulties begin to multiply. The old material must be used and after the outlay for track construction, new cars and additional power at the station there is little left to put in the feeder system. The capacity of the feeder system is increased only as absolute necessity demands. Each year additional lines and feeders are added until it is not unusual to see as many as 20 or 30 large cables strung along the streets near the power houses.

The feeder system has passed through the same evolution as have the track and trolley line. At first the trolley wire was of small cross section and the feeder ran along parallel to it and connected at frequent intervals, thus making practically one conductor of double capacity. It was soon demonstrated that this plan would not fulfill the requirements for long lines, for the voltage decreased as the line extended away from the power station and a break in the trolley disabled the whole system. Then the trolley wire was sectioned, which minimized the effects of a break in the trolley or of a short circuit.

Good judgment, based on experience, is needed in designing a feeder system to meet all the varied demands of the whole or a part of an extensive trolley system. The number and headway of the cars, the location of the power station, possible extensions, unusual loads on one or more sections, are some of the points to be considered. Boosters are sometimes employed, but not very extensively, for most of the modern stations are equipped with machines generating current at 550 volts and with direct feeders to outlying sections this voltage is sufficiently high.

Information received from street railways operating under different conditions shows some interesting facts. On the Niagara Falls Park & River Railway, which is a comparatively new road, five feeders, ranging from two to seven miles in length and of stranded wire, weather-proof and insulated, are used. Two power stations are equipped with General Electric multipolar machines generating current at 550 volts. The maximum drop allowed is 5 per cent. The trolley wire is No. 00 B. W. G.

There are 225 miles of trolley which belong to the Twin City Rapid Transit Company of Minneapolis and St. Paul. This company is to have the advantages of alternating current, transmission and cheap water power, as soon as the plant at St. Anthony's Falls is completed. At present three power stations, equipped with Edison and Thomson-Houston machines, furnish the power. There are 60 feeder lines of an average length of three miles and of such cross section as to allow 3,000 circular mils per ampere. Some of the feeders are placed in paper tubes enclosed in a pitch-

box, but this conduit is hardly satisfactory. For the most part the feeders follow the trolley lines and have solid trolley connections. The trolley sections are equalized at the trolley circuit breakers through a No. 12 bare copper fuse 12 in. long. The station voltage is from 600 to 625.

The City & Suburban Railway Company, of Portland, Ore., is very happily situated for the cost of fuel does enter into the calculations of the feeder system as it is supplied with mill refuse at a fixed price and in great abundance. A loss in transmission is consequently of little moment and the problem is to keep the voltage at the proper figure. The system has expanded from a small one to its present size and no attempt has been made to accurately proportion the feeders to the different branches, though the down town portion is so arranged that three sections can be handled by switches in the general office. The power is furnished from one power station having one multipolar and four 60-k. w. bipolar dynamos. The voltage is from 520 to 550. The power factor of the station, or the ratio of the average to maximum load, is about .6. There are six feeders ranging from one to three miles in length, and these are of No. 0000 solid copper insulated wire. The trolley wire is No. 0. The feeders follow the trolley lines, usually fixed on the same poles and connected to the wire by a special feeder ear.

The Union Traction Company, of Philadelphia, has 10 power houses and one sub-station with storage battery equip-

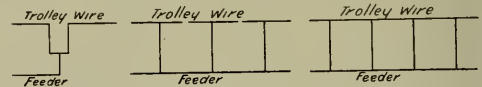


FIG. 1.

ment and for which a booster is used. The voltage varies from 500 to 550 with an average drop of 50 volts on the lines.

The feeders are mostly underground in iron pipes, terra cotta and creosoted wood ducts, and insulated with paper, jute and rubber. In all there are 1,426.35 miles of ducts and 269,236 ft. of conduit. From this it may be seen how extensive the system is. There are three methods of attaching the feeders to the trolley wire as shown in Fig. 1. There are 331 feeders aggregating 698.3 miles in length and besides this, 193.2 miles of return feeders and 153.3 miles of telephone wire. All the overhead feeders are on the same poles as the span wires. The cross sections of the feeders are determined by the drop in voltage with a maximum current carrying capacity of 1,000 amperes per sq. in.

The Union Railroad, of Providence, R. I., has one power station equipped with five multipolar General Electric dynamos which give a voltage of 575. From the station run 35 feeders with a total length of about 90 miles. These are 500,000 and 300,000 circular mil cables with weather proof insulation. The feeders are strung on the poles supporting the trolley wire and are connected to it at intervals of about 500 ft. by a live span of insulated wire.

The Washington Water Power Company, of Spokane, Wash., operates 36 miles of street railway. The current is generated from water-power at the same station where current is furnished for lighting purposes. No. 0 trolley wire is used and is divided into sections which are connected with fuse wire only.

On the Camden (N. J.) & Suburban Railway the cars have a headway of 10 minutes. There are five feeders radiating from the station and these are at a voltage of 535.



No. 0000 B. & S. weather proof insulated wire is used for feeders. A booster is being considered for high potential on some of the lines. The maximum drop in voltage is 20 per cent. There are no ground returns on most of the circuits, thorough rail bonding being sufficient. The trolley wire is No. 00.

The Cass Avenue & Fair Grounds Railway, the St. Louis Railway, the Baden Railway, the Southwestern Railway and the Citizens' Railway of St. Louis, are all under one management and are operated from one power station. General Electric direct connected generators furnish the current. There are 52 feeders, from one-half to seven miles long; the greater number are 500,000 circular mils cross section but some are No. 0000. The voltage at the station is 550 and the allowable drop on the line is 50 volts. In most cases the feeders are on the same poles as the trolley lines.

The Helena (Montana) Light and Power Company has six cars operating on 22 miles of track with an average headway of one hour on each branch. This is the consolidation of two systems, but is operated from one power house, equipped with a Thomson-Houston multipoler and a bipolar generator of the U. S. type. The load on the station varies from 71 to 280 h. p. according to the location of the cars, for there are heavy grades on some of the branches. The trolley wire is No. 0 and No. 2 and is divided up into five sections, being fed from feeders one to three miles in length. These feeders extend from the station to the trolley lines by the shortest route and then follow on the trolley poles and are connected to the wire at every fifth pole. A drop of 10 per cent is allowed, the voltage carried at the station being 500 to 550.

The power station of the New Orleans City & Lake Railroad and the Crescent City Railroad is located on the bank of the river and close to the railroad tracks, convenient to coal and water. Most of the lines are parallel and the station is nearly midway between the extremities. The equipment consists of four 500-k. w., one 800-k. w. and two 200-k. w. machines. The average load is 1,400 c. h. p. with a maximum of 3,600 h. p. although as great a load as 5,000 h. p. has been carried. In the feeder system there are twenty-one 500,000-c. m. cables, five 250,000-c. m. cables, seven No. 0000 wires, two No. 0 and two No. 000 wires for feeders, besides thirteen 500,000-c. m. return cables connected to the rails of several of the lines nearest to the station. The feeder lines were designed for the present needs with a view to indefinite extensions whenever necessary. The feeders follow the trolley lines and are on the line poles except for two or three main trunk lines running from the station to the principal points of distribution. The drop in voltage is less than 10 per cent under four miles and rarely over 20 per cent even where the lines are more than seven miles from the station. The sections of the line are on an average 2,500 ft. long and are joined together by fuses and switches, ordinarily kept closed. As a rule the different lines are separate unless used to help one another, but they can be connected by switches at their junctions if desired. Section boxes are placed every 2,000 to 3,000 ft. and at each box is a pair of feeder span wires that stretch across the track 16 ft. apart. Each feeder span wire is continued down one pole to the box where it passes through the switch and fuse and then the two are joined together at the point where the feeder is tapped by a T connection. The voltage at the station is 550.

The accompanying map and tables give a comprehensive statement of the conditions of the feeder system of the Toronto railway. The generators in the station are by the General Electric, Edison and Siemens-Halske Companies and run at a voltage of 560. The average headway of the cars is four minutes and the average drop on the lines is 8 per cent. The feeders are connected to the trolley lines every 1,000 ft. by soldered feed ears, 15 in. long. Table I gives the sizes and lengths of the feeder lines and Table II the dimensions of the trolley wire. The improvement that has been made in the feeder system in recent years is plainly indicated by the figures in Table III, which gives the drop in potential at different points along the line in 1891 and in 1897.

TABLE I—FEEDER WIRES.

| Section Numbr | Feeder Number. | Size of Feeder, B. & S. | Sectional Area, Circular Mils. | A     | B     | Total Length | Length of Trolley in Section, Feet. |
|---------------|----------------|-------------------------|--------------------------------|-------|-------|--------------|-------------------------------------|
| 1             | 1-A            | 0000                    | 206116                         | 17400 | 5500  | 22000        | 15500                               |
|               | 1-B            | 0000                    | 206116                         | 7500  | 9450  | 16050        |                                     |
|               | 1-C            | No. 1                   | 837000                         | 6750  |       | 6750         |                                     |
| 2             | 2              | 0000                    | 206116                         | 7200  | 3000  | 10700        | 31250                               |
| 3             | 3              | 0000                    | 206116                         | 1200  | 750   | 1950         | 4700                                |
|               | 4              | 2-No. 1                 | 837000                         | 2625  | 900   | 6825         | 10600                               |
| 5             | 5-A            | No. 1                   | "                              | 300   |       | 300          | 9150                                |
|               | 5-B            | No. 1                   | "                              | 3150  | 450   | 3600         |                                     |
|               | 5-C            | No. 1                   | "                              | 600   |       | 600          |                                     |
| 6             | 6-B            | 0000                    | 206116                         | 3600  | 375   | 3975         | 6300                                |
|               | 7-A            | No. 1                   | 164                            | 1200  | 4050  | 5250         | 14150                               |
| 7-B           | 0000           | 206116                  | 1200                           | 5700  | 6900  |              |                                     |
| 8             | 8-A            | No. 1                   | 164                            | 2475  | 600   | 2775         | 10300                               |
|               | 8-B            | No. 1                   | "                              | 2475  | 4125  | 6600         |                                     |
| 9             | 9-A            | No. 1                   | "                              | 4050  | 900   | 5500         | 11950                               |
|               | 9-B            | 0000                    | 206116                         | 4050  | 6150  | 10800        |                                     |
| 10            | 10-A           | 0000                    | "                              | 5400  | 750   | 6150         | 8550                                |
|               | 10-B           | 0000                    | "                              | 9000  | 500   | 9500         |                                     |
| 11            | 11             | 0000                    | "                              | 4500  | 2175  | 6675         | 5500                                |
| 12            | 12             | 0000                    | "                              | 8550  | 3675  | 12225        | 7250                                |
| 13            | 13             | 0000                    | "                              | 11325 | 1875  | 13200        | 9700                                |
| 14            | 14             | 0000                    | "                              | 9300  | 2025  | 12225        | 6578                                |
| 15            | 15             | 0000                    | "                              | 11600 | 8400  | 20000        | 10100                               |
| 16            | 16             | 0000                    | "                              | 9450  | 9300  | 18750        | 22950                               |
| 17            | 17             | 0000                    | "                              | 16800 | 6150  | 22950        | 17300                               |
| 18            | 18             | 0000                    | "                              | 12600 | 4050  | 16650        | 15240                               |
| 19            | 19             | 0000                    | "                              | 17700 |       | 17700        | 14350                               |
|               | 20             | 00                      | 1320000                        | 21900 | 11400 |              |                                     |
| 20            | 20             | 0                       | 105000                         |       | 6000  | 53224        | 20950                               |
|               |                | No. 1                   | 837000                         |       | 13024 |              |                                     |
| 21            | 21             | 0000                    | 206116                         | 21900 |       | 21900        |                                     |
| 22            | 22             | 0000                    |                                | 21900 | 9900  | 31800        | 9900                                |

Column "A" shows the length of each feeder from the power house to the point where it first feeds into the trolley wire.

Column "B" shows the length of each feeder from where it first feeds into the trolley wire to its end.

TABLE II—TROLLEY WIRE.

| Street.                 | From                | To                     | Size of Trolley Wire, B. & S. |
|-------------------------|---------------------|------------------------|-------------------------------|
| Avenue road.....        |                     |                        | 0                             |
| Bathurst street.....    |                     |                        | 0                             |
| Bloor street.....       | Spadina avenue..... | Sherbourne street..... | 00                            |
| Bloor street, west..... | Landsdowne ave..... | Spadina avenue.....    | 0                             |
| Broadview avenue.....   |                     |                        | 0                             |
| Carlton street.....     |                     |                        | 00                            |
| Church street.....      |                     |                        | 0                             |
| College street.....     |                     |                        | 00                            |
| Dovercourt road.....    |                     |                        | 0                             |
| Dufferin street.....    |                     |                        | 0                             |
| Dundas street.....      | Queen street.....   | Bloor street.....      | 00                            |
| Dundas street.....      | Bloor street.....   | Humberdale ave.....    | 0                             |
| Frederick street.....   | Front street.....   | King street.....       | 00                            |
| Frederick street.....   | Front street.....   | Motor shop.....        | 0                             |
| Front street.....       |                     |                        | 00                            |
| Gerrard street.....     |                     |                        | 00                            |

|                                       |                      |                        |       |
|---------------------------------------|----------------------|------------------------|-------|
| George street.....                    |                      |                        | 00    |
| High Park avenue.....                 |                      |                        | 00    |
| King street.....                      | Don River.....       | Dufferin street.....   | 00    |
| King street.....                      | Dufferin street..... | Roncesvalles.....      | 0     |
| Lansdowne avenue.....                 | West Track.....      |                        | 00    |
| Ossington avenue.....                 | East Track.....      |                        | 0     |
| Parliament street.....                | Gerard street.....   | Winchester street..... | 00    |
| Parliament street.....                | Queen street.....    | Gerrard street.....    | 0     |
| Queen street.....                     | Don River.....       | Subway.....            | 00    |
| Queen street, east.....               | Don River.....       | Balsam avenue.....     | 0     |
| Queen street, west.....               | Subway.....          | G. T. R.....           | 0     |
| Roncesvalles avenue.....              |                      |                        | 0     |
| Scollard street.....                  |                      |                        | No. 4 |
| Shelbourne street.....                |                      |                        | 00    |
| Spadina avenue.....                   |                      |                        | 00    |
| Station street.....                   |                      |                        | 00    |
| St. Lawrence street.....              |                      |                        | 0     |
| Winchester street.....                |                      |                        | 0     |
| Yonge street.....                     | Front street.....    | Davenport road.....    | 00    |
| Yonge street.....                     | Davenport road.....  | C. P. R.....           | 00    |
| York street.....                      |                      |                        | 00    |
| Yorkville avenue.....                 |                      |                        | No. 4 |
| Toronto and Mimico.....               |                      |                        | 0     |
| Toronto and Mimico Elec. Ry.....      |                      |                        | 0     |
| Toronto and Scarborough Elec. Ry..... |                      |                        | 0     |

Chicago Street Railroad consists of copper cables, 17,000,000 c. m. cross section. The capacity of the cable for the return circuit is about 50 per cent of the feeders. These are carried overhead in the same manner as the feeders and attached to the track every 1,000 ft. When the trolley lines run under the elevated roads the track is connected at intervals to the iron structure to which the return circuit cables are also attached. At the expansion joints of the elevated structure leaf bonds are used and in this way a return circuit of very great cross section is available.

One troublesome factor in designing a system of feeders is the extra power required in ascending grades. As a rule ample allowance should be made in the feeders, for the current to be supplied increases very fast as the grades become steeper. This is shown in Fig. 2 by the curves which have been plotted and are used by the Westinghouse Electric & Manufacturing Company. The approximate power of the motors required to operate cars under given conditions of speed and grade may be readily determined. Wherever

TABLE III—POTENTIAL READINGS.

|                             | 1894<br>Volts. | 1897<br>Volts. |                               | 1894<br>Volts. | 1897<br>Volts. |
|-----------------------------|----------------|----------------|-------------------------------|----------------|----------------|
| King and Church.....        | 455            | 515            | Bloor and Bathurst.....       | 475            | 515            |
| King and Spadina.....       | 490            | 540            | Bloor and Dovercourt.....     | 480            | 520            |
| King and Subway.....        | 488            | 520            | Bloor and Dufferin.....       | 480            | 520            |
| King and Queen, end.....    | 488            | 520            | King, East Bams.....          | 450            | 520            |
| Spadina and Queen.....      | 490            | 515            | G. T. Crossing.....           | 475            | 520            |
| Spadina and College.....    | 500            | 520            | Broadview and Queen.....      | 495            | 520            |
| Spadina and Bloor.....      | 485            | 540            | Leslieville.....              | 485            | 550            |
| Yonge and King.....         | 480            | 525            | Woodbine.....                 | 500            | 550            |
| Yonge and College.....      | 475            | 515            | Balsam avenue.....            | 495            | 525            |
| Yonge and Bloor.....        | 485            | 520            | Blantyre ave., Scarboro.....  | 495            | 520            |
| Yonge and C. P. R.....      | 450            | 520            | Main and Gerrard.....         | 490            | 520            |
| Queen and Yonge.....        | 490            | 565            | Rosedale, Elm avenue.....     | 480            | 510            |
| Queen and Spadina.....      | 495            | 515            | Bathurst, End C. P. R.....    | 480            | 515            |
| Queen and Bathurst.....     | 475            | 510            | Sunnyside.....                | 515            | 525            |
| Queen and Dundas.....       | 465            | 510            | West Side, Humber Bridge..... | 515            | 525            |
| Lansdowne and Dundas.....   | 465            | 520            | East Side, Humber Bridge..... | 515            | 525            |
| Humber side avenue.....     | 460            | 510            | Half-way Creek.....           | 515            | 525            |
| College and Yonge.....      | 475            | 520            | Mimico.....                   | 515            | 525            |
| College and Spadina.....    | 500            | 520            | New Toronto.....              | 515            | 525            |
| College and Bathurst.....   | 475            | 520            |                               |                |                |
| College and Dovercourt..... | 480            | 520            |                               |                |                |
| Bloor and Sherbourne.....   | 485            | 520            | Highest reading.....          | 525            | 565            |
| Bloor and Yonge.....        | 485            | 520            | Lowest reading.....           | 450            | 510            |
| Bloor and Spadina.....      | 485            | 540            | Average for whole system..... | 485            | 526            |

The difference in the methods is that in 1894 the feed wire was tapped into the trolley wires at the extreme end of the feed wires, consequently the current working back sometimes a distance of two miles making the resistance much greater than in the method of 1897, where feeders are connected at intermediate points from 800 to 1,000 ft. apart. No additional copper was used, and the voltage at the power house is the same. By referring to the map it will be seen that the feed wires are tapped in at the nearest point of the section to the power house. The trolley wires act as feeders in multiple with the main feeders, giving a uniform distribution of current.

Most of the street railway electricians believe that voltages of 750 on the trolley lines are practical with some alterations in the motors and extra precautions at trolley crossings. If these changes were made there would be a great saving in feeder lines, although it might necessitate a considerable alteration in the apparatus and would likely meet with opposition in the cities.

When the station is of very large capacity little dependence is placed in the track as a return circuit. For instance, the return circuit to the Western avenue station of the West

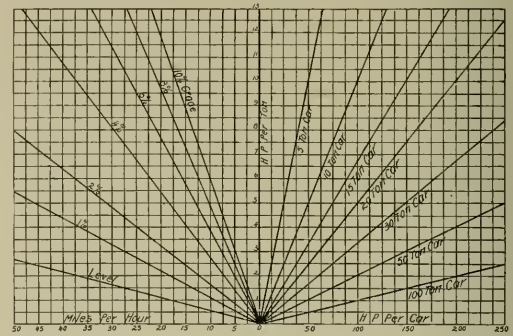


FIG. 2.

grades are encountered the motors and feeder system can be somewhat relieved by careful manipulation of the controllers. The handles should be turned slowly enough to give a constant acceleration in speed and some companies instruct the motormen not to use the last notch on either the series or parallel portions of the controller. In Minneapolis, where the grades are from 5 to 6 per cent in places, the management believes it is best to run the motors in parallel to prevent heating; the motors are more efficient at the higher voltage, and fast running time can be made.

### MAIL SERVICE IN MAINE.

The first street railway in Maine to have the U. S. Railway Mail Service extended to its lines, is the Rockland, Thomaston & Camden, an interurban line 15¼ miles long connecting these three towns. The car which has been fitted up for this work is 28 ft. long over all, with a separate compartment for the mail. The car is mounted on a Taylor single truck with 33-in. wheels and a wheel base of 6 ft. 6 in.; it is equipped with two G. E. 1,000 motors. Mail is distributed and collected along the entire line of the road.

The company has recently completed a ¾ mile extension on the Highlands branch; this line runs to the limestone quarries and the roadbed is ballasted with stone chips and gravel.

o c. m. They are lead covered without further protecting station is very well

and seat 52 persons; the bus., and each can draw one as much. There are 200 under the seats in hermetically sealed under the seats in the interior of the car. The difference of potential; the time required from to

with two 25-h. p. motors operated by electricity. The hour within the city and

#### OR WINDING.

of the Cincinnati, Covington and Cincinnati, Covington, recently related some facts concerning an electrical Club which presented to account for the enormous field coils on West-where there were heavy coils of which Mr. Smith is supplied with larger wire. This was No. 7 wire. The same was used in the second case as 100 ampere turns were the result. It was naturally found to have no other effect save to magnetize many field coils. As a result it was found that it increases the resistance hard to account for that it being true, but it has ways. It was first discovered in the first car that was sent to Cincinnati that it maintained a schedule that was very similar, but with the exception of further investigation, it was found that the coils of level double track run side by side. The second was similar except that the coils were wound with No. 7 wire and the number of turns of No. 7 was exactly alike and allowed a point for the 2,000 ft. the No. 6 field coils had this. Another test was made of a mile per hour run at Cincinnati finding the number of rail

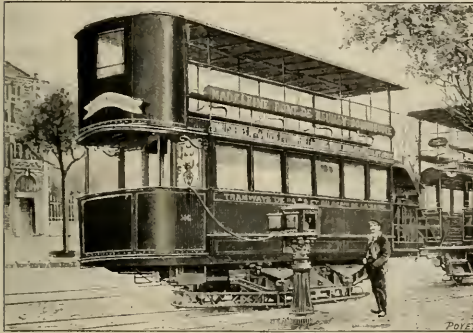
amount of good argument that such a change in the resistance with the speed of the motor is not decreased and the difference is very slight. It does not account for the facts, but we have the matter discussed in the following questions or answers to this, which is in dynamo or motor





**ELECTRIC TRACTION IN PARIS.**

The progress so far made in the substitution of mechanical for animal traction in Paris has been confined to experimental lines operating with accumulators, one with surface contacts and several using gas, air and steam motors. The latest is a rapid charging accumulator line described by J. Laffargue in *La Nature*. It was installed by the Tramway Company of Paris and the Department of the Seine, and extends from the Madeleine to the suburbs of Courbevoie,

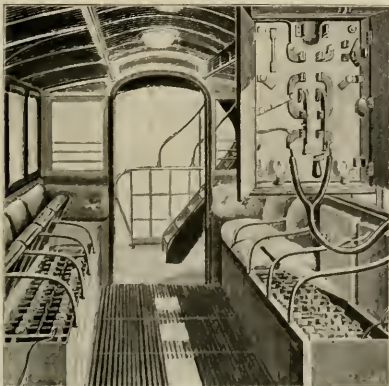


CAR AT CHARGING STATION.

Courbevoie-Neuilly and Levallois, the lengths of the several sections of the lines being respectively 4.1, 4.2, and 2.9 miles.

The generating station is equipped with three water tube boilers furnishing steam at 220 lbs. pressure to three triple expansion Willans engines, each of which is connected to a 120-k. w. 4-pole Brown dynamo. The speed is 460 r. p. m. The engines may be operated either condensing or non-condensing.

Current is distributed through six mains, one each for the four charging stations and two for the electric pumps and lights at the power station. The conductors to the charging



INTERIOR OF CAR.

stations have an area of 300,000 c. m. They are lead covered and armored and laid in the earth without further protection. The terminal at the charging station is very well shown in the illustration.

The cars are double-decked and seat 52 persons; the motor cars weigh about 31,000 lbs., and each can draw one trailer which weighs one-half as much. There are 200 Tudor cells to the car, placed under the seats in hermetically sealed boxes, which are arranged under the seats in the manner shown in the view of the interior of the car. The charging is done at a constant difference of potential; the mean current is 120 amperes and the time required from 10 to 12 minutes.

The motor cars are equipped with two 25-h. p. motors running at 500 r. p. m. and are lighted by electricity. The speed is limited to 7½ miles per hour within the city and 10 miles in the suburbs.

**A PUZZLE IN MOTOR WINDING.**

G. J. Smith, master mechanic of the Cincinnati, Covington & Newport Street Railway, recently related some facts at a meeting of the Cincinnati Electrical Club which puzzled the many bright electricians present to account for. Owing to the burning out of numerous field coils on Westinghouse No. 3 motors on lines where there were heavy grades, it was decided on the road of which Mr. Smith is master mechanic to rewind the fields with larger wire. This was done, using No. 6 to replace No. 7 wire. The same number of turns of wire were used in the second case as were used in the first, so that the ampere turns were the same as before the fields were rewound. It was naturally supposed that this change would have no other effect save to prevent the burning out of so many field coils. As a matter of fact, however, it has been found that it increases the speed of the car. This is so hard to account for that many have expressed doubts as to it being true, but it has been demonstrated in a variety of ways. It was first discovered by the ease with which the first car that was sent out with the rewound field coils maintained a schedule that was impossible for other cars exactly similar, but with the old fields of No. 7 wire. This led to further investigation. Two cars were taken out on a stretch of level double track 2,000 ft. long, where they could be run side by side. The cars, trucks and motors were exactly similar except that the motors under one car were wound with No. 7 wire and those under the other with the same number of turns of No. 6 wire. The cars were accelerated exactly alike and allowed to run with controllers on the highest point for the 2,000 ft. At the end of that run the car with the No. 6 field coils had beaten the other by three car lengths. Another test was made by estimating the number of miles per hour run at full speed by the two cars by counting the number of rail lengths passed over in a given time.

Such are the simple facts. Any amount of good argument can be brought forward to prove that such a change in winding ought to make no difference with the speed of the motors, since the ampere turns are not decreased and the decrease in the resistance of the motor is very slight. Nevertheless such argument does not account for the facts. The REVIEW would be pleased to have the matter discussed in its columns, and to receive explanations or answers to this electrical puzzle from any one interested in dynamo or motor work.

## NO TAX ON CAPITAL STOCK.

The assessors of New York have strenuously insisted upon assessing the capital stock of street railway companies and other corporations. In the case of the Brooklyn City Railroad Company, Justice Cullen, of the Appellate Division of the Supreme Court, renders an important decision and says in part:

"This controversy proceeds from the struggle that still exists by the boards of assessors of various cities to continue to tax the capital stock of corporations under the method that generally if not uniformly prevailed throughout the state until the decision in the case of the *People ex rel. Union Trust Company v. Coleman* (126 N. Y. 448), and the various cases in the Court of Appeals following the decision. Before the decision of the *Union Trust Company* case, it had been the rule with the assessors, where the shares of the stock of a corporation sold above par, to treat that fact as conclusive evidence that the capital stock had not been impaired, and in assessing the corporation for personality, to deduct only its real estate, the amount of stock held by them in other corporations, and the amount of their stock held by charitable, literary and eleemosynary institutions. The decision cited overthrew this rule and worked a revolution in the method of assessing corporations and the extent of their liability to local taxation. The capitalization of corporations and the market value of their shares of stock depend largely on their earning power. In the *Union Trust Company* case it was held that these were not the subject of consideration in assessing the corporation; but that it was to be assessed only for actual capital or property owned by the corporation. Recently the question has again come before the Court of Appeals, and again the law has been declared that the franchise of a railroad cannot be assessed for taxation. It is, therefore, now settled law that corporations have two classes of property, one subject to local taxation and the other wholly exempt from it. This being the law, there should no longer be any attempt to avoid it or to tax property that is exempt. If the law is just every one should favor it; if it be unjust, the only remedy is by application to the legislature to alter it, for it is unquestionably within the power of the legislature to subject this character of property to the same public burden which other property within the state has to bear, a burden which for over forty years corporations have borne without cavil or complaint, and without suggestion that it was not imposed on them by law.

"The return of the relator and the statement were to the effect that the capital stock of the corporation was \$12,000,000 and was all paid in; that the actual value of all the assets of the corporation was \$8,079,271.82; that the assessed value of its real estate, including its tracks, was \$5,471,570, and that its indebtedness was \$6,925,000. The sum of these last two items, which the relator was entitled to deduct from the value of its assets, is \$12,396,570. The result is that the relator's property stands \$4,317,298.18 below the point at which it would be liable for any assessment for personality. For the market value of the shares of stock, the president of the relator refers to the financial reports of the day. These show that the stock sells above 180. It is insisted that the statement that the company has only \$1,500,000 assets in excess of its liabilities is not to be credited in the face of the fact that the value of the whole stock exceeds \$21,000,000. There is undoubtedly great

force in this argument, and it would be unanswerable were it not borne in mind the distinction between the two kinds of assets. If all the assets of this company were only \$1,150,000 it would be incredible that any amount of business skill or any peculiar use of those assets would make the stock of the company worth in excess of \$20,000,000. But there is another asset of the company which it has not returned to the assessors, and which, as we have already seen, under the authorities, the law does not require it to return, that is the franchise of maintaining and operating railroads on some sixty miles of the streets of the city of Brooklyn. This asset may be of sufficient value to warrant even a greater market price for the stock of the relator than that which now obtains. We are of the opinion, therefore, that the Special Term properly vacated the assessment.

"We think that the order directing a reassessment also was properly made. The relator borrowed \$6,000,000 some few years ago. The assessors asked for the details of the expenditure of that sum. This the witness was unable to give, but referred the assessors to the books of the corporation, which, he stated, he would produce. The books of the company were not in fact produced. These the assessors were entitled to examine, to see how the capital of the corporation and money borrowed by it were expended, because the details of such expenditures might show the existence of personal property not returned to the assessors. The president of the relator is hardly subject to criticism in not producing the books, because there seems to have been no subsequent application for them. The matter seems to have been left inchoate and undetermined. We therefore think it wise that there should be a rehearing before the assessors of which they may probe the returns of the company to any further extent that they may desire and obtain any further evidence as to the assets of the corporation. But the assessment must be laid in accordance with the law, and the fact that the justice or the favor of the statutes of the state, as construed by the courts, renders this relator subject to local taxation on some \$5,000,000 and exempts it from taxation on over \$15,000,000 does not justify an attempt to value the latter class of property as part of the former. The order appealed from should be affirmed without costs to either party."

## THE HOUSTON STRIKE.

A strike of motormen and conductors of the Houston Electric Street Railway Company took place July 4th and continued for nearly two days. It was caused by a refusal of the management to reinstate two men discharged for cause and to recognize the Amalgamated Association of Street Railway Employes of America. It was finally decided by the company withdrawing its opposition to the union and agreeing to leave the cases of the discharged men to an arbitration committee consisting of three well-known business men, who decided in favor of the company, but recommended that the men be granted another trial.

To promote harmony and good feeling the management decided to adopt the recommendation of the committee, and reinstated the men. No further trouble is anticipated.

James C. McSpadden of Pittsburg, has been given the contract to build six miles of the West End, Mt. Washington and Banksville line for the Pittsburg & West End Traction Company.



## THE USE OF ALTERNATING CURRENT.

Rotary Converters in Sub-Stations—Alternating Current Motors—Synchronous and Induction Types—Requirements for Interurban Service—The Bradley System—Use of Alternating Currents on the Swiss Railways—Long Distant Transmission.

## PART III.

If alternating current motors were used on street cars, transformers could be placed in sub-stations and would operate with no other care than daily inspection. But at present one other machine has to be interposed between the transmission line and the application of the current. It is but very recently that rotary converters, or motor-generators as they were first called, have come into practical use. Both street railway service and electro-metallurgical work require direct currents and a very efficient type of machine has been developed for the purpose of converting the alternating to a direct current. A rotary converter has somewhat of the booster effect upon the system as it can be made to maintain a constant voltage or can be overcompounded and give an increased potential with greater loads. This is accomplished by having a weak shunt and a powerful series field. The efficiency of a rotary converter is equal to that of a continuous current dynamo while the output for a given size is from 50 to 60 per cent greater. The armature need only be designed for the larger current which is from the transformer and for the greater voltage which is that of the direct current.

Like all rotary machines they require constant supervision and this necessitates a considerable item for labor at each sub-station where the line must be connected to the feeder. This is an objectionable feature for it brings complications into the system, though in many cases the saving in copper in the transmission lines will more than compensate for the expense of sub-stations.

For many uses and possibly for traction purposes poly-phase motors are preferable to continuous current motors. In street railway service a motor should be capable of carrying large overloads without failure and of running in either direction, should have a high initial torque, the speed should be varied with ease, it should have a high efficiency over a considerable range of load, it should be light, compact and require few repairs. It may be seen from the cut of the polyphase motor how simple and substantial is the construction. There are no commutators and brushes to care for and renew; the armature conductors are massive, well protected and insulated in the slots of the armature. The fields and armature are so compact and strong that there is little chance for injury nor is there danger of burnt-out field or armature coils. The motors can be made very light when need be, 70 lbs. per h. p. is an average with a minimum limit of 30 lbs. per h. p. As for the starting torque, the design of the machine can be so made that it will be four or five times the running torque. The reversal of an induction motor can be accomplished by reversing the connections of any two of the primary wires, thus rotating the field in an opposite direction to the armature and bringing it to rest very quickly.

The alternating current motors are the synchronous and induction types, each having some advantage over the other. Synchronous motors were the first to be developed as they are essentially generators used as motors. This type of

motor can be made by replacing the commutator of a direct current motor with collector rings. When supplied with an alternating current the speed of the armature would correspond to the rate of alternation of the current in order that the poles produced by the armature currents may be maintained in a fixed position with relation to the field poles, or in other words, the motor must run in synchronism. If the armature drops out of synchronism, as might be caused by a considerable overload or in starting, the reaction of the revolving pole on a fixed field would tend in one direction and then in the other, bringing the armature to rest. This type of motor necessitates a direct current for field excitation,

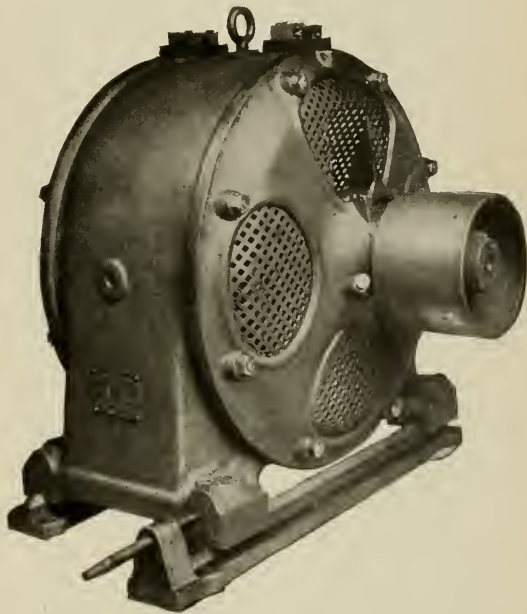


FIG. 10—TESLA MOTOR.

consequently a commutator or auxiliary dynamo. The initial torque is very small and the machine runs at a constant speed. These characteristics make this motor unsuited for street railway work under any conditions.

The next step was to produce a revolving field pole which will keep just ahead of the pole induced in the armature core and thus cause a constant pull in one direction. This is accomplished by a different type of field which is induced by the currents in the armature, similar to the currents induced in the secondary of a transformer. This is the non-synchronous or induction type of motor. The principle of the induction motor is very much like that of the static transformer. It has a primary and a secondary either of which may be the rotor of the motor according to the design. When the rotor is the secondary the currents, with the electromotive forces displaced in phase with each other, are sent through the field circuits. The currents in the rotor are induced, the magnetic flux being produced by the stator circuit. The possibilities of great initial torque in alternating current motors are largely due to the fact that its fields do not approach saturation at the normal load and thus the

magnetization of the fields can be doubled if need be to get a much greater torque. This is in contrast with the direct current motors in which the fields at normal loads are near saturation and increased torque must be obtained by a corresponding increase in the armature current. The speed can be regulated by the introduction of a non-inductive resistance in the secondary circuit and it acts in the same manner as a rheostat in the armature circuit of a series motor. With this arrangement the speed can be accurately governed although the efficiency of the motor is lessened by the use of the resistance.

No commutator or even collector rings are used on the smaller sizes of these motors. At overloads there is a decrease in speed but no greater than with a direct current motor. The induction motor is superior in every way to the synchronous motor except its power factor. For the synchronous motor the power factor is nearly unity; for a 25 or 30-h. p. induction motor the power factor would be about .8 which with an efficiency of 90 per cent would give an efficiency from generator to tractive effort of about 72 per cent over a considerable range of load. Fig. 19 represents a Tesla induction motor without collector rings. The primary, or armature, is stationary and the current is fed to the motor through the terminal blocks on the top of the field. The motor is compact; the moving parts can easily be strongly constructed, and as the induced currents are of low potential, the insulation is such as to make burn-outs and break-downs of rare occurrence. The most essential

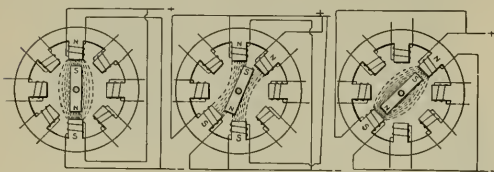


FIG. 20. FIG. 21. FIG. 22.

and the least understood, but the simplest feature of this machine is the rotary field. If a permanent magnet be pivoted in the center of the fields, as shown in Fig. 20, and the field coils be commutated so that each pair of poles can be successively excited the action will be as follows. The lines of force will pass from one pole to the other and through the magnet, drawing it in parallel to the field lines. If two pairs of poles be equally excited as in Fig. 21 the permanent magnet will be drawn into the strongest field which will be intermediate between them. If the first pair of poles be then cut out as in Fig. 22, the magnet again seeks the strongest field which is in line between the excited poles. The action on the permanent magnet is a rotary one which continues as the poles are successively excited. An induced field from an alternating current acts in the same manner. The current passing through the primary circuit induces the currents in the secondary or rotor and these produce a magnetic pole in the rotor core which is attracted by a pole of opposite polarity in the primary field and a rotary motion is the result. A succession of such impulses causes the rotor to revolve and work is effected. Curves, plotted from tests of this type of motor, are shown in Fig. 23 and 24. Fig. 23 indicates the speed and efficiency of a 50-h. p. motor. The brake horse-power, the drop in speed from no load to full load, the efficiency curve and the torque

are shown in Fig. 24. It will be noticed that the speed is very nearly constant, there being a drop of only two or three per cent, and the efficiency is very high over a great range of load.

An induction motor is called non-synchronous, yet it has a tendency to keep in synchronism with the generator.

This property will make the use of the alternating current motor desirable over undulating country for it will maintain a nearly constant speed in ascending grades and instead of racing going down hill will act as a generator and return power to the circuit.

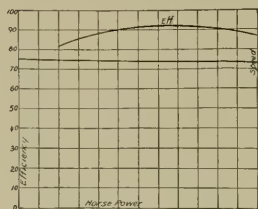


FIG. 23.

The greatest objection to the application of alternating currents to street railway work at present is the lack of a specially designed motor for traction purposes. From a theoretical standpoint the system with rotary transformers is very faulty. It is rather awkward to put up a transmission for two phase or three phase currents and then have substations with rotary converters at frequent intervals. At Buffalo and Salt Lake City where steam power can be supplied by the cheaper water power and all machines and apparatus are made for direct currents, that system is undoubtedly preferable.

When a proposed interurban is being planned the system which will contain the least amount of copper, the least number of moving machines, and the fewest number of sub-stations is the most desirable. Overlooking for the time the imperfections of the motor, a single phase, low frequency system, with dynamos generating at high voltages and static transformers placed at suitable intervals along the line, would be an ideal one. Its superiority over the multiphase would be in its only requiring one trolley line whereas two would be necessary in the other case. A single phase induction motor of good efficiency can be constructed but the fatal defect is the low starting torque.

An alteration of this plan as been suggested by C. S. Bradley and that is to transmit a single phase current on the line and instead of having transformers placed at intervals along the road, put a phasing transformer in each motor car. By this plan a single trolley line and polyphase motors

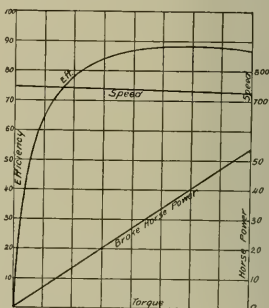


FIG. 24.

could be employed. The transformer reduces the voltage at the same time it changes the single phase to a polyphase current and with all this conversion the transformer has no moving parts. The advantages of this system are quite plain for the transformers need only be equal to the capacity of the motors and are used when actually needed, while with transformers in sub-stations their capacity must be equally to the greatest load likely to be on the section of the line to which they are connected. But one trolley is required

with this arrangement. A condenser must also be carried on each car but this can be of small and convenient size. Fig. 25 shows the connections in each car. M is a mesh winding for an induction motor and its connection to the transformer is shown by the diagram. The function of the condenser is to assist in the phasing and prevent lag on the line which would give a low power factor. One objection to this scheme is that it is difficult to get suitable commercial condensers and another is the high voltage on the trolley line.

The Déri system makes use of the alternating currents on the line but has a combination of storage battery, alternating and direct current motors on the car. Single or poly-phase currents are transmitted, with transformers to reduce the voltage at suitable intervals. The direct current motor is intended to be operated as a dynamo a portion of the time and may be combined with the alternating current motor as a motor-generator. When the car is under headway the tractive power comes from the alternating current motor which also expends all its surplus energy in operating the direct current motor as a dynamo. The storage battery B, with connections as shown in Fig. 26, is charged from the shunt motor. In starting and when the alternating current motor is overtaxed the direct current motor receives current from the battery to actuate the car. The electrical connections without the controlling devices for either the direct or alternating current motor are shown in the figure. The diagram is for a three phase system. The full lines represent the alternating current connections and the dotted lines the continuous current connections.

T, T represent the two trolley lines and the track, M, M the motors, R the regulating resistance and A an automatic regulator. It is needless to say that the system as planned at present is too complicated to be of practical use.

It has remained for the Swiss to develop the first three phase system of electric traction. Three phase currents are used on the Lugano and the Gorner-Grat Railways and will operate the Jungfrau Railway. These lines have only been in operation for a short time and no reliable results can be deduced from their performance as yet. The road at Lugano is only three miles long and is under conditions which would not require the use of alternating currents.

secondary of the transformer connections are made to the two trolley wires, and the rails take the place of a third one. The motors on the cars are single reduction, 24-h. p., 12-pole machines which give a maximum speed of  $9\frac{1}{2}$  miles per hour. The speed is controlled by resistance in series with

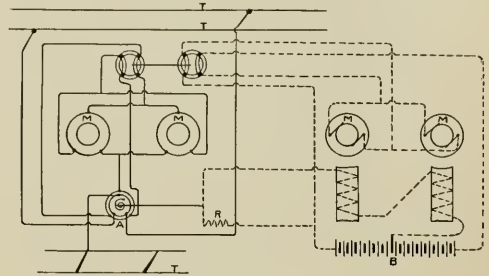


FIG. 26—DÉRI SYSTEM.

the rotor. At slow speeds and in starting the motors have to run on the rheostat and arc, therefore, not very efficient where frequent stops and slow speeds are necessary. A polyphase system will hardly find application in the city for the double trolley would make switches and cross-overs very complicated. However it could be used with success on conduit lines where a double trolley is not objectionable. It is said that on the Swiss lines the double trolley does not cause any great inconvenience. Even in this country there has been some experience with the double trolley and it has been in use for years in Cincinnati.

Alternate current apparatus will find application in any vicinity where there is a cheap and abundant source of power whether it be from water falls or steam plants favorably situated. The limit of voltage has not been reached for with every new transmission line a higher potential is suggested. Whereas a few years ago a potential of 3,000 to 5,000 volts was looked upon as a high potential, those of 10,000 to 15,000 are now in service. Contracts have been let for a line from San Bernardino to Los Angeles, 70 miles, which will have a voltage of 33,000. However, there is one feature of long transmission and a central source of power which causes serious questioning. With the excessively high voltages break-downs are liable to be of more frequent occurrence and the long lines will increase the chance of accident. This will have to be carefully guarded for the value of such power depends largely upon its reliability. High grade apparatus, substantial line construction, good insulation and protection from lightning will largely remove these dangers.

### STREET RAILWAY INSPECTORS IN MASSACHUSETTS.

The law which provides that the State Board of Railroad Commissioners of Massachusetts shall have the same jurisdiction over street railways as steam roads is now in effect. The inspectors will, at certain periods, examine the tracks, the rolling stock and appliances and report to the commissioners, who are empowered to force the companies to make such alterations or additions as will add to the convenience and safety of the public.

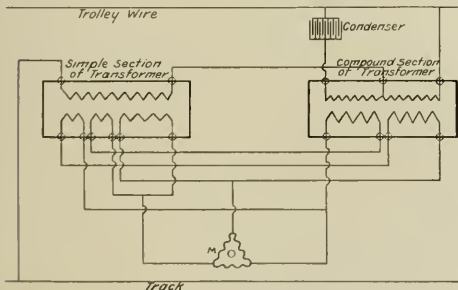


FIG. 25—BRADLEY SYSTEM.

Lugano is  $7\frac{1}{2}$  miles from the water fall which is the source of power and over this distance a three phase alternating current is transmitted at 5,500 volts and with a frequency of 40. The transformer house is centrally located with reference to the lines which have a voltage of 100. From the



## WATER POWER TRANSMISSION AT MINNEAPOLIS AND ST. PAUL.

The Twin City Rapid Transit Company intends ultimately to abandon its steam plants, which are a rather expensive necessity at present owing to the high price of fuel in Minneapolis and St. Paul, and to get all its power from the water power plant now being put in at St. Anthony's Falls about  $1\frac{3}{4}$  miles from its Minneapolis power station. The transmission will be made by means of high voltage 3-phase alternating currents at different pressures according to the distance of transmission. All the transmission wires will be laid in vitrified clay conduits. The cables will be paper insulated. The present steam plants will be used as sub-stations to which the power from the falls will be conducted and transformed into direct current of proper voltage. The shortest transmission will be from the falls to the main power plant in Minneapolis. The voltage for this will be 3,500 and the calculated line loss 3 per cent. At this plant two 600-k. w. rotary transformers will be put in. At the 31st street plant in Minneapolis one 600-k. w. rotary transformer will be installed, the transmission to this plant being at 3,500 volts with 7 per cent loss. To the main plant at St. Paul the transmission will be at 12,000 volts with 5 per cent loss and two 600-k. w. transformers will supply the St. Paul lines.

## BUCKEYE COMPOUND ENGINES.

The first compound engine built by the Buckeye Engine Company was built in 1879; the cylinders were 10 and 20 x 18 in. and it was operated at a steam pressure of 80 lbs. per gauge. Careful tests were made and the water rate found to be 19 lbs. per h. p. per hour, a performance which compares very well indeed with more modern constructions. Later designs have been made to keep pace with the increase in steam pressures and the performance of the engines improved in consequence. At the same time it has been



BUCKEYE ENGINE AT CARNEGIE STEEL WORKS.

demonstrated that the Buckeye devices are just as well adapted to the multi-cylinder engine as to the simple one. With tandem engines, automatic cut-off valves are placed on both cylinders and the same may be done with those of

the cross-compound type if desired, though the company recommends the use of a single cut-off placed on to the high pressure cylinder except where the fluctuation of load is very extreme.

The illustrations show two views of one of six engines recently supplied to the Carnegie Steel Company; three of these are installed at the Bessemer plant and three at the



BUCKEYE ENGINE AT CARNEGIE STEEL WORKS.

Duquesne plant of the company. Each is direct connected to a Westinghouse generator, the current from which is used for operating traveling cranes and other machinery.

The nominal capacity of the engines is 500 h. p., the maximum being 750 h. p.; the cylinders are 18 and  $32\frac{1}{2}$  x 33 in.; three of the engines run at 130 and three at 142 r. p. m. Blake condensers are installed with the engines.

## BRUSSELS-TERVUREN RAILWAY.

The exposition at Brussels is not all united in one enclosure as has been the case with the international expositions heretofore; one part is located at the park of the Cinquanteaire in Brussels and the other at the Royal Park in Tervuren; the distance between them is 6 miles. On May 15 an overhead trolley electric railway between the two parks was opened for traffic; the present Brussels terminus is temporary only and the line will be extended farther into the city making the total length 8.3 miles. Cars are run on a 15 minute headway from 7 a. m. to 7 p. m.; the round trip fare is 14 cents for first class and 10 cents for second class places.

The line is double track throughout, of 1 meter gage, and laid with Vignole rails weighing 50 lbs., carried on cross-ties of wood. The trolley wires are of the figure 8 section and carried on iron poles. The power house is located at what will be midway of the line.

Each train consists of a motor car equipped with two 25-h. p. motors and two trail cars. The motor car weighs 16,500 lbs. empty and carries 32 passengers; the trailers are open cars, smaller and lighter, weighing only 5,200 lbs., and have cross benches. The speed is approximately 12 miles per hour.

Charles LeBlanc was the consulting engineer, under whose direction the line was designed and installed.

## REPAINTING OLD CARS.

BY CHARLES KOONS.

PART III.

The proper coloring of the outside body of a street car is not the only difficult feature about repainting. It is a matter just as difficult and of as much importance to secure harmony in the ornamentation, striping and lettering as in the body colors, and it is here that the skill and judgment of the master is seen.

A badly colored car can be made to look all right if there is harmony of colors in the striping; so also can a good color be made to look very common by the style and taste of the ornamentation. Some colors go with others at all times and in all places and are never out of place. Gold harmonizes with any color. It can be used any place in ornamentation, striping and lettering, and looks well. In fact, it stands at the head as the means of beautifying and decorating any color. Its natural richness adds warmth to cold and lightness to heavy coloring, and it is wonderful how a little gold striping and scrolling will change the cumbersome looks of a large street car. It is the painter's best material for decorating, and also the most costly, but it pays well in spite of the extra cost, as it does not wear out or fade. It always looks well and wears until the car is ready to be painted again, which cannot be said of colors, as they all in time grow dingy and gradually fade. Another leaf that has come into common use for street car decorating is aluminum or nickel leaf as it is commonly called. It is very cheap and has superseded silver leaf altogether. Like gold, this harmonizes with all colors, and though not so rich as gold leaf, will last equally as long. It is used mostly for lettering, and looks well when used with gold decorations. Stripes and ornaments of gold and letters of aluminum with the proper shading make a good combination. But where color is used upon color care must be taken to secure harmony. Some colors add coldness, while others add warmth in the way of decoration. There is no fixed rule by which a decorator can judge what is suitable for decorating a color; he must be guided by the looks and the effect when he first started to do his work.

In large factories when striping, ornamenting or lettering is first designed, the designer has the finished work in his mind's eye. He generally is a skilled workman and judges ahead, as when the work is placed upon the car it must pass judgment with experienced mechanics who can tell at a glance if there is anything wrong in regard to harmony of colors, size of lettering, width and kind of striping suitable for certain paneling, and more than anything else the necessary ornaments for certain colored work.

There is such a thing as overdoing this kind of work, and it takes the best judgment possible to pass upon work when it is first begun; no one but a skilled mechanic in this special line is competent to see the finished work; this is the painter's business and he is trained up to see the finish at the start. He has one advantage, however, over any other trade; if his work as he has planned it does not suit he can rule it off and try again, but this does not often happen, for the man in charge has had the matter in mind probably for weeks, and when the work is ready he is ready with suitable colors for striping and ornamenting.

It is often the rule in trade work to be bound by specifi-

cation; in this case somebody else has passed judgment and the same rule holds good. A tailor should never undertake to make a pair of shoes for any one, and the appearance of work should not be spoiled by some one who knows nothing about beauty and taste; if the painter cannot fulfill this part of his work, even if he has to curtail here and there on account of economy, he is not doing his part, and some one else is attending to his work, or trying to do so at least. There are plenty of improvements in the paint shop, as well as in other departments to meet the demands for economical street car painting. Of course, there are not many machines to improve in a well designed paint shop, but there are quick methods of doing parts of the work that aid wonderfully. There are paint journals that will keep any one posted on this score. The painter does not need to be ignorant of any of the new methods of saving money in the painting department, and a dollar or two invested in special magazines will do more towards helping him than a dozen books on the same subject. These monthly issues are full of valuable information and discoveries in the way of improvements, formulas, receipts, newly devised apparatus for paint shop work and everything that is in the line of bettering the work of the painter. In fact a painter is not up to the times without a copy or two of these helps coming to him every month.

A trial of the different improvements soon convinces the most skeptical on the matter of economy. For instance, how much quicker can pumice work be done with Shumacher's rubbing stone than the old way of rubbing with the common pumice, and how much better and quicker will steel wool answer for intricate moldings and carved parts than sand paper, and how could we get along without the Fitch striper for edging stripes, and paint mixers, steam paint mills and dipping troughs of all sizes?

It would surprise some of the painters all over the country to know the price that is being paid for certain kinds of work, but still workmen are making full wages at it. But if it were not for the improvements they could not do it. For instance, with the gilding wheel gold leaf may be laid five times as fast as by hand, and a great saving of material effected. There are scores of things being brought out every year to save time and labor. Patent transfer ornaments and letters are among the greatest of time savers. When the question of cutting down expenses is uppermost in connection with the paint work here is where money can be saved, and still the beauty and ornamentation not be sacrificed. These things the painter should keep in mind, and when the matter of doing cheaper work is broached he should not cut off that which will destroy his part of the work nor sacrifice the quality of it, but he should try and see wherein he can improve his working material so as to bring down the cost. If transfers, gilding wheels, dipping tubs, graining tools, spraying machines or any improvement in the way of brushes, pencils or paint apparatus of any kind will do quicker and cheaper work they should be adopted without delay, and it has surely been proved that these improvements are efficient or they would not be used by the large concerns.

The question of service should always be weighed, however, when adopting a new contrivance, as this is the painter's only hope for his work. When it is sacrificed all is gone. Quality should never be sacrificed for any new improvement, and if the new apparatus will not do as good work as the old way it should not be used. Serviceable





## JUDGE SHOWALTER'S DECISION IN THE INDIANAPOLIS 3-CENT FARE CASE.

The history of the celebrated controversy between the city of Indianapolis and the Citizens' Street Railroad Company has been given in the REVIEW; the text of the act of 1897 prescribing a 3-cent fare in April, page 206; President Mason's report detailing the attempt by the city to confer the rights of the Citizens' company upon the City Railway Company in May, page 290; and the decision of the supreme court of Indiana holding the 3-cent law to be constitutional in June, page 417; the decision of Judge Showalter on the motion to dissolve the preliminary injunction granted by him in April and on the motion of the complainant, the Central Trust Company of New York, to make certain persons who had commenced actions against the company for damages, because a 3-cent fare was refused, parties to the original suit, is here given in full. In accordance with the rule allowing these parties to be made parties to the original suit Judge Woods has granted the decree prayed for.

The present status of the case is that the city is enjoined from enforcing the "law," the company from complying with it, and all parties who have commenced actions for damages from prosecuting the same, which will continue until a higher Federal court can pass upon the case.

The title of the case is Central Trust Company, of New York v. Citizens' Street Railway Company of Indianapolis, the City of Indianapolis and Charles S. Wiltzie, (prosecuting attorney.) The decision of Judge Showalter was handed down on July 22.

On a former hearing a preliminary injunction was granted. A statement of the case is found in the opinion then delivered. 80 Fed. Rep. 218. The defendant, the City of Indianapolis, now demurs to the bill and also moves to dissolve the injunction. It appears that after the hearing on the motion for preliminary injunction the City of Indianapolis brought suit in one of the state courts against one Navin to recover a penalty, under an ordinance of the city for alleged misconduct of Navin in boarding a street car and refusing to pay the fare demanded, namely, 5 cents. This alleged offence by Navin was after the hearing on the motion for the injunction, but before the injunction had been granted. Navin pleaded the act of 1897, called in question by the complainant here, in justification. The cause went by appeal to the supreme court of Indiana and that court on the 11th of June rendered a decision holding the enactment of 1897 valid. Motion to dissolve is made on the strength of that decision. Complainant on its part moves for leave to amend the bill by making defendants thereto certain persons who have brought actions in the state courts for penalties pursuant to said act of 1897.

It is again urged that this suit cannot be maintained against Prosecuting Attorney Wiltzie, because he represents the state of Indiana. If the enactment here in question be valid, then Mr. Wiltzie does represent the state—not the state as a proprietor, however, but the state as a governmental agency. If the enactment be invalid, then he does not represent anything. On the latter hypothesis, he, or any successor to him in office, in attempting to enforce the penalties in the enactment of 1897, would be merely in a wrong-doer. The theory of the bill is that that statute is unconstitutional and void. If the complainant be mistaken in this one proposition, then the bill cannot be sustained as to any defendant. I get the impression from the argument and citations made that a "suit in law or equity" against a state within the sense of the 11th amendment to the constitution of the United States, is a suit affecting in some manner a property right of the state as a municipal corporation. But the discussion on this point seems to me aside from the case at bar. If, as said, the enactment of 1897 be invalid, then Mr. Wiltzie does not here represent the state; if it be valid, he does. But on the latter hypothesis the entire suit must be disposed of before any question special to Mr. Wiltzie can arise. The validity of the amendment, I take it, this court must pass upon. What the rule of decision shall be—whether the opinion of the state court shall be deemed final, or whether this court is charged with the responsibility of investigating the question independently—on any view of that matter, the validity of the amendment, so far as concerns this litigation and apart from any subsequent review by the federal court of appeals or federal supreme court, depends upon the pronouncement of this court. For these reasons I doubt if the discussion concerning the force of the 11th amendment be pertinent.

In *Reagan v. Farmers' Loan & Trust Company*, 154 U. S. 362, the legislature of Texas had on April 3rd, 1891, passed an act establishing a board of three commissioners with authority to fix rates on railroads in that state. Sec. 6, of the act provided that if any railroad company, "or other party at interest," be dissatisfied with a rate as fixed by the board, such "dissatisfied company or party" could

commence a proceeding in a court of competent jurisdiction in Travis County, Texas, against the board and thus determine the question of reasonableness in such rate and from the decision there made either party could "appeal to the appellate court having jurisdiction of said cause." By Sec. 5 of the same law, it was provided, in substance, that the railroad company must carry for the rate fixed by the board and that such rate be "conclusive and deemed . . . reasonable . . . until finally found otherwise" in the direct action provided for in Sec. 6. By Sec. 14 of the same act, if any railroad company, its agent or officer, charged more than the rate fixed by the board, said "company and its said agent and officer" should "forfeit and pay to the state of Texas a sum not less than \$100 nor more \$5,000." Sec. 15 defined unjust discrimination and fixed a penalty of not less than \$500 nor more than \$5,000 upon any railroad company violating any provision of that section. Other penalties were provided recoverable by "the persons injured." By Sec. 19 it was made the duty of the attorney general of the state to prosecute suits in the name of the state for all penalties except those recoverable by individuals. It will now be noticed that by force of Secs. 5 and 14 a railroad company, unless it chose to accept the rates fixed by the board—rates which had not yet been found reasonable by any judicial authority and which in fact might be unreasonable—would be subject to prosecutions at the suit of the state, instituted by the attorney general.

On April 30, 1892, the Farmer's Loan & Trust Company, a New York corporation, being mortgagee of the railroad property of the International & Great Northwestern Railroad Company, a company organized under the law of Texas and having and operating its road entirely within the limits of that state, exhibited its bill in the circuit court of the United States for the western district of Texas, making said railroad company, the three members of the board, and the attorney general, parties defendant. Upon the showing of this bill that the rates fixed by the board were in fact unreasonable, the court issued its writ enjoining the company from adopting such rate, the attorney general from instituting or prosecuting any suit to collect any penalty by reason of the failure of the company to adopt such rate, and the members of the board from any such action by them as would have been appropriate in the aid of prosecutions by the attorney general had Secs. 5 and 14 been valid. This injunction was sustained by the supreme court of the United States. One contention before that court was that by the force of the 11th amendment, the suit could not go against the attorney general, since in the enjoined prosecutions the state would be plaintiff and the attorney general was the state officer and representative in that behalf. Mr. Justice Brewer who delivered the opinion of the supreme court of the United States reviewed the arguments and citations and held that the suit was not against the state within the meaning of the 11th amendment. If Sec. 5 had been valid for any purpose or if Sec. 14 had been valid according to its terms, that is, as applied to any refusal of the company where the rate had not previously been judicially found reasonable as provided in Sec. 6, and was in fact unreasonable, then the attorney general in the inhibited prosecutions would certainly have represented the state. As the case stood and assum-



JOHN W. SHOWALTER,  
United States Circuit Judge.

ing the invalidity of said sections, he represented nothing. His prosecutions would simply have been gross wrongs under the color of void legislative enactments.

The opinion last cited was delivered in May, 1894. The position of Mr. Wiltstie here is the same as that of the attorney general in the Reagan case. If the attorney general had not been specifically named as the officer to carry on the prosecutions under the Texas statute, the duty would have devolved upon some prosecuting attorney in Texas, and such officer in place of the attorney general would have been the defendant. I cannot hold that this suit, as against Mr. Wiltstie, is inhibited by the 11th amendment, without disregarding the law as laid down by the supreme court of the United States. If, in the Reagan case, Secs. 5 and 14 had been deemed valid, the injunction could not have issued or been sustained. Here the injunction is the purpose of the bill. If, as said, the enactment of 1897 be valid, the case fails and the bill must be dismissed as to all defendants; if that enactment be invalid, Mr. Wiltstie, so far as the threatened prosecutions are concerned, does not represent the state in any capacity whatever. So much as preliminary to the matters which arise more particularly on this hearing.

When a federal question is involved the decision of the highest court of the state is not final, but is reviewable by the supreme court of the United States. To this extent, at least, the judicial power of a state is subordinate to that of the United States. But there is no relation of subordination on the part of any federal court to any state court. In certain cases the federal courts of their own motion follow the decision of the state court as determinative of the rights of a litigant. In *Forsyth vs. City of Hammond*, decided April 19, 1897, by the supreme court of the United States, it was ruled that a late decision of the supreme court of Indiana on the validity of proceedings under Indiana statutes enlarging the boundaries of the city of Hammond was law for the parties, especially in view of the circumstance that Mrs. Forsyth herself had taken the appeal which resulted in that decision, and in view of the further circumstance that the state decision was upon essentially the specific controversy afterward, in another form, made the subject of litigation in the case before the supreme court of the United States. But where the controversy concerns a contract and the meaning of the contract depends upon the construction of a state statute, or a provision of a state constitution, a decision on the meaning of said statute, or constitutional provision, by the highest court of a state, made after contract was entered into and rights had vested thereunder, is not conclusive upon a litigant in a federal court. The litigant in such a case is entitled to the independent judgment of the national tribunal.

*Burgess vs. Seligman*, for instance, 107 U. S. 20, involved the construction of a contract between the defendant, a citizen of New York, and a Missouri corporation. The former had received certain shares of stock from the latter. Whether this stock was owned absolutely, or held as the security for another obligation, was the question. The sense of the contract depended on the construction of a statute of Missouri. After the making of the contract, but before the decision in the supreme court of the United States, the supreme court of Missouri ruled in another controversy between the same parties upon the same question that within the sense of the statute the stock was owned and not pledged. Having this decision before it, the supreme court of the United States made a contrary ruling and this in a case where there was no federal question, but only diverse citizenship. If the Missouri decision had been prior to the contract, the federal tribunal would doubtless have said that the contract was made on the meaning of the statute as declared in the state decision and that construction of the statute would doubtless have been followed, as of course. The Missouri statute, be it noticed, was, in a sense, part of a contract—that is, the court could not tell what the contract meant when the parties made it without construing the statute. For a full and clear discussion of the subject and the cases in point, see the opinion of Lurton, circuit judge, in *Louisville Trust Co. vs. City of Cincinnati*, 76 Fed. Rep., 206. If the controversy in a federal court involve a federal question—and all the more if it involve both a contract right, as above explained, and also a federal question—then, of course, that court must decide for itself, treating a state decision with due consideration, but not as foreclosing independent judgment.

Whether the decision in the *Navin* case be conclusive upon the litigants here, depends on the nature of the present controversy, in view of the rules above adverted to.

In the *Dartmouth College* case, 4 *Wheaton*, 519, it was ruled that the charter of a private corporation is a contract between the corpo-

rate body and the state, and that an act of the legislature changing the charter in any respect material to the rights of the corporation is a violation of the provision of the national constitution which inhibits a state from making a law impairing the obligation of a contract. The action was trover, and the parties were citizens of New Hampshire. The appeal went to the supreme court of the United States by reason of the federal question. The case was decided in 1819. This doctrine is still the law—and it applies to the charter of a railroad company. Take, for instance, *Banking Company vs. Smith*, 128 U. S., 74. There the state of Georgia had granted a charter to a railroad company, and the contention was that within the sense of this charter the company was authorized or given the right to charge for carriage of freight as much as 50 cents per hundred weight, or 10 cents per cubic foot, for each hundred miles. The legislature of Georgia had passed a law creating a board with authority to fix rates for common carriers. That board had prescribed rates much less than the 50 cents or the 10 cents mentioned above. The supreme court of the United States ruled that the railroad charter was a contract which the subsequent act could not alter; that if the charter provision upon fair construction had the meaning contended for, then the subsequent enactment could have no application as against it; but upon examination of the words of the charter they were held, when applied to the case before the court, not to have the meaning contended for. The doctrine of the *Dartmouth College* case applies also to a general incorporation law. See, for instance, *Railroad Company vs. Iowa*, 94 U. S., 155. In such a case the sections of the general incorporation law constitute a contract between the state and any corporation organized thereunder. If in a charter it be provided that the corporation may charge rates up to, or within, a specified limit, or that the directors may, subject to certain limitations, themselves fix the rates in their discretion, such provision cannot be annulled or changed by the legislature unless power in that behalf be reserved as part of the charter agreement, and subsequent action by the legislature must be referred to and be within the reservation.

In *Reagan vs. Farmers' Loan & Trust Company*, supra., Mr Justice Brewer says: "If the charter had in terms granted to the corporation power to charge and collect a definite sum per mile for transportation of persons or property, it would not be doubted that that express stipulation formed part of the obligation of the state which it could not repudiate."

In the case at bar it was provided in Sec. 9 of the act of 1861, under which the defendant company was organized, that the directors should have the power to fix the fare on its street railroad; by Sec. 12, that the corporation could not build tracks or operate cars on the streets at all except under conditions which the city would first agree to; and by Sec. 11, that, "This act may be amended or repealed at the discretion of the legislature." The city agreed that the fare charged by the company might be as much as 5 cents. Subject to this, the right to fix the fare was vested in the corporation, and this right cannot be modified otherwise than as provided in the charter contract, namely, by amendment of the act according to the terms of Sec. 11, when read in the light of those restrictions in the Indiana constitution bearing upon the matter of amendment to that act. There is no general authority in the legislature under which the corporate power on the matter of fares can be changed in contravention of the charter contract. Whatever the legislature may do, must be within the sense of Sec. 11 of the act of 1861, that section being itself a term in the charter contract, 11 *Morawetz Priv. Corp.*, Secs. 1, 106, 1, 095.

A railroad corporation chartered, for instance, by some other state, might own or operate a railroad in Indiana. Such a company would have no charter contract with the state of Indiana. The state might provide by law for a board authorized to fix rates, and such rates, if reasonable, might be rates for such foreign company and regulate its charges in Indiana. Such a law would be within the power of the legislature. But the enactment of 1897, here in question, cannot be referred to any such untrammelled power in the legislature, since the charter agreement between the state and the defendant railway company covers the subject of rates. The grant by Sec. 9 of the act of 1861 cannot be taken back, evaded or annulled in any way other than that stipulated, namely, by a law which shall be an amendment to the act of 1861: and valid legislative interference must fall within the scope of Sec. 11 of the act last mentioned, that being part of the agreement. The state and the corporation have agreed that, within the restrictions imposed by the constitution of Indiana on the legislative function touching any law for the formation of business corporations, the legislature may amend the act of 1861, and the ques-



tion is whether or not the act of 1897 is, in view of said restrictions, competent as an amendment to the act of 1861.

These distinctions are made here because, as will presently appear, the supreme court of Indiana rules in the Navin case that the enactment of 1897 is solely by virtue of the general power of the state to legislate on rates. In this way that court clears the subject of constitutional objections. The defendant railway company is treated as though it had no charter agreement with the state of Indiana—as though its charter had been granted, for instance, by Ohio or Illinois. The police power of Indiana on railroad tariffs is thought of as authority, which is in itself unquestionable and all-sufficient for the enactment of 1897. Considered merely as referable to the police power, want of uniformity in operation, it seems to me, might be a valid objection to said enactment. But that question need not be discussed. I think it may be said as a general proposition that no enactment which would be invalid as an exercise of the police power could be valid as an amendment to the act of 1861: but, on the other hand, an enactment proposed as an amendment to the act of 1861 might be unobjectionable as a police law, and yet not be an amendment within the constitutional restrictions which concern a law like that of 1861. To hold such an enactment valid would sanction a breach of the charter agreement. Under a police law the rates must be reasonable; but where there is a charter agreement as to rates that agreement controls. In *Banking Company vs. Smith*, supra, though the rates fixed by the board might have been reasonable, yet if the court had found that the charter gave the corporation power to charge, if it saw fit, 50 cents per hundred weight, or 10 cents per cubic foot for each hundred miles, such could have been the rates, whether reasonable or unreasonable. I may add that a law for the purpose of securing and enforcing fair and reasonable charges by common carriers, is not to be classed with those laws making for the public health and public morals, the power to enact which cannot be contracted away, or parted with, by the state.

It being now understood that the words of Sec. 11 of the act of 1861, "This act may be amended \* \* \* at the discretion of the legislature," constitute in connection with Secs. 9 and 12 an agreement binding upon the state of Indiana, what the sense of this agreement is—whether the enactment of 1897 is an amendment to "this act"—can be determined only by reference to certain provisions in the Indiana constitution bearing upon the question. As the supreme court of the United States in *Burgess v. Seligman*, supra, was obliged to construe the statute of Missouri in order to find the meaning of the contract between Seligman and the corporation, so here the meaning of the contract between the state and the corporation cannot be known without a construction of said constitutional provision. If in the light of constitutional restrictions on the legislative function of corporations, the act of 1897 be not competent as an amendment to the act of 1861, then,—and in breach of the national constitution—the act of 1897 would impair the obligation of the charter agreement as expressed in Secs. 9, 12 and 11, and should be held void.

I take it as clear that no enactment can be competent as an amendment to the act of 1861, which, when read in connection with what would be left of said act, would make the whole an unconstitutional statute. If the enactment of 1897 be valid, then the law for the formation of street railroad corporations in Indiana, as now extant, provides that in the one city which had a population of 100,000 in 1890, namely Indianapolis, such a corporation cannot charge more than 3 cents for each passenger, no matter what its contract with the city may be, and must transfer passengers from one of its lines to another without extra charge, and this under a special code of penalties, involving the forfeiture of its street franchises and divers criminal prosecutions; while in any other city, regardless of population, now or hereafter, the rate agreed on with such city may be charged, the matter of transfers being there left to the company, subject to agreement with the city, and the penal code applicable in the one city identified by the law can have no force. It seems to me that, as to the one city identified in the act, the law, on the hypothesis now under view, would be special and local, since it could never apply to street railroad business by corporations organized under the act of 1861 in any other part of the state; and as to that portion of the state, other than the one city, it would be special and local, since it could not apply to the one city.

Sec. 22 of Art. 4 of the constitution of Indiana reads: "The general assembly shall not pass local or special laws in any of the following enumerated cases, that is to say, regulating the jurisdiction and duties of justices of the peace and of constables, for the punish-

ment of crimes and misdemeanors, and so forth," enumerating fifteen additional subjects. Sec. 23, following in the same article, reads: "In all the cases enumerated in the preceding section, and in all other cases where a general law can be made applicable, all laws shall be general, and of uniform operation throughout the state." Section 13 of Art. 11 reads: "Corporations other than banking, shall not be created by special act, but may be formed under general laws."

From the language of Secs. 22 and 23, when read together, it will appear that a "local or special" law is any law which is not "general;" that it is to say, "of uniform operation," as applied to similar conditions, "throughout the state." Assuming the validity of the enactment of 1897, then the law of which that enactment forms a part is "local or special," since it is not "general and of uniform operation throughout the state." The people of Indiana said in their constitution that "where a general law can be made applicable, all laws shall be general and of uniform operation throughout the state." Also that "corporations other than banking, \* \* \* may be formed under general laws;" in other words, that a general law can be made applicable when the formation of business corporations is the subject matter of legislation. These propositions, when read together, express the meaning that any law for the formation of corporations must be general; that is to say, of uniform operation under like conditions throughout the state. The question whether or not a general law can be made applicable to the matter of corporate organization for enterprises of business and profit is thus foreclosed in the constitution itself. Upon this question no discretion, or power of deciding, is vested in the legislature or the courts of the state. A law for the formation of street railroad corporations must be general; that is to say, of uniform operation under similar conditions throughout the state. Otherwise it is void. If the enactment of 1897 be held valid, then as an amendment it displaces a portion of the act of 1861, and becomes itself part of the law. The effect would be to make the entire law for the formation of street railroad corporations local and special. Therefore the enactment of 1897 is unconstitutional and void.

As to any law on any one of the seventeen subjects mentioned in Sec. 22, of Art. 4, of the constitution, and as to any law for the formation of corporations for business and profit, the question whether such law may be local or special, or must be general, as these terms have already been explained, is settled in the constitution itself. Such law must be general, meaning of uniform application to similar conditions whenever they arise and wherever they exist in the state. A law upon any other subject may be special or local, provided a general law cannot be made applicable to such subject. Concerning this last proposition the supreme court of Indiana long ago ruled that the question whether a general law could be made applicable was a judicial question upon which the judgment of the legislature was not conclusive—and this, I suppose, upon the ground that it was for the courts to construe the constitution. Later, that court reversed this ruling and held that the judgment of the legislature was conclusive. But never, so far as I am advised, until the Navin decision, did that court suggest or intimate that the express declaration by the people of Indiana in their constitution, namely, corporations for business and profit "may be formed under general laws," left the legislature at liberty to decide that such corporations could not be formed under general laws.

In the case at bar the charter agreement between the corporation and the state on the matter of rates, as expressed in Sec. 9 of the act of 1861, subject to the conditions in Secs. 12 and 11, was the chief consideration which induced the acceptance of the charter by the corporators, the expenditures by the corporation in the streets of Indianapolis, and the investment in the railroad property by this complainant, Under Sec. 11 the security, aside from the wisdom and fairness of the legislature, was that an amendment could not be made otherwise than by an enactment which would still leave the law, as a whole, "general and of uniform operation" upon all corporations formed, or to be formed, under it, or at least upon all such corporations formed, or to be formed, as could be associated for legislative purposes by any germane and appropriate classification. No such classification is made by the act of 1897. To the contrary, upon this proposition, I find nothing in the opinion in the Navin case. I may here add that, while the constitutional inhibition is against "local or specific laws," the court rules in the Navin case that it is not material whether the act of 1897 be "local" or not, the decision resting upon grounds entirely distinct from that question.

The charter contract says: "This act may be amended at the dis-



cretion of the legislature." Is the enactment of 1897 an amendment to "this act" within the meaning of the foregoing reservation? This is the question—and it concerns the construction of the charter contract. Whether the act of 1897 is an amendment, and what discretion the legislature is vested with—in other words, whether the act of 1897 would break, or be in accord with, the contract depends upon the sense of certain provisions in the constitution of Indiana. I now call attention more specifically to the state decision in the Navin case. Mr. Justice Monks says in the opinion:

"It is insisted by appellant that the act of 1897 is unconstitutional because it impairs the obligation of a contract. Counsel for appellant do not point out any contract, the obligation of which is impaired by such act.

"If it is the contract under which the street railway company took possession of the streets of Indianapolis and constructed its tracks, it is sufficient to say that the city was not authorized to enter into any contract which would prevent the legislature from legislating upon the subject of fares. It is settled law that the legislature has the power to reasonably regulate the rates of fare for transportation of passengers within the state on street railways."

Here a number of cases are cited; but they are upon the general proposition that where there is no charter contract on the matter of rates, legislation looking to reasonable rates is competent. Not one of the citations concerns any street railroad corporation organized under the act of 1861. The opinion proceeds:

"Besides Sec. 11 of said act of 1861, being Sec. 5,463, R. S., 1894, Sec. 4,153, R. S. 1881, expressly reserves to the legislature the right to amend or repeal said act at its discretion.

"The right of the legislature, however, to regulate the fare upon street railroads organized under the act of 1861, does not depend upon the reservation of the right to amend or repeal the act in Sec. 11 of the act, that power would exist, even if the right to amend or repeal the act had not been reserved."

How can this be? If Sec. 11 were omitted, the legislature could not touch the subject of rates. Note the quotation made above from the Reagan case. Does the supreme court of Indiana mean that where a charter contains no reservation of power to amend, such reservation is implied? or that the vested rights of a corporation, organized under a general corporation law which contained no reservation of power to amend, can be disturbed by any subsequent amendment?

The opinion goes on:

"In order to exempt a common carrier from legislative control over its rates of fare, it must appear that the exemption was made in its charter by clear and unmistakable language, inconsistent with the exercise of such power in the legislature."

If Sec. 11 had been omitted, then, as said, the charter agreement between the corporation and the state would have been that the directors of the corporation could fix the rates, subject to no condition or limitation other than the agreement with the city. As the case stands, the grant to the corporation as to the rate is subject to the condition or limitation other than the agreement with the city and the agreement with the state that the legislature might within the appropriate constitutional restrictions, repeal or amend the act of 1861.

If the learned writer of the opinion means that, in addition to a contract covering the subject of rates, there must also appear in the charter an express exemption from such legislative action as might be competent if there were no contract at all—which would be competent, for instance, as respects a carrier chartered by some other state—I cannot agree with him. The three citations made by Mr. Justice Monks, among which are *Banking Company vs. Smith*, supra, and *The Railway Company v. Iowa*, supra, are to the point, as above stated herein, that if the charter contract cover the matter of rates, legislative interference in that behalf, otherwise than within the terms of the contract, is unauthorized. The state opinion goes on:

"Appellant (meaning the city of Indianapolis) had the power to prescribe the terms upon which and the time for which a street railroad company organized under said act of 1861 should occupy the streets of said city, but such contract when made was subject to the right of the legislature to amend or repeal said act at its discretion, and no contract made by the city with the street railroad company could prevent the exercise of such power by the legislature."

Now follows the conclusion drawn by Mr. Justice Monks from those portions of his opinion herein above quoted:

"It is clear, therefore, that said act of 1897 does not impair the obligation of any valid contract of either the state or the appellant."

If in view of constitutional limitations touching the legislative function as to laws for the formation or creation of corporations, the act of 1897 be not competent as an amendment to the act of 1861, then said act of 1897 certainly does impair the obligation of the charter agreement, as well as the obligation of the contract made with the city—and this in violation of the constitution of the United States.

The learned writer of the state opinion characterizes the enactment of 1897 as "a mere regulation of an existing corporation." In so doing he still has reference to the police power as the untrammelled source of legislative authority for the enactment. But the state contracted that no amendment, which would leave the act as amended a special or local law, should be made. The point is that the enactment of 1897 is not the kind of amendment which it was stipulated in the charter agreement could be made. The long settled doctrine that the twelve sections of the act of 1861 constituted the contract between the state of Indiana and any corporation organized under that act, and the terms of that contract, are ignored in the state opinion. The citations to the proposition that the act of 1897 is "a mere regulation of an existing corporation" concern what may be done when the state is not fettered by its own agreement, upon the face of which the other contracting party has acted and expended his money.

It is said in the state opinion that the legislature, since the adoption of the present constitution in 1851; has occasionally and by some special, specific enactment "enlarged the powers and privileges" of some particular corporation organized by special charter prior to 1851. Surely, the legislature could not diminish the powers and privileges (so as to destroy the vested property right) granted by a special charter to a business corporation—unless by a term in the charter reserving that power. The argument seems to be, however, that in view of the legislative practice referred to touching old corporations under special charters, the grant of an additional power or privilege to an existing corporation is not inhibited by the words in the constitution—"corporations \* \* \* shall not be created by special act." It is thence, apparently, inferred that a special enactment, like that of 1897, destroying the right previously vested in the defendant railway company to fix the fare on its lines at 5 cents, is not unconstitutional. But the scope of the agreement between the state and the defendant company is that any such change on the subject of fares must be by an amendment which, when put into the charter, would still leave that instrument a general law for the formation of street railroad corporations; that is to say, a law uniform in operation under like conditions throughout the state.

If before this defendant company was organized, or, possibly, if before this complainant took its mortgage, the supreme court of Indiana had decided that an enactment taking from the street car companies of one particular city the power to fix rates as agreed upon with that city was, within the terms of the Indiana constitution, an amendment of the act of 1861, the case here would be different. But, as the matter stands, it seems impossible to say that the parties litigant here are not entitled to the opinion of this court, treating the decision of the supreme court of Indiana with respectful and careful consideration, but not as of binding force. Apart from the diverse citizenship of the parties, there is here distinctly the question whether or not the enactment of 1897 impairs the obligation of the charter contract—whether or not the enactment of 1897 does not violate the constitution of the United States. The decision of the Indiana court—assuming that appellant in that case was entitled to and did make upon the record the federal question—is not final, but subject to review by the supreme court of the United States. In *Burgess v. Seligman*, be it noticed, there was no federal question, and the decision of the state supreme court was final and conclusive upon the parties and state courts.

In *Adams Express Company v. Ohio*, 165, U. S., 194, the decision of the supreme court of Ohio upon the question whether the tax law in controversy violated the constitution of Ohio, was held final. But this feature of that case raised no federal question. The state of Ohio has made no contract, the sense of which was to turn on the meaning of the Ohio constitution as authorizing, or not authorizing, such legislation. In deciding merely that the statute in question was not in violation of the constitution of the state, the supreme court of Ohio had no federal question before it. But the construction of the statute apart from its relation to the constitution of Ohio by the Ohio

court was not taken as final by the federal courts. There was no claim made that the law, if valid, would break the obligation of any contract to which the state was or was not a party. But it was contended that the act violated certain other provisions of the national constitution. On this contention the opinion of the supreme court of Ohio was not treated as conclusive. The federal courts followed that court merely because they agreed with it.

The federal question is more distinctly to the front in the case at bar than even in *Reagan vs. Farmers' Loan & Trust Company*. In the latter case it did not appear that the charter contract contained any express provision as to rates. The court inquired whether an engagement by the state to permit reasonable rates was not an implied term in the charter contract, and ruled that this inquiry brought the charter contract into the case for construction. If the charter contract contained such an implied term, then the question would be whether the statute objected to in the case was in violation of that contract. Following is the language of Mr. Justice Brewer:

"Still another matter is worthy of note in this direction. In the famous Dartmouth College case, 4 Wheat, 518, it was held that the charter of a corporation is a contract protected by that clause of the national constitution which prohibits a state from passing any law impairing the obligation of contracts. The International & Great Northwestern Railroad Company is a corporation created by the state of Texas. The charter which created it is a contract whose obligation neither party can repudiate without the consent of the other. All that is within the scope of this contract need not be determined. Obviously one obligation assumed by the corporation was to construct and operate a railroad between the termini named; and, on the other hand, one obligation assumed by the state was that it would not prevent the company from so constructing and operating the road. If the charter had in terms granted to the corporation powers to charge and collect a definite sum per mile for the transportation of persons or of property, it would not be doubted that that express stipulation formed a part of the obligation of the state which it could not repudiate. Whether, in the absence of an express stipulation of that character, there is not implied in the grant of the right to construct and operate, the grant of a right to charge and collect such tolls as will enable the company to successfully operate the road and return some profit to those who have invested their money in the construction, is a question not as yet determined. It is at least a question that arises as to the extent to which the contract goes, and one in which the corporation has the right to invoke the judgment of the courts; and if the corporation, a citizen of the state, has the right to maintain a suit for the determination of that question, clearly a citizen of another state, who has, under authority of the laws of the state of Texas, become pecuniarily interested in, equitably indeed the beneficial owner of, the property of the corporation, may invoke the judgment of the federal courts as to whether the contract rights created by the charter and of which it is thus the beneficial owner, are violated by subsequent acts of the state in limitation of the right to collect tolls. Our conclusion from these considerations is that the objection to the jurisdiction of the circuit court is not tenable."

I may here add, in connection with the matter above quoted, that the *Reagan* case must necessarily be understood as presenting a federal question, and not only a federal question, but a question which concerned "the construction or application of the constitution of the United States," or a question which concerned "the constitution or law of a state" as being in contravention of the constitution of the United States." Otherwise, the *Reagan* case could not have gone, in the first instance, to the supreme court of the United States, but must have gone to the court of appeals of the Fifth circuit. It will be seen from the foregoing quotation from the opinion of Mr. Justice Brewer what one federal question was.

In the case at bar there can be no inquiry as to the reasonableness of the 3-cent rate, or the unreasonableness of the 5-cent rate, unless the enactment of 1897 be, within the terms of Sec. 11, when read in the light of constitutional restrictions, an amendment to "this act," meaning the act of 1861. If the enactment of 1897 be void, then the city and Mr. Wiltzie, in enforcing it, would be mere wrongdoers. The bill avers, in effect, that if no injunction be granted, the railway company will either obey the "law," through fear of the city and defendant Wiltzie, in which case the complainant's security will be diminished in value, or, in defiance of the city and defendant Wiltzie, refuse to obey, in which case the security will be destroyed. Under the circumstances and assuming the act of 1897 invalid, can the defendants, the city and Wiltzie, insist as against this bill that con-

plainant must show that a reduction from 5 cents to 3 cents in the fares would make the income from the mortgaged property insufficient to pay operating expenses and the interest on the mortgage debt? Does it lie in the mouth of a mere wrongdoer, as against a proceeding to stop the wanton destruction, or impairment in value, of a given property, to object that since the complainant holds the property as security for a debt he can have no cause of complaint without a specific showing that there will not be enough value left after the proposed spoilation to satisfy the debt?

The complainant's lien attaches as much to that portion of the property which is to be destroyed as to any other. The general owner whose management of mortgaged property is objected to by a mortgagee may well urge that what he proposes to do with said property will still leave ample security. But what right would a mere wrongdoer have as against even a mortgagee to destroy any portion of the property pledged.

The demurrer is overruled, the motion to dissolve the injunction is denied, and complainant's motion to amend is allowed.

## FT. WORTH CUTS A MELON.

The conditions under which street railways have operated the past three years have not been specially conducive to that delightful operation of "cutting a melon," but the Polytechnic line, at Ft. Worth, Texas, came out with hand bills and posters on July 22 and invited all the world to be present and share in the good time of a "watermelon cutting." While the stock may literally be said to have been watered, as a means of creating travel it was a grand success, and with the interesting program provided, of music and speeches, the event proved an attraction which roads outside the watermelon belt might work with profit. It certainly would be a novelty in the north. Who will be the first to try the scheme?

## STREET CAR BUILDING IN ST. LOUIS.

St. Louis is the greatest street car manufacturing center in the world, there being four large concerns whose entire product goes to street railways. The St. Louis Post Dispatch gave some interesting figures regarding these firms. These four companies, the Brownell Company, the American Car Company, The St. Louis Car Company, and the Laclede Car Company, have a capitalization of \$2,500,000, the annual output exceeds \$4,000,000 and 1,600 men are employed. One very good recommendation is that every line in St. Louis is equipped with cars made in the city and it is often stated that St. Louis has the best equipped street car lines in the world. Last year more than 3,000 cars were built and sold. Among this number were several parlor cars, a dining car and several director's cars, some of these costing as much as \$5,000 apiece. Closely allied to these manufactories is the Missouri Car & Foundry Company which furnishes nearly all the wheels for the street cars. These companies build cars not only for street railway lines in the United States but their reputation has given them access to foreign markets as well, notably Mexico and Central America.

While excavating on a line of the Belt Railway Company, Lexington, Ky., one of the workmen struck what appeared to be a piece of pipe. It proved to be a 64-lb. dynamite cartridge and a terrific explosion followed, killing five of the negro workmen and fatally injuring the sixth. The police are inclined to think the bomb was placed there by someone hostile to the railway company but it might have been accidentally left there by the workmen of the Cincinnati Southern railroad when excavating at that point.



## ELECTRIC TRACTION.

From a paper by M. H. Gerry, Jr., read before the American Institute of Electrical Engineers.

A part of this paper relates especially to the application of electric power to passenger rapid transit on elevated and suburban roads. The conditions for this service differ somewhat from common railway practice. Regular stops are made at frequent intervals; the distance between stations on elevated roads, for example, averaging about 2,000 feet. The interval between trains is small, and the time of stops very short. The traffic is irregular, is heavy at certain hours, and is apt to increase and decrease at a rapid rate. To make the fast running time desired, the speed must increase up to the point where the brakes are applied; thus the maximum of speed is high compared with the mean speed. There is little or no opportunity for maintaining the speed, and the running time depends almost entirely upon the rate of accelerating and of retarding the train.

With a given number of stops per mile, the amount of power required will increase very rapidly with the speed beyond a certain point, and the cost per car-mile will not furnish a reliable basis of comparison for the motive power of different roads unless the conditions are the same. A slight difference in the average speed, or in distance between stations may cause a considerable change in the amount of power required.

There is no longer a question in regard to the ability of properly designed electric motors to operate trains of the heaviest weights in service, and at any speed permissible under practical railroad conditions. In the future, matters of efficiency and general utility must determine the desirability of electric power for any particular railway service.

If traffic is such that a large number of trains must be operated on a division, the electric power will have an advantage in point of economy, over steam locomotives; and if the trains are few, the reverse will be the case. This condition holds good independently of the weight of the trains or of the speed attained. The length of the line is in itself no bar to the successful operation of an electric railway system, as, by using alternating current apparatus, the power stations may be located favorably, and at long distances apart.

For roads operating on their own right of way, there is really no serious objections to the third rail, and all of the difficulties encountered at crossings, switches and in yards can be overcome by methods already in use, or by other devices that have been proposed. The experience already gained also justifies the statement that a reliable

Current is conveyed to the trains by the third rail system, the "trolley rail" being placed 20½ in. outside, and 6½ in. above the running rail. It is of the common T section, bonded with leaf copper bonds, divided into sections to provide for expansion. The insulation for the third rail, on all but a very small section of the road, consists of hardwood blocks, mounted on small iron chairs fastened to the ties. On a recent extension an improved form of insulation made of stoneware has been tried with success. The electric leakage is small at all times. In dry weather it is entirely negligible, and in wet weather is never more than a few amperes. It is greatest after a dry season, when the first shower is washing the accumulated iron dust from the insulating blocks. Steel rails are used for feeders and copper only to make connections. The feeder system is divided into six sections, which are tied together at junction points, through circuit breakers placed in the interlocking tunctions.

The rolling stock consists of motor cars, passenger cars and a few coal and flat cars. The motor cars were furnished by the Barney & Smith Company, and measure 47 ft. in length and weigh about 62,000 lbs. when loaded to their maximum capacity. They are mounted on rigid bolster locomotive type trucks having 33-in. steel tired wheels. The truck centers are 33 ft. 6 in. apart, and the truck wheel base is 5 ft. 6 in. One truck of each motor car is equipped with two motors, each nominally rated at 2,000 lbs. drawbar pull. The motors are operated by series-parallel controllers situated in the cabs at each end of the car. Rheostats of the packed ribbon type, used in connection with the controllers, are placed underneath the car. A circuit breaker placed in each cab is used both as a safety device and as a main switch for opening the circuit between the trolley and the controller. A main fuse box is also provided, but experience has shown that failures of the circuit breaker to act are so rare that the fuse box might well have been omitted. Circuit breakers have proved very satisfactory for this service, as they cost little for maintenance, are reliable as safety devices, and by their quick action reduce to a minimum the damage to apparatus from grounding and short circuiting.

The cars are warmed by electric heaters arranged in three circuits, two of which take about about seven amperes each, and the remaining circuit about four amperes. All of the heaters are required only in the coldest weather, and are turned off and on by the trainmen. By cutting out all or part of the heaters for a short time when the traffic is the heaviest, the peak of the load can be reduced and the heaters used to improve the load factor.

The air-brakes are of the direct or "straight" air type with an additional re-enforce cylinder. The air is compressed to 60 pounds by a vertical pump, driven by a motor of about 3 h. p. The pump motors have automatic control, regulated by the air pressure and also hand control from each end of car. The pump with its motor and automatic controller is placed in one of the cabs.

The passenger cars are 47 ft. in length and of the standard pattern, in use on all elevated roads. They are mounted on swinging bolster trucks, having 30-in. wheels and when loaded to maximum capacity weight about 45,000 lbs. Two, three, and four car, trains are in service at different hours, corresponding with the traffic. About 1,200 trains are handled daily and under very close headway out of Franklin street terminal.

The power house is supplied with water tube boilers, mechanical chain stokers, coal and ash handling machinery, forced draft, automatic oiling system and all modern appliances. The boilers are 14 in number and work at 165 lbs. pressure. There are four vertical cross-compound engines, direct connected to the electric generators. The condensing water is taken from the Chicago river by tunnel, and water for the boilers from the city mains. There are four electric generators, two of 1,500 k. w. and two of 800 k. w. capacity. The switchboard is placed on a gallery and is provided with the usual instruments, including recording wattmeters for each generator. There are six feeder panels corresponding to the divisions of the feeder system.

In an electric railway system the mechanical energy generated is divided into two classes, that utilized in propelling the train and that lost in transmission and conversion. The energy utilized in propelling the train is again divided into that necessary to overcome inertia and accelerate the train, that necessary to overcome grades and that necessary to overcome train resistance, which as here used includes all retarding forces other than the two first mentioned. From experiments on the Metropolitan it was found that the expression  $R = 2 + .19 S$  will give the train resistance with sufficient accuracy, R being



FIG. 1—METROPOLITAN SYSTEM, CHICAGO.

overhead or conduit system for heavy service can be constructed if the conditions favor the use of such methods.

The Metropolitan Elevated Railroad, now in its second year of operation, is the largest road in existence employing exclusively electric power for a heavy passenger service.

The structure has four tracks, from Market street west to Marshfield avenue, at which point three double track lines diverge. The northerly branch divides again near Robey street into two double track branches. From Market street to each of the terminals, the distance is about six miles. (See map, Fig 1).



the resistance in lbs. per ton of 2,000 lbs., and S the speed in miles per hour.

Assuming a 100 ton train run as indicated by the curves in Figs. 2 and 3, which including a stop of 12 seconds give a mean speed of 15 miles an hour the average rate of using power including stops is:

|                                        |             |
|----------------------------------------|-------------|
| On a .5 per cent ascending grade.....  | 106.5 h. p. |
| On a level.....                        | 76.5        |
| On a .5 per cent descending grade..... | 46.5        |

The power may also be divided as follows:

|                                 |          |
|---------------------------------|----------|
| For accelerating the train..... | 60 h. p. |
| For ascending grade.....        | 30       |
| For train resistance.....       | 16.5     |

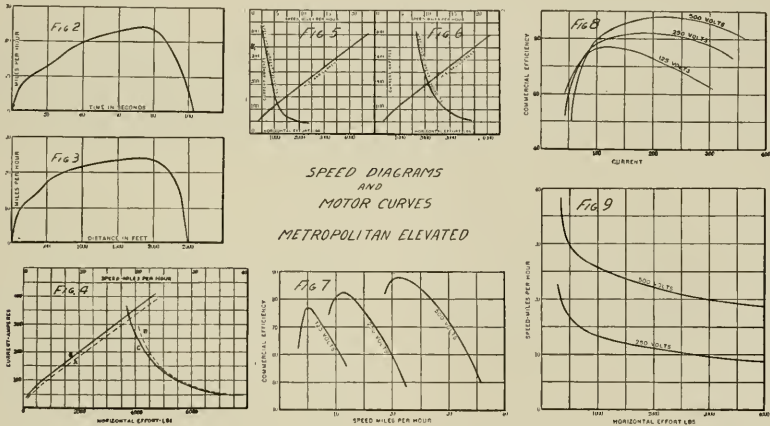
These figures, of course, do not include losses in applying the power.

If the rate of accelerating the train be increased the power required at the axle to move it a given distance in a given time will be reduced since the maximum velocity necessary to make the schedule is reduced.

The train weight may be considered as made up of two parts, the live, or paying load, and the dead load, which includes the weight of rolling stock, motors, etc. As the amount of power required by the train varies almost directly as the weight, it is desirable to have the

zontal effort is shown at A, Fig. 4 and at B the same when running with 500 volts at the terminals and at the speeds shown at C. The horizontal distance between A and B shows the loss in tractive effort due to friction and core losses, and that between C and D the corresponding loss in speed. In Figs. 5 and 6 the relations between current and speed, and horizontal effort for the same motor at 125 and 250 volts are shown. At the lower voltage the running horizontal effort is greater, because the losses affecting it are less at lower speeds but the internal losses are greater and the efficiency at the lower voltage reduced in consequence. Fig. 7 shows the relation of efficiency to speed for various voltages and Fig. 8 the relation of efficiency to current. Fig. 9 shows relation of speed to horizontal effort. The maximum working range of the motor is from 350 to 4,000 lbs. horizontal pull and the total speed variation on this range at 500 volts will be about 14 miles, and at 250 volts about 10 miles. In practice the range of speed at a given voltage is about one-half of this and with 250 and 500 as the pressure at the motor in the series and parallel combination, without further alteration of voltage by putting resistance in circuit, will be about 12 miles over a total range of 34 miles.

The armatures of the Metropolitan motors weigh 1,400 lbs, and are 18½ in. in diameter. At 800 r. p. m. which corresponds to 25 miles per hour the kinetic energy of each motor is 43,000 ft.-lbs; thus there



non-paying or dead load as small as possible. In order that there may be sufficient traction, a separate locomotive must weigh between four and five times the maximum drawbar pull required by the train, all of which is dead load, in addition to that of the cars. It has been stated that a rapid acceleration is desirable if there are many stops, but as each pound of increased maximum drawbar pull from a locomotive must add four or five pounds to the dead weight of the train, a point is soon reached where no further advantage is obtained by increasing weight on the drivers and drawbar pull. The weight admissible on the locomotive driving wheels, on account of track and structure, also limits the amount of traction, hence the drawbar pull and rate of train acceleration. Thus, for a service combining high speed and many stops, there are advantages in a form of motor which may be so placed as to utilize a part of the car weight and live load for purposes of traction. The cars should weigh as little as possible so as to reduce the total dead weight of the train, for it is well known that the ton-miles of paying load form only a small percentage of the total ton-miles moved. On elevated roads it is probably below 6 per cent on the average and on some roads, below 1 per cent.

The requirements of a railway motor are a large output, ability to withstand heavy overloads, freedom from sparking, a low rotative speed, light weight and limited space. The result is the cast-steel multipolar motor, operating with nearly saturated fields and high magnetic densities in the armature. The characteristics of the motors in use on the Metropolitan are introduced instead of a general discussion. The relation between the current flowing and static hori-

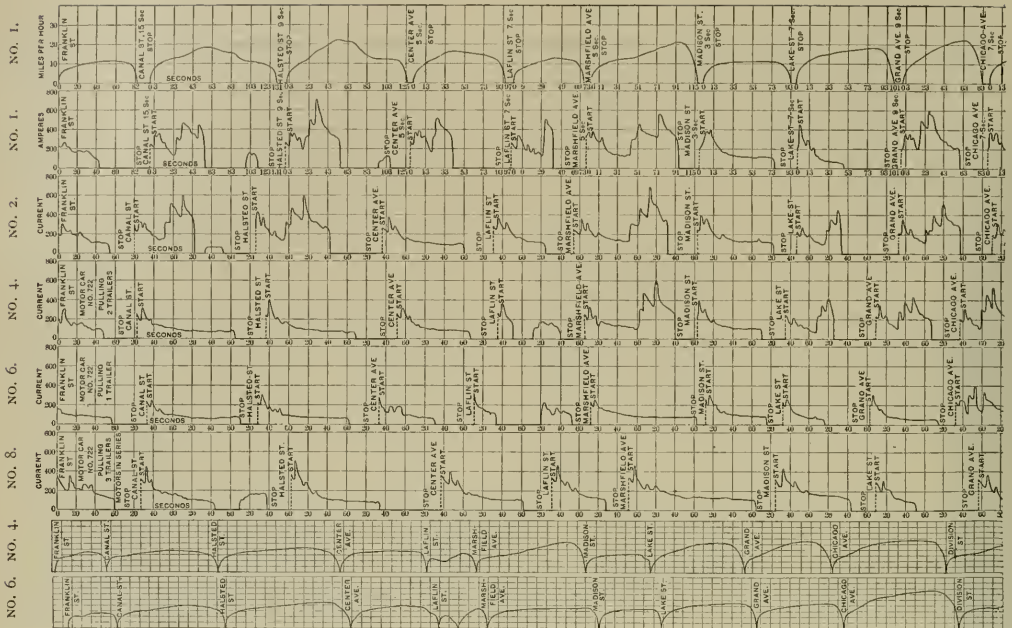
zontal effort is shown at A, Fig. 4 and at B the same when running with 500 volts at the terminals and at the speeds shown at C. The horizontal distance between A and B shows the loss in tractive effort due to friction and core losses, and that between C and D the corresponding loss in speed. In Figs. 5 and 6 the relations between current and speed, and horizontal effort for the same motor at 125 and 250 volts are shown. At the lower voltage the running horizontal effort is greater, because the losses affecting it are less at lower speeds but the internal losses are greater and the efficiency at the lower voltage reduced in consequence. Fig. 7 shows the relation of efficiency to speed for various voltages and Fig. 8 the relation of efficiency to current. Fig. 9 shows relation of speed to horizontal effort. The maximum working range of the motor is from 350 to 4,000 lbs. horizontal pull and the total speed variation on this range at 500 volts will be about 14 miles, and at 250 volts about 10 miles. In practice the range of speed at a given voltage is about one-half of this and with 250 and 500 as the pressure at the motor in the series and parallel combination, without further alteration of voltage by putting resistance in circuit, will be about 12 miles over a total range of 34 miles.

The armatures of the Metropolitan motors weigh 1,400 lbs, and are 18½ in. in diameter. At 800 r. p. m. which corresponds to 25 miles per hour the kinetic energy of each motor is 43,000 ft.-lbs; thus there are 86,000 ft.-lbs. of energy dissipated in stopping the two armatures of a motor car at every stop made at this speed; with frequent stops the loss is a very appreciable one.

The average load on the motor is fixed by the permissible increase in temperature. With the air at 60° F. and under average working conditions a Metropolitan motor will radiate heat at the rate of about 650 B. T. U. per minute. This is equal to 15 h. p., corresponding to about 60 b. p. of loading. But these motors will readily withstand for a considerable period of time a loading of three times this amount. Most of the heat produced by this additional loading must be stored in the metal of the armature and frame. A considerable portion of the heat must be generated in the armature, but its thermal capacity is nearly 150 B. T. U. per degree, and a large amount of heat may be stored before the danger point is reached.

The controllers in use on the Metropolitan are two combination series-parallel and have three steps on the rheostat for each voltage. The losses in this apparatus vary from 10 to 20 per cent, depending upon the skill with which it is handled. With care it may be kept down to 10 per cent, making no allowance for the reduced efficiency of the motors at the lower voltages.

Railway generators at the present time are nearly all of a direct current type, but there is reason to believe that in the future two or three phase alternating current machines will be installed. The development of the rotary transformer will be largely responsible for the change in practice. Power stations can be more favorably located in respect to fuel and water supply and through sub-



SPEED AND CURRENT DIAGRAMS,

stations furnish power to large areas. With this change will come also greater economy in the production of power which cannot but have a favorable effect on the development of the electric railway.

The commercial efficiency of railway generators varies from 90 to 95 per cent. Under favorable conditions, the average or "all day" loss for large connected machinery (units over 600 k. w.) is about 7 per cent. Direct connected alternating current generators give about the same efficiency as direct current generators. Commercially, the best results are obtained with a few units of large size. It is unnecessary and poor practice to install many small units for railway work.

The load line of an electric railway is subject to two kinds of fluctuations; first, those sudden changes caused by the starting together of a number of trains, and secondly, the more gradual change due to the variation of traffic at different hours of the day. On roads operating but few cars the fluctuations due to the first cause are of considerable amount, but on the large systems with many cars the changes in loading from starting up of trains are very slightly noticeable in fact—and this is especially the case if feeders are tied together and form a net work. There still exists, however, the change in the load line corresponding to the traffic. A railway load line differs from that of a lighting station in having two nearly equal peaks or points of maxima, one in the morning and one in the evening. These variations are best taken care of by cutting in and out units, while the momentary changes can usually be cared for by a slight overloading of the machinery. Engines and generators for railway purposes have a good efficiency over quite a wide range and generally stand overloads very well. In Fig. 10 are shown seven load curves from the power station of the Metropolitan elevated. The curves correspond to the days of the week and indicate the average power taken, but do not show momentary fluctuations, caused by the movement of trains. The chief characteristics of these curves are the two decided "peaks" occurring daily with great regularity. The peaks vary as to amount and time, with the season of the year, and to some extent with the weather, but are always present in a marked degree.

The load curves of the Metropolitan have proved to be a very sensitive index of the traffic. A delay on the competing cable lines, or increase of travel from any cause is at once noticeable in the power house. The greater station loading is due not so much to the increased weight in passengers carried, as to the longer stops neces-

sary to discharge and to take on passengers, thus requiring a higher speed to keep the trains on time.

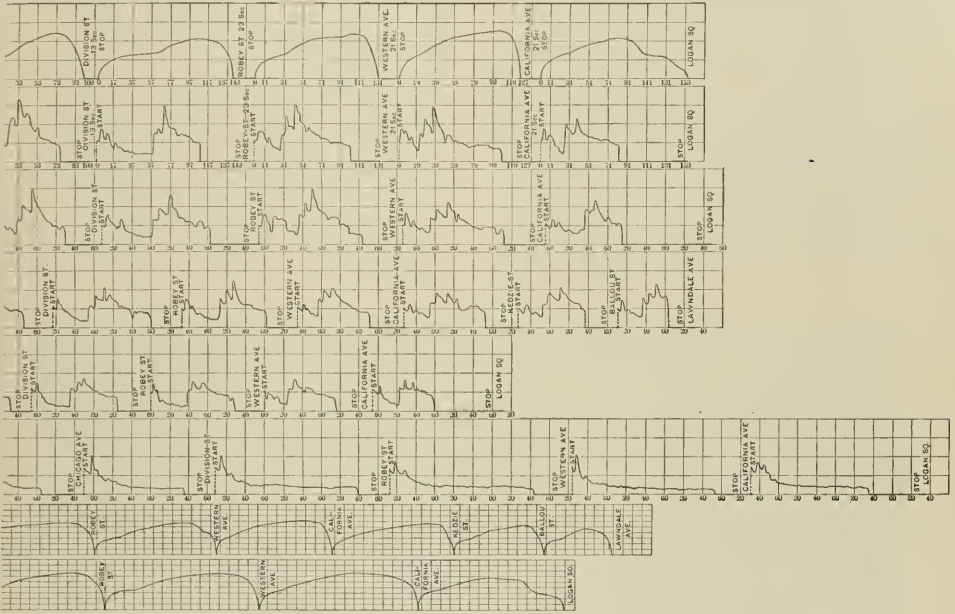
The feeder system has an effect upon the form of load curves as well as upon the total amount of energy required. The highest percentage of loss will occur at the moment of greatest loading, but this rarely takes place at the same time on different sections, and an advantage is obtained by connecting the lines together to form a net work as far as possible. Feeders are usually divided into sections as a matter of safety and convenience. The best economy of copper and of power, and the most favorable load lines are obtained when the number of such sections is as few as consistent with the safety and flexibility of the system. When feeder sections are connected, the best practice calls for a fuse or circuit breaker in this circuit. The permissible percentage of loss between the power house and the trains is partly a commercial question, depending on the cost of power and interest on feeder investment. Transformers, rotary converters, boosters, batteries, and similar apparatus forming a part of the feeder system, should be considered with special reference to cost, operating expense, all day efficiency and effect on the load factor of the generating station.

The energy dissipated between the engine and the car axles may be divided into three parts, that lost in the electrical generators, the losses in the transmission lines (including transformers, rotaries, etc.) and the losses in the car controlling apparatus and motors.

The amount of loss in the generators will depend upon their efficiency and average loading. Modern railway generators have good efficiency above half load, and in stations designed with reference to the load line, there is but little difficulty in keeping the machinery above three-quarters at all times.

With machines of good type and size, the all day efficiency ought to be about 92 per cent. A sub-station provided with rotaries and static transformers working under a good average loading, should have an efficiency of about 89 per cent; a loss of 8 per cent in the rotaries and 3 per cent in the transformers. The sub-station apparatus is at its highest efficiency at the time of greatest loading, when the feeder lines are at the lowest efficiency and thus has a favorable effect on the load line.

The losses on railway feeders vary from 10 to 25 per cent. Often there is sufficient copper if rightly distributed and tied together to reduce this at least one-half. Such a change would also improve the load factor and increase the efficiency of the station.



METROPOLITAN ELEVATED RAILROAD.

The data for eight trips are given in the accompanying table and for some of them graphical logs plotted on a speed and time, or a current and time basis. In all of the current curves, it is easy to distinguish by inspection when the motors are in series and when in multiple. The stops on the controller are also distinguishable by the greater peaks on the curves. The smaller peaks and other irregularities are due, principally, to changes in voltage, caused by other trains in the same section, taking more or less current.

Electrical energy can be produced in the vicinity of Chicago, with cheap coal, under the conditions of a railroad load, at less than 5 cent per kilowatt-hour, and in the form of mechanical energy at the car axles, costing about 1 cent per kilowatt-hour, it is several per cent cheaper than it can be generated by steam locomotives. Add to this the actual saving in energy from a more rapid acceleration and from reduced train weight and the total direct advantage

for the electrical system is obtained as far as economy in power is concerned.

While any reduction in the cost of power (not only for fuel, but repairs, labor, water, oil and waste, etc.) is of great importance to railroads, the many other advantages of electricity, representing betterments of the service and greater earning capacity are the chief qualities which will determine its adoption in any case in place of steam locomotives. As a motive power electricity is simple, efficient and wonderfully flexible, and it is hardly wise to predict its limitations.

DATA FROM THE METROPOLITAN ELEVATED.

|                                                         | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8*    |
|---------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| No. of trip.....                                        | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8*    |
| No. of cars in train.....                               | 4     | 4     | 4     | 3     | 3     | 2     | 2     | 4     |
| Total time of trips; min.:sec.                          | 28:20 | 29:03 | 28:30 | 28:37 | 27:20 | 25:30 | 23:48 | 32:44 |
| Time running; min.:sec.                                 | 26:07 | 26:58 | 25:58 | 26:50 | 26:10 | 24:36 | 22:26 | 34:03 |
| Average speed, including stops.....                     | 13.3  | 13.0  | 13.2  | 13.88 | 14.4  | 14.9  | 15.9  | 11.53 |
| Average speed, not including stops.....                 | 14.4  | 14.0  | 14.5  | 14.7  | 15.1  | 15.3  | 16.8  | 12.2  |
| Average current, including stops, amperes.....          | 138.3 | 142.6 | 138.6 | 130.2 | 129.5 | 90.1  | 106.6 | 101.1 |
| Average current, not including stops, amperes.....      | 148.7 | 153.2 | 151.8 | 137.4 | 135.6 | 92.5  | 112.4 | 106.4 |
| Average volts at train.....                             | 504   | 498   | 503   | 512   | 510   | 521   | 520   | 509   |
| Efficiency, from generators to car axles, per cent..... | 51    | 50.5  | 52    | 50    | 51    | 51.5  | 50    | 47.5  |
| Kilowatt-hours per car-mile at train.....               | 1.32  | 1.36  | 1.32  | 1.60  | 1.62  | 1.58  | 1.76  | 1.11  |
| Kilowatt-hours per car-mile at station.....             | 1.44  | 1.52  | 1.44  | 1.81  | 1.68  | 1.67  | 1.60  | 1.21  |

\*Series control only used.

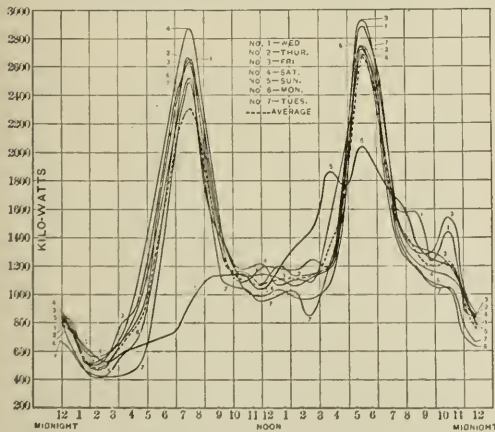


FIG. 10—STATION LOAD LINES.

## BICYCLE PATH ON THE BROOKLYN L.

President Uhlmann, of the Brooklyn Elevated Railroad, is considering the proposition received from a capitalist to build a superstructure over the elevated lines for a bicycle path. The scheme has been outlined, and as the proportion of the receipts offered to the railroad company is very liberal the officials are disposed to consider it. The residents along the lines are protesting against this proposition as it will add another story to the elevated structure and shut out light and air. The bicycle is a vehicle, and it is claimed that a special act of the legislature is necessary for the building of any pathway or road along a thoroughfare.



### PROGRESS ON METROPOLITAN, N. Y., RECONSTRUCTION.

The underground conduit which the Metropolitan Street Railway Company of New York is now installing was illustrated in the REVIEW for April, page 248, and we here present two views of the Circle at 59th street and 8th avenue showing the work on the cross-town connection between 1st and 10th avenues now building. The four lines on which the conduit will be laid immediately are, on 8th avenue from Harlem river to 59th street, on 6th avenue from 59th street to the Battery and on Madison and 4th avenues from Harlem river to the Post Office. The cross-town connec-

### SAGINAW vs. UNION STREET RAILWAY.

There has been considerable friction between the street railways in Saginaw, Mich., and the city authorities over the question of keeping the railway roadbeds in good condition and the expense of paving the streets. A statement of the case is made by City Attorney Beach as follows:

"The common council by resolution forfeited the rights, privileges and authorities of the Consolidated Street Railway Company in our streets, pursuant to an ordinance of the city which provided that the company was to relay its tracks on Michigan avenue, Hamilton, Cleveland and Madison streets, within a certain time. The company failed to



CURVE AND CROSSINGS AT FIFTY NINTH STREET AND EIGHTH AVENUE.

tion on 59th street will enable passengers to make continuous trips from 8th avenue to 4th avenue and from upper Madison to 6th avenue, and vice versa, without changing cars.

The illustrations for which we are indebted to the Scientific American, are from photographs taken during the building of the conduits and special work at the Circle. In the view looking south, 8th avenue is at the left; in the other, 8th avenue is shown at the right and at the left the commencement of the Boulevard. On the completion of the work at this point the entire Circle will be paved with asphalt.

The West End road of Boston is building an addition to its North Cambridge car barn that will cover over an acre of ground, providing room for 80 cars. In the front part are eight tracks which extend to the street and in the rear ten tracks.

comply with the terms of the ordinance and permitted its tracks to be unsafe and dangerous, and the tracks being in such condition and the cars being operated by electricity the pavement adjoining the tracks was injured and ruined. A bill was then filed by the city in our circuit court for the purpose of enforcing the resolution. An injunction was issued restraining the company from operating its cars over the tracks in the streets above mentioned. The merits of the case will not be disposed of until our September term of court. Action has also been commenced against the Union Street Railway Company operating a line of cars in other streets of the city. The Union Company filed a bill in the circuit court asking for injunction to restrain the city from passing a resolution that had been offered in the council, which resolution forfeited the company's rights and privileges in the streets. It also instructed the chief of police to prevent the company from operating its cars, and instructed the board of public works to tear up the tracks and put

the streets in a reasonably safe condition, fit for travel. This was done under the same resolution, which also provided that the city in the first instance should pave between the tracks at street intersections, the cost for said paving to be paid by the company on demand. The cost for paving between the company's tracks on other parts of the streets was to be paid in five annual payments. Improvements have been made by the city for the company to the amount of over \$35,000. There is now due the city for paving during the years of 1895 and 1896, \$7,250, which the company refuses to pay, and the resolution was offered to forfeit the company's rights, privileges and authorities after it had been given 30 days notice to pay the city the

Three days later the Boston Deposit & Trust Company, which holds the property of the railway company in trust for the bondholders, agreed to pay the claims of the city and asked that receivers for the road be appointed. The court appointed receivers and the sheriff put them in possession on the 24th; at the same time the city was temporarily restrained from tearing up the tracks.

The last move of the company is the most important; an appeal was taken from the decision of the Michigan supreme court to the United States supreme court, which granted a writ of error, citing the circuit judge to appear on October 11th. This may result in tying up the lines until final settlement. Meanwhile the people walk.



THE CIRCLE, FIFTY-NINTH STREET AND EIGHTH AVENUE, LOOKING NORTH.

amount due for paving, and on the failure to pay the same, the city would forfeit its rights, privileges and authorities. The company's bill sets up the fact that it has not paid and cannot pay on account of the financial panic that has existed for the past two years. The city filed its answer and the matter was heard by Byron A. Snow, circuit judge, and the injunction asked for was denied. The company then petitioned the supreme court for a restraining order and also for mandamus to compel the circuit judge to issue the injunction."

The supreme court issued the restraining order, but on July 13 denied the application for mandamus, holding that the insufficient earnings of the company is no legal excuse for its failure to comply with the terms of the contract between it and the city.

On July 16 the city caused the tracks leading from the car barns to be blockaded and stopped the running of all cars,

## RAILWAY ADVERTISING COMPANY SOLD.

The Railway Advertising Company of New York, was formed shortly after street railway advertising came into vogue and grew to be the largest concern of its kind in the country. Ex-Mayor Hugh J. Grant was instrumental in building up the business and has been president of the company. He secured control of the advertising of the Broadway road, the Metropolitan Traction Company, the trolley lines of Jersey City, Newark, Orange, Elizabeth, and other New Jersey towns, also the street railways of Providence, R. I., and contiguous territory. This business ex-Mayor Grant has sold to three of the Winburgh brothers who are engaged in the same vocation in Boston, Baltimore and Washington. The sale is conditional, however, as Mr. Grant holds the title of the concern until the business proves to be as guaranteed.



## NATIONAL ELECTRIC CODE.

The 1897 edition of the rules of the National Board of Fire Underwriters has just been printed, and the uniformity, so much desired in such regulations, is now accomplished. To make this code satisfactory to electrical and industrial men, as well as to the insurance companies, the rules were compiled by the National Conference on Standard Electrical Rules, consisting of one delegate from each of the following organizations: American Street Railway Association, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Architects, Underwriters' National Electric Association, National Electric Light Association, National Board of Fire Underwriters, National Association of Fire Engineers and the Factory Mutual Fire Insurance Companies.

Each delegate reports the rules to his association and recommends their approval or adoption. At the meeting of the National Electric Light Association held June 8 at Niagara Falls, the rules met with approval and the other associations will doubtless accept them. Frank R. Ford will present them before the October convention of the A. S. R. A. at Niagara Falls.

The rules having particular reference to street railways are as follows:

**3. Switchboards—**

*a.* Must be so placed as to reduce to a minimum the danger of communicating fire to adjacent combustible material.

Special attention is called to the fact that switchboards should not be built down to the floor, nor up to the ceiling, but a space of at least ten or twelve inches should be left between the floor and the board, and from eighteen to twenty-four inches between the ceiling and the board in order to prevent fire from communicating from the switchboard to the floor or ceiling, and also to prevent the forming of a partially concealed space very liable to be used for storage of rubbish and oily waste.

*b.* Must be made of non-combustible material or of hardwood in skeleton form, filled to prevent absorption or moisture.

*c.* Must be accessible from all sides when the connections are on the back, but may be placed against a brick or stone wall when the wiring is entirely on the face.

*d.* Must be kept free from moisture.

*e.* Bus bars must be equipped in accordance with rules for placing conductors.

**4. Resistance Boxes and Equalizers—**

*a.* Must be placed on a switchboard or, if not thereon, at a distance of a foot from combustible material, or separated therefrom by a non-inflammable, non-absorptive, insulating material.

**5. Lightning Arresters—**

*a.* Must be attached to each side of every overhead circuit connected with the station.

It is recommended to all electric light and power companies that arresters be connected at intervals over systems in such numbers and so located as to prevent ordinary discharges entering (over the wires) buildings connected to the lines.

*b.* Must be located in readily accessible places away from combustible materials, and as near as practicable to the point where the wires enter the building.

Station arresters should generally be placed in plain sight on the switchboard.

In all cases, kinks, coils and sharp bends in the wires between the arresters and the out-door lines must be avoided as far as possible.

*c.* 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.

Ground wires for lightning arresters must not be attached to gas pipes within the buildings.

It is often desirable to introduce a choke coil in circuit between the arresters and the dynamo. In no case should the ground wire from a lightning arrester be put into iron pipes, as these would tend to impede the discharge.

**6. Care and Attendance—**

*a.* A competent man must be kept on duty where generators are operating.

*b.* Oily waste must be kept in approved metal cans and removed daily.

Approved waste cans shall be made of metal, with legs raising can three inches from the floor, and with self-closing covers.

**9. Railway Power Plants—**

*a.* Must be equipped in each feed wire before they leave the station with an approved automatic circuit breaker (see No. 44) or other device, which will immediately cut off the current in case of a ground. This device must be mounted on a fireproof base, and in full view and reach of the attendant.

**12. Wires—**

## TROLLEY WIRES.

*j.* Must not be smaller than No. 6 B. & S. copper, or No. 4 B. & S. silicon bronze, and must readily stand the strain put upon them when in use.

*k.* Must have a double insulation from the ground. In wooden pole construction, the pole will be considered as one insulation.

*l.* Must be capable of being disconnected at the power plant, or of being divided into sections, so that, in case of fire on the railway route, the current may be shut off from the particular section and not interfere with the work of the firemen. This rule also applies to feeders.

*m.* Must be safely protected against accidental contact where crossed by other conductors.

Guard wires should be insulated from the ground and should be electrically disconnected in sections of not more than 300 ft. in length.

## GROUND RETURN WIRES.

*n.* For the diminution of electrolytic corrosion of underground metal work, ground return wires must be so arranged that the difference of potential between the ground dynamo terminal and any point on the return circuit will not exceed twenty-five volts.

It is suggested that the positive pole of the dynamo be connected to the trolley line, and that whenever pipes or other underground metal work are found to be electrically positive to the rails or surrounding earth, that they be connected by conductors arranged so as to prevent as far as possible current flow from the pipes into the ground.

**34. Car Wiring—**

*a.* Must be always run out of reach of the passengers, and must have an approved rubber insulating covering.

**35. Car Houses—**

*a.* Must have the trolley wires securely supported on insulating hangers.

*b.* Must have the trolley hangers placed at such a distance apart that, in case of a break in the trolley wire, contact can not be made with the floor.

*c.* Must have cut-out switch located at a proper place outside of the building, so that all trolley circuits in the building can be cut out at one point, and line circuit breakers must be installed, so that when the cut-out switch is open the trolley wire will be dead at all points within 100 feet of the building. The current must be cut out of the building whenever the same is not in use or the road not in operation.

*d.* Must have all lamps and stationary motors installed in such a way that one main switch can control the whole of each installation—lighting or power—independently of main feeder-switch. No portable incandescent lamps or twin wire allowed, except that portable incandescent lamps may be used in the pits, connections to be made by two approved rubber-covered flexible wires (see No. 40 *a*), properly protected against mechanical injury; the circuit to be controlled by a switch placed outside of the pit.

*e.* Must have all wiring and apparatus installed in accordance with rules under Class "C" for constant potential systems.

*f.* Must not have any system of feeder distribution centering in the building.

*g.* Must have the rails bonded at each joint with not less than No. 2 B. & S. annealed copper wire; also a supplementary wire to be run for each track.

*h.* Must not have cars left with trolley in electrical connection with the trolley wire.

**36. Lighting and Power from Railway Wires—**

*a.* Must not be permitted, under any pretense, in the same circuit with trolley wires with a ground return, except in electric railway cars, electric car houses, and their power stations, nor shall the same dynamo be used for both purposes.

**40. Wire Insulation—**

*a.* Rubber Covered—The insulating covering must be solid, at least three-sixty-fourths of an inch in thickness and covered with a substantial braid. It must not readily carry fire, must show an insu-



lating resistance of one megohm per mile after two weeks submersion in water at seventy degrees Fahrenheit and three days submersion in lime water, and after three minutes electrification with 550 volts.

#### 44. Cut-outs and Circuit Breakers—

d. Circuit breakers must operate successfully, under the most severe conditions they are liable to meet with in practice, on short circuits when set at fifty per cent above the current, and with a voltage twenty-five per cent above that for which they are designed.

#### 55. Lightning Arresters—

a. Must be mounted on non-combustible bases, and must be so constructed as not to maintain an arc after the discharge has passed, and must have no moving parts.

In justification of rule No. 36, a separate pamphlet has been issued giving the opinions of some of the leading electrical engineers, all of whom are opposed to the practice of using the current from trolley lines for light and power other than street railway work. The electrician of the National Board of Fire Underwriters concludes that there is great danger of fire in an arc of all safeguards and protective devices. The principal reason given for the source of danger is that one side of the circuit is normally grounded—that is, the current depends upon the earth or pipes or wires in the earth for part of its path. This means that but one accidental electrical connection between any part of the wiring of the system and a gas or water pipe or structural iron work or conducting substance of any nature in electrical connection with the earth is necessary, in order to establish current flow and a resulting "burn-out" or fire. In a complete metallic circuit two such connections are necessary, one on each side of the circuit, before current flow can be established, and, therefore, the grounded system is considerably more than twice as hazardous as the metallic.

For those now using power from trolley circuits it is suggested that the street railways put in separate generators and a complete metallic circuit for such service, but if this can not be done the following course is advised: If the foregoing is not possible, and it is not feasible to supplant the electric equipment with some other power machinery, have the entire installation, including motor, resistance box, switch, cut-outs, wire and electrical arrangements of all kinds moved outside of the building and installed in a separate fire-proof structure, entirely cut off from the main building. Power can be communicated from the separate structure to the main building by means of a shaft enclosed in an iron pipe, sealed at the ends. The motor can be started, stopped or regulated from inside the main building by any convenient mechanical means which does not bring about a possibility of communicating fire from one structure to the other. The separate structure should be built of brick, with a noncombustible roof. Not necessarily being larger than simply sufficient to include the motor and its controlling apparatus, this structure can be built at a comparatively small cost, and together with cost for foundations for the motor, would well repay the investment in the increased safety secured in having all power machinery located outside of one's premises. Special attention must be paid to the construction of the structure containing the motor to insure its successfully preventing fire starting in it from communicating with the main building.

A Buffalo syndicate recently purchased the Canandaigua, (N. Y.) Electric Light & Railroad Company and has made arrangements with John Finney, of Rochester, to manage the road. C. J. Purdy is retained as superintendent.

## MOUNTING CAR WHEELS.

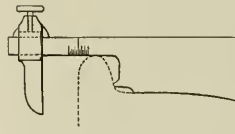
The proper gage to which car wheels should be mounted in order that the impingements on the guard rails and frog points may be avoided has in recent years received considerable attention from the Master Car Builder's Association, and several modifications of the rules made. Prior to 1894 the rule was that the distance between the backs of the wheels should be between 4 ft. 5¼ in. and 4 ft. 5½ in. with a further variation of ¼ in. either way from this; the standard thickness of flange was fixed at 1⅜ in. and the minimum at 1 in. In 1894 the standard distance between backs was fixed at 4 ft. 5⅜ in., with a maximum variation either way of ⅜ in. for new wheels; 4 ft. 6¾ in. was adopted as the frog distance dimension (the distance from the protecting side of the guard rail to the gaging line at the frog point); the maximum thickness of flange was made 1 ⅞ in. In 1895 it was recommended that the wheels with flanges less than 1¼ in. should not be remounted and in 1896 that no wheels having a greater difference in the thickness of the flanges than ⅜ in. be mounted on the same axle.

George Tatnall of the Pennsylvania Railroad presented an elaborate discussion of this subject before the New York Railroad Club and deduced as the proper rule: "The distance between inside of flanges shall always be the difference between the constant figure, 4 ft. 6¾ in. and the variable figure, found by measuring the thickness of the thicker flange of the two wheels to be used together;" and that "wheels with a greater difference in thickness of flanges than ⅜ in. shall not be mounted together on one axle;" that "the thickness of flange be measured on a line parallel to the base line, from the gage line of wheel to the plane of the back of the wheel;" that "the maximum thickness of flanges be 1⅝ in., and the minimum to be used in remounting 1 ⅞ in."

At the last M. C. B. convention the committee on mounting wheels recommended changes in the rules and the manner of using the check gage, which if adopted will make the recommended practice identical with the rule as deduced by Mr. Tatnall except that the greatest difference in thickness of flanges of the two wheels mounted together is 1⅞ in., and that the maximum thickness is not changed to 1⅝ in.

W. S. Irvine illustrates in the Railroad Gazette a gage used by him in measuring flanges the thickness of which it is necessary to determine before the rule above given can be applied. The contour of the wheel shown is that of the standard tire. The scale is graduated in 32nds, the center line being at the standard 1⅜ in. and the minimum 1 in.

The lightning arresters on one of the lines of the Staten Island Electric Railroad Company grounded two strokes on the station circuit at New Brighton but the third one went into the armature of the generator, doing considerable damage. The station attendants conducted themselves in a commendable manner, stopping the engine immediately and breaking the ground connection to the dynamo. The power station was left in complete darkness but the connections were changed and the duplicate unit started and within five minutes the cars were running again.



## EMERGENCY WAGON, NEW ORLEANS.

The new emergency wagon of the New Orleans City & Lake Railroad Company was designed by General Superintendent Willard, and has been in service only a few weeks, long enough, however, to demonstrate its great utility and superiority over the old wagons. It is light, compact and very handsome, being painted bright yellow with red wheels and running gear. The platform rests over the front truck of the wagon, and when not elevated forms the driver's seat. The tower is raised by means of a crank, which one man can easily operate. Tools and apparatus of all kinds for repairing the trolley and feed lines are kept in the wagon ready for immediate use.

The wagon is kept ready for service at all times at the station on the corner of Canal and Wells streets, and this being right in the heart of the city enables very quick time to be made to any point of trouble. The stalls, harness and wagon stand are similar to those in a fire engine house, and a span of fine horses have been trained to respond quickly



NEW ORLEANS EMERGENCY WAGON.

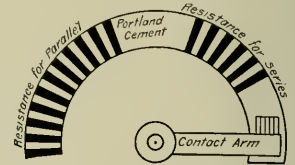
when a call comes in. A fire alarm gong has been placed in the emergency station, and in case of a fire on the line from Carrollton to the barracks the wagon responds with hose bridges. The bridges are then laid on the track and the traffic on the line continues without interruption. Besides the large wagon for general repair work shown in the illustration a one horse spring wagon with extension ladder is used for making light repairs, such as bells off, etc., and a third wagon answers calls for appliances to put cars on tracks.

## NEW ROADS IN MASSACHUSETTS.

The proposed suburban line between Mansfield and Easton is making satisfactory progress, the stock having been subscribed and preliminary legal arrangements made. It will come under the same management as the Mansfield, Norton, Taunton and Attleboro system. A special meeting of the subscribers and stockholders of the Norton & Attleboro Street Railway Company was held to authorize the issue of \$40,000 of first mortgage bonds to complete the construction and equipment of the railway. It is thought that the work which begins this fall will be finished in the spring. Work on the electric railway between Foxboro and Mansfield will soon be commenced.

## SERIES-PARALLEL CONTROL AT MINNEAPOLIS.

For some years the Twin City Rapid Transit Company of Minneapolis and St. Paul has led a very independent existence as regards electrical and mechanical repairs and renewals. Instead of buying new motors to replace early types as the majority of roads have done which found themselves with old equipment on their hands this road has rebuilt in its own shops nearly all the older motors purchased by it. As a result it now has a motor equipment which is fairly economical as to repairs. Following out the same policy the method of car control was some time ago changed from rheostatic to series-parallel by building series-parallel controllers in the company's shops from material taken from the old rheostat controllers. The principle of these controllers is very simple. There is no contact drum for changing connections, the change from series to parallel being made by a switch which is operated by the controller handle when the handle is at the point where the connections are to be changed from series to parallel. A rheostat of the old T.-H. type is used for resistance. The first thing done by the controller handle when the current is turned on is to establish a circuit through a few segments of the rheostat and the motors in series. As the handle is advanced the contact arm of the rheostat cuts out the resistance until finally after all the resistance has been cut out the circuit is opened at the contact arm and the handle operates the switch which changes the motor connections from series to parallel. The contact arm then moves on to another set of rheostat segments thereby establishing a circuit with the motors in multiple. As the contact arm advances the rheostat is cut out and the motors are brought up to full speed. The arrangement of the rheostat is roughly shown by the accompanying sketch.



Where the circuit is broken between the series and parallel combinations the contact arm passes over a filling of Portland cement which has been found to be the best material to withstand the arcing and one which is easy to renew when worn out. The whole mechanism is contained in a large wooden box on the platform, and while rather cumbersome is a good home made improvement on rheostat control.

## WHEELS CARRIED BY THE ALLEY L.

It has not been generally advertised that wheels may be carried on the trains of the South Side Elevated, but an order was given to that effect some time since. The order was the result of an accident to a young lady friend of General Manager Hopkins, who was a guest at his house. While riding in the parks her wheel was damaged and she was obliged to walk home, a distance of two miles. The result of this forcibly bringing to the attention of the management the necessity of providing accommodations for cyclists, it was decided to permit wheels in the front car of each train. If it is found that this privilege is not abused and that a reasonable number of wheels are carried the service will be continued indefinitely.

## STREET RAILWAY LAW.

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

*Amount of Change Furnished by Conductor.*

A rule requiring change to the amount of \$2 to be furnished by conductors on street cars to passengers is a reasonable provision for the convenience of the public, and the conductor cannot be required to furnish change for a \$5 bill.

Notice need not be brought home to a street car passenger of a rule reasonably limiting the amount of change which a conductor is required to furnish in order to make the rule operative.

Bartlett, J., delivered the opinion of the court:

This appeal presents a novel question which has not been considered by this court in any case to which our attention has been called.

No opinion was written in the court below.

The defendant corporation operates a horse railroad in the City of New York as a common carrier of passengers.

On the 12th of January, 1889, the plaintiff entered one of the defendant's cars, as a passenger, and when called upon for his fare of 5 cents found that the smallest amount of money in his possession was a \$5 bill.

The plaintiff offered the bill to the conductor, who stated: "I am not supposed to change it; you must get off." To this the plaintiff replied: "I won't get off; you must put me off." The conductor thereupon put the plaintiff off the car.

It is not claimed that he used any more violence than was necessary, or that the plaintiff was actually injured in person or property. The transaction was undoubtedly a technical assault and battery, and the plaintiff seeks in this action to recover his damages therefor. It may be conceded, as was urged by plaintiff's counsel in his very able argument, that if plaintiff was unlawfully ejected from the car, this is a case for substantial damages.

A number of points were discussed at the bar, but in the view we take of this case there is but one question to be considered.

The plaintiff's counsel asked to go to the jury on several questions, and among others the following:

"Whether the \$5 was in this case and under the circumstances testified to, a reasonable amount for the plaintiff to tender the conductor in payment of his fare?"

The complaint was dismissed at the close of the plaintiff's case, and the point is made whether the reasonableness of the tender of \$5 to the conductor is a question of law or a question of fact on the evidence.

It was stipulated at the trial that the defendant has a rule requiring its conductors to be prepared to furnish change to the amount of \$2, and that such rule was not brought to the attention of plaintiff.

It was further stipulated that there was no regulation forbidding the conductors to make change to a greater extent than \$2.

On cross-examination of the plaintiff he testified as follows:

"Q. Why did you say to the conductor, before making any tender, 'I have only got a \$5 bill'?"

"A. Well, because I felt rather apologetic about offering that large amount; because I didn't know whether it might inconvenience him with using up a great deal of his change or not, and, of course, I wouldn't have offered \$5 if I had anything else, and I wanted to explain it."

It thus appears that the plaintiff regarded his offer of the \$5 bill as unusual and requiring explanation.

There is no evidence of a custom on the part of the plaintiff or the public of tendering to defendant \$5 in payment of 5 cent fare and receiving the change, nor of any rule of the defendant imposing upon its conductors the duty of furnishing passengers with change in so large an amount.

The plaintiff swore to the occasion when he had offered a \$5 bill for his fare and had it changed, but it was on the car of another line.

There is no evidence which would have warranted the trial judge in submitting to the jury the question whether the plaintiff's tender of the \$5 bill under the circumstances was unreasonable.

On the evidence, as it stands, the plaintiff's tender of the \$5 bill was unreasonable, as a matter of law, and the undisputed facts are not of such a nature that reasonable men might differ in regard to the inferences proper to be drawn from them.

In this state of the record it is well settled that there is no question for the jury: *Vedder v. Fellows*, 20 N. Y., 126; *Hibbard v. New York & E. R. Co.*, 15 N. Y., 455, 459, 460; *Avery v. New York C. & H. R. R. Co.*, 121 N. Y., 31, 44.

It is quite apparent that a carrier of passengers must make and enforce such reasonable rules as will enable it to discharge its duties to the general public in a proper manner, and if the facts are undisputed and not susceptible of different inferences the question of their reasonableness ought not to be submitted to a jury who might not readily understand the reasons upon which the rule is sought to be founded. If the question is treated as one of law, uniformity is secured, a matter in which the public are interested quite as much as the corporations who are carriers of passengers.

In this case at bar the reasonableness of the rule established by the defendant is obvious. In a large city like New York the round trip of a car of any street line means a very considerable number of fares paid in, and the necessity for the conductor to carry and pay out a large amount of change. When the defendant enacted the rule requiring its conductors to furnish change to a passenger to the amount of \$2 it did all that could reasonably be expected of it in consulting the convenience of the general public, and it would be unreasonable and burdensome to extend the amount to \$5. It would require conductors to carry a large amount of bills and small change on their persons, and greatly impede the rapid collection of fares.

It is not necessary that a common carrier should bring home to each passenger a personal knowledge of any reasonable and just rule which it is seeking to enforce, to so hold would render the enforcement of the rule impracticable.

We have been cited to but one case holding with the plaintiff in this action: *Barrett v. Market Street R. Co.*, 81 Cal., 296, 6 L. R. A., 336.

We agree with the learned supreme court of California, that a passenger upon a street railroad is not bound to tender the exact fare, but must tender a reasonable sum, and the carrier must accept such a tender and furnish change to a reasonable amount; but we cannot assent to the conclusion that a tender of \$5 is a reasonable sum.



It is quite possible that there existed local reasons for the decision in California, as the judge writing the opinion suggested that the \$5 gold piece was practically the lowest gold coin in use in that section of the country.

The plaintiff urges that there are several other questions than the one of reasonableness of amount tendered that should have been submitted to the jury. We have considered these questions in the light of the record as it stands and are of opinion that the dismissal of the complainant was proper.

(Court of Appeals of New York: *Barker v. Central Park, North, East and River Railroad Co.*, 35 Lawyers' Reports, Annotated, 489.)

*Injury to Drunken Man—Excessive Damages—Second Remittitur.*

In February, 1894, the appellee, then in his fifty-sixth year, but with, so far as it appears, mental and physical powers unimpaired by age or disease, left the hotel where he lodged at 5:30 p. m., to go north across Madison street for his supper. In the language of the clerk of the hotel he "was sober enough to walk and drunk enough to be a little noisy," which description of his happy condition is corroborated by the testimony of the proprietor of the hotel.

When he reached the cross-walk a street car of the appellant was standing on the track and in his own version of the affair he stepped over the first rail, and the car struck and threw him down under the car and rolled him for about twenty feet, catching him in the hip. To a man attentive to his surroundings, and in the exercise of ordinary care no such accident could have happened. The home of appellee had been in Chicago nearly all his life. He knew or ought to have known had he given the matter a thought that the car had stopped only momentarily.

Thus far this is my own opinion, but the majority of the court does not agree with the conclusion at which I arrive. In their opinion the question of care by the appellee was for the jury, that in considering it they might take into consideration the usual conduct of ordinary prudent and careful persons in threading their way through the crowds, and across the streets thronged by the multitudes of this great bustling city.

Also, that other testimony presents the manner of the accident more favorably to the appellee than does his own. A policeman stationed at the cross-walk testified that the car was about six feet west of the cross-walk and that as the appellee stepped upon the track the car started forward; appellee made a plunge to get off the track and the car struck him and knocked him against another man and he, appellee, fell under the car.

Paraphrasing the language in *Robinson v. Pioche*, 5 Cal., 461, a drunken man is as much expected to exercise ordinary care as a sober one, and much more is the need of it.

We agree that there is no error in the record if upon the evidence the verdict of the jury was justifiable. The jury awarded \$10,000 after a remittitur of one-quarter of the verdict—the court have entered judgment for the other three-quarters.

It is the judgment of this court that those fractions should be exchanged, and that within ten days after this opinion is filed the appellee enter another remittitur of \$5,000; the judgment is affirmed for \$2,500, otherwise the judgment be reversed and the cause remanded, in either event at the cost of appellee.

(Appellate Court of Illinois, *West Chicago Street Railroad Co. v. Raustedt*, 29 Chicago Legal News, 318.)

*Noise Caused by Electric Car—Liability for Frightening Mule*

The frightening of a mule, caused by the usual noise incident to the running of a street car by electricity, without any unnecessary noise for the purpose of scaring the animal, is held not to make the street railway company liable for the resulting damages.

Supreme Court of North Carolina, *Doster v. Charlotte Street Railroad Co.*, 34 Lawyers' Reports Annotated, 481.

*Agreement of Street Railroad not to Cross at Grade—Control of Chancery over Municipal Corporation as to Use of Street Railroads.*

Each of these parties operates under ordinances of the City of Chicago, lines of street railway in the south part of the city.

In 1892, when they were laying the tracks, they made an agreement by which they both agreed that with the exception of crossings mentioned in the agreement, no crossings at grade or one road over the other should be made.

The appellee thereupon procured from the city an ordinance permitting it to put down tracks on more streets, and in permitting them to do it *vi et armis* made crossings at grade over other places than those the agreement mentioned.

Appellant filed this bill to enjoin the appellee from operating over those crossings, and from making any more grade crossings.

It is further settled in this state that a court of chancery will not control a municipal corporation as to the use of street railroads. *Phillips v. N. W. El. R. R.*, 166 Ill., 131; affirming the same case, 60 Ill. App. 471, is the last reported of the many cases to that effect. And *Doane v. Chicago City Ry. Co.*, 160 Ill., 22; affirming the same case, 51 Ill. App. 353, is a complete answer to all claim of the appellant under the agreement. Not to cross at grade may be—practically probably is—an agreement not to cross at all, and is void against public policy.

(Appellate Court of Illinois, *South Chicago City Railroad Co. v. Calumet Electric Street Railway Co.*, 29 Chicago Legal News, 334.)

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### IRON FELT.

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Mr. Monaghan, U. S. Consul at Chemnitz has advised the state department of the invention of a material which is to be known as iron felt. It is made of the best of woolen materials and impregnated with the inventor's patented preparation which gives it a resisting strength of a trifle over 14,300 lbs. per sq. in.; it is not stated whether this is in tension or compression. The article is said to be very useful for railroads of all kinds. Placed between rails and sleepers it deadens sound and prevents shocks. The first experiments were made on one of the Berlin street railways at a point where there were over 360 trains passing daily and the results in reducing wear and noise surpassed the company's most sanguine expectations. It is to be tried on the new road at Leipsic.

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Pascor & Crilly, contractors, are about to begin work on six miles of trolley line for the South Bethlehem & Hellertown Electric Railway Company of South Bethlehem, Pa.

## ASSESSMENT OF THE TORONTO RAILWAY COMPANY.

The rails, poles, etc., of the Toronto Railway Company were assessed for taxation at \$285,000, but the company took an appeal which was sustained by the courts. The city's case was based on the fact that the pipes, etc., of the gas company are taxed. The court said:

"The Toronto Railway Company has only a street railway privilege for the purposes of the railway, and has neither the same powers nor property in the street as the Consumers' Gas Company has in the lands occupied or used by it for its gas works and pipes. And I do not think that the judgment in the supreme court in the Consumers' Gas Company case governs this appeal.

"It is again argued that the exemption from taxation which I conceive has been conferred upon the company by its agreement with the city is illegal and void. The short answer to this is, that this agreement has been confirmed by an act of the legislature, and has thus been taken out of the ordinary rules which govern such assessments. The city, should I be wrong, has the option of proceeding with

## AIR MOTORS NOT RECOMMENDED.

After a thorough test of the Hoadley-Knight air motor on the Eckington & Soldiers' Home Railway, Engineer Commissioner Black handed a report to the Commissioners, in which all the features of the motor are discussed. He does not anticipate any trouble from explosions. The cars are comfortable, and the machinery operates with little noise. The wheel base, to accommodate the air mechanism, is too long for medium sized curves and the cars are so heavy as to necessitate a reconstruction of the tracks. As the system was planned, trailers could not be used and the power to operate a car was greater by 23 or 24 h. p. than that required for an electric car. While the motor possesses many good qualities yet its development is in such a stage that it would be bad policy to equip such a large system with experimental apparatus.

## Z RAIL AS TRACK RAIL.

Last month we mentioned the work being done for the Market Street road in San Francisco, by the Falk Manufac-



FIG. 1.

FIG. 2.

FIG. 3.

the pending appeal to a higher court. I think the assessment should be struck out and the appeal allowed."

## TROLLEY VICTORY IN PENNSYLVANIA.

The completion of the Philadelphia & Bristol railway is now assured by a recent decision of Judge Yerkes. A permanent injunction against the construction of the road was refused and also a rehearing in the equity suit dissolving the preliminary injunction. The plaintiffs in the case were the Pennsylvania Railroad Company and Henry Gaw, owners of adjacent property on the Bristol turnpike. The court in his opinion stated that considering the apparent disposition of the supreme court to hold that only the want of consent of intervening municipalities shall prevent the building of all or any part of a street railway, this court is not warranted in granting an injunction against the construction of the entire line, at this suit of a private complainant. This will now allow the trolley people to complete the line at Croyden station, which has been open for about 1,000 ft., owing to this litigation. Of course the abutting property owner can maintain an action for damages, but he cannot prevent the completion of the street railway. This decision establishes the principle contended for by the Young bill defeated in the late legislature.

turing Company, in cast-welding cable slot rails, or what is known as Z iron, to enable its use as track rail. We have since secured some views of this work, which are reproduced herewith, and which require little additional description.

Fig. 1 show the chair previously used in construction and a joint exposed for cast-welding. Fig. 2 is of a defective joint which was broken off while hot, a portion of casting remaining on the rail. Fig. 3 shows two finished perfect joints.

The rail is 8 in. in depth and weighs about 80 lbs. to the yard. The joints weigh approximately 175 lbs. each. The rail ends were in very bad shape previous to welding but now the track is perfectly smooth and free from any drop or jar while passing over joints. Not one cast joint has been broken since the work of welding has been completed, and the management does not hesitate to express satisfaction at the results.

The Berkley, Va., street railway was first opened in 1890 and consisted of  $1\frac{1}{4}$  miles of track with two horse cars. Recently it has been lengthened to  $2\frac{1}{2}$  miles and converted into an electric line. The equipment is of the General Electric system throughout. When the line was formally opened invitations were sent to the town officials, members of the press and others interested in the development of Berkley. T. H. Synon is president of the line.

## FARE REGISTERS ALTERED.

One of the conductors of the Staten Island Electric Railroad was arrested for changing the records of the fare registers. The conductor was suspected for some time and a watch was kept. Although his returns did not tally with the count of the passengers on his car yet they always agreed with the register and no one was able to detect the conductor tampering with the register. One evening the detectives noticed the number of fares was less than a short time previous and the conductor was arrested, also another man who had been seen with him many times on the car. Upon being searched a number of small tools and several screws from the registers were found in their pockets. It is suspected that these men are a part of a gang of expert thieves who have worked the fare registers on the Broadway cable, the Brooklyn trolley lines and the New Jersey roads.

## AN AID FOR THE BLACKSMITH SHOP.

C. E. Moore, master mechanic of the Chicago City Railway, who has in years past acquired a very practical acquaintance with the needs of the blacksmith and tool maker, recently devised a very simple little appliance which is meeting with a ready sale, and which is a great time saver when



THE GARDEN CITY ARCH.

it comes to heating iron. It is simply a small arch made of fire brick which is put over the ordinary blacksmith's fire. The inside of the arch becomes white hot almost immediately, so that heat is reflected back from the arch to the iron which is placed inside the arch over the fire. As a consequence the time required to heat the iron is much less than with an open fire, and less fire and therefore less fuel is needed. This arch is being made under the name of the "Garden City."

The charter for the Ingersoll (Ont.) Radial Electric Railway has been granted and arrangements are being made for subscriptions to the stock of the company.

## CORRESPONDENCE.

PENACOOK, N. II., July 19, 1897.

## EDITOR REVIEW:

I noted with interest your article in the current number of the REVIEW entitled "The Telephone in Connection with Wheatstone Bridge for Shop Measurements," and while acknowledging the force of some of your arguments against the laboratory form of Wheatstone bridge for shop practice, it hardly seems as if the advantages offered by the telephone arrangement are bona fide. In the first place, every one who has had occasion to use the bridge form of measurement has found it a tedious and oftentimes vexing matter to balance the arms even when a galvanometer was used and indicated whether the resistance of the unknown arm was plus or minus. With the telephone method there seems to be nothing to indicate from which arm of the bridge the current is flowing, or, in other words, whether the resistance is higher or lower in the unknown arm than in the arm with the variable resistance, and the operator is, therefore, entirely in the dark and at a loss to know whether to increase or decrease the known resistance to strike a balance.

The portable testing set seems to offer the best solution of the problem, although the hitherto high cost has, to a great extent, prohibited its use in shop practice. An instrument of this type, however, accurately adjusted and containing a galvanometer, which would not be more susceptible to outside magnetic influences than any high grade commercial voltmeter, and without batteries (most shops have batteries and therefore do not care to pay for high priced, portable dry cells), at an expense not exceeding \$25, should find a place in every shop where resistance has to be measured. Such an instrument is already on the market.

J. ALBERT MASSIE.

## NO MORE PASSES IN NEBRASKA.

One of the state laws which went into effect July 11 prohibits persons or corporations from furnishing to any officials of cities or towns in Nebraska free light, water, telephone or transportation service, or to charge a less rate than is charged other patrons. If any official violates this law he is fined upon conviction not less than \$200 or more than \$500 and his office is declared vacant. In consideration of this law the Omaha Street Railway sent out the following to those interested:

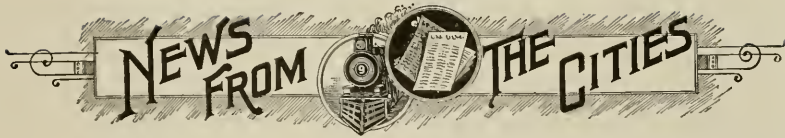
Our attorney expresses the opinion that, inasmuch as the penalties seem unusually severe, that as a matter of protection to all parties in interest with us, we should, as far as possible, place in the hands of those connected with city affairs who have had transportation, some special notice of the action of the state legislature.

It will be seen that outside of the misdemeanor provisions, with its fines, etc., Sec. 7 declares that upon conviction of any officer for violation under the act that this office shall become vacant and subject to the law governing vacancies.

We regret that we have to place this matter before you, and ask your aid in complying with the law, but we see no other course open to us at present, and on July 11, 1897, our conductors will be instructed to collect from those holding passes by virtue of their connection with any of the city departments.

The police are especially dissatisfied with the operation of the law as their duties often require them to make long and quick trips. Their street car fare will amount to a larger sum than they can afford to pay.





### California.

**OAKLAND, CAL.**—Suit against the East Oakland Street Railway Company and others, to recover on two notes for \$25,000 each, has been brought by the Realty Syndicate Company.

**SAN DIEGO, CAL.**—Affairs of the Citizens Traction Company are still in litigation after five months of negotiation. Recently \$12,000 of receiver's certificates were sold to representatives of Spreckels, owner of the rival street car system, and he will probably ultimately acquire the plant.

### Chicago.

**CHICAGO.**—The Chicago Passenger Railway, controlled by the West Chicago Street Railroad Company, has given a blanket mortgage for \$2,000,000 to the Equitable Trust Company.

**CHICAGO.**—Mayor Harrison's veto of the ordinance granting the General Electric Railway Company right to install the overhead trolley in place of the Love conduit has been sustained.

**CHICAGO.**—On July 31 the Chicago General Railway Company began operating its cars over the 22nd street tracks of the Chicago City Railway between the river and lake. It is proposed that stockholders of the Illinois National Bank purchase the bonds of the Calumet Electric Railway held by the bank.

**CHICAGO.**—Judge Showalter has decreed the sale of the Englewood & Chicago Electric Street Railway. The proceeds will be applied first to pay the \$60,000 of series A receiver's certificates, then \$260,000 of series B certificates, and lastly the bonds. The organization of a new company has already been agreed upon.

**CHICAGO.**—Judge Horton has discharged John A. Roche, receiver of the Suburban Construction Company. New officers have been elected for the Suburban Railway Company. William H. Holcomb is president, J. Charles Moore, treasurer and C. S. Leeds, secretary. From this it would appear that Mr. Leeds has been successful in regaining control, and probably with the assistance of Charles T. Yerkes, J. Charles Moore being president of a line in which Mr. Yerkes is interested.

### Colorado.

**CRIPPLE CREEK, COLO.**—The Cripple Creek District Railway is pushing construction. On July 8 the company ordered 27,000 lbs. of trolley and feeder wire.

**COLORADO SPRINGS, COLO.**—Irvin Howbert, promoter, asks the city council of Colorado Springs for a franchise and water rights for an electric road to be built between that place and Cripple Creek.

**PUEBLO, COLO.**—The Pueblo Electric Street Railway, the Pueblo Gas & Electric Light Company, the Pueblo Light, Heat & Power Company and the Citizens' Light, Heat & Power Company will be consolidated.

**CRIPPLE CREEK, COLO.**—A mortgage has been given by the Cripple Creek District Railway Company to the Central Trust Company of New York to secure an issue of \$500,000 bonds. The proceeds will be employed to build the road as reported in these columns.

**OURAY, COLO.**—Surveys have been made and details arranged for the construction of eight miles of cog wheel electric railway from Ouray to the famous Virginus mine and Revenue tunnel. The enterprise is backed by the Virginus Company, of which A. E. Reynolds of Denver is the head.

**DENVER, COLO.**—The Loretto Heights Railway Company has been incorporated to build a car line two miles long. The cars will be

drawn by horses at first, but if the project proves a success electricity will be installed as a motive power, current being supplied by the Denver Tramway Company. Capital stock, \$15,000; incorporators, Rev. T. H. Malone, Charles M. Ford, Thomas J. Carlin, Mary E. Bindewald and Mary C. Walsh.

**CRIPPLE CREEK, COLO.**—Charles W. Hascall, one of the promoters of the Canon City & Cripple Creek Gold Belt Railroad, says the bonds of the company have been placed in New York. The overhead trolley will be used. Orman Crook & Co., have been awarded the contract for the first five miles of grading. Power houses will be erected at three points along the line, to be supplied with fuel from the company's own mines. At Canon City the company will operate a large reduction works. The estimated cost of construction is \$1,500,000.

### Connecticut.

**HARTFORD, CONN.**—Poles, wire and ties for the proposed extension from Farmington to Plainville have been purchased by the directors of the Hartford & West Hartford Street Railway. Senator Gay, a director says: "We expect to have this road completed and running by the last of September, as there is no hard digging along any portion of the entire route, and we do not anticipate any trouble in securing the right of way."

### Delaware.

**WILMINGTON, DEL.**—The New Castle & Wilmington Electric Railway Company has been doing a large business. F. H. Treat, of Philadelphia, has been elected president; Judge Koch, of Pottstown, vice-president, and C. P. King, of Philadelphia, secretary and treasurer.

### District of Columbia.

**WASHINGTON, D. C.**—An extension of ten miles from Falls Church to Fairfax is contemplated by the Washington, Arlington & Falls Church Electric Railway Company.

**WASHINGTON, D. C.**—Again will the commissioners try to sell the Anacostia Railroad to satisfy certain certificates of indebtedness. It is alleged the company owes the District \$4,000 for repaving.

### Georgia.

**SAVANNAH, GA.**—The City & Suburban Railway Company, it is said, will equip the lines between Sandy and Montgomery with electricity.

**ATLANTA, GA.**—D. H. Livermore has interested northern capital in the Atlanta Electric Railway with a view to its extension to the business part of the city.

### Iowa.

**MASON CITY, IA.**—The Mason City & Clear Lake Traction Company has placed its line in operation.

**DUBUQUE, IA.**—Mayor Dufy has signed the ordinance extending the franchise of the Dubuque Street Railway to 1918.

### Illinois.

**FREERPORT, ILL.**—Citizens offer to aid the Freeport General Electric Company to extend the car line to South Freeport.

**WAUKEGAN, ILL.**—Work has begun on the extension of the Bluff City Electric Street Railway to Evanston. Ground has been broken at Wilmette.

**EAST ST. LOUIS, ILL.**—The East St. Louis Electric Street Railway Company on July 16 petitioned the city council for franchises to build lines running north and east.

**EAST ST. LOUIS, ILL.**—The Belleville & St. Louis Electric Railway Company is buying right of way. The stockholders are Edward Abend, Sr., Paul W. Abt, John A. Day, George J. Kobusch, Judge H. S. Priest, A. M. Meintz and Charles Sutter.

**EAST ST. LOUIS, ILL.**—Within six months the extension of the East St. Louis Electric Street Railway to Gross Park and the city limits will be completed. Surveyors are now at work on this line and when through with it, will survey other lines which will be extended later.

**EAST ST. LOUIS, ILL.**—The East St. Louis & Belleville Electric Railway Company has been incorporated to build between the two cities. Capital stock, \$50,000; incorporators, John A. Day, Belleville; Charles Sutter, St. Louis; Paul W. Abt, Albert M. Meints and E. C. Rhoads, East St. Louis.

**JOLIET, ILL.**—The recently incorporated Kankakee, Wilmington & Morris Electric Railway Company has elected J. A. Henry of Joliet, president, Thomas J. Divens of Chicago, vice-president, and John Hulsizer of Joliet, secretary and treasurer. No time has been set for construction to begin, this depending largely upon the subscriptions of landowners.

**LAKE FOREST, ILL.**—The first 50-year franchise in Illinois was granted July 23 by the Lake Forest council to the Bluff City Electric Street Railway of Waukegan, in which C. E. Loss, the railway builder is interested. The company pays \$10,000 cash or \$15,000 bonds, and will pave the right of way. Immediately the company will build to Highland Park, and next spring to North Evanston, thus giving a continuous ride of 36 miles along the north shore.

### Indiana.

**INDIANAPOLIS, IND.**—The suit of Knight & Jilson to have a receiver appointed for the Indianapolis & Broad Ripple Rapid Transit Company has been dismissed, their claim having been paid.

**CRAWFORDSVILLE, IND.**—It is said several capitalists are interested in a scheme to construct an electric railway from Crawfordsville to the Shades of Death.

**MARION, IND.**—The Indianapolis, Anderson & Marion Electric Railway Company has canceled its contract with Mr. Enricht of Chicago for the construction of the line, and is now considering propositions from other contractors. At a recent meeting in the office of Judge T. L. Sullivan at Indianapolis the following directors were elected. Frank A. Maus, Noah Clodfelter, D. J. Sullivan and Mr. Pearson of Alexandria.

**HAMMOND, IND.**—The council has granted a 30-year franchise for a street railway in the two principal streets, to a number of Chicago and Crown Point capitalists. The line will form part of one 25 miles in length and will connect with Cedar Lake, Crown Point, Griffith and Highlands. Passengers, freight and express packages will be carried on hourly trains. Among those interested are Lamb D. Wold, John Brown, John G. Strabel, Robert P. Bates and Malcom T. Hart.

**INDIANAPOLIS, IND.**—Suit for attachment has been brought against the Indianapolis, Anderson & Marion Electric Railway Company by the F. C. Austin Manufacturing Company of Chicago. Plaintiff sold to Cochran & Ross, who are grading the road, a leveling machine and were given an order on the company for \$1,050, which was accepted by Louis Enricht, the general contractor. It is alleged the account has never been paid and judgment is asked against the railroad company and Mr. Enricht.

### Kansas.

**GALENA, KAN.**—The electric railway people have engaged J. B. Hodgdon to make a survey of their proposed line between Galena and Baxter Springs.

**WICHITA, KAN.**—The Wichita Street Railway & Power Company has transferred its lines to the Wichita Street Railway Company, recently organized by a Boston syndicate headed by William F. Ellis, of Boston.

**LEAVENWORTH, KAN.**—Willard E. Winner, of Lausing, has applied to the county commissioners for a franchise to build an electric road between Lansing and Leavenworth. It is said that Mr. Winner has already obtained the necessary capital.

**LEAVENWORTH, KAN.**—When the matter of granting a right of way to the Winner Electric Railway came up before the county board, Attorneys Kelso and Van Tuyl asked that the matter be postponed until the August meeting stating, that they represented parties who would ask for a franchise to build an electric railway from Kansas City, Mo., through Lansing to Leavenworth, Atchinson and probably St. Joseph.

### Kentucky.

**PADUCAH, KY.**—A consolidation of the People's with the Paducah Street Railway is being negotiated.

**LOUISVILLE, KY.**—The Louisville Street Railway Company's plan to raise \$250,000 by the conversion of 5,000 shares of common into preferred stock has been successful.

### Maine.

**WATERVILLE, ME.**—The reorganization of the Waterville & Fairfield Electric Railway & Light Company is progressing. W. D. Spaulding of Boston, representing bondholders and I. C. Libby of Waterville, will each advance \$20,000 for the contemplated improvements.

**LEWISTON, ME.**—A syndicate of Maine capitalists has purchased a controlling interest in the bonds of the Lewiston & Auburn Railroad Company. The railroad will be reorganized. It is said that 81 miles of extensions will be built with Lewiston as the center, including lines to Brunswick, Bath, Turner and Sabattus.

### Maryland.

**HAGERSTOWN, MD.**—Baltimore capitalists, it is said, will construct an electric road between the various resorts in the vicinity of Penmar. A surveying party is working between Penmar and Waynesboro.

### Massachusetts.

**MILFORD, MASS.**—It is said the Milford Street Railway Company will not build.

**FALL RIVER, MASS.**—The Globe Street Railway petition for an extension in Thompson and Brownell streets was heard July 19.

**WORCESTER, MASS.**—The petition of the Worcester & Clinton Street Railway Company for an extension through Clinton was heard August 4.

**BOSTON, MASS.**—The Boston Elevated Railroad Company has asked the state railroad commissioners to approve an issue of \$15,000,000 capital stock.

**BEVERLY, MASS.**—It is said that President Fergus, of the Gloucester, Essex & Beverly Street Railway plans a branch line four miles in length from Essex to Manchester.

**BROCKTON, MASS.**—The work on the Taunton end of the Taunton & Brockton Street Railway Company's line, which was delayed owing to the non-arrival of rails, has been resumed.

**FRAMINGHAM, MASS.**—The Framingham Union Street Railway, which for ten years has been operated by horse power, has just been equipped in its central division with four electric cars.

**BROCKTON, MASS.**—The state railroad commission has granted the Taunton & Brockton Street Railway Company permission to issue \$100,000 of bonds, and to cross the Consolidated Company's tracks at South Easton.

**BRIDGEWATER, MASS.**—H. Fisher Eldredge, John M. Stetson, N. F. Ryder and others have incorporated the Bridgewater & Middleboro Street Railway Company to build an electric line between the two cities.

FALL RIVER, MASS.—The project to build an electric road from Fall River through Swansea and Warren to connect with the contemplated extension of the Union Street Railway of Providence has been revived.

MANSFIELD, MASS.—E. D. Hewins of Boston is treasurer of the Norton & Attleboro Street Railway Company, recently incorporated to build 5.5 miles of electric road between Norton and Attleboro. Capital stock, \$40,000.

BRAINTREE, MASS.—The railroad commissioners have authorized the purchase of the Randolph Street Railway by the Braintree Company. For this purpose the latter is authorized to issue \$35,000 additional capital stock to be exchanged for stock of the former.

BOSTON, MASS.—The Boston Elevated Railroad Company has been authorized to issue \$10,000,000 of capital stock. Engineer Kimball estimates the cost of constructing ten miles of road at \$3,000,000. His estimates includes 53 motor cars at \$10,000 each and 144 trailers at \$3,000 each.

MANSFIELD, MASS.—A company has been formed to build ten miles of electric road to Easton. The directors are David E. Harding of Mansfield, Lemuel K. Wilbur of Easton, Douglas A. Brooks of Braintree, Edward D. Hewins of Boston, Josiah F. Gaward of North Easton, Franklin Mead of Norton and George H. Swazey of Malden.

WORCESTER, MASS.—The Worcester & Blackstone Street Railroad Company has been formally organized with the election of M. J. Whittall of Boston, as president; Alfred Thomas, vice-president, and Willard E. Ballou, clerk. The officers will operate the road themselves, the talked of consolidation with the Worcester & Suburban being improbable.

PITTSFIELD, MASS.—The Peck Manufacturing Company has had a survey made for an extension of the Pittsfield Street Railway in Peck's road. R. D. Gillette, of the Peck Company, is himself engaged in the street railway business at Westfield, and is so confident that the extension would prove a paying investment that his company will take enough stock in the railroad to build the new line. Rumor has it that other interests are figuring on building an electric road over some of the most important streets in the city.

## Michigan.

JACKSON, MICH.—An electric railway is projected from Jackson to Howell, via Dansville.

ADRIAN, MICH.—The sale of the Adrian Street Railway has been continued for 60 days, the court not approving the ridiculously low bid of \$3,000 made by H. R. Clark.

SAGINAW, MICH.—The receivers of the Union Street Railway have been authorized to issue \$35,000 of certificates, of which \$4,000 will be expended for necessary repairs.

FLINT, MICH.—Flint capitalists have decided to raise \$50,000 to build 16 miles of electric railway to Long Lake and Fenton. George H. Johnson of New York, promises \$150,000 of eastern capital.

PAW PAW, MICH.—Mr. Patterson of Benton Harbor and Mr. Fifield of Chicago are about to purchase the franchises of the proposed S. H. & E. Electric Railway. Citizens have been asked to subscribe \$10,000 toward building the road.

DETROIT, MICH.—Citizens of Utica are enthusiastically in favor of the proposed electric railway from Detroit to Romeo via Center line, Warren, Utica, Disco and Washington, which is being promoted by Fred Blakeley, of Detroit, on behalf of Pack and Everett.

SAGINAW, MICH.—Receivers Loring and Morley, for the bondholders, have taken possession of the Union Street Railway. After standing still a week the cars have been placed in operation. The settlement has been secured by the bondholders paying the \$17,000 due the city.

SAGINAW, MICH.—On receipt of the supreme court decision sustaining the revocation of the Union Street Railway franchise, the city

ran a 20-ton road roller on the track in front of the car house, thus stopping operation. The council then prepared a new franchise to be sold to the highest bidder, but was enjoined from proceeding by the circuit court on petition of the bondholders.

BENTON HARBOR, MICH.—Judge Coolidge has dissolved the injunction issued upon application of Vice-president Deam against other directors of the Benton Harbor Electric Railroad. The decision declares that the 5,500 shares of stock which were divided among the directors were null and void. The court also ordered Deam to at once open the safe of the company, the combination to which he is alleged to have changed and to deliver over to the company's secretary all the books and papers belonging to the company. There are now but 800 shares of stock out, the original amount issued. The stock book shows that they are held 100 shares each by the following eight persons, H. D. Deam, John L. Deam, A. H. Deam, John S. Moats, John W. Hamilton, Charles G. Davies and H. W. Griswold. It is intimated that some of the stock above mentioned has been sold by the original holders and that the defendants in the case now have a majority of the stock of the company. The court also held the 500 shares alleged to have been issued to H. D. Deam for past services were illegally issued and that they were worthless. Arrangements will be made at once to resume work on the road.

## Minnesota.

MANKATO, MINN.—Hankson Taylor of St. Paul is investigating the possibilities of constructing an electric railway in Mankato. Capitalists of St. Paul are interested.

ST. CLOUD, MINN.—Local bondholders, representing \$16,500 have accepted the terms of the eastern bondholders, who now own all the stock. The line will be improved from one end to the other with a view to placing it on a paying basis. It will be taken out of the receiver's hands as soon as necessary arrangements can be made. The eastern bondholders have settled the claim of Receiver C. S. Benson of the Water, Light & Power Company, for \$4,000 for power, also a claim of \$2,500 for personal injury.

## Mississippi.

JACKSON, MISS.—With regard to the new electric railroad Robert E. McKisson, mayor of Cleveland, O., says: "The city council of Jackson granted a franchise to the Jackson Railroad & Light Company, to construct and operate an electric railway over five miles of streets, and to build and operate an electric light and gas plant. The company is capitalized at \$250,000, and C. W. Howard, a wealthy citizen of Chattanooga, Tenn., is the chief holder. I do not own any of the stock, but am interested as a promoter of the enterprise. I went down there to get the matter through the council, and succeeded admirably. The city of Jackson has a lighting contract which expires in 1899, so that we will not have to hurry in establishing our plant, but the street railway has to be commenced right away. The company may sell its rights to some one else after a while."

## Missouri.

JOPLIN, MO.—The city council is asked to grant an electric railway franchise.

ST. LOUIS, MO.—The sale of the Fourth Street & Arsenal Railroad to Albert Arnstein for \$70,050 will be set aside by Judge Flitcraft.

KANSAS CITY, MO.—The Supreme Court has affirmed the ruling of Judge Slover in annulling the franchise of the East Fifth Street Railway Company. The line has not been operated for three years.

ST. LOUIS, MO.—The St. Louis Railroad Company asks the council for right to extend the Broadway cable road to the south, and for permission to install electricity in place of the rope. The Southern Electric road views this proposition with disfavor, as it would be an invasion of its territory.

KANSAS CITY, MO.—The Kansas City & Leavenworth Traction Company has been incorporated to build a great interurban electric railroad. Capital stock, \$250,000; incorporators, F. D. Hutchings, James F. Getty, C. F. Hutchings and Benjamin Schierle, of Kansas City, and W. F. Street, of New York.



ST. LOUIS, Mo.—Receiver Green, of the Fourth Street & Arsenal Railroad, has been discharged by Judge Flitcraft. The sale of the road has been set aside, and the road placed in the same position it was in before the receivership proceedings were brought, excepting that \$5,000, which was put up by the road's backers, was applied to pay debts.

ST. LOUIS, MO.—The North & South Railway Company has been granted a franchise to build 32 miles of electric road in the heart of the city. Construction must begin within six months and be completed within two years. The incorporators of the company are John H. Blessing, John H. Overall, F. F. Barada, John A. Holmes, T. H. Rockwood and G. Becker.

### Nebraska.

LINCOLN, NEB.—M. L. Scudder of New York, and Judge Belcher of New London, Conn., representing bondholders, are in Lincoln to investigate closely the Lincoln Street Railway, with a view to taking the road out of the hands of Receiver B. D. Slaughter, who has made a good record during his two years of management. When reorganized an extension will probably be built to Havelock.

### Nevada.

RENO, NEV.—W. G. Caffrey and associates contemplate constructing an electric railway to carry ore from Olinghouse canyon to the river. Afterward they may put in a line from the Adelaide copper mines to the concentrator at Golconda.

### New Hampshire.

EXETER, N. H.—The new Exeter Electric Street Railway has been placed in operation. The road is 12 miles long.

### New Jersey.

PLAINFIELD, N. J.—The trolley extension up Watchung Mountain has been abandoned owing to the refusal of two property owners to give their consent.

ENGLEWOOD, N. J.—Mayor Currie has signed the ordinance granting the trolley company right of way on Palisade avenue. The company will now apply for the right to cross the Northern Railroad at grade.

HACKENSACK, N. J.—The Hackensack & Passaic Railroad Company has been organized to build from Passaic to Garfield and Lodi to connect with the Union Traction Company's line in Hackensack. Among those interested are W. P. Standish, of Hackensack; J. H. Hertzberger, of New York, and Mr. Smith, of Jersey City.

### New York.

NEW YORK, N. Y.—Rumor has it that a project is on foot to grid-iron the whole of Westchester county with trolley lines.

ALBANY, N. Y.—The new electric railway connecting the Albany Railway and the Cohoes City Railway has been placed in operation.

NEW YORK, N. Y.—Plans for a 3-story power house on 1st avenue have been filed by the Metropolitan Street Railway Company. It will cost \$350,000.

OLEAN, N. Y.—The state railroad commissioners have approved an increase in the capital stock of the Olean Street Railway from \$16,000 to \$300,000.

ONEONTA, N. Y.—The application of the Oneonta Street Railroad for permission to build a line on Maple street has been granted by the state railroad commission.

NEW YORK, N. Y.—The Metropolitan Street Railway sale of \$2,000,000 5 per cent bonds was enormously oversubscribed, investors having offered to buy \$50,000,000.

LONG ISLAND, CITY, N. Y.—Citizens of Whitestone have united in an effort to secure an extension of the Steinway Electric Railway from College Point to their village.

CORTLAND, N. Y.—The judgment for \$298 in favor of Anna V. Ray having been satisfied, the sheriff has released the coal supply and rolling stock of the Cortland & Homer Traction Company.

ONEONTA, N. Y.—The application of the Oneonta Street Railway Company for permission to change its motive power from horse to electricity has been granted by the state railroad commissioners.

OLEAN, N. Y.—A movement is on foot to extend the Olean, Rock City & Bradford Electric Railroad, now running to Rock City, to Duke Centre from Red Rock, or to traverse the old Kendall and Eldred narrow gage route.

BUFFALO, N. Y.—The counsel and president of the Buffalo & Depew Railroad Company have agreed with the village of Depew to accept some minor changes in the franchise. As soon as all consents are obtained construction will begin.

SYRACUSE, N. Y.—Seventeen acres of land has been purchased by the Syracuse & Suburban Railway, on which it is said water power will be developed. The Syracuse Rapid Transit Company has applied for a franchise for ten miles of track.

SYRACUSE, N. Y.—The ordinance granting a franchise to the Onondaga Lake Railroad Company has been signed by Mayor McGuire. Two per cent of the gross receipts must be paid into the city treasury, and the road must be completed before October 1, 1898.

PATHOGUE, N. Y.—No action has been taken by the Patchogue & Port Jefferson Traction Company on the franchise recently granted by the Patchogue village trustees. Its restrictive conditions militate against its acceptance, but nothing will be done until the return of President Bailey from Europe in September.

OSWEGO, N. Y.—C. Sidney Shepard, Robert Maclay and Max B. Richardson have called on the bondholders of the Oswego Street Railway to deposit their bonds before July 27. If a majority of them do so the road will be taken out of Receiver Tiddman's hands, properly equipped and run on business principles.

BUFFALO, N. Y.—The report that a receiver would be asked for the Tonawanda Street Railroad is denied by Treasurer John A. Read. The Buffalo Traction Company has let the contract for the erection of its car house to Henry Rummell, Jr., & Co. Forty carloads of rails were received July 9 by the Traction Company.

PENN YAN, N. Y.—Prospects are that the Savona Valley & Lake Keuka Electric Railroad route will be modified by making Penn Yan the terminus in place of Keuka, as was first proposed. John Zimmerman of Bradford, and Frank Plaisted, of Wayne, are getting right of way over the abandoned Corning and Sodus bay road from Keuka to Penn Yan. An extension from Savona to Bath is also being considered.

CANANDAIGUA, N. Y.—The Canandaigua Electric Light & Street Railroad Company and the Canandaigua Gas Company have been reorganized by the election of new officers. The electric company elected: president, Thomas H. Feary; secretary and treasurer, H. B. Ferguson; general manager, John H. Finney. Directors, Thomas H. Feary, J. H. Pardee, Mr. Root and J. H. Finney. C. S. Purdy was elected superintendent.

NEWBURGH, N. Y.—A consolidation of the Newburgh Electric Railway, Walden & Orange Lake Railroad and Newburgh and Orange Lake Railroad has been closed by the incorporation of the Newburgh Electric Railway Company, under which name the three lines will be operated. Capital stock, \$150,000; directors, Benjamin Norton, of New York; Silas B. Dutcher, William H. Pouch, Alfred J. Pouch, Frederick H. Pouch, Alden S. Swan, William M. Tobias and S. Stewart Whitehouse, of Brooklyn, and Charles N. Finch, of Summit, N. J.

COXSACKIE, N. Y.—T. E. Smith of New York is the principal stockholder in four electric railway companies which have just been incorporated. Other stockholders are W. G. Raines, W. F. Leland, W. F. Smith, M. E. Ingersoll, P. Anderson, E. Richter and Albert A. Lawson of New York, and George C. Spencer of Chicago. These com-

panies will operate in connection with the Greene County Traction Company. The Cossackie & Greenville Traction Company, with \$150,000 capital stock, will build 12 miles of road to Greenville and Durham. The Oak Hill Traction Company, with \$250,000 capital stock, will build 20 miles of road to Oak Hill, Conesville, Cooksburg, Rensselaerville, East Durham and Cairo. The Windham Traction Company, with \$250,000 capital stock, will build 20 miles of road from Durham to Conesville, Manor Hill, Windham, Ashland, Harrisonville and East Windham. The Middletown & Oak Hill Traction Company, with \$300,000 capital stock, will construct 25 miles of line in Greene, Albany and Schoharie Counties, from Rensselaerville through Broome and Middleburg.

## North Carolina.

WILMINGTON, N. C.—The generator of the Wilmington Street Railway was burned out July 11 by a short circuit in the car house. Traffic was stopped for an hour and a half until the reserve machine could be connected.

## Ohio.

MANSFIELD, O.—The proposed line between Mansfield and Shelby is a steam and not an electric road.

CINCINNATI, O.—The Cincinnati & Miami Valley Traction Company has formally placed in operation its line between Middletown and Dayton.

YOUNGSTOWN, O.—R. G. Sykes confirms the report that the Mahoning Valley Street Railway and the Trumbull Electric Railway would be consolidated.

CLEVELAND, O.—Stockholders of the Cleveland & Lorain Electric Railway Company met August 11 to increase the capital stock from \$50,000 to \$1,000,000.

CANTON, O.—Engineer George P. Williams of Pittsburg has been employed by capitalists of that city to survey the proposed Canton Louisville & Alliance Street Railway.

COLUMBUS, O.—The Columbus & Buckeye Lake Traction Company will not build, the promoters alleging that the sale of their bonds was prevented by the influence of steam railroad rivals.

COLUMBUS, O.—Fenders will be attached to its cars by the Columbus Central Street Railway Company, the court having authorized the sale of \$3,000 of receiver's certificates for this purpose.

CLEVELAND, O.—The temporary injunction restraining the Cleveland Electric Railway Company from crossing the tracks of the Cleveland, Canton & Southern Railroad has been dissolved.

TOLEDO, O.—Rumor has it that the Toledo & Maumee Valley Railroad Company will lease and operate the Toledo, Bowling Green & Fremont Electric Railway, and subsequently extend to Waterville and Woodville.

DEFIANCE, O.—Receiver M. R. Fabin of the Defiance Light & Railway Company has been instructed by the court to operate the cars only at such times as receipts cover expenses. Accordingly operation was discontinued July 9.

DELAWARE, O.—The Delaware Electric Street Railway Company contemplates building an extension about one mile in length and will be in the market for track and line material. Quotations should be addressed to F. P. Welch, manager.

CHILLICOTHE, O. J. P. Myers, president of the Electric Street Railway, Light & Power Company, says that as soon as the council settles the matter of right of way the company will begin to lay ties and put in track for the line to Platt street and thence to Arch street. A number of improvements have been made at the power house.

NAPOLEON, O.—The Napoleon & Terrace Park Railroad Company has been incorporated to build a street railway from the main line of the Detroit & Lima Northern Railroad to Napoleon and Terrace Park. Capital stock, \$10,000; incorporators, E. M. Hiner, A. J. Richter, M. Donnelly, James W. Hanna and L. L. Oring.

COLUMBUS, O.—The county commissioners on July 30 hear the petition of the Buckeye Lake Electric Railway Company for a continuance of its franchise. When the franchise was extended last spring it was promised that construction would be in progress by July 1, but nothing has been done. However, it is said that Hon. Thomas J. Keating, attorney for the company, has recently succeeded in interesting outside capital.

DAYTON, O.—Fremont Hill and L. A. Scoville of Chicago have been over the route of the proposed Dayton & Western Traction line together with J. C. Feight, the promoter. The Dayton & Troy Traction Company is being organized to build from Dayton to Troy by way of Harrisburg, Union, West Miller, Ludlow Falls and Pleasant Hill. Among the incorporators are Galen C. Wise, A. G. Feight, W. H. Tomlinson, M. A. Nippen and F. M. Turner.

ASHLAND, O.—The New London & Loudonville Electric Railroad Company, which proposes to build, held a meeting at Ashland recently and elected H. A. Thomas, H. A. Mykrantz, J. R. Swartz, Ashland; G. F. Shelly, Loudonville; S. J. McCready, New London and Bert Hank and E. J. Best, Cleveland, directors. The following officers were elected: H. A. Thomas, president; H. A. Mykrantz, vice president; F. N. Patterson, secretary, and G. A. Ullman, treasurer.

EAST LIVERPOOL, O.—The East Liverpool, Fredericktown & Lisbon Railroad Company has been incorporated to build an electric line between East Liverpool and Lisbon. Capital stock, \$500,000; incorporators, G. A. Steinbrenner, Jonathan Head, S. H. Talles, F. H. Goff and Daniel Moynahan. The latter is a resident of Niles, O., and last spring sold his electric railway for \$90,000 to the Niles & Mineral Ridge Electric Railway Company. James L. Charters of Lisbon has been getting right of way with good success. At Fredericktown the company has bought an option on a site for a power house.

## Pennsylvania.

MCDONALD, PA.—The Carnegie & Cannonsburg Electric Railway Company is meeting with success in getting right of way.

POTTSTOWN, PA.—Engineers are laying out the extension of the Ringing Rocks Electric Railway to New Hanover, a distance of four miles.

TITUSVILLE, PA.—Construction of the Titusville Electric Street Railway is proceeding under the supervision of W. M. Jeffries of Warren.

PITTSBURG, PA.—Permission to extend its lines along Forbes street from Craig street to Joncaire has been granted the Consolidated Traction Company.

CHAMBERSBURG, PA.—Place, Smith & Miller, of the proposed trolley company, have presented a bond to the borough council to guarantee construction.

EASTON, PA.—Surveyors are staking out the route of the new Easton, Palmer & Bethlehem Electric Street Railway, the right of way having been secured.

CONNELLSVILLE, PA.—The Connellsville, New Haven & Leisening Street Railway Company contemplates important extensions to Vanderbilt and Uniontown.

CARLISLE, PA.—The council has passed an ordinance depriving the electric railway company of its franchise in Carlisle, alleging that the company has failed to fulfill its contract with the town.

WEST CLARION, PA.—James Bailey of Brockwayville is president of the West Clarion Railroad Company, just incorporated to build an electric line from Brockwayville to the West Clarion Mines. Capital stock, \$20,000.

READING, PA.—The Mohusville & Adamstown Passenger Railway Company has voted to change its motive power from steam to electricity. The electric current will be supplied by the Reading & Southwestern Railway Company.

BUTLER, PA.—The Butler Traction Company has been incorporated. Capital stock, \$50,000; incorporators, T. B. Clawson and J. D. Woodard, of Warren; M. W. Buvee and George Priestly, of Goodwill Hill, and Lucien Clawson, of Greensburg.

**MCKEESPORT, PA.**—The Allegheny Valley Electric Railway Company asks right of way through the boroughs of Versailles and Christy Park. Most of the right of way for the 18 miles between West Newton and McKeesport has been obtained.

**PHILADELPHIA, PA.**—The Pembroke Electric Railway Company has been incorporated with \$300,000 capital stock. Edward Thompson, of Philadelphia, is president. Other directors are Nathan Spring, Henry C. Ferry, E. D. Wadsworth, W. W. Webster and Henry C. Terry.

**DOYLESTOWN, PA.**—The project to build a trolley line from Doylestown to Willow Grove is dead. The terms exacted by the turnpike company were too hard, and the backers of the trolley company refused to make a cash deposit of \$2,000 as a guarantee that the line would be built within nine months.

**PITTSBURG, PA.**—McKeesport is proceeding against the Second Avenue Traction Company, to compel the adoption of fenders. A big electric railway scheme, with Greensburg as the center, is proposed by Judge Saddler and others. A line will be run from Greensburg to Latrobe, another to Mt. Pleasant, and one in all probability to Delmont, branching off near Manor, through Claridge and Harrison City to Bouquet.

**UNIONTOWN, PA.**—The Uniontown Street Railway, which was recently sold by the sheriff, has been reorganized as the Uniontown Electric Railway Company, with H. L. Robinson as president and R. F. Hopwood as secretary. An extension to Brownfield, three miles distant, at a cost of \$20,000, will be made very soon, R. F. Hopwood, George A. McCormick, Fred S. Chalfant and M. H. Bowman having been appointed a committee to let contracts.

**ALLEGHENY, PA.**—M. K. McMullin and others of Allegheny have incorporated three electric railway companies. One is the Greentree Electric Railway Company, with \$3,000 capital stock, which will build from the junction of Perrysville avenue and East street in Allegheny to the Ross township line. The second is the Northern Electric Railway Company, with \$24,000 capital stock, which will build four miles of road from a point in Ross township to Perrysville. The third is the Ross Electric Street Railway Company, with \$4,500 capital stock, to construct a line on the Perrysville plank road.

### South Carolina.

**CHARLESTON, S. C.**—An extension to Chicora Park is being constructed by the City Railway Company, which has obtained a lease of a part of that resort.

### Tennessee.

**KNOXVILLE, TENN.**—Fenders will be required on all cars after the passage of the ordinance in the council, which has already had a second reading.

### Texas.

**YOAKUM, TEX.**—A franchise to build an electric street railway has been granted to M. G. Ramsey & Co.

**WACO, TEX.**—Application has been made for a new receiver for the Waco Electric Light & Railway Company, the court of appeals having entered an order which, it is claimed, invalidates orders heretofore made respecting the property.

### Vermont.

**BARRE, VT.**—It is expected that cars will be running September 1 on the new Barre & Montpelier Electric Railway. Work is being pushed by the contractors, Ferguson & Richardson of Boston.

### Virginia.

**MANCHESTER, VA.**—John C. Robertson and associates have received a franchise to build an electric road in Manchester to connect with the lines of the Richmond Railway & Electric Company.

### Washington.

**TACOMA, WASH.**—The Tacoma Railway power house was wrecked July 12 by the bursting of a 40-ton flywheel. The breakage of the connecting rod operating the governor caused the engine to race. Traffic was stopped on all but two lines.

**WATERVILLE, WASH.**—It is said that J. W. Mathews and R. S. Steiner are considering the construction of an electric road costing \$250,000, from Waterville to Wenatchee.

### Wisconsin.

**EAU CLAIRE, WIS.**—Attorney T. F. Frawley has accepted the franchise on behalf of the Chippewa Valley Street Railway Company.

**STEVENS POINT, WIS.**—The Stevens Point Lighting Company has given up the proposition to build a street railway, surrendering the franchise.

**APPLETON, WIS.**—The city council of Appleton has passed the ordinance permitting the Fox River Valley Electric Railway Company to build its road through the city.

**RACINE, WIS.**—Receiver Hiram J. Smith sold the Belle City Street Railway July 19, to Frank H. Miller, representing bondholders, who will reorganize the property with Jackson I. Case as manager.

**RACINE, WIS.**—The Belle City Electric Company has been incorporated to carry out the reorganization of the street railway as outlined in these columns. Capital stock, \$200,000; incorporators, Thomas M. Kearney, E. J. Hueffner, G. N. Fratt, Frank J. Miller and Jackson I. Case.

**CHIPPewa FALLS, WIS.**—A franchise has been granted the Chippewa Valley Street Railway Company to build and operate a street car line in the city. This means the construction of an inter-urban line to Eau Claire. Work must be begun within 90 days and cars must be running within a year.

**MILWAUKEE, WIS.**—The Milwaukee Traction Company has been incorporated to build, maintain and operate street railways in Milwaukee. Capital stock, \$2,500,000; incorporators, John W. Wegner, George W. Wilson and Robert O. Betz. The same parties are interested in the Milwaukee & Waukesha Electric Railway project.

**OSHKOSH, WIS.**—The Citizens Traction Company has accepted its additional franchises. J. K. Tillotson says the Citizens Company will build from Neenah to Oshkosh to connect with the line which Henry C. Payne and others are about to build. For the latter enterprise, H. D. Smith of Appleton, has deposited \$1,500 to guarantee the replacing of pavement.

**MILWAUKEE, WIS.**—Another snag looms up before the Milwaukee & Waukesha Electric Railway promoters, in a suit brought by Stutley I. Henderson, a stockholder, who is friendly to the Milwaukee Electric Railway & Light Company, for the appointment of a receiver to wind up the affairs of the company and to restrain the sale of the franchise to the Milwaukee Traction Company.

**MILWAUKEE, WIS.**—The Milwaukee Electric Railway & Light Company closed a deal July 8 whereby it acquired a site for the proposed addition to its power house. This will supply the power required to operate the new line to Waukesha, the line to Whitefish Bay and perhaps the lines to Wauwatosa and North Greenfield. For its line to North Greenfield the company has acquired the right of way held by S. I. Henderson.

**NEENAH, WIS.**—The Fox River Valley Electric Railway Company has been incorporated to build and maintain a line between Menasha, Neenah, Kaukauna and Appleton. Capital stock, \$200,000, which will be given to the contractors. Among those interested are: Henry C. Payne, president; C. W. Collister of Cleveland vice-president; H. D. Smith of Appleton, treasurer; J. J. Hogan of Cleveland, secretary; Henry C. Payne and Charles Pfister of Milwaukee, H. D. Smith of Appleton, M. J. Dregon and C. W. Collister of Cleveland, William Christy, B. K. Miller, Jr., and Frank G. Bigelow.

### Canada

**WINDSOR, ONT.**—Sandwich has finally granted a franchise to the Windsor, Amherstburg & Lake Erie Electric Railway Company. The city of Windsor will be asked to grant right of way.

**WINDSOR, ONT.**—The Windsor, Amherstburg & Lake Erie Railway has brought action against the Sandwich, Windsor & Amherstburg Electric Railway to prevent the extension of the latter to the town limits.



## NO DAMAGES FOR STREET IMPROVEMENT.

The city of Philadelphia has been successful in the suit brought by Ridge Avenue Passenger Railway Company for \$100,000 damages resulting from interruption of traffic while street improvements were being made. The litigation has been in progress for 22 years and all the original counsel in the case are now dead. For a period of four years the improvements of Ridge avenue were being made and the railway company claimed it had suffered great loss during this time.

The supreme court of Pennsylvania sustains the contentions of the city for the most part. A conclusion is reached that much obstruction of public travel by private vehicles and cars had occurred as the result of the work done under the various contracts. The justice was of the opinion that the evidence failed to show any negligence of the city clearly occasioning damage to the company. It was to be inferred, he stated, that the city deemed a long-continued prosecution of the work by many contracts in succession as less injurious

## STREET RAILWAYS IN SYDNEY, N. S. W.

H. McLachlan, secretary of the Board of Railway Commissioners of New South Wales, advises us concerning the street railways of Sydney and Newcastle as follows:

The street tramways in Sydney and Newcastle are under control of the Railway Commissioners. At the present time three systems of traction are in operation, viz., steam, 54 miles; cable, 5 miles and electric (overhead trolley), 3½ miles.

The lines were first equipped with steam power in 1879, and at that time cable or electric traction was practically unknown. Since then, however, lines have been built to be operated by cable and electricity, and the Commissioners are so satisfied with the merits of the overhead electric wire system that it has been decided to build an important line through the principal streets of the city and to work such line by electricity. It has also been decided that the existing city lines which are worked by steam power are to be altered and made suitable for the overhead-wire electric system. The existing cable lines will be continued.

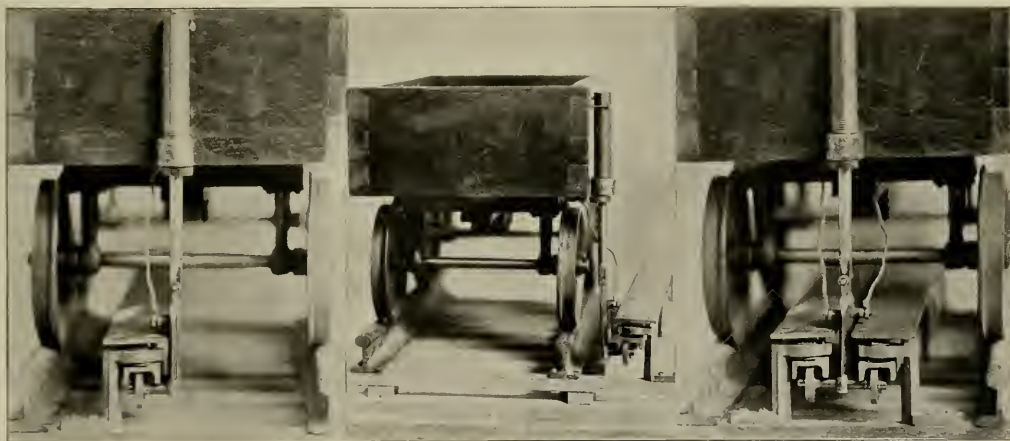


FIG. 1.

FIG. 2.

FIG. 3.


to the public interests than a performance of the entire work at one time. This would have completely stopped travel for a short while. The opinion of the court decides positively that the railway company had no greater rights against interruption in course of highway improvements than any other person, private or corporate, using the road.

It is clear that the city had authority to grade and improve this street. In doing this it had the right to adopt such a method of allotting and carrying out the work as to it seemed best. For the damage resulting to the public, because of the necessary interruption to travel during the progress of the work under the plans adopted, it is not answerable to one of the public, unless the complainant shows a damage different in kind and peculiar to himself. The damage here shown by plaintiff, though probably different in degree than that sustained by any other persons, was of the same kind as suffered by the general public using the street.

## A THIRD RAIL SYSTEM.

The accompanying illustrations show the essential features of a third and fourth rail system which was invented by Benson Bidwell, of Chicago. In Fig. 1 the conductor is between the rails, supported by Z-shaped iron arms which are bolted to the ties at suitable intervals. The conductor is of channel section laid with the flanges down so that sleet and ice will not reach the contact surface. The trolley is supported by a spiral spring inside the vertical pipe and this gives flexibility vertically. The lower part of the trolley arm is pivoted so as to permit a lateral motion. Fig. 2 shows the conductor outside the track. In Fig. 3 the four rail system is represented, which is the same in design as the other except that it provides for a return circuit independent of the track.

The West Chicago road has armed the crews on its "hold-up" lines.



# 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 Engineering Magazine, in its August review of the British Press, calls attention to an alleged misuse of the expression "transmission of power." The distinction drawn is that a trolley wire or a steam pipe transmits energy, in the one case electrical energy from the central station to the car and in the other heat energy from the boiler to the engine, while a rope drive, a belt or a shaft transmits power. To reach this conclusion power is said to be "work quantitatively expressed in units performed in a specified time," which is a more complicated statement of the technical definition of power as the rate of doing work. It is said: "A trolley wire conveys energy, not power, from the power house to the motor of an electric car. The energy thus conveyed performs no work, except in overcoming the resistance of the wire, till it reaches the motor, wherein it is converted into power, which is expended in the performance of work." In other words it is converted into the rate of doing work (rate is an abstract thing) which is expended in the performance of work." It is not apparent to us why a belt may properly transmit the "rate of doing work" and a trolley wire be denied the same privilege, as is the contention of the Engineering Magazine. If power is used in its general and non-technical sense it is defined as "capacity for action or performance or for producing an effect" and does not differ from energy, "capacity for performing work," if we admit that work is an "effect." As is well said, if we are to agree in thought we must agree upon the symbols of language used to express thought. This is true but we think that there is little use in objecting to the use of power in its popular and non-technical sense when no confusion can arise therefrom.

\* \* \*

Black smoke is annoying but the loss due to the presence of the carbon which makes it black is very slight; a little carbon will discolor a large volume of gas as a single drop of ink discolors a tumbler of water. When much black smoke is produced it is indicative of a loss; but the loss is due to the escape of unburned invisible gasses, hydrocarbons and carbon monoxide. Conditions favorable to the complete combustion of these gasses are also favorable to the production of but little smoke. The best smoke preventer is a good fireman; a poor one will make smoke under any circumstances.

In discussing smoke nuisance before the Franklin Institute, Jay M. Witham states that in order to get good combustion, and hence not to form smoke, it is important to secure:

A grate with 40 to 70 per cent air openings.

A draft strong enough to produce an active combustion, i. e., not a sluggish fire.

A high furnace temperature.

A roomy furnace, so that the gases may linger and have time for burning before traversing much of the heating surface of the boiler.

To feed the fuel regularly, as with a mechanical stoker, or lightly and at short intervals by hand firing.

To thoroughly understand the fuel to be burned.

As to the cost of preventing smoke, he says: It is not necessary to expend a large sum in installation in order to burn fuel with but trifling smoke formation. In hand-firing ordinary furnaces and ordinary boilers, but little smoke will be formed if the furnace be coaled lightly, through alternate doors. In this way but a part of the fire is covered at one time and the gases and air are heated by the remainder. The fire should not be sliced or broken up until the coking is effected. Openings in the front of the furnace, varying with the rate of combustion from  $\frac{1}{2}$  to 2 sq. in. per sq. ft. of grate surface area, are a decided advantage, while but little gain results by the use of a split bridge.

In horizontal tubular boiler settings no special advantage results from the use of a refractory coking arch over the front of the grate, but its presence is desirable for a volatile coal burned under a water tubular boiler. When such an arch is used, of course the coal should be coked in front and then spread, the fires being from 10 to 14 in. thick in front and from 4 to 8 in. thick behind. With mechanical stokers the period of smoke formation need never be long, if they are properly handled. Such devices are, however, costly in installation and repairs, the first cost being from \$25 to \$40 per sq. ft. of grate and the repairs often amounting to from \$5 to \$10 per sq. ft. per annum.

William M. Barr, in the same discussion, which was with special reference to the prevention of smoke in Philadelphia, thinks the thing most to be feared in that city is that changed conditions may bring about a change in the fuel commonly burned. A large number of the boiler plants, and especially the newer ones, have been installed for the use of anthracite coal and the grates are for the most part not more than 24 in. below the boilers, which distance for that coal yields good results but is too small for bituminous coals. Bituminous coals vary in the amount of smoke produced, and the grates may be placed closer to the boiler with the more smokeless ones; 40 in. is recommended as the minimum and a furnace height of 48 in. has been found to give excellent results with unusually smoky coals.

\* \* \*

The cost of steam power depends upon so many conditions and varies to such an extent with them, that any figures as to the average cost must be misleading unless examined with all the limiting conditions in view, and applied to individual cases by one with considerable experience. The tables of costs of which those of Dr. Emery are perhaps the most widely known, are careful estimates for rather large units operating under a nearly constant load. That is to say we already have data sufficient to tell what it should cost to furnish steam power in a given amount; but in commercial plants the power required must also be esti-

mated and provision made for future needs as the business expands, and the result is that the power is not generated under the conditions assumed when making preliminary estimates.

This subject is discussed by Horatio A. Foster in a paper read before the American Institute of Electrical Engineers and data are given from tests upon 22 steam plants of different capacity and operated under widely varying conditions. The rated capacity of the plants tested varied from 40 h. p. to 2,500 h. p., the number of hours per day from 3 to 24, and the cost of fuel from \$1.45 to \$3.35 per short ton. As might have been expected it was found that the costs, even when reduced to a uniform price for coal, varied so greatly that no comparisons could be made except in the case of large compound condensing engines. The cost, including fixed charges, for the four plants of this type tested by Mr. Foster was from .634 to 1.136 cents per h. p. per hour. For three of them, however, the average is .723 cent, the higher cost in the one case being due to the low ratio of output to capacity.

The costs per h. p. for 3,050-hour power generated by compound condensing engines as determined by Mr. Foster and the estimates by various engineers may be summed up as in the table below. All the figures are for coal at \$3 per short ton and include the fixed charges on the plant.

|                                                     |         |
|-----------------------------------------------------|---------|
| Foster—1,346 h. p.....                              | \$37.17 |
| Foster—three plants—926; 1,272 and 1,011 h. p. Av., | 21.78   |
| Emery—556 h. p.....                                 | 23.82   |
| Emery—250 h. p.....                                 | 26.36   |
| Weber—1,050.....                                    | 19.93   |
| Weber—650 h. p.....                                 | 22.46   |
| Hale.....                                           | 16.96   |
| Main—1,000.....                                     | 19.76   |

The three plants reported by Foster were grouped together and the costs averaged because the ratio of output to rated capacity for these was from 84 to 98 per cent and for the other test quoted only 54 per cent. Even eliminating this test the variation between estimates amounts to nearly 50 per cent.

F. P. Sheldon gives in the Engineering Record the cost of power in several textile mills in New England as much below the lowest of these figures. The engines were compound condensing, using steam at about 125 lbs. pressure, and of from 1,000 to 1,200 h. p. The load was steady 10 hours per day for 307 days per year. The costs are stated to be from the accounts kept by the mill owners and include fixed charges. The highest cost per h. p. per annum (3,070 hours) was \$14.85 in a plant using coal at \$3 per long ton, and the lowest \$11.64 in a plant using coal costing \$1.76.

\* \* \*

The most satisfactory unit for rating the performance of a power plant has been much discussed of late and while not always so stated the question is: Is a commercial or an abstract unit preferable?

For an abstract unit the heat units per horse-power-hour or per kilowatt-hour has been proposed. The heat unit basis is called abstract because the statement of performance is in terms of so much useful work for so much heat expended, and the ratio when reduced to similar units is the efficiency of the plant. This is most admirably suited for measuring engine performance especially in an electrical plant, as it is a very easy matter to run the feed water through a meter, take its temperature and read the steam gages and wattme-

ters and therefrom the heat units per unit of work done. When it is attempted to extend this to the boiler plant the question: How many heat units in a pound of coal? presents itself. A coal calorimeter may be used to determine this but cases are on record where independent determinations on the same coal, both made by competent chemists, have differed as much as 15 per cent. The most common way, at the present time, of stating performance is in pounds of coal per unit of work, which leaves much to be desired.

To us it appears that the best basis is what may be termed a purely commercial one of cost per horse-power-hour or per kilowatt-hour, the cost to include fixed charges on the plant. This for the reason that the evaporation per pound of coal or the water rate of the engine ought to be, and in a well managed plant, is a function of the cost of the boiler or engine. To make comparisons on this basis full data as to costs, prices, load line, output and other conditions are necessary, but until such complete data are given but little benefit can be gained from comparisons. When the costs are itemized the inefficient portions of the plant may be readily detected, and when the engine performance or the boiler performance is compared with that of other plants of the same type it can be determined whether the plant is as economically operated as it should be. The objection to the adoption of this basis is the unwillingness of owners and managers to give out data as to costs, being restrained from so doing by the tendency of others to make comparisons without due regard to the conditions.

\* \* \*

The accompanying illustration is from a photograph of the cooling tables installed at the power house of the Chicago Suburban Railroad at Harlem avenue and 22nd st. The details of the construction were described in the



\* \* \*

COOLING TABLES—SUBURBAN RAILROAD COMPANY, CHICAGO.

REVIEW for April, page 210. The reservoir is 100 x 200 ft. and each of the three leaves of the table is 30 x 184 ft., making the total surface from which evaporation may take place 36,560 sq. ft. The intake for the circulating pump is placed at the bottom of the reservoir and being at the end adjacent to the power house is 200 ft. from the point where the water is finally discharged from the tables. The capacity of the reservoir is 150,000 cu. ft. and the water for condensing is always drawn from the coolest part. The water is discharged on to the tables at about 110° F., while the temperature at the intake is about 80° F. This is the second table to be erected in Chicago, the other one being at the plant of the Calumet.



## Fly-Wheel Accident at Tacoma.

On July 11 the power house of the Tacoma (Wash.) Railway & Motor Company was wrecked by the bursting of a fly-wheel. The loss is estimated at \$20,000 and through the accident the greater part of the road was tied up for several days. A detailed description of the accident was contributed to the Engineering News by A. McL. Hawks from which the following is abstracted.

The primary cause of the disaster, which occurred at 1 p. m., Sunday, while the engine was working under a somewhat heavy load, was the breaking of one of the brass arms attached to the sliding collar on the governor, letting the valve stem drop. The engineer, who was in another part of the room, heard the rod snap and, seeing the engine speeding up, hastened to shut the steam off by means of the hand wheel, which was located in a very bad position, as any one operating it had to stand directly in line with the



FIG. 1.—DAMAGED PORTION OF POWER HOUSE.

fly-wheel and beneath the belt by which this wheel drives the counter shafting.

By the time the engineer had partly cut off the steam, this belt was badly frayed and the cable engine, which was "in clutch" on the axle shaft with this engine was giving way on its bed plate. So, when he had the valve half closed, seeing that the speed of the engine was gaining and being disconcerted by the snapping of the frayed edges of the belt, the engineer sought safety in flight. He had scarcely reached a place of safety when the explosion (which sounded like the bursting of a boiler) occurred. The time interval between the first break and the final one was about three minutes. When the dust had cleared away the scene of the accident was as shown by Fig. 1. The bright spot showing through top opening is a break in the roof made by three large pieces which flew straight up and

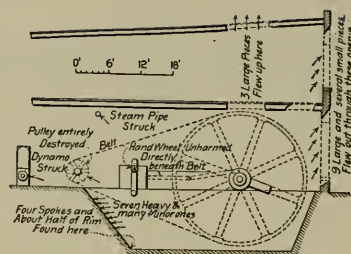


FIG. 2.—SKETCH SHOWING PATH OF PIECES.

came down through the same hole, landing within a few feet of their starting point. The pieces flying through the front of the building traveled distances ranging from a few feet to 400 ft. The width of their path was very narrow, nothing striking more than 15 ft. out of line, although some pieces bounded erratically and finally stopped some considerable distance from the line.

The sketch, Fig. 2, gives a better idea of the paths of flight of the pieces than can be obtained in any other way. The wheel seems to have burst into three parts, divided somewhat as follows: One arm and about a quarter of the rim flew up through the roof; two arms and a quarter of the rim flew out through the front of the building; four arms and nearly a half of the rim piled up in the back end of the wheel pit. Besides these major divisions several small pieces of the rim flew through the engine room, knocking down a steam pipe, entirely destroying the 4-ft. pulley on the counter shaft, injuring two dynamos, and about half of one arm remained in place. The other arms are broken off close up to the hub plates.

The rim broke into strips varying from 1 ft. to 8 ft. of the length of the circumference and entirely across the face of the wheel. As these pieces show from 250 to over 300 sq. in. of clean fracture in the two faces, some idea of tremendous stress may be gained. The normal speed of the engine was 62 r. p. m. How far this was exceeded is not known owing to the excited condition of the few who were present through only a part of the racing.

The engine was built by the Frick Engine Company of Waynesboro, Pa., and was rated by the builders at 750 h. p. under 80 lbs. of steam. But it had been run under loads estimated as high as 900 h. p. The fly-wheel was built up of two heavy hub-plates keyed to the shaft. Between these plates and bolted through them were the arms, of cruciform shape, 8 x 16 x 2 in. thick. The rim was 2½ in. thick, 4 ft, 8 in. wide, reinforced by two ribs on the back, 2 in. thick by 6 in. high, and also reinforced by heavy shoulder plates at the points where the arms were bolted to the rim. The diameter of the wheel was 25 ft., and the total weight 40 tons. Of the engine, practically the only parts left in place and in good condition are the steam chest and the bed plate. Even the piston rod is bent almost beyond repair.

\* \* \*

Considerable excitement was caused among the passengers on the motor car of one of the Lake Street elevated trains in Chicago on account of the car being set on fire by a melted wire. An excessive current melted the connectors above the motorman and the hot metal dropped on his head causing a severe burn. The fire department, with the assistance of the passengers, put out the fire in the car.

## FOREIGN FACTS.

The electric railway at Port Elizabeth, South Africa, has been placed in operation.

The Portsmouth town council has decided to acquire the street railway at an estimated cost of £100,000.

The Irish Tourist & Development Syndicate is making progress with its electric railway and lighting scheme at Dundalk.

Particulars of the 50-year electric railway concession at Sofia, Bulgaria, will be supplied on application to D. M. Yablanski, mayor.

Novorossjisk (Russia) municipal authorities will receive proposals until November 13th for the construction and operation of an electric railway.

The Brighton-Rottingdean seashore railway is now in operation, the car which was wrecked by the storm last December having been replaced.

Shareholders of the Bristol Tramways & Carriage Company met to approve the construction of a light electric railway to Hanham from St. George.

Opposition to the Teeside Tramways Bill has been withdrawn. The bill grants power to construct electric railways in Middlesbrough, Stockton-on-Tees and Thornaby.

Jassy, Roumania, will receive bids from September 6th to 18th for the construction, maintenance and operation of an electric railway. Bidders will be required to deposit 50,000 fr. cash. Plans and specifications will be forwarded on application to C. Gall, secretary.

Sunderland Tramways Company offers to sell its lines and rolling stock to the city, and to equip for electricity, provided the council will give a lease of the lines for 21 years. No action has been taken by the city, except to approve the change to electricity.

The House of Commons committee has approved the bill of the Swansea Tramways Company to change the motive power from horses to electricity, and to raise additional capital. The bill is opposed by the municipality, which has desired to acquire and operate the lines.

The Calcutta Tramways Company has not been able to install the electrical equipment as arranged in the contract with Crompton & Company, owing to the refusal of the corporation to grant necessary consent. Since January, negotiations have been continually in progress.

For the proposed electric railway the city of Halifax, England, has purchased 630 tons of steel rails at £6 10s. per ton; 30 tons of fish plates at £8 10s. per ton; a Lancashire boiler at £415; 29 sets of switch points at £19 per set, and 100 poles to carry overhead wires, at £1,090.

Birkenhead has appointed a special committee to report to the council: 1. As to the desirability of reconstructing and extending the system of tramways in the borough, and to submit estimates of the same. 2. As to the best system of mechanical haulage to be adopted in the borough. 3. As

to working the same: (a.) Corporation to lay lines and provide power, lessees to provide plant and work same on lease; (b.) The entire system, lines, power, plant, etc., to be provided and worked by the corporation.

The Gesellschaft für Elektrische Hoch-und-Untergrundbahnen has been formed at Berlin, with 12,500,000 marks capital, to acquire certain concessions from Siemens & Halske for the construction of electric railways in the city and suburbs. The Deutsche Bank, Siemens & Halske and others have subscribed the entire capital stock.

The Compressed Air Traction Company has been incorporated at London to enter into an agreement with the American Air Power Company of New York, to acquire and develop inventions and patents relating to mechanical traction, and the production, distribution and use of compressed air and electricity. The capital stock is £125,000.

The street railways of the island of Java comprise the Nederlandsch-Indische Stoomtram Company of Batavia, Samarang-Joana Stoomtram Company of Samarang, Oost Java Stoomtram Company of Sourabaya, Solosche Tramway Company of Solo, Samarang-Cheriban Stoomtram of Samarang, Serajoedal Stoomtram Company of Serajoedal, and Stoomtramweg Djakjakarta-Brosset of Djakjakarta. The last two are in process of construction; the others, except the first, are extending new lines.

## TURN THE GUNS ON THE ENEMY.

E. D. Dubois, manager of the Muncie lines, has an emphatic and radical solution for the bicycle problem. It is, "the way to beat wheels is to go into the business." He undoubtedly voices the almost universal belief when he states that wheels will continue to increase in numbers rather than grow less. The constantly decreasing price places them each year within reach of a larger number of people, and so it goes. His theory, which is being carried into practice with gratifying results, is to make a place specially attractive to cyclists, and locate that place at a point on your lines a sufficient distance out so that the riders will use the cars one or both ways. This of course includes facilities for transporting wheels on your line, either on the dash, or if in sufficient numbers to some initial point like a park, by providing "wheel cars," as has already been done in several cities. For an interurban road he would locate a park midway, and there provide a fine cinder track, divided into three courses, one outside the other. One for scorchers, another for moderate riders and a third for "lazy" wheels. As an adjunct, make it a record track, if possible, as riders will then be more apt to use the cars to save their energies for the track. Some mechanical or other music of a good order and such other entertainment as practicable should be provided.

At this park he would keep wheels to rent by the hour. It may sound like heresy for a street railway to go to buying wheels, but they rent readily at good prices.

In his judgment, for cities of 25,000 to 100,000, where the desirable streets for wheeling are somewhat limited, and where municipal restrictions against fast riding are enforced, the scheme is particularly good. At any rate, says Mr. Dubois, find some way to induce the riders and their wheels to use your cars. And he is right.

## CHICAGO CITY CUTS WAGES.

For years the Chicago City Railway has paid the highest wages of any street railway in the country. There has been considerable newspaper talk of late about changing the cable system to electricity, although several directors have stated no action has been taken by the board, and in any event, a year would be required to build and install the machinery. The present cable conduit is large enough and would require little alteration. It is highly improbable, however, that the present cable driving machinery will be abandoned before it is worn out, as it is useless for any other purpose.

On August 10th, General Manager Bowen sent out the following to all cable car crews:

It is contemplated that all cable lines be electrically equipped. As an expression of preference you will state on this card whether you would prefer to operate an electric car at 21 cents per hour or a cable train at approximately 23 cents per hour for trains.

I prefer to operate.....car.  
Signature.....  
Position.....  
Depot.....

NOTE.—Depot masters will explain any details as to filling out card, etc. Employees, after filling out card, stating preference, name, position, etc., will enclose same in envelope furnished with card, and after sealing hand to clerk of Depot. All cards must be returned before August 14, 1897.

## CHICAGO CITY RAILWAY COMPANY.

If the men reply they would rather take an electric car, at 21 cents, than a cable at 23 cents, it will be an easy matter to shift the present electric men to cable at the price now paid them (21 cents) and put the cable men on electric cars at 21 cents, in accordance with their own written request. Rather than be transferred several miles away to another depot, necessitating moving their families, etc., they would probably accept the cut and remain on cable lines where they now are.

Good cable runs pay as high as \$20 per week and the new rate will reduce this to about \$16.

## TROLLEY PATENT DECISION.

The Circuit Court of Appeals for the Second Circuit of New York on July 21 rendered a decision in the case of the Thomson-Houston Electric Company against the Hoosick Railway Company, which involved the validity of the Van Depoele trolley patent. The opinion was written by Judge Wallace, all the judges concurring, and holds that the five claims under which the Thomson-Houston Company has successfully prosecuted a large number of suits for infringement are invalid, as being anticipated by an earlier patent. The later patent, known as the "broad under-running trolley patent," has always heretofore been held to be the generic patent and the earlier one a special patent covering only the apparatus there illustrated and described.

The court says in part:

This is an appeal from an order granting a preliminary injunction restraining the defendant from making, using or vending the apparatus specified in claims 6, 7, 8, 12 and 16 of Letters Patent No. 495,443, granted April 11, 1893, to the administrators of Charles J. Van Depoele, assignors to the complainant, for "traveling contact for electric railways." The application for the injunction was resisted upon the ground that the patent as to these claims was void because the inventions covered thereby had been previously patented to the same inventor by Letters Patent No. 424,605, granted April 1, 1890, for "suspended switch and traveling contact for electric railways." The validity of the claims, notwithstanding a similar defense, had

been adjudicated at final hearing in the case of this complainant, against the Winchester Avenue Railway Company by the Circuit Court for the District of Connecticut (71 Fed. Rep. 192). In granting the present injunction the court below followed that adjudication without attempting an independent consideration of the validity of the defense.

Both patents originated in the application of Van Depoele, filed in the Patent Office March 12, 1887, and relate to the apparatus of that class of electric railways in which a suspended conductor conveys the working current, and a contact device carried by the car is employed for taking off the current, and more particularly to an improved traveling contact, and an improved arrangement and construction of the switches by which the traveling contact is directed to the proper conductor, and to various details of construction and arrangement of the traveling contact and switches. The application was divided, and while one of the divisional applications was involved in an interference proceeding which delayed the issuance of a patent, the other divisional application culminated in the patent granted April 1, 1890.

The operative parts of the contact device are described in identical language in each patent; and the language of the claims apply describes these parts. While the function of the tension device is stated with more particularity in the earlier patent, the description does not contain a word or hint by which its characteristics can be differentiated from those of the tension device of the later patent. The additional matter is in effect a fuller statement of the advantages of the device.

It is manifest that both patents are intended to and do secure to the patentee the same general inventions as are comprised in the combination of suspended conductor and contact devices, and the combination of suspended conductor, contact device and switching devices, although the earlier patent also covers improvements in the switches, and subordinate combinations between these devices and the elements of the principal combination.

The order granting the preliminary injunction is reversed with costs.

While this decision no doubt disposes of the five claims in controversy, another suit against the same parties is now pending, in which other claims of the patents are involved and the matter if far from being finally settled.

## EXTENSION TO THE YERKES LINES.

Nearly 30 miles of double track will soon be added to the North and West Chicago Street Railroad systems as feeder and connecting lines. The work will be pushed forward with vigor, and already some of the contracts have been let. Superintendent John M. Roach has placed an order with the Johnson Company for 8,000 tons of 85-lb. rails. From 75 to 100 additional cars are required, but bids will not be asked for these until the winter or spring. These lines will be operated from the California avenue, the Cicero & Proviso and the Western avenue power stations. It is likely that one large engine and dynamo will be added to the California avenue station, otherwise the power equipment is ample. To the north side system will be an additional 5 miles on Montrose boulevard from Milwaukee avenue to Evanston avenue; on Robey street  $2\frac{1}{2}$  miles from Lincoln avenue to Rose Hill cemetery; 2 miles on Crawford avenue from Peterson to Elston; 5 miles on Lawrence avenue from Milwaukee to Evanston avenue; the Chicago avenue roadbed will be relaid for  $\frac{3}{4}$  mile from the river to Milwaukee avenue, and the Dearborn street line will be relaid from Monroe for  $\frac{1}{2}$  mile to Polk street. The following lines will be extensions to the west side system: on Robinson avenue from 25th to 35th street, 1 mile; on West 26th street from 40th to Ogden and 48th avenues, 1 mile; on West 12th street from 40th avenue 4 miles to Harlem avenue; on Robey street 1 mile from Milwaukee avenue to Elston; on



California avenue, from Elston  $2\frac{1}{2}$  miles to Division street; and Kedsie avenue 1 mile from Chicago avenue to Madison street. Block pavement, 16 ft. wide, will be constructed along the streets not already paved in that manner. The estimated expenditure will be \$1,500,000.

**THE NEW YORK ASSOCIATION.**

J. P. E. Clark, of the Binghamton Railroad Company, advises the REVIEW that President Rogers of the New York State Street Railway Association is in communication with the local committee at Niagara Falls in regard to the program and entertainment for the convention of September 14 and 15. It promises to be the most interesting and largely attended meeting in the history of the association. From 15 to 20 short, concise papers will be given on practical subjects by some of the leading street railway men in the state. There will also be a large line of exhibits. After the program there will be a general line of entertainment, trolley rides on the lines about Niagara Falls, tours of inspection of power stations and manufacturing plants, etc.

**TRAMWAYS INSTITUTE OF GREAT BRITAIN.**

The annual meeting of the Institute was held on July 22, in London. President John Fell, in his address, reviewed the progress of the year as satisfactory. The official organ of the association had been mailed to all municipal officers in cities having tramways. Officers of tramways owned by municipalities had been made eligible to membership. Officers were elected as follows:

- President—Mr. John Fell, J. P.
- Vice-Presidents—Messrs. J. Carruthers Wain, W. Turton, R. Whittaker (Mayor of Oldham), and W. Mason.
- Council—Messrs. J. Waugh, J. Coomer, W. Stansfield, Graham Harris, J. H. W. Rosenthal, J. E. Waller, E. Pritchard, T. Parker, S. Sellon and E. Garcke.

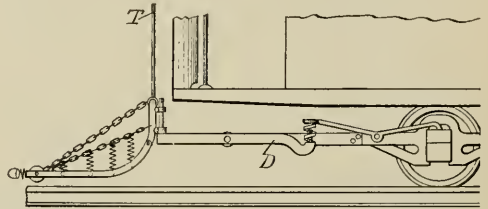
**NEW PUBLICATIONS.**

The report of the proceedings of the 30th annual convention of the American Railway Master Mechanics' Association, held June 15, 16 and 17 has been issued. Reports from nine committees, which have had technical subjects under consideration, were received at this convention; the most elaborate were those dealing with "Locomotive Grates" and "Ratios of Grate, Heating Surface and Cylinder Volume," the most complete data obtainable being here collected and made available for convenient reference. Copies of the proceedings may be obtained of the secretary, John W. Cloud, 674 Rookery Building, Chicago. Cloth, \$1.50; postage, 15 cents additional.

The Entropy-Temperature Analysis of Steam Engine Efficiencies, with a Blank Diagram arranged for easy application in any concrete case. Prepared by Sidney A. Reeve, M. E. The Progressive Age Publishing Company, 280 Broadway, New York. The discussion of the subject by the author is brief and to the point and the method of defining and illustrating the meaning of the term entropy is a particularly happy one. In order to determine such questions as the commercial economy of re-heaters, jackets, super-heaters, etc., where the gain in efficiency must be balanced against increased cost of construction no method of analyzing steam engine efficiencies is superior to this one, and the principal reason that it has not heretofore been more widely applied is the great labor of preparing the necessary curves; this the author has obviated by doing the work once for all and preparing the blank form which accompanies the book. Price, 75 cents.

**HARAN STREET CAR FENDER.**

The cut of this fender shows a side view of its attachments and a part of the car truck and body. The frame of the fender is made of 1-in. pipe, with a hinge in the angle between the upper and lower parts, so that it can be folded when not in use, or to change from one end to the other of the car. The fender is held about 4 in. from the ground by two chains while a third one is attached to the lever T by which the motorman can raise the fender to clear any obstruction. The fender is hung from one end of lever D



and at the other end is a spring which gives flexibility and saves the lever from being broken should the car tip forward enough to strike the outer end of the lever. Wire netting is used as a covering to the fender. In front are two hollow steel rollers, 3 in. in diameter, which keep the fender from plowing into the roadbed. The merits claimed for this fender are that it can be kept within any desired height above the rail and that it is so constructed that the springs mitigate the force of the blow to persons who may come in contact with it.

**CHANGE IN TRANSFER SYSTEM IN SCRANTON.**

There have been changes in the transfer system of the Scranton Railway Company to prevent abuses of that privilege. It has been the custom of certain clerks living on the opposite sides of the city to exchange transfer tickets, and to break this up two young lady clerks were arrested as a warning to others who had made a practice of getting free rides. The new series of transfers has places for punch marks indicating the line giving and receiving the ticket. These are given only at certain points on the lines and have a time limit of one-half hour. It is imperative that the passenger leave the cars at designated points and board the other car at the same place.

**WOODMAN TICKET PUNCH.**

The No. 2 ticket punch made by the R. Woodman Manufacturing & Supply Company, 63 Oliver street, Boston, was designed for use on transfer tickets on electric and horse railways and is made with an extra long reach, suitable for transfer, commutation and duplex tickets. These punches are sold at low rates but excellence of material and workmanship have not been sacrificed. The company refers to the many roads using this style of punch, among them the West End of Boston, which has 3,500 in use. The Woodman Company is the pioneer in this line of business, having commenced in 1872.

## PERSONAL.

Senator Wellington, of Maryland, has been elected president of the Cumberland Electric Railway Company.

Jos. J. Sullivan has been appointed manager of the Bennington (Vt.) & Woodford Electric Railway Company.

C. A. Murray resigned the management of the Bluff City Street Railway, Waukegan, Ill., and Superintendent Todd now has control.

George B. Morley and Homer Loving on July 24, qualified as receivers for the Union Street Railway Company of Saginaw, Mich.

L. N. Wheelock, superintendent of the Shelburne Falls & Cosrain Electric Railway has resigned to accept a similar position with the Amherst & Sunderland.

E. D. Dubois, superintendent of the Citizens, Muncie, Ind., pleased his REVIEW and other Chicago friends by a call last week. He reports a good and increasing business on his road.

G. J. Smith, master mechanic of the South Covington & Cincinnati Street Railroad, spent a week in Chicago visiting the local plants and calling upon friends, which included the REVIEW office.

I. B. White has resigned his position as superintendent of the Haverhill (Mass.), Georgetown & Danvers Street Railway Company to go to Bradford, Pa. Benj. Bartlett succeeds Mr. White.

Frederick Scullen, son of John Scullen, president of the Union Depot Railway Company, St. Louis, while sojourning in Chicago was overcome by the heat inducing an attack of temporary insanity.

John T. Gordon, who built the first street railway between Oakland and Allegheny City, died at his fruit ranch in El Canjo, Cal. He went from Pittsburg to California ten years ago to become a fruit grower.

C. E. Flynn, general manager of the Carbondale Traction Company recently made a flying trip to Chicago and to Peoria, where it will be remembered he was electrical engineer of the road for several years.

Henry Hubbard resigned his position as general manager of the Pittsburg, Allegheny & Manchester Traction Company and in recognition of his faithful service and popularity the employes presented him with a gold Masonic emblem.

James Rawle, secretary and treasurer of the J. G. Brill Company and vice-president of the Fairmount Park Transportation Company, has been elected to the presidency of the street railway company in place of George S. Grandy, resigned.

At the last meeting of the board of directors of the Wilmington (Del.) City Railway Company the duties of general manager were conferred upon President Lea, and he appointed H. B. Vandergrift to be his assistant. C. F. Hutchings, who has been superintendent, resigned.

C. S. Van Wagoner, president of the Van Wagoner & Williams Hardware Co., of Cleveland, accompanied by Frank X. Cicott were REVIEW callers a few days since. Mr. Cicott sails for Europe on the 20th, where he will represent a number of American street railway supply houses.

James F. Heyward, who has been general manager of the City & Suburban Railway Company of Baltimore, has accepted a position with the United Traction Company of Pittsburg. Before leaving Baltimore the employes under Mr. Heyward presented him with a handsome punch bowl as a token of their good will.

Willis F. Kelly, general manager of the Columbus (O.) Street Railway, called on the REVIEW during a three days' visit to Chicago last week. He predicts a large attendance from Ohio to the Niagara Falls convention in October. He was accompanied by E. N. Stewart, 1st vice-president, and R. E. Sheldon, 2nd vice-president of his road.

Carl K. Mac Fadden, well-known as a writer and expert street railway electrician, spent several days in Chicago. He has literally struck oil in his Indiana wells, and his numerous friends will learn with pleasure of his fine property. While his daily product does not yet rival that of the Standard Oil Company, he says his wells give just as many gallons to the barrel.

Alonzo G. Collins, consulting engineer, who has opened an office at Room 710 Pabst building, Milwaukee, has had an extensive experience in his line of business. For some years he was with the E. P. Allis Company; in 1890 he built the Jones Street station for the new Omaha Thomson-Houston Electric Light Company, and for the last year was chief draughtsman for the Filer-Stowell Company of Milwaukee. At present Mr. Collins is engaged in developing an apparatus for automatically proportioning the materials for making concrete.

W. W. Wheatly has been appointed assistant general superintendent of the Brooklyn Heights Railroad and C. E. Harris has been transferred to the southern division to take Mr. Wheatly's place. R. K. Haldame was placed in charge of the Broadway, Jamaica, Cypress Hills, Reid, Ralph and Sumner avenue lines of the Brooklyn, Queens County and Suburban Railroad.

John S. Bradley, president of the New Haven Register Company has returned from an extended trip to the Pacific coast, during which he traveled nearly 10,000 miles and visited all the railroads west of the mountains. He reports the outlook for business of all kinds as improving as a result of big crops everywhere and better prices. As a side pleasure trip he spent a week in the Yellowstone Park, which is unusually attractive this year owing to the great activity of the geysers.

Jilson J. Coleman, on July 1, became the eastern sales agent for the St. Louis Car Company, and will make his headquarters at Allentown, Pa. Mr. Coleman has had an extended and valuable experience, having been associated with A. L. Johnson, at Cleveland, ten years. He then went with the Steel Motor Company, and built and managed the Allentown road for the Johnsons. When the Johnsons began operations in Brooklyn he was called to the Nassau road, from which he resigned a year ago on account of poor health.

H. F. MacGregor, of Houston, Texas, long and favorably known in street railway circles, on account of his connection with the Houston City Street Railway Company, both while it was operated as a mule line and later by electricity, has purchased a large block of the stock of the reorganized company, and on July 16th assumed the management of the property, succeeding A. H. Hayward, who has managed the road since December, 1895. Mr. Hayward, during his stay in Houston, has carried out many substantial improvements and has made a great many friends, both in a business and social way, and many were the expressions of regret that he is to leave Houston permanently.

F. C. Randall, who for the past three years has had charge of the Chicago office of the J. G. Brill Company, severed his connection with that firm on August 1 to become the eastern representative of the Christian Engineering Works of Milwaukee. His office will be in New York City. Mr. Randall was early engaged in the railroad business in New England and was in the service of the New York & New England, the Boston & Lowell and the Boston & Maine railroads. His experience with street railway apparatus began with the Tripp Manufacturing Company, where he was first foreman and later superintendent. He left this company to take charge of the eastern agency for the J. G. Brill Company. Mr. Randall's long and varied experience in street railway affairs ensures success in his new field.

## SAFETY DEVICES IN MICHIGAN.

The street railway lines of Michigan are being inspected by order of Railroad Commissioner Wesselius and all dangerous crossings at steam roads and drawbridges will be reported, with a view to ordering the construction of derauling and interlocking devices at such points. Undoubtedly the commissioner has authority to require railroad crossings to be properly protected but it is questionable whether his authority extends to bridge crossings.

### THE DULUTH-SUPERIOR BRIDGE.

The great steel drawbridge which joins the twin cities, Duluth, Minn., and Superior, Wis., has been completed and its opening was celebrated in a fitting manner. As may be noted from the illustration the bridge is of noble proportions and it is said to be the third largest drawbridge. Between the piers on the dock lines of Duluth and Superior the bridge is 1,094 ft. and rests on five piers; the draw-span is 491 ft. in length and weighs 1,800 tons. The draw-span rests upon 60 rollers which are arranged in a circle 40 ft. in diameter; it is actuated by electricity. The rollers are of cast steel and weigh 2,000 lbs. each. The motors are connected to the power station by means of submarine cables and also to a set of storage batteries on the pier which can be used in the event of an accident to the cables. The electrical equipment is the most powerful ever placed on a drawbridge as it is designed to turn the bridge inside of two minutes even in the highest wind. Automatic electric brakes and indi-

that "the charges for passage on said road shall not exceed 20 cents for any through line and 10 cents for half lines or short distances." In 1890-1 the Consolidated secured from the legislature a validating act to remove alleged flaws in the charters of the absorbed companies, and as this act contained the clause "be liable for street paving and to other regulations of municipal companies incorporated by separate acts by the law of this state," it was construed that the Consolidated was brought under all regulations passed by legislature in the case of all other street railways in the state. One of these legislature bills allowed the city of Augusta "to regulate fares," and on the strength of this the Atlanta council passed an ordinance to take effect May 1, 1897, by which a passenger was to ride from any point on the company's line to any other point for one 5-cent fare. The effect of this ordinance caused a slump in the company's securities, and bondholders residing in another state took the case into the United States court in New Orleans, where a restraining order was issued May 27.



STEEL DRAWBRIDGE CONNECTING DULUTH, MINN., AND SUPERIOR, WIS.

cators enable the man in the operating cab to tell the exact position of the bridge and manipulate the end locking apparatus with certainty.

The bridge was designed to carry four tons per lineal foot, which together with the weight of the structure makes a load of 10,000 tons. The material is mild open hearth steel furnished by the Pennsylvania Steel Company. Work began in July, 1896, and ended July 3, 1897; the cost exceeded \$1,000,000. It is considered a triumph of engineering skill as it meets the requirements of all kinds of traffic between the cities and does not interfere with the great volume of commerce on the bay. There are two steam railroad tracks, two trolley tracks, two roadways and two side walks.

### ATLANTA CONSOLIDATED WINS THE TRANSFER CASE.

In the United States circuit court sitting in Asheville, N. C., on July 23, a decision was rendered denying the right of the city of Atlanta to pass an ordinance reducing the rate of fare. The Atlanta Street Railway, of which the present Consolidated is the successor, constructed its lines under a city ordinance passed in 1868, which allows

The case came to trial in the circuit court of the United States of the Northern District of Georgia, under the title "The Old Colony Trust Co., trustee, et al., vs. The City of Atlanta and the Atlanta Consolidated Street Railway Co., bill in equity." The case was heard at Asheville, and a decision rendered on July 23. The legislative right of the city to change the existing rate of fare or demand transfers is expressly denied, and the opinion of the court is also that there is grave doubt as to the right to approve rates conferring a right to fix rates.

The court also declares: "One continuous ride is one thing and two or more rides with the necessary stoppage and letting passengers off and taking them on, is another and entirely different thing."

It is a splendid victory for President Joel Hurt; and although the mayor had threatened to appeal in case the city lost, the case may be considered settled.

The Syracuse Rapid Transit Company has elected officers as follows: William M. Brown, New Castle, Pa., president; Willard R. Kimball, vice-president; William P. Gannon, secretary; Austin C. Chase, treasurer. The three latter are all of Syracuse. The executive committee consists of Messrs. Brown, Kimball and Gannon.



## ARION MEETS HIS DEATH.

One of the best known and daring performers at street railway pleasure resorts during the past three years was D. H. McDonnell, or as he was better known, Professor Arion. While he performed a large number of feats in mid air, his principal one was riding a bicycle at night on a live trolley wire suspended 75 to 100 feet from the ground. The wheel and his body were covered with 32-c. p. incandescents taking current through the wheel from the wire on which he rode. A smaller wire overhead completed the circuit. Arion filled a long engagement last summer for the Calumet Electric Railway, of this city, performing several times each day and night at a height of 90 feet and drawing thousands. During this time he was a frequent visitor to the REVIEW office, and by his gentlemanly bearing and



RIDING A LIVE WIRE.

natural modesty made friends of all who knew him. To the writer he said he would never fall unless it was from shock which rendered him insensible. Once during his Chicago engagement he was short circuited and badly burned but succeeded in completing the trip safely. The same accident occurred on the first of this month, at Brooklyn, where he was killed by a fall of 75 feet. The autopsy showed that he evidently had been shocked into insensibility through leakage of the rubber insulating suit he always wore.

He was a man of most exemplary habits, an electrician of no mean ability, and had crossed Niagara 11 times. He formerly lived in Chicago, and his income amounted to \$1,000 per week.

## METROPOLITAN ELECTRIC COMPANY FAILS.

The Metropolitan Electric Co., 188 Fifth avenue, Chicago, dealing in street railway supplies, was closed by the sheriff at noon, July 27, on confessed judgments amounting to about \$35,000, of which \$27,000 is in favor of its president, Wm. H. McKinlock. Capital stock is \$300,000, and assets claimed at \$100,000. Poor business and slow collections are given as the cause.

## CITY LINE LEASED BY THE CHICAGO GENERAL.

E. M. Phelps and F. R. Green, representing the Chicago City Railway Company, and J. T. Witbeck and L. C. Bonney, of the Chicago General Railway Company, have signed a contract for a lease of the 22nd street line of the Chicago City Railway. The stockholders of the Chicago General received the following notice:

"A lease has been executed under which this company secures the right to operate over the East 22nd street tracks of the Chicago City Company from the Chicago river to Lake Michigan.

"This lease is dated July 5, 1897, and runs for a term of 45 years. This company pays to the Chicago City Company 6 per cent per annum on the cost of the physical construction; also the entire expense of maintaining the portions of the street between the river and Wentworth avenue and between Clark street and Wabash avenue and between Indiana avenue and South Park avenue, also one-half of the expense of maintaining the crossings used jointly by the two companies. The expense of maintaining the street from Wentworth avenue to Clark street and from Wabash avenue to Indiana avenue will be paid by the Chicago City Company.

"All litigation between the two companies has been settled and will be dismissed. The settlement is considered extremely advantageous to both companies."

The estimated cost of the leased line is \$45,000. An extension will be made to South Park avenue some time this fall and this will enable the Chicago General to run to the lake. This same company is also negotiating with the West Chicago Street Railroad Company for a line on Throop or Morgan street. A long and bitter fight is thus settled. When, on April 4, 1895, the Chicago General attempted to run a horse car over City Railway tracks, the latter company met it with four wrecking wagons and 200 shop men and reduced the car to kindling wood.

## TAXING FRANCHISES IN DULUTH.

The franchises of the quasi public corporations in Duluth, Minn., were last year assessed for taxation as personal property, and a decision has just been had on the appeal taken by the companies. The judge did not pass on the right to levy the tax but decided that it had not been levied in the proper manner. The case will be carried to the supreme court. The total tax assessed against the different companies was \$9,000. The franchise of the Duluth Street Railway Company was valued at \$75,000.

## STREET RAILWAY TROUBLE AT TAMPA.

There has been a sharp conflict in the management of the Consumers' Electric Light & Street Railway Company of Tampa, Fla. At a recent meeting of the board of directors the Consumers' Company was leased for a term of ninety-nine years to the Tampa Suburban Railroad Company. E. S. Douglas, general manager of the Suburban Company, took charge of the operation of the Consumers' Company. Superintendent Munsing and other of the directors objected to the radical and unexpected changes. Each faction gave orders to the employes which caused great confusion for a time. Mr. Douglas' authority was recognized and a policeman was placed on each car to prevent any interference in the operation of the lines. It was expected that President Chapin, on his arrival from New York, will straighten out this muddle.



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

The Lake Street "L" of Chicago is endeavoring to get the consent of the holders of its debentures to redeem them at 78 cash.

Tenders for a \$4,000,000 issue of 5 per cent bonds of the United Traction Company of Pittsburg greatly exceeded that amount.

W. H. Patton is trying his new motor on the lines of the Stillwater, Minn., road. It is a combination of gas engine and storage battery.

The Camden (N. J.) & Suburban Railway Company lately distributed \$500 among its employes as rewards of merit, more than 100 motormen and conductors profiting by it.

J. K. Tillotson, who is interested in the street railways of Oskosh, Wis., produced two comedy dramas, Queena and Lindwood, of which he is the author, at the company's pleasure resort.

The fare box system has been adopted on the Northeast line of the Brooklyn Avenue Railway Company, Kansas City, and the directors look with favor upon its installation on the 10th street line.

There seems to be little or no progress in the contemplated change in the motive power of the Manhattan Elevated although it is reported that the third rail system is looked upon with favor.

For the third time the Bridgeton (N. J.) & Millville Traction Company has suffered the loss of a portion of its copper return circuit. Thieves chopped up about 1,900 ft. of wire with axes and carted it away.

It is stated that George S. Grandy has retired from the presidency of the Fairmount Park Transportation Company, and after a period of rest and recreation will devote his attention to some of his other large interests.

An Italian rag peddler stole 900 ft. of live trolley wire from an unused line of the Buffalo, Kenmore & Tonawanda Electric Railroad Company and carted it to Buffalo. He was arrested and turned over to the Tonawanda officials.

The experienced conductors and motormen of the Galesburg (Ill.) Electric Motor & Power Company have had their wages increased to \$11 per week, while those who have been with the company less than a year receive \$10 a week.

The total aggregate of the subscriptions for the \$2,000,000 of 5 per cent gold bonds offered by the Metropolitan of New York amounted to above \$50,000,000. They were sold on the street at 110½. Other securities of the system have advanced sharply.

The vitascope exhibition at Budd Park, Kansas City, has proven a great attraction; every evening 1,500 or more people go out in the trolley cars to watch the moving pictures and listen to the music reproduced by the large phonograph in the park. The exhibition is free.

A verdict of \$16,500 was given to Thomas Leach against the Chicago City Railroad for injuries received in 1893. Leach was then a conductor, and while beneath the car fixing a brake chain another train ran into the rear of the car he was repairing and very seriously injured him.

Frank E. Scovill, superintendent of the Austin (Texas) Rapid Transit Company, informs us that there have been many improvements to the system during the spring and summer. Among other things 8,000 new ties of mountain cedar have been put in place. Traffic has been quite good considering all conditions.

The Lafayette Street Railway Company has extended a line to the Indiana State Soldiers' Home and to Tecumseh's Trail. It passes through some picturesque country and makes a delightful outing for the citizens of Lafayette. The street railway company recently carried in one day 17,000 passengers with an equipment of 19 cars.

Tom L. Johnson, H. A. Everett, Albert Pack, J. C. Hutchins, W. L. Johnson, A. B. Dupont, and A. E. Peters were chosen directors of the Detroit Electric Railway Company. Subsequently the board elected Albert Pack, president; J. C. Hutchins, vice-president and treasurer; A. E. Peters, secretary, and A. B. Dupont, general manager.

The transfer privilege on the lines of the Detroit Electric Railway have been curtailed. Heretofore a passenger could ride on a continuous trip of 28 miles or even all day long by judiciously using the transfers. The recent regulation is to the effect that passengers must ask for transfers when tendering their fares and but one transfer will be issued on one fare.

Wheeler & Boody, contractors for the East Penn Traction Company have commenced suit against the Pennsylvania Railroad Company for \$2,000. The plaintiffs state that their employes were driven from their work by railroad men and some of their tools destroyed. To protect the workmen it was necessary to employ 100 extra men and the damages are designed to cover the wages of these men and the loss of time and tools.

A daughter of one of the directors of the Staten Island Midland Railroad, is spending the summer at one of the hotels on Staten Island and has become quite an expert "motorman" under the tutorship of General Manager Rockwell. The young lady enjoys manipulating the controller handle and has officiated at that post during several trips taken by officials and friends in the directors' car over the lines of the Midland railway.

July 12th was the 38th anniversary of the introduction of street cars in the city of Baltimore. E. H. Hartzell, who still resides in Baltimore, was the driver of one of the two cars first brought to the city. The cars were box-shaped affairs and built to accommodate 12 passengers. When the line was formally opened each car was gayly decorated and

drawn by six horses. The guests, after enjoying the luxury of a street car ride, ended the festivities with a champagne supper.

A syndicate for operating street railways has been formed by C. H. Davis, an electrical engineer of New York City, and B. W. Porter of Derby, Conn., is to be general manager. The ownership and financial interests of the railways are not to be disturbed but the syndicate proposes by buying in large quantities and by scientific management of the roads to lower operating expenses and increase receipts.

The Trenton Passenger Railroad Company brought suit against the Guarantor's Liability Indemnity Company, of Philadelphia, for claims which were presented and payment refused. The lower court decided in favor of the railway company, with the proviso that it should later be established that such insurance is legal. The Supreme Court decided that the contract is valid and deferred action on the amount of damages.

A charter has been granted to the Montreal & Southern Counties Railway by the Senate at Ottawa in spite of strong but unreasonable opposition. This is one of the largest of the proposed railways in Canada, as the lines are expected to serve a territory of 150 sq. mi. connecting with the Montreal Street Railway and passing through the towns of Chambly, St. Johns, Iberville, Bedford, Waterloo, Sherbrooke and intervening places.

The Schuylkill Valley Traction Company has secured a lease on Oak View Park, near Norristown, Pa. Many improvements and attractions will be added to the park. An orchestra has been secured; arrangements are to be made for operatic and dramatic performances, balloon ascensions and other things which will make the park a pleasant resort. The town council gave permission for the company to build a branch line to the park.

The hot weather of July 4th and 5th caused the people of Brooklyn and vicinity to seek the ocean breezes, and the street railways were taxed to the utmost to accommodate the traffic, over 700,000 passengers being carried by the surface roads in one day. The record of the Nassau lines was broken, 275,000 fares being collected on the 5th and 250,000 on the 4th. The Brooklyn Heights Railroad reported 328,999 and 325,000 passengers for the two days.

An ordinance was passed by the council of Pittston, Pa., taxing all street cars entering the city \$10 a piece, but the Scranton & Pittston Traction Company refused to pay this. The city authorities decided to enforce the law and the means employed was to arrest every motorman and conductor in charge of a car coming into the town. This did not last long for the cars discharged the passengers at the city limits and started back over the same route.

The Columbus Street Railway Company has been giving kinoscope entertainments at Olentangy park. The company secured views of Governor Bushnell and staff in the Grant memorial parade and extended an invitation to the governor to be present at the initial presentation. This invitation was accepted and the governor with his staff and their lady friends were taken to the park on the beautiful excursion car, Electra, and enjoyed the entertainment.

On the lines leading to the ocean resorts the Nassau Electric Railroad Company of Brooklyn has had some trouble with disorderly passengers and an example was recently made of such a one. A tailor, named O'Brien, had some words with a conductor and struck him in the face. The police refused to arrest the man and President Johnson was notified. He, with the company's attorney, John M. Ward, of base ball fame, dragged O'Brien from the car and took him to the police station. The obstreperous passenger was fined \$20 for disorderly conduct.

After a decision had been rendered against the Cincinnati Incline Railway by the Superior Court the Board of Administration of the city ordered the company to remove its tracks on Main street, south of Liberty, and a resolution was passed to the effect that no applications for extensions would be received from the same company until it has paid into the city treasury the money due for delinquent licenses. Later the board ordered permits granted to the Cincinnati Street Railway Company to lay track on Main street, previously occupied by the Incline Railway Company.

The report of the receiver of the Metropolitan Elevated of Chicago shows a gain for May over the preceding month. For the time up to and including June the average daily passenger traffic is as follows:

|                                |        |
|--------------------------------|--------|
| January 20 to February 28..... | 44,434 |
| March.....                     | 47,811 |
| April.....                     | 45,546 |
| May.....                       | 40,353 |
| June.....                      | 42,050 |

During the receivership the income and expenditures have been:

|                             | Income—   | Fares.    | Rents.    | Misc.     | Total. |
|-----------------------------|-----------|-----------|-----------|-----------|--------|
| January 20 to February 28.. | \$86,647  | \$1,040   | \$21,406  | \$109,103 |        |
| March.....                  | 74,108    | 2,300     | 359       | 76,767    |        |
| April.....                  | 68,310    | 2,601     | 201       | 71,112    |        |
| May.....                    | 62,546    | 1,051     | 65        | 64,563    |        |
| June.....                   | 63,076    | 3,400     | 48        | 66,533    |        |
| Total.....                  | \$354,606 | \$11,310  | \$22,070  | \$388,080 |        |
|                             | Expenses— | Payrolls. | Supplies. | Gen'l.    | Total. |
| January 20 to February 28.. | \$30,021  | \$13,017  | \$5,050   | \$49,890  |        |
| March.....                  | 26,202    | 11,357    | 454       | 38,104    |        |
| April.....                  | 26,610    | 11,437    | 47,231    | 87,279    |        |
| May.....                    | 27,728    | 13,433    | 3,108     | 44,270    |        |
| June.....                   | 28,334    | 20,665    | 150       | 49,149    |        |
| Total.....                  | \$140,085 | \$70,790  | \$56,902  | \$268,600 |        |

## OBITUARY.

John S. Hoagland, who for many years was connected with the street railway interests of Brooklyn, died at Hempstead, L. I. After being with the Brooklyn City Railroad Company for many years he became superintendent of the Smith street line and guided that line from poverty to prosperity. He accepted the position of superintendent of transportation on the Brooklyn Bridge, which position he held until his retirement a few years ago.

Col. C. F. Crocker, president of the Market Street Railway Company of San Francisco, died at San Mateo, Cal. Besides his street railway interests he was vice-president of the Southern Pacific Railroad, president of the Oriental Steamship Company and was prominent in the many other corporations owned or controlled by the Southern Pacific Railroad. He served on the staff of Governor Perkins and took a prominent part in political affairs. He was president of the California Academy of Sciences, a trustee of the Stanford University, and a member of the Pacific, Bohemian, Union, and University Clubs of San Francisco, and of the Union Club of New York.



### ALLEY L EQUIPMENT.

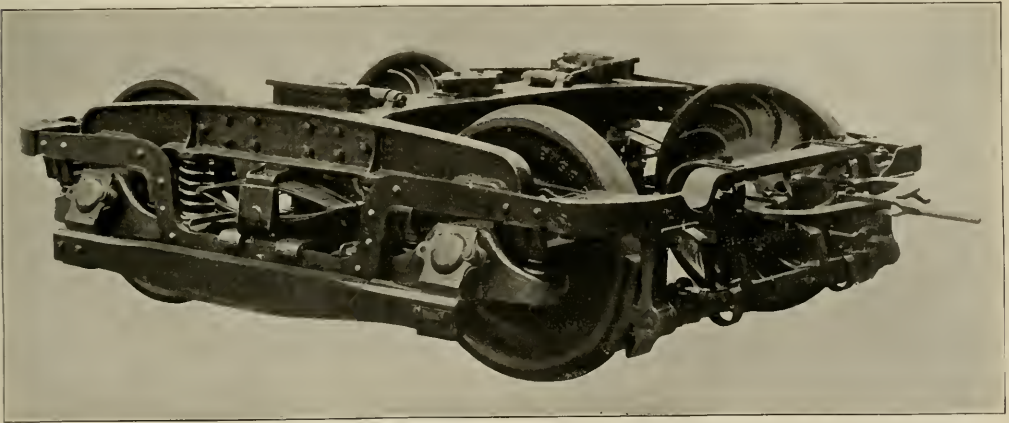
For several weeks past tests have been in progress on the experimental track of the General Electric Company at Schenectady, N. Y., for the purpose of deciding whether the Sprague system of control is adapted to the conditions of service on the Alley L of Chicago. The tests were under the personal supervision of Frank J. Sprague and were witnessed by President Carter of the South Side Elevated, A. D. Lundy of Sargent & Lundy, consulting engineers for the road, M. G. Hubbard, Jr., of the McGuire Manufacturing Company, of Chicago, which furnished the trucks, and a number of the General Electric engineers.

Six cars were equipped with the Sprague system of control and each car had two 55-h. p. G. E. motors, both on the same truck. Thorough tests were made to determine the rate of acceleration, starting torque, maximum speed, etc.

The construction of the truck is peculiar in that the equalizing bars are extended so as to form a complete lower frame to which the brakes, motor supports, etc., are attached;

aged so that it cannot be operated. In the Sprague system one of these trucks is used on each car, an ordinary trail truck being used at the other end. It is said by parties who witnessed the tests that the motor truck was easier riding than the trail truck.

From two to six cars were run together to determine how the system is affected by different sized trains. It was found that any sized train acted practically in the same manner as one car in tractive effort, acceleration, speed, current consumption, etc. In fact three cars were joined together electrically, but with no drawbars, and so even were the acceleration and speed that they did not pull apart. A maximum speed of 32 miles an hour was attained, but it is intended that the maximum speed shall be sacrificed for greater torque. Some minor alterations will be made in the equipment, although as a whole the tests have proved the system to be very successful. The final tests will be made on the tracks of the elevated company in Chicago sometime in the near future. Already the third rail, which is in 60-ft. lengths and weighs 40 lbs., is being laid. The



M'GUIRE TRUCK FOR SOUTH SIDE ELEVATED, CHICAGO.

this frame is cushioned by springs over the journal boxes. The top frame containing the pedestals and bolster is of cast steel in three pieces. The pedestals set over the boxes and form an additional means of keeping the truck in square and distribute the pulling points from the center plate to the pedestals over each box; the spring supports are entirely on the equalizing bars of the lower frame. This construction is designed to avoid transmitting kicking from the brakes or shocks from the action of the motors to the upper frame, and to make an easy riding truck with a maximum of strength and safety. To meet the ideas of railway men who believe that swing bolsters are indispensable, a second bolster hung on links, is inserted into the main top frame or bolster, the center and side bearings passing up through openings in the fixed bolster and clearing the top surface by about  $\frac{1}{2}$  in. No appreciable deflection can take place except through breakage or some extraordinary strain, in which case the center plate and side bearings would rest upon the rigid bolster and would still be perfectly safe and operative. The truck is constructed so that so long as the wheels and axles are intact there is no danger of the truck being dam-

running rail will be bonded to make a continuous return circuit, and will also be bonded to the structure at frequent intervals. The Roebbling bond is used for the track work and the Atkinson bond on the third rail. Contracts have been let for the engines, dynamos, cooling tower and other apparatus as given previously in the REVIEW. All the bids for the power house construction were considered too high and rejected. Some alterations will be made in the plans and other bids invited.

Since last January there has been in operation between Stuttgart and some neighboring industrial centers, 8 to 10 miles distant, a service of automotor cars equipped with steam engines and Serpollet generators. The cars fitted for service weigh about 37,400 lbs. of which about two-thirds is on the front axle, which is the driving axle. The cars average about 120 miles per day at an average speed of 24 miles per hour. Briquette fuel is used and in the summer the consumption was from 8.9 to 10.6 lbs. per car-mile run. The estimated cost of fuel, oil and waste was 2.8 cents per car-mile, which it is expected will be further reduced.



A. J. Jolly has received the contract to build the Mount Troy & Reserve Township Electric Railway at Pittsburg, Pa.

H. H. Penny & Co., of Charleroi, Pa., have been given the contract to build the Charleroi, Bellevorn & Fayette City Electric Railway.

Mulholland & Elmond have received the contract to lay 1.75 miles of double track for the Metropolitan Street Railway of Kansas City, Mo.

Henry G. Issertel, recently of the firm of Crafts and & Issertel, New York, has withdrawn from the concern to become sales agent for an electrical company.

William D. MacQueston of Mount Vernon has received the contract to complete the extension of the New York, White Plains & Elmsford Railway to Tarrytown, N. Y.

The Goulds Manufacturing Company, Seneca Falls, N. Y., is mailing a new and decidedly interesting illustrated booklet describing many of the plants using its electrically driven pumps.

Pierce & Richardson have incorporated at Chicago to do a general engineering business. The capital stock is \$10,000 and the incorporators are Richard H. Pierce, R. E. Richardson and Charles T. Foster.

George W. Henry, George B. Foster and F. B. Duncan, have associated themselves with J. Holt Gates, 1323 Monadnock building, Chicago, as selling agents for the electrical supplies represented by Mr. Gates.

Among recent orders the American Engine Company, Bound Brook, N. J., has secured an order from the United States Government for a 35-k. w. direct connected plant for the Pension Office in Washington.

One of the most attractive advertisements that we have seen is a 9 x 12-in. card with a photogravure of Niagara Falls; the title is "A Great Source of Supply," Western Electric Company, Chicago, New York.

The National Car Fender Company has been incorporated at New York. The capital stock is \$20,000, and the incorporators are John A. Henneberry, Matthew Baird, Bernard Mahon and others of New York.

The Joseph Dixon Crucible Company, Jersey City, N. J., has recently issued a pamphlet in which the merits of lead paints and graphite paints are compared and some extensively circulated misstatements regarding the former corrected.

The Indianapolis, Anderson & Marion Electric Railway Company has revoked its contract with Louis Enricht of

Chicago and handed the construction over to A. W. Frances, Howard Wilson, E. E. Downs and L. N. Downs of New York.

The Partridge Carbon Company, of Sandusky, O., has established an agency at New Orleans, La., where Schminke & Newman will distribute its self-lubricating motor brush and other well known carbon specialties in the southern territory.

The Crane Company of Chicago will supply the high pressure valves and steam fittings for the power houses of the St. Louis & Kirkwood Railroad, the Memphis Street Railway and the Indianapolis, Anderson & Marion Electric Railway.

George M. Huss, of 218 Clark street, Chicago, has been awarded the contract to build 15 miles of electric railway at Cleveland, O., for the Cleveland, Painesville & Eastern Railway Company. The overhead construction will be done by Christy Bros., of Akron, O.

The Pennsylvania Steel Company has recently opened an office at 413 Western Union Building, Chicago, to look after its business in the western states. W. H. Stearns, for the past three and a half years general sales agent of the Buda Foundry & Manufacturing Company and A. F. Klink are the western agents.

The new catalog of the Buckeye Engine Company, Salem, O., is devoted to compound engines and in addition to the general and detail illustrations contains a good discussion of the theory of the compound engine, the advantages of compounding, results of tests and the considerations leading to the choice of proportions adopted.

Arrangements were recently completed by which the Northern Electric & Manufacturing Company, Ltd., of Montreal, takes the agency for the products of the Ohio Brass Company of Mansfield, O. This company's goods are already well known in Canada, and the combination will no doubt be of advantage to both parties.

W. B. Upton, who is well known as a consulting engineer of several electric railways and power plants in and about Washington, has located his offices in the Washington Loan & Trust Building, corner of 9th and F streets, N. W., Washington, D. C. His specialties are the installation of steam, electric and hydraulic plants and the equipment of power stations and railways.

The Standard Underground Cable Company has issued a circular letter to its customers advising them that it is at all times ready to defend suits brought against the users of its goods for infringement of patents on paper insulated cables and wires. It asks to be promptly notified of such suits that it may be given an opportunity to defend them.

On July 2, the Philadelphia & Reading put on a 60-minute train between Philadelphia and Atlantic City. The train which made the first trip on this schedule ran from Camden to Atlantic City, 55.5 miles, in 48 minutes or at 69.35 miles per hour; the maximum speed was 82.26 miles per hour for

4.8 miles. The entire train was equipped with bearings made by the Ajax Metal Company, 46 to 52 Richmond street, Philadelphia.

A very handsomely illustrated booklet is being circulated by the E. T. Burrowes Company of Portland, Me. The various kinds of curtains and curtain appliances, made by this firm, are fully described and shown by cuts. Detail drawings are also given of the anti-friction swivel device, chains, pulleys and tips, so that the excellence in the design of these fixtures is apparent. The "pinch handle," "climax" and "royal" car curtains are illustrated.

The interurban railway building out of Meadville, Pa., is known as the Meadville Traction Company, and the bond issue of \$250,000 was placed in New York by C. Townsend Blake, of Philadelphia. The contract for constructing the 11½ miles of this road was let to the Walker Construction & Engineering Co., of Philadelphia, which is now pushing the work forward as rapidly as possible and expects to complete it about October 1st.

The Jackson & Sharp Company, of Wilmington, Del., is busily engaged in completing the cars ordered by the Southeastern Railway, London, the sample car which was shipped some weeks since having been approved by the directors of the road. These cars are 55 ft. long with steel underframing, and with the exception of the English style of buffers are the regulation parlor cars of America. They are equipped with Gould vestibules and automatic couplers.

H. B. Coho & Co., St. Paul building, New York, have taken the agency for the well known insulating material manufactured by the Fiberite Company of Mechanicsville, N. Y., and have become associated with Mr. Medbery for the handling of the Warren apparatus. During the past few weeks the firm has closed a contract with the Oyster Bay Electric Light Company and has started a plant of 500 h. p. for the Jones Brothers Tea Company, Brooklyn, the latter is equipped with Eddy apparatus.

The Ohio Brass Company has adopted as a trade mark for its "Genuine Bell Metal Motor Bearings," a cut of a bell on which appear the letters O. B. Co., and hereafter an outlined reproduction of this will be stamped into the metal on each bearing, as a positive means of distinguishing them from those manufactured by other companies. This mark in itself will also serve as an absolute guarantee of the quality of the bearings, for the company stands ready to replace any which do not give perfect satisfaction.

The New England Construction Company has been incorporated at New Haven, Conn., to build and equip street railroads, etc. Its first contract will be the construction of 14 miles of electric railway at Bangor, Me. The capital stock is \$300,000, and the incorporators are ex-governor Thomas M. Waller, of New London; I. A. Kelsey, general manager of the Winchester avenue road; Attorney S. Harrison Wagner, Julius Watterman, Henry L. Mitchell, of Bangor Me.; Charles B. Wellington, of Albion, Me.; Arthur R. Hopkins and a number of other well known Bangor capitalists.

The Bradford Belting Company, Cincinnati, has been appointed agent for that city and vicinity for the sale of

the products of Van Wagoner & Williams Hardware Company of Cleveland. The arrangement gives a good concern good representatives. Hayes & Arthur, Cleveland, are agents for Western New York and Northern Ohio; James Clark, Jr., & Co., Louisville, and Arthur S. Partridge, St. Louis, have been appointed agents for these cities and vicinities. The Van Wagoner copper segments which are made of drop forged pure lake copper are already standard on a large number of roads.

The J. G. Brill Company advises us that its works are running full time with entire complement of men. Business is better than in 1896. During the first half of that year it was very good, but with a rapid falling off after July; now there is more work turned out and very much more on the books. While the prices of glass, paint and other material have advanced the cost of the finished product will not be any higher because of the large building capacity. The outlook is regarded as most favorable because of the fact that the orders received are for new equipment for old lines which have long ago passed the speculative stage.

The Central Union Brass Company of St. Louis has increased its facilities for making electric and railway goods and now has a complete line of overhead material, all new and up to date, designed by M. M. Wood, who is now connected with this company, and whose reputation as an expert in this line is well known. The company will continue making car trimmings and will add from time to time the new patterns and machinery that will be necessary to meet the demands of the trade. It carries a large stock of goods, and can fill orders promptly. This company was established in 1882, and its trade extends over a large territory.

The Mica Insulator Company of New York and Chicago will shortly issue an extensive catalog which, besides a full list of their micanite specialties, contains several pages of useful information for electrical engineers. The catalog includes all the latest types of street railway motors and is thoroughly up to date. The company has excellent reports from its customers to show on the special micanite plates for commutator segments, and that part of the factory in which they are made is very busy. A new specialty outside of the regular mica insulations is an oiled paper, very tough, and made in large sheets, which are one yard wide and two yards long. This is a great improvement upon the small sheets hitherto made. They are able to supply more than double the area of paper for the same price.

The Composite Brake Shoe Company of Boston is represented by the following manufacturers and supply agents, who have the exclusive sale of the "compo" brake shoes for the electric street railway service as follows: Barbour-Stockwell Company, Cambridgeport, Mass., the New England States; Mayer & Englund, Philadelphia, the middle states; Hayes & Arthur, Cleveland, O., the states of Ohio, Michigan, and West Virginia, Western Pennsylvania and Western New York. The shoes will be shipped at present from foundries at Boston and Buffalo, but all purchases and settlements are to be made with the above agents. This arrangement will be an advantage and convenience to parties who wish to use this well known shoe in these sections of the country.



The International Register Company of Chicago reports that its business is much better now than ever before. The factory has been crowded all the spring, but several large orders received lately have made it necessary to increase the number of men considerably, and even with the increased facilities the present orders cannot be filled for several weeks. The company wishes to announce, however, that all orders for registers to be used in open cars this summer will be given immediate attention.

G. B. Coleman, general manager of the Metropolitan railroad, Washington, D. C., has recently completed the Connecticut avenue extension, reaching the Zoological park, one of the most interesting resorts in the city. In making this extension it was necessary to enlarge both power houses which was done by the addition of a new McIntosh & Seymour engine of 750-h. p., and a 500-k. w. General Electric direct connected generator for each station. From the American Car Company were received 50 cars which are now in operation. The new machinery has displaced smaller units, which the railroad company offers for sale. The engine is a compound Corliss, 15 and 26 x 36, with 15-ft. fly wheel of 25 in. face, and heavy double belting. The generator is practically new and is a G. E. multipolar 200-k. w., 525 volts; also switchboard and double heavy belting.

The Consolidated Car Heating Company, Albany, hands us the following: "The United States Circuit Court of Appeals for the Second Circuit, on Thursday, July 22, rendered an elaborate and sweeping decision, reversing the decree of the Circuit Court, which had granted to the Dewey Electric Heating Company an injunction against the Albany Railway Company, to prevent the use of the Consolidated Car Heating Company's temperature regulating switch in connection with an indicating device as being an infringement of the ninth claim of the Dewey patent No. 464,247. The court holds that this claim is entirely void for want of patentable invention, and this decision finally settles the right of the Consolidated Car Heating Company and its customers to use its temperature regulating switches with indicators as the same have been and are now constructed."

"On August 2 Judge Wheeler of the United States Circuit Court for the Second Circuit rendered a decision in favor of the defendant in the case of the Burton Electric Company against the Union Railway of New York, which was defended by the Consolidated Car-Heating Company."

The Western Electric Company, of Chicago, has just issued a very beautiful and complete catalogue of its "E," "EE" and "Q" switches. The different sized switches are described by numbers with their capacity in amperes, and all the dimensions of the switches are given in tables so that it is possible to drill switchboards before the switches are received with the assurance that the switches will fit when they are placed in position. Also a cut and the catalogue number of every switch part are given, which facilitates the ordering of small parts at any future time. Special switches are made for 500 volts, and the Q switches, which represent the quick break type, are made in all sizes from 25 amperes up. There are also shown in the catalogue the latest design of the round type Ellicott voltmeter switch,

the "V" changing switch, and the switch board spring jacks, plugs and cords. A copy will be sent upon application.

The Carnegie Steel Company, Limited, of Pittsburgh, just placed an order for 6,500 h. p. of Cahall vertical boilers for its blast furnaces D and E at the Edgar Thomson Steel Works. This is the fourth order placed for this kind of boilers by the Carnegie Steel Company, making a total of nearly 15,000 h. p. The Cahall people are also building 4,000 h. p. boilers for the Shenango Valley Steel Company of New Castle and 6,000 h. p. for a new sugar refinery. There are now in the shops unfinished orders for upwards of 30,000 h. p., including boilers for the Brooklyn Edison Company, the Union Traction Company of Philadelphia, the Detroit & River St. Claire Electric Railway Company, the Pittsburgh Plate Glass Company, the Buhl Steel Company of Sharon, Pa., the North Hudson Railway Company, and the Hudson Electric Light Company of Hoboken, N. J.

The Central Electric Company, Chicago, which is making a specialty of overhead line material is in receipt of the following letter from a manager of a company which has long been a customer. He says: "I take great pleasure in saying that all the line material which we have purchased from your company has given us the very best of satisfaction. I am using the 15-in. clinch ear altogether, and do not solder and find they work admirably. Your drawn wire trolley splices I have never known to give way. The hangers are first class in every particular. If I can be of service in speaking a word for your line materials, please call on me and I shall be pleased to do so." The Central clincher ear is made in 6, 7, 9, 12, and 15-in. lengths for all sizes of round as well as figure 8 trolley wire, and is growing in popularity, a single recent order being to construct 28 miles of road.

The McGuire Manufacturing Company of this city is very busy and the earlier prediction of a prosperous fall seems about to be realized. The truck department is running full force and an additional order for 50 trucks from the Consolidated Traction Company of Pittsburgh, Pa., has just been received, making 172 trucks which this company has ordered from the McGuire Company in the past six weeks. The company also have quite a number of orders on hand for its combination snowplow and sweeper for fall delivery and has every reason to expect an unprecedented business in this line. Careful managers are already considering methods of car heating for the coming winter and the company already has orders for a great many stoves. It claims the exhaustive tests of coal vs. electricity have resulted in orders being placed with it, almost exclusively for its "Columbia" heaters. The orders for the positive lock ratchet handles continue unabated and the orders for the "Star" grain doors for freight cars are the largest in the past two years.

The Pope motor carriage, of which the technical papers have made frequent mention, successfully covered the distance from Hartford, Conn., to Springfield, Mass., and return. On this trip of 76 miles the storage batteries were recharged several times and the reported cost of energy ranged from 1/2 to 2 cents per mile. The test was considered very satisfactory.

**PENNSYLVANIA STREET RAILWAY ASSOCIATION.**

The sixth annual convention of the Pennsylvania Street Railway Association will be held at Allentown, Pa., September 1 and 2. The Association will convene on Wednesday, September 1, at 11 o'clock a. m. at Manhattan Park, along the line of the Allentown & Lehigh Valley Traction Company. Scientific papers on various subjects of general interest to the members of the Association will be read and discussed and means for the promotion of the general interest of street railways considered. The usual annual business of the Association will also be transacted at this meeting, including the election of officers of the Association for the ensuing year. The second day will be occupied with a series of entertainments provided for the members and visitors of the Association, including an excursion over the lines of the Allentown & Lehigh Valley Traction Company and a banquet at the Manhattan Hotel, Manhattan Park. 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 the State of 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 sending membership fee of \$25 and one year's dues, \$10, to the secretary, S. P. Light, Lebanon, Pa.

Members of the Association are urged to send as many representatives as possible to the convention, and others who have not yet joined the Association are also cordially invited to attend the convention.

S. P. LIGHT, Secretary. JOHN LLOYD, President.

**CITY TAX IN SYRACUSE.**

The city council of Syracuse, N. Y., recently passed an ordinance granting to the Syracuse Rapid Transit Company franchises over an additional 10 miles of streets which was vetoed by the mayor. When returned to the council it was passed over the veto and an amendment added making the franchises conditional upon the company paying to the city after January 1, 1905, one-quarter of a mill for each passenger carried on any lines owned or operated by it within the city. With a 5-cent fare this amounts to a tax of 1/2 per cent of the gross receipts from passengers.

**ENGLEWOOD & CHICAGO SOLD.**

On July 26 Judge Showalter entered a decree for the sale of the Englewood & Chicago Electric Street Railway, the storage battery road, and it is quite probable that the reorganization committee which has financed the receiver's certificates to the amount of \$320,000 and owns all of the uncontested bonds of the company will purchase the property. The proceeds of the sale will be applied to the payment of the expenses of administration, the redemption of the receiver's certificates and the payment of bonds in the order named. The outstanding bonds amount to \$1,178,000, of which \$278,000 are contested by the receiver on the ground that the company received no consideration for them.

**OPENING OF A NEW JERSEY LINE.**

The Rutherford branch of the Union Traction Company is now in operation and forms an important part of the system which is to connect Newark, Jersey City, Arlington, Rutherford, Woodbridge and other New Jersey towns. These lines will also make connection with the street railways of Passaic, Paterson, Hoboken and Newark and will pass through an extensive and populous district. The road has been well constructed and the equipment is first-class. The power station and car barns are located at Rutherford.



INTERURBAN CAR, UNION TRACTION COMPANY.

There are three 300-h. p. engines, three 200-k. w. belt-driven generators and 1,200 h. p. in Stirling water tubular boilers. The cars were built by the Jackson & Sharp Company and are of exceptionally fine design, as shown by the illustration. The length of the car body is 24 ft., over all 33 ft., and is 7 ft. 7 in. in width. The cars are mounted on Peckham double cushion swivel trucks, No. 14. Motors are General Electric 1,000 type.

**ORLEANS BARN IS BURNED.**

The old car barn of the Orleans Railroad Company at New Orleans, La., was partly destroyed by fire at an early hour on the morning of July 22. The flames were discovered first in the car shop, where, fed by paint and other highly inflammable material, they burned furiously and threatened to consume the entire building. While the employees were removing cars and saving other valuable property the city department got the fire under control, but only after the best portion of the barn had been destroyed. The buildings were old and scattered over an entire square. The total loss is \$34,500, of which \$500 is on office furniture, \$2,200 on tools and \$50 on paints in the workshop, and \$17,500 on seven motor cars. The operation of cars was not interrupted. A new and well appointed building with shops will be erected.

The Wichita Street Railway & Power Company has been organized to handle the street railway interests of Wichita, Kan. The corporation has a capital stock of \$300,000 and will soon begin the work of re-equipping the lines and putting them in first-class condition. The directors are William F. Ellis, H. B. Church, and William I. Church, of Boston; A. C. Jones and R. R. Vermilion, of Wichita.

### A TROLLEY LINE ON THE PIER AT ATLANTIC CITY.

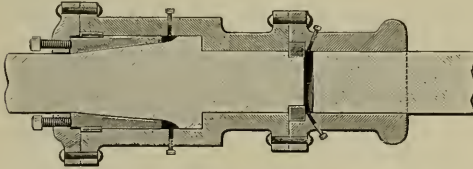
The 500-ft. extension to the Ocean Pier at Atlantic City makes it the finest and most complete structure of its kind. The pier has been widened and a fishing platform and several pavilions have been built. The most unique addition is an electric railway which extends the entire length of the pier, about 1,900 ft. into the ocean. The power station is located at the inner end of the pier. The gage is 2 ft. 9 in. and



OCEAN PIER RAILWAY.

at the shore loop the distance between the inner rails is 30 ft., which necessitates a very sharp curve. The loop at the ocean end is broader and permits a curve of 30 ft. radius.

To prevent excessive friction and wear on the wheels the Denney divided axle is used, which permits the wheels to rotate independent of each other. The coupling is of gun metal, in three pieces, which are riveted together after the brasses are in place. The portion of the coupling shown at the right in the cut is shrunk into that half of the axle. The



DENNEY AXLE.

collar at the extreme end of the coned portion of the axle is also shrunk on. A long conical bearing with adjustable brasses is provided as shown. The joints of the coupling are tight so that it may be filled with oil. With this axle little trouble is experienced from the sharp curves. Messrs. Young and McShea were the builders and now operate the line. The illustration shows a train of four cars out on the pier some distance from shore. The pleasant ride and the fine view of the city makes the road a favorite with the summer visitors.

### DOWN TOWN CONNECTION FOR CHICAGO SUBURBAN.

A traffic agreement has been entered into between the Suburban Railroad Company and the Lake Street Elevated Railroad Company and the former will use the line of the latter instead of the Metropolitan, as first planned, to reach the down town district. Reference to the map of the

Suburban Company, published on page 208 of the REVIEW for April, will show how much more favorable is this arrangement to making quick time. The Chicago, Harlem & Batavia division of the Northern Pacific is within two squares of the western terminus of the Lake Street, at West 52nd street, and does not strike the Metropolitan until West 40th street. A large force of men is at work extending the track in West 52nd street north, and cars will be running by August 19. At the junction with the Lake Street passengers will be transferred in the electric elevator.

### EXCELLENT SNOW PLOW WORK.

In these hot days when the manager is letting extra power into his electric fan, or trying to think up some excuse to go and inspect a line in close proximity to some lake or near the sea shore, it might seem unseasonable to talk about snow plows, or the big drifts they went through like a Fourth of July rocket. Nevertheless it will not be so very many months when snow drifts and blockaded tracks will force their unwelcome attention, and it is always well to be too soon rather than too late. The illustration shows a drift nine feet deep, which interested the manager of the Somerset Traction Company, at Skowhegan, Me., last February. The plow which went through this drift



WORK OF TAUNTON SNOW PLOW.

without shoveling was built by the Taunton Locomotive Works, Taunton, Mass. Its purchase was rather unique, for the president of the road had no idea of buying it, when one day he chanced to be in Taunton. Visiting the works when none of the office men were in, he strolled out through the yard and saw this plow. He afterwards was in the market for one, but after inspecting several sent for one just like that he had shown himself. It is the only plow of its special pattern, having a large nose of peculiar shape which rolls the snow out instead of bunting it. The plows are very heavy, and are built and equipped ready for use, with any make of motor specified. As to required power the builders recommend the G. E. 1,000, or Westinghouse 12A, or other motors of corresponding power to these types.



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### THE DALE AUTOMATIC BRAKE.

The illustration is from a photograph of a car equipped with the Dale automatic brake. The braking mechanism consists of clutches to engage the rails, and a sliding block with inclined slot, which is so connected with cams engaging the wheels of the car, that by the action of these cams against the wheels the clutches may be raised or lowered; it also actuates wedges that cause the clutches to grasp the rails. The shoes carrying the clutches that bear on the



THE DALE AUTOMATIC BRAKE.

rails are curved upward so that should a rail be loose and project above the other, or out of line at a joint, the clutches will slide over without catching. The brakes are adapted to stop a train going in either direction; both are automatic or under the control of the brakeman, as may be desired, and adjust themselves automatically for a quick or

a gradual stop. Should one end of the car leave the track or run off at the end of a rail, as would be the case with an open draw bridge, the clutches would at once bear and throw the brake into action.

### BLACK SAND POOL, YELLOWSTONE PARK.

"No person who visits the Upper Geyser Basin should fail to see Black Sand Pool. It lies on the south of the main Upper Basin, and is reached by a road leading past the beautiful Punch Bowl Spring. Black Sand Pool is an oval spring some 40 feet long by 20 or 25 feet wide. The water is of a light blue sapphire or turquoise color—it is not easy to name the precise tint in many instances—extremely beautiful, from whose surface the steam constantly rises. The great peculiarity about it is that the encircling sides, which are in places fifteen feet high or more, are composed of black, partially decomposed obsidian, sand."

The above is taken from "Wonderland 97," a new book published by the Northern Pacific Railway. Send six cents to CHAS. S. FEE, Gen'l Pass. Agent, St. Paul, Minn., for it.

Since the article "Chicago City Cuts Wages" on page 542 of this issue was printed, it has been learned that the men on cable runs held a meeting, and almost unanimously, refused to fill out the cards and make the election of working for 21 or 23 cents instead of the present rate 28 cents. The question now is, what will the company do about it?

## ELECTRIC MUTUAL CASUALTY.

W. W. Wharton, secretary of the Electric Mutual Casualty Association, reports that the business and finances of the association are in a satisfactory condition. For the 16 months ending August 1, 1897, the following statement is made:

|                                                          |             |
|----------------------------------------------------------|-------------|
| Gross receipts.....                                      | \$61,426.72 |
| Expenses.....                                            | \$16,583.31 |
| Claims and attorney's fees.....                          | 16,918.40   |
| Total.....                                               | 33,501.80   |
| Balance.....                                             | 27,924.92   |
| Deduct: claims adjusted and in course of settlement..... | 1,006.      |
| Net balance.....                                         | \$26,918.92 |

The expenses of the association, for the four months ending August 1, have been \$3,048.52, which is less in proportion than \$13,534.79 for the preceding 12 months, the latter amount includes also the cost of organization. Numerous reports of accidents, which may or may not develop into claims against the members of the association, have been received. A few claims are being contested by the advice of different members, as some accidents have occurred in which there is either no liability on the part of the company or else the claims are for such excessive amounts that adjustment in court is necessary. It is the policy of the association to keep out of the courts whenever reasonable settlement can be made, and for that reason the claims are closely settled to date. There is at present a membership of 45 exceptionally good risks from which the association has an income of \$60,000 and a contingent liability of \$40,000. The different departments are thoroughly organized and are running smoothly, and the association feels that it is offering the best insurance of this kind than can be obtained.

## BROWNELL CAR COMPANY FILES DEED OF TRUST.

The Brownell Car Company on July 23 filed a deed of trust to protect its creditors. The assets, including a large amount of valuable real estate, schedule about \$200,000 more than the liabilities, and the company will undoubtedly straighten out and resume in the near future. Car building has been very light the past year, and as it was impossible to dispose of the real estate except at too great a sacrifice, it was decided best to take this step. The company was one of the oldest in the business, and always prided itself on the superior quality of its product. Mr. Brownell's many friends in street railway and other circles greatly regret this misfortune, even though it be, as there is every reason to expect, only a temporary one, and will wish him a speedy solution of the matter.

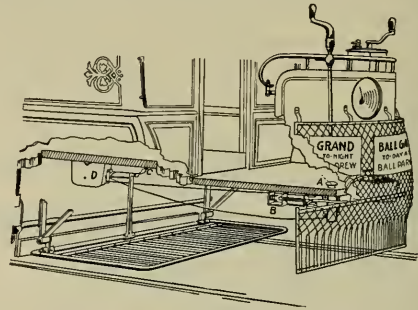
## NICKEL-IN-THE-SLOT MACHINE CAUSES TROUBLE.

The Union & Middlesex Traction Company has adopted a unique fare-box and register. It is a glass jar 4x10 in. and registers automatically each nickel as it is put in. The trouble comes in making change, for each coin dropped in, whether a penny or a quarter, indicates one fare. Its supposed utility comes in making it unnecessary for the conductor to handle any money. He passes it around the same

as a contribution basket, but it is forbidden to permit the machine to accept a one cent piece as a fare and the passengers are not disposed to drop in a quarter if a 5 cent piece is not at hand. Two men boarded a car, one tendered five pennies and the other one offered a dime when the conductor presented the fare box. The conductor informed them that they would have to tender exact fare, and this they refused to do. They were then put off and walked to their homes some distance away. Each brought suit for \$5,000 damages.

## THE ELECTRIC FENDER.

The illustration shows the mechanism of the electric fender, invented by Paul Jones, 640 June street, Cincinnati, Ohio. The fender proper, or scoop, which is relied upon to lift the person clear of the track, is suspended under the car as close to the wheels as possible, and is normally held at about six inches above the rails, and dropped when needed. The catch at C which engages the vertical arm and holds the scoop in its normal position may be tripped either by the motorman pressing the trip A, or by action of a magnet



located in the box D. This magnet is energized from the line circuit when contact is made at the circuit closer at B. For the circuit closer to act it is only necessary that the resilient buffer attached to the front of the car be deflected one inch, by striking the body to be picked up. The buffer is of light wire work, and while it is low enough to strike any one prostrate on the track, it is flexible and bends back as it passes over. The buffer having been deflected and made electrical contact at B, the scoop is tripped and drops to the rail where it is locked in position before it reaches the object struck.

## SUMMER TOURS.

## Rivers, Mountains and Seashore.

## GRAND TRUNK RAILWAY SYSTEM.

The sale of Summer tourist tickets from Chicago to Eastern Tourist Resorts reached by the Lines of the Grand Trunk Railway System, embracing Niagara Falls, Muskoka Lakes, St. Lawrence River, White Mountains, Portland and Seacoast Resorts, commences June 1st, continuing to September 30th, inclusive.

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For further particulars, Excursion Folders, Time Tables, Berths in Sleepers, or Tickets, apply to L. R. Morrow, C. P. & T. A., 103 Clark St., Chicago.



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 OLD COLONY BUILDING, - - CHICAGO.

TELEPHONE, HARRISON 754.  
 Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

*Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.*

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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. SEPTEMBER 15, 1897. NO. 9

A BROOKLYN conductor who was discharged went and shaved off all his whiskers and came back a new man with a new name. Now he has been found out and wishes he had his whiskers back.

ABOUT two years ago the Cincinnati Street Railway laid some steel ties experimentally, but nothing has been heard of steel ties in a long time. Recent examination of these ties shows such good results the company will now lay a considerable number of them.

NEW JERSEY, in spite of the mosquitoes which are said to cut the trolley wires in summer, maintains 613 miles of road, on which the capital and funded debt is \$74,000,000. The capital stock is nearly \$40,000,000, on which dividends amounting to \$124,000 were paid in 1896.

THE Boston subway, built by the West End road, under the famous Common, and the finest piece of work of its kind in the world, went into service September 1. If some of the staid old fathers of early days, who used to hold tea parties, could awake to see the fine electric equipment emerging from under their blessed Common they would experience several varieties of shocks.

THE Manhattan Elevated, in New York, appears to be still halting between electricity and compressed air. The

one thing of which it seems to be convinced is that steam locomotives as motive power must retire. Trial trips are being made which the air people pronounce very satisfactory, and regarding which the road maintains a profound silence. The railroad commissioners of the District of Columbia have an expert still investigating, which would seem to indicate possibilities for air in Washington in spite of the recent failure there.

Unless compressed air can make some decided and positive advance in the near future in the nature of securing the equipment of some road of standing, it will have to step aside and electricity will have the field practically to itself.

If some men would devote the same energy to securing an honest living that they do to beating a railroad, they would get rich and the manager add to years to his life. The scheme this month described on another page was to remove the screws to the hand rail and then pull the handle off while falling from the car. The man with the pull overlooked one screw and the handle held; but the police got a pull on the man which worked all right, and he went with them to jail.

NOT a month passes but we record the loss of trolley or feeder wire which has been stripped from the hangers and is usually found chopped up into short lengths of a foot or two, suitable for melting into pigs to prevent identification. Some months there are several such reports, the losses ranging all the way from a few dollars to several hundred; and occasionally the damage done causes an expense of one or two thousand. The nuisance is not confined to any state, but is "prevalent all over."

Managers surely are equal to the occasion and will devise some means to discourage this sort of thing. Where current is not carried all night, some one might manage to short circuit the robbers and get a ground with a shot gun; but it's no easy matter to patrol one or two hundred miles at night.

The remedy would seem to lie in suitable legislation which will provide a much more severe penalty on conviction than can at present be enforced in a case of mere theft. This would be another good subject to discuss at the October convention.

THE carrying of your Uncle Samuel's letters is becoming quite important to such roads as are fortunate enough to be posted as mail routes. One road we call to mind earns nearly \$3,000 per annum without any extra expense other than the fuel necessary to pull the extra trailers. The magnitude of the work and its rapid expansion are better understood when we consider the appropriation for the fiscal year is a full quarter of a million of dollars for cable and electric service.

The ruling that compensation should be no more than last year created some apprehension on such lines as are being largely increased as to mail service; but the comptroller of the Treasury gladdens our hearts with the assurance that this applies to the rate paid and not the amount, which is quite a different matter. The department certainly gets as much, if not more value received from its expenditures on street railway mail service, than from the same amount in any other way. If the money contemplated to be spent in the house to house collection were diverted to increasing the street car service, it would yield vastly better returns.



THE executive session at the street railway convention ought to be one of the most valuable features of the meeting, and managers would do well to hand the secretary such subjects as they especially desire taken up at that time. We suggest as one timely topic which has been guardedly spoken of on one previous occasion, viz., the following up and securing conviction of persons caught in making fraud claims for damages. The tendency and temptation, of course, is to follow the lines of least trouble and expense, and the result is that a company seldom follows up an exposure by insisting on the penalty of the law being enforced. As a rule, a manager is satisfied with detecting the fraud and glad to escape being bled. But it seems to us there is a certain moral obligation on all the roads, to prosecute such offenders to the full limit of the law. The expense is not great, as the prosecution is made by the state, but even if it did cost something the results are worth the price paid. If a considerable number of roads would express their determination to seek the punishment of all detected in crooked claims, and the fact was known to the public, the moral effect would be great in discouraging such experiments. Courts resent any effort to use the process of law to secure money through fraud, and juries which are liberal to the plaintiff where real injury exists, are no less severe in rebuking blackmailing efforts, where the facts can be squarely proved. Last month we gave the particulars of the daring attempt to defraud the Memphis road out of \$25,000, and in that case the company was able to produce unquestioned evidence as to the criminal intent and action, and the court promptly inflicted the full penalty of the law, 364 days, which was as little less than the "not to exceed one year" as it could well be.

Companies ought to stand shoulder to shoulder in these things, and one of the chief benefits of the Association lies in the acquaintance thus formed which makes possible a well defined and mutual understanding as to policy, even though no formal agreement is made.

THE general business outlook has taken on a vastly improved aspect since our issue of one month ago. The crop reports continue to improve, and the wheat crop is now known to be assured. Unless an early frost catches the corn in the central and northern corn belt there will be an enormous surplus over home requirements to sell abroad, where, fortunately for us, a shortage in cereals exists. The splendid advance in prices of farm products, both grains and live stock, sets the dollars in motion which will soon roll through all the avenues of trade and manufacture. The settlement of the tariff question, even for such lines as are least affected, is already showing its beneficial effect, for a settled basis is established and the people know exactly how to operate and readily adapt themselves to the settled conditions. The great manufacturing districts of the east are already awakening and ere long will be moving with the old time activity. A spirit of hope and confidence is in the air everywhere, and people who have been guarding their capital most jealously for three years now lend a listening ear to legitimate and promising enterprises. The American people recuperate with a vigor and rapidity not equaled by any other nation, and now the current has fairly turned we may confidently look for the tide which leads to fortune.

The winter business of street railways is never as good as the summer business, but with mills and factories opening

up and thousands of employes once more going and returning from their daily work, there will be a fine increase over last winter's earnings.

The season has not been marked by any considerable new construction. The cities are already well provided for, and in many cases for several years in advance; still there will be some extensions in the towns and a large amount of renewals and reconstruction. The great bulk of new tracks will be found in the many interurbans which will furnish the large part of the new work for the next three years. Of these, there will be hundreds of miles built, and altogether 1898 has every promise of a good year both to operators and manufacturers of materials.

The difficulty in placing bonds which has stalled so many operations planned during the past two years will largely be removed by January 1, giving time to place securities and construct next year. It is to be hoped promoters will confine their efforts to the many really good operations, and not kill the goose as was done four years ago, by foisting a lot of worthless schemes upon a gullible public. However, there is little danger of that, as information on the subject is now general, and investors have a pretty good knowledge of the conditions necessary to success.

#### GOVERNMENT BY INJUNCTION.

THE present coal strike and the mass-convention held under the auspices of the labor unions at St. Louis have served to call attention to the subject of "government by injunction" which first became a grievance during the railroad strike of 1893, and which also appeared in the background as one of the issues of the last presidential campaign. Early in the present strike the state courts of Pennsylvania issued injunctions restraining the strikers from trespassing upon the property of the operators and from intimidating the miners who desired to continue work, and on August 4 Judge Jackson of the circuit court of the United States for the district of West Virginia issued a similar order, which was as follows:

"\* \* \* a temporary restraint order is allowed, restraining and inhibiting the defendants and all others associated or connected with them from in any wise interfering with the management, operation or conducting of said mines, and their owners, or those operating them, either by menace and threats or any character of intimidation used to prevent the employes of said mines from going to or from said mines, or from engaging in the business of mining in said mines.

"And the defendants are further restrained from entering upon the property of the owners of said Monongah Coal & Coke Company for the purposes of interfering with the employes of said company, either by intimidation or the holding of either public or private assemblages upon said property, or in any wise molesting, interfering with or intimidating the employes of the said Monongah Coal & Coke Company so as to induce them to abandon their work in said mines.

"And the defendants are further restrained from assembling in the paths, approaches and roads of said property leading to and from their homes and residences to the mines, along which the employes of the Monongah Coal & Coke Company are compelled to travel to get to them, or in any way interfering with the employes of said company in passing to and from their work, either by threats, menaces or intimidation; and the defendants are further restrained from entering the said mines and interfering with the employes in their mining operations within said mines, or assembling upon said property at or near the entrances of said mines."

As to the effect of this, Mr. Debs, who has been prominent as a leader in the present strike, in the call for the mass-convention of labor unions at St. Louis, says in part:

"The injunction has again done its deadly work. Constitutional liberty has been bludgeoned to death and labor bound and gagged for the perpetual exploitation of corporate capital. There is no relief in the courts. We have tried them all, from the bottom to the top, and they are all against labor. So far as I am concerned, I will appeal to them no more. We will now appeal to the American people. Judges, the creatures of the plutocracy, rule the country by injunction. From justice of the peace to the justice of the supreme court, the injunction has full sway. American citizens are forbidden to open their lips or to walk on the public highway. Sheriffs, marshals and other petty officers issue proclamations and then proceed to shoot and club workmen if they are not as servile and obedient as if they were so many savages off their reservation."

A careful reading of the injunction shows that the strikers have not been restrained from doing anything that they could of right do, and it appears to us that Mr. Debs has permitted his sympathy to prejudice him and his enthusiasm to lead him to make inaccurate statements of fact. No law abiding citizen will claim the right to trespass upon his neighbor's property, to assault his servants, or to interfere with him in the conduct of his business. It would appear that strikers believe that these rights were conferred upon them when they became members of a union; the claim is not made in words, only in deeds.

The writ of injunction is a preventative writ in equity which will issue only where irreparable damage would otherwise ensue, and where there is no plain, adequate and complete remedy at law, and only then when the damage suffered by the complainant is special. Among those who seek to curry favor with the unlawful element, excepting the few that are bare-faced in the advocacy of anarchy, the claim is not made that these injunctions as issued are illegal, because it is too evident that the damage which they seek to prevent would be special and irremediable. But it is said that it is unwise and unjust that a man be restrained from committing an unlawful act, because thereby the brand of criminality is put upon him, and it is urged that nothing should be done until the act is committed, when it may be punished. In other words, a man should stand by and see his business ruined and then have recourse to a prosecution for trespass or assault or malicious mischief or what not, and to a civil action for damages against those who have nothing, a procedure in the nature of trying to get blood out of a turnip.

The efficacy of the injunction lies in the fact that violations of it can be summarily punished. An ounce of prevention is worth a pound of cure, particularly when the cure offered is entirely inadequate as is the case here.

While we sympathize heartily with the strikers in this instance and share the opinion which the leading mine operators do not hesitate to express that the men are underpaid, we think that their leaders are not justified in attacking the courts.

We believe that the danger confronting us is not the prostitution of liberty to "government by injunction," which is in truth no hardship to the law abiding; but that it lies in the attempt to so tie the hands of equity that this "extraordinary" remedy can not be used in the extraordinary circumstances which unfortunately have of late so frequently arisen.

Trolley day at LaFayette, Ind., was not a financial success, the Young Men's Christian Association, which was the beneficiary, receiving but \$160. The conclusion drawn by one of the local papers is that the people are not interested in the Y. M. C. A.

## NEW KIND OF FAKE DAMAGE.

Removes Screws From Hand Rail—Then Tries to Fall and Get Hurt.

In these latter days the life of a manager is being shortened by a multitude of schemes to rob his company and spoil his good record. Last month there was a woman in the case; this month there is a screw loose; if the screw had come out things might have been different as between one Krause and the Joliet, Ill., railway. The scheme is quite a novel one, and out of the multitude of fake claims which are brought to our notice, seems to be the first of its kind and original with Krause.

In some respects the plan was open to detection; in others it would have made a bad case to defend in court, which was evidently part of the program.

It was on the pleasure resort line which runs out to the suburbs, and there is a laying time of several minutes at the



AUGUST KRAUSE, ALIAS JOHN CRAMER, ALIAS JOHN MILLER THE GRAB HANDLE MAN.

park terminus. While the conductor and motorman were talking on the front platform, Krause removed two of the screws which fasten the grab handle to the car, using a screw driver, which he had brought for the purpose. As the hour was late the result of his work did not show.

When the car reached a populous corner near the city the man motioned the conductor to stop. As the car slowed up the man stepped forward, gave a strange pull at the hand rail and rolled off upon the pavement, where he lay in an unconscious condition. Apparently he had been badly injured, and as soon as possible he was removed to St. Joseph's hospital and physicians summoned.

While Superintendent Rush was examining the car he discovered the two screw holes and immediately had search made at the starting point, resulting in finding the steel screw driver in some weeds.

The police were at once advised of the situation and with these facts in their possession hurried to the hospital, determined to place the man under arrest. They found him in a comatose state, surrounded by physicians and nurses, who were endeavoring to revive the apparently unconscious sufferer. When the doctors were informed of the sham they

adopted new methods which soon convinced them the man was not injured at all.

But the fellow was game and during the next few hours astonished everyone with his wonderful exhibition of nerve. Despite the most painful and fear-inspiring tactics of the doctor, the man maintained an appearance of absolute unconsciousness and baffled all attempts to make him admit he was shamming.

The doctors stuck needles into his body, laid operating knives across his flesh and did other terrible things, but the fellow never quivered. Finally, one of the physicians forced open the man's eye and made a motion as though to run a long needle into the optic. This was too much for the imposter, and he dodged. It was then only a matter of a few moments to bring him to his senses, and he finally admitted the suspicions of the authorities were well founded.

The failure of the handle to pull off as he evidently expected was due to another screw which he evidently did not notice in the dark, as it was concealed by paint. His expectation evidently was that the handle would readily yield and the peculiar nature of such an accident would be one a company might naturally settle without much delay. Failing to do so it would make a good jury case. But like the Webbs, last month, his game didn't work, and he gets nothing. He was held on a charge of malicious mischief in bail of \$300. As he made no claim for damages, it will be difficult to secure a conviction, as anybody has a right to jump at his own risk, and there is no law against yanking at grab handles. But the secret is out and every manager will do well to add to his list of doubtful cases those which have any connection with the hand rail.

This man, giving the name of August Krause, at Joliet, is known to have worked the same game in St. Paul, Minn., and in Canton, O., being known in the former city as John Cramer and in the latter as John Miller. The particulars of these cases are as follows:

On September 28, 1895, a man who gave his name as John Cramer and his address as Hastings, Minn., was a passenger upon one of the grip cars of the Twin City Rapid Transit Company in St. Paul. He sat in the rear seat and when he reached Robert street tumbled off into the street with a small brace-handle in his hand. He claimed to be severely injured and was taken to the city hospital and received treatment for some time, his symptoms being mainly subjective. The handle which he held was a small brace running from the seat to the side post, the car being an open one; there was no reason why these should work loose and none have been known to do so either before or since this "accident." The company thought that the case was without merit and at first declined to settle; but as it was unable to secure any evidence that he had removed the screws himself, finally concluded to compromise and settled for \$32.50. Since the Joliet accident John Cramer has been recognized as August Krause.

On March 25, 1897, a man giving his name as John Miller was a passenger on one of the cars of the Canton-Massillon (O.) Electric Railway, and stood on the rear platform. When the conductor left the car at a railroad crossing and the car started to cross the tracks the passenger was thrown to the ground. He claimed that the grab-handle to which he was holding was loose at one end by reason of the nut which fastened it being off. In falling he still held to the handle and continued to do so until it was jerked loose at

the other end also. He claimed to be severely hurt in the hip and back, and was conveyed to the hospital. All the circumstances of the case were such as to excite the suspicions of the officers of the railway company, but they were entirely without evidence (he being the only passenger on the car at the time) and thought it best to settle the case without a lawsuit, and paid his expenses at the hospital and paid him for his lost time. Nothing more was thought of the matter until the company was advised of the case at Joliet. The description of the man and the details of the accident led the officers of the Canton road to think that it was the same man and on receiving a photograph of Krause immediately recognized him as John Miller.

### SYRACUSE RAPID TRANSIT COMPANY.

Since the purchase of the Syracuse Consolidated Street Railway Company under foreclosure sale by a strong company and its consolidation with the Syracuse Street Railway Company to form the Rapid Transit Company, almost the entire system and equipment have been remodeled and many improvements made. The new power station has a capacity of 3,400 h. p.; 2,000 h. p. is furnished by two Allis Corliss cross-compound, condensing engines, 26 and 50 x 48 in., running at 80 r. p. m., and the remainder is from three cross-compound, condensing vertical marine engines, with cylinder dimensions of 16 and 31 x 24 in., and a speed of 150 r. p. m. The Allis engines are direct connected each to one 800-k. w. generator; on the same shaft is a steel plate fly wheel weighing 50 tons. Each of the small engines is belted direct to a 300-k. w. General Electric multipolar generator.

In the boiler room the new equipment consists of six 250-h. p. Stirling water tube boilers and four old return tubular boilers which are 90 in. x 16 ft. There are two main heaters between the condensers and the exhaust of the Allis engines, and one auxiliary heater taking the exhaust from condenser and boiler feed pumps for its heat supply. Also there is one small heater receiving the exhaust from the boiler pumps in the old plant and heating the feed water going to the return tubular boilers. There are no economizers or stokers. A trestle leads directly into the boiler house and the coal is dumped from gondola cars to the floor.

The lines are divided into 12 sections, each controlled from a separate panel on the switch-board. Two types of lightning arresters are in service; the General Electric being placed within the station on the generator panels, and the swinging-ball type suspended outside the building and protecting the feeders to each section.

Single o trolley wire is suspended from span wire with side pole construction. The poles are chiefly of iron, made of 4, 5 and 6-in. extra heavy pipe, 28 ft. over all. For curves, 5, 6 and 7-in. pipe is used. The wooden poles are 7-in. octagonal for straight line and 9-in. top for curves. In the track construction the Johnson half grooved section girder rail, weighing 90 lbs. to the yard and in 60 ft. lengths is the standard. The 36-in., 12-bolt ribbed joint, staggered, is used. The ties are of Georgia pine, 6 x 8 in. x 8 ft., spaced 32 to 60 in. At the joints the spacing is 18 in., so as to give a three tie joint. The sharpest curves on the lines are of 35 ft. radius and the heaviest grade 8.61 per cent. The whole system is thoroughly modernized, and its efficiency and capacity for handling heavy traffic is vastly increased.



## CENTRAL AVENUE STATION, METROPOLITAN STREET RAILWAY, KANSAS CITY, MO.

The new electric power house of the Metropolitan Street Railway Company, at Kansas City, Mo., offers a good example of modern power house construction. The dimensions of the power house are: Boiler room, 144 ft. long, 51 ft. wide; engine room, 144 ft. long, 63 ft. wide, the boiler and engine rooms both being 33 ft. 7 in. from the top of foundation masonry to the under side of the bottom chords of the roof trusses. The unloading shed is 41 ft. long by 20 ft. wide.

The steel frame work construction, in a general way, consists of steel columns supporting steel roof trusses, all rigidly bound together with longitudinal struts and sway rods and transverse lateral bracing, the bracing for this plant being extra heavy to withstand the very high winds peculiar to the locality. The advantages of this construction are: a rigid building capable of withstanding high winds and the vibrations of the engines, and of sustaining heavy loads. The roof covering for both boiler and engine rooms is slate laid upon wood sheathing with heavy builder's felt between, all supported by steel channel purlins.

In the engine room supported by the side columns are longitudinal plate girders carrying a 30-ton electric traveling crane.

In the boiler room, in front of and above the boilers, are located the steel coal hoppers, holding 1,000 tons; two hoppers directly in front of the stack are used as ash receivers. These hoppers are supported on two independent rows of latticed channel columns; the sides and ends of the hoppers forming the longitudinal and cross supporting girders respectively. Each hopper is supplied with a hinged spout containing a cut-off valve, the coal being fed into the boiler stokers by gravity.

The unloading shed is of light steel frame construction, covered on the roof, one side and the gable ends with corrugated iron. This shed is used as a protection during the unloading of coal from the cars.

The economical handling of the fuel supply and of the ashes is deserving of special attention. From the car in the unloading shed the coal is shoveled by hand into the receiv-

ing hoppers; then a conveyor carries it under the boiler room floor to the end elevator, thence to the coal hoppers overhead, where a horizontal conveyor distributes it throughout their length. From the hoppers it is fed by gravity into



CENTRAL AVENUE STATION, KANSAS CITY.

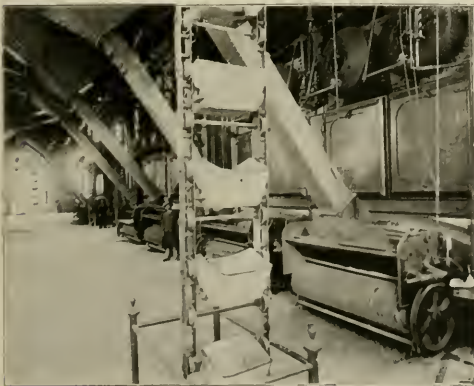
the stoker hoppers. The vertical conveyor also carries the ashes from the ash pits and delivers them into the two center hoppers located in front of the stack, from which they are drawn by gravity directly into the receiving cars in the unloading shed. By this arrangement the fuel and the refuse ashes are handled only once.

The conveyor driving machinery is located in the boiler room roof trusses, the trusses being designed especially heavy to carry this machinery, the conveyor and its load. The floors of the engine room and boiler room are supported on steel beams.

The stack for this plant is a self-supporting steel one, 175 ft. high above the foundations by 10 ft. 6 in. diameter of shell, with a clear flue of 8 ft. 4 in. inside of the brick lining. The stack is located between the boilers in the center of the boiler room.

The entire metal work of this plant, including the structural steel, the coal hoppers and the steel stack, was designed and furnished by the Variety Iron Works Company of Cleveland, Ohio.

The engine-room contains at present one Reynolds-Corliss tandem compound condensing engine with cylinders 30 and 60 x 48 in.; main shaft, 21 in. long by 24 in. diameter in hub fit of armature and fly wheel; main journal 22 in. x 12 in.; fly wheel is 20 ft. 8 in. in diameter and weighs 120,000 lbs., and runs at 80 revolutions per minute. The engine has an automatic stop valve operating by a special governor which is set to operate when engine runs 5 r. p. m. above normal speed. This governor acts and closes the valve shutting of the steam in the main steam pipe, preventing any possibility of the engine running off and wrecking itself as well as the buildings, which has often happened in large power stations. The condensing apparatus consists of a Wheeler surface condenser,



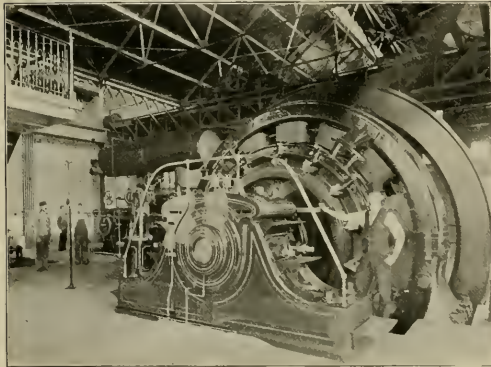
INTERIOR OF BOILER ROOM.

The air pump and circulating pumps are of the Reynolds make and are all well driven by one engine with Corliss valve gear, making a very efficient condensing system. Water is taken from the Kaw river through a 20-in. suction pipe and passed through the condenser and returned to river through a 24-in. pipe. The engine room has provision and space for three more engines and generators of same capacity as the one now in place, making a total of 8,000 h. p.

Provisions are being made for a duplicate of the present unit which the company hopes to have installed and ready for operation before cold weather. In this engine room there is a 30-ton traveling crane with a span of 62 ft. and a travel of 144 ft., the full length of building; it is used in handling the machinery during process of erection and in making repairs. This crane was made by the Brown Hoisting & Conveying Machine Company, of Cleveland, Ohio.

The boiler room contains at present six 250-h. p. water tubular boilers with wrought steel headers, which are designed to carry 200 lbs. steam pressure. These boilers are equipped with chain grate stokers, making the firing almost automatic and smokeless. Provision was made in this room for the installation of 1,600 additional horse-power in boilers. There is also located in this room one Berryman's feed water heater of 3,000 h. p. capacity.

The steam from condenser engine, the large boiler feed pumps and stoke engines is turned into this heater and utilized for heating the boiler feed. In this room there are



1,300-K. W. GENERATOR.

also two large Admiralty boiler feed pumps, made by the I. R. Worthington Company, that are of a pattern especially designed for the navy.

The steam pipe system for this power house consists of one 16-in. header supported on brackets bolted to the steel columns of the building some 12 ft. above the boilers; this header has extra heavy fittings with pipes bent to a large radius connecting it to the drums of the boilers. All flanges are of wrought steel, bored and faced with a corrugated surface and shrunk on the pipe and peened for steam joints. This peculiar arrangement of piping with long sweeps makes it flexible and obviates the use of expansion joints, which are much dreaded by the operating engineers of large stations.

All the valves and piping for this station were furnished by the Crane Company of Chicago. All of the valves are

that company's high pressure gate valves which the company has been using for some time with such success at some of its other stations, carrying 160 lbs. of steam.

The peculiar location of this power station has made it necessary for the company to expend a great deal of money on foundations. The house is situated on the west bank of the Kaw river where the foundation is gumbo and quicksand for a depth of 18 ft., at which depth there is a good, deep stratum of coarse sand. In order to get the floor of the building above high water mark the stone foundation was built 14 ft. high, thus making the foundation machinery and buildings 32 ft. high. This location was chosen on account of its convenience to water, for its good switching facilities and because it is a central point for the distribution of power to the various electric lines which it is intended that this station shall run.

The generator has a capacity of 2,400 amperes at 550 volts, and runs at 80 r. p. m.; it is guaranteed to work at 50 per cent overload for a period of five hours. The armature is 10 ft. 6 in. in diameter and the field has 14 pole pieces.

The switchboard consists of two generator panels, one Wattmeter panel and 20 feeder panels, and was manufactured by the General Electric Company. The feeder panels are supported by a steel gallery in the engine room. This gallery and the stairs leading thereto have an ornamental iron railing, which, together with the switchboard panels, adds to the appearance of the engine room. The frame work of the switchboard and gallery has been erected for two generators and six feeder panels in addition to the above number which provides for increasing the size of the switchboard in the future without increasing the size of the gallery. Sufficient space in the engine room has been allowed for extending the gallery to double its present size. The wattmeter and generator panels are located on the engine room floor under the gallery which supports the feeder panels. The wattmeter panel has one 8,000-ampere Thompson recording wattmeter and the quick break switches for controlling the lights in the power house. The generator panels are equipped with Weston illuminated dial ammeters of 4,000 amperes capacity, automatic circuit breakers of the magnetic blow out type of 8,000 amperes capacity for breaking the circuit in case of an overload, and main switches of the quick break type of corresponding capacity. To the left of the generator panels, supported on a hanging frame, are two Weston illuminated dial voltmeters, which have been calibrated together. One is used for indicating the potential of the line and the other is arranged with plugs for taking the potential of the generator before cutting it in on the line.

The feeder panels are equipped with round pattern Weston ammeters, automatic circuit breakers and quick break switches; also electric bell signals, which give alarm when any of the circuit breakers are open from an overload. The generator is connected to one of the generator panels with three 800,000-c. m. rubber covered cables for the positive connection and three for the negative. The other generator panel is used for receiving the current from the power house, at 9th and Wyoming streets, and delivering it through the wattmeter to the feeder panels. The power house, at 9th and Wyoming streets, with its number of smaller type machines, is maintained to supply current for the "owl" train service and lights during the latter part of the night, also to supply current in case of an accident to the machinery of the new plant. The feeder panels are divided up as follows: Seven panels for the Kansas City Elevated Railway, three for the

Quindaro boulevard line, two for the Armourdale and Argentine line, three for the Southwest boulevard, two for the West Side line, one for the Summit street line and one for a 400-h. p. motor, which drives the cable machinery at the 9th and Washington street power house, and one for the Broadway line, which will be changed from horse car to electric this year.

Arrangements have been made for mounting wattmeters on the feeder panels, one for each road, in order to accurately arrive at the power furnished for each of the lines separately, and the proportion of the cost of operating the power house can be charged against the lines according to the amount of power consumed. On the back of these panels is a long bus bar running the full length of the board, to which eight 800,000-c. m. cables from the main wattmeters are attached. Short bus bars connecting the panels for each road are mounted above the long bus bar, and connections will be made from the long bar through the meters to the short bars. The feeders running from the feeder panel out to the various

is buried 16 ft. below the basement floor on top of the coarse stratum of sand which is from 8 to 10 ft. below low water mark in the river. The plate is not in any manner connected so that the return currents can pass over it to the generator, except at such times as lightning may momentarily cause the generator current to pass over the discharged points of the arrester, thus reducing the action of electric currents on the plate to a minimum, and insuring at all times the proper ground connections for the lightning arresters. This plant is now furnishing current to operate 77 cars daily on 55 miles of electric road and the Summit street cable line with  $4\frac{1}{2}$  miles of track.

On the Summit street cable eight regular trains and two extra trains in the morning and evening are operated daily. Each train consists of grip car and trailer. On the electric lines thirty-one 30-ft. motor cars, four 18-ft. motor cars, fourteen 16-ft. motor cars and eight trailer cars are operated daily.

On July 5, 116 cars, comprising 63 motor cars with 8 trailers and 20 grip cars with 25 trailers were operated during the day, and not a spark of any character was seen on the commutator or at the brushes of the generator, although at times the ammeter indicated 2,700 amperes. The motor operating the cable lines consumed as high as 900 amperes for short periods of time.

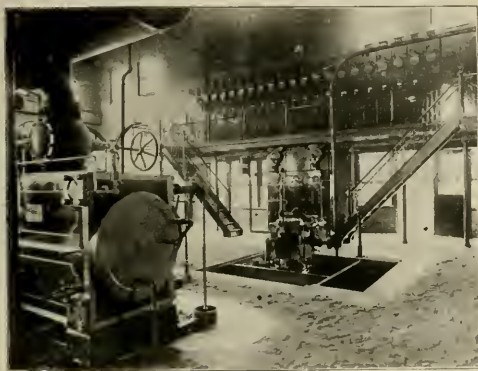
The officers of the Metropolitan Street Railway Company are C. F. Morse, president and treasurer; W. H. Holmes, vice-president and general manager; J. A. Harder, auditor; C. F. Holmes, general superintendent; Charles Grover, electrician; D. W. Dozier, chief engineer of power station.

We are indebted to General Manager Holmes for illustrations.

#### A CELEBRATION BY THE AMERICAN ELECTRICAL WORKS.

The nineteenth anniversary of the founding of the American Electrical Works was commemorated by a gathering of the friends and the business associates of the firm at the Pomham Club in Providence, R. I. The day was occupied with base ball, billiards and other amusements. About 300 guests partook of a sumptuous dinner and clambake, the clams for which were grown on the reservation of Eugene F. Phillips, president of the works. Toasts were responded to in a felicitous manner and the remarks were enthusiastically received. Eugene F. Phillips, Mayor McGuinness of Providence, George R. Stetson, vice-president of the National Electric Light Association, H. F. Wood, of the West End Street Railway, Boston, and Hon. J. C. Wyman were among the speakers. Silver headed canes with the inscription, "Souvenir American Electrical Works' Clambake" were presented to the guests. The party then returned to the city in special trolley cars, all feeling that the gathering had been a great success.

The annual reports for the year ending June 30, 1897, of the two operating companies of the Brooklyn Rapid Transit Company, namely, the Brooklyn Heights Railroad Company and the Brooklyn, Queens County & Suburban Railroad Company show that the former company has a surplus of \$112,492 against a deficit of \$13,109 for the previous year, and that the latter reduced the deficit from \$93,727 in 1895 to \$55,116 in 1896.



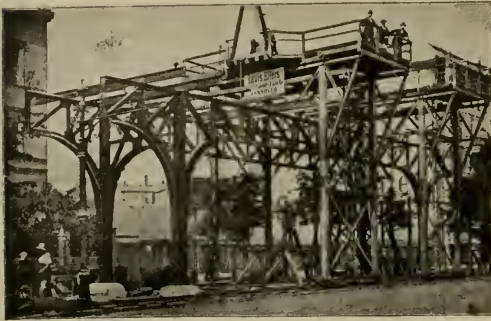
SWITCHBOARD.

sections on the different lines range from 300,000 c. m. to 1,000,000 c. m. in area, with a total area of 7,786,000 c. m., and all are made sufficiently large to operate 50 per cent more cars in case the travel demands them. The 20 large feeders are carried from the panels to the wall, and thence along the wall on porcelain insulators in a neat and systematic manner, thence through the openings in the wall, where they leave the building and are carried on iron poles to the elevated railway structure, at which point they branch to the various roads. The longest feeder is that carrying current from the power house to the west end of the Armourdale and Argentine line; it transmits power to cars 28,300 ft. from the power house. The negative bus bar, which is 2 in. in diameter, is supported on insulated hangers under the gallery floor about 4 ft. back of the generator panels. Four 1,000,000-c. m. cables are carried from the negative bus bar through brass tubes down to and through the engine room floor into the basement, then through a duct under the street to a column of the elevated railway structure. They are carried up the columns on the structure, then branch in different directions to the several roads. Each feeder and generator panel is provided with lightning arresters, all terminating in one ground plate, which consists of 72 sq. ft. of 16 gauge sheet copper. This ground plate



## BERLIN ELEVATED RAILWAY.

An elevated railway for Berlin was first proposed by the Siemens & Halske Company in 1880, the plan being to support the road on a single line of columns. This plan was approved by the municipality but violently opposed by abutting property owners on several of the streets, who appealed to the Emperor and finally secured the abandonment of the scheme. After ten years, the great increase in the street traffic in Berlin led to the renewal of the project

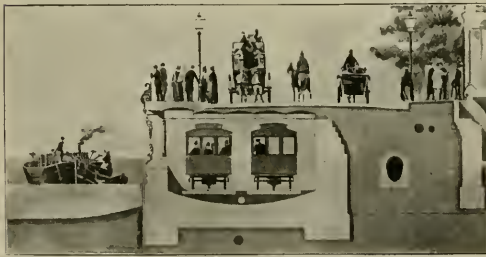


BERLIN ELEVATED ELECTRIC RAILWAY.

for an elevated road, and this time it met with greater success.

The road will be 4.7 miles in length, extending from the Zoological Garden to Warschauer place, with a branch to Potsdamer place; it is a double track structure throughout. It is to be operated by electricity. Work was begun September 10, 1896, and it is to be completed by March, 1898, under a penalty of \$10,000.

The Siemens & Halske Company received a franchise for



THE UNDERGROUND LINE.

a term of 90 years, beginning March 15, 1896. After four years the company is to pay the city 2 per cent of the total gross receipts, provided they do not exceed \$1,500,000; 2½ per cent if the receipts reach \$1,750,000, etc., the rate on the whole amount being increased ¼ per cent for each \$250,000 increase in the gross income. The minimum is, however, \$5,000. The rate of fare is left to the discretion of the company for the first seven years, after which it is to be fixed by the authorities. Trains are to commence running from both ends at 5:30 a. m. and continue at not less than

5-minute intervals until midnight or half an hour later, depending upon the season.

The illustration shows the type of the structure. The minimum clearance or headway is fixed at 18 ft. The curves have a minimum radius of 900 ft.

From the Potsdamer railroad station an underground line will extend north to the river Spree and thence along the river, in an open gallery just below the pavement, to the Castle bridge. The total length of the underground portion is about two miles.

The second of the illustrations, which are reproduced from the *Zeitschrift für Kleinbahnen*, shows the arrangement very clearly. Where completed through trains will be operated from each terminus to each of the other two termini of this combined overhead and underground electric line.

There are to be 13 stations, the average distance between them being 3,100 ft. The buildings are as simple as possible in design.

## SEVERE STORM IN WASHINGTON, D. C.

We have received from G. B. Coleman, general manager of the Metropolitan Railroad, Washington, D. C., particulars of the severe electrical storm in that city on August 10. It struck Washington about 8 o'clock and lasted 45 minutes, during which an enormous volume of water fell.

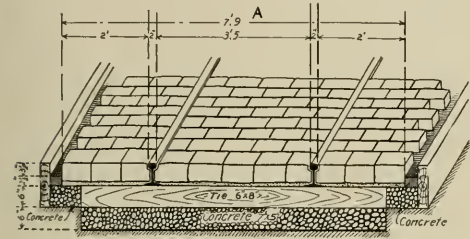
From 4½ street and Maine avenue to 9th and B streets, a distance of nearly a mile, the conduits were entirely flooded. Along Missouri avenue and near the Baltimore & Potomac Depot the water in some places was between 3 and 4 ft. deep, making it utterly impossible for even a vehicle drawn by horses to pass along. In addition to this, along Connecticut avenue, on the F street branch of the Metropolitan, the water rushed like a river, and in Georgetown at 32nd street the water was 2 ft. deep along the streets. In passing from Dupont Circle down P street the Metropolitan tracks cross what is known as the R street bridge over Rock creek. At this point the water rushed as if the heavens had opened the flood gates; the bridge was entirely submerged and the tracks covered to a depth of over 3 ft. It was not alone the underground road that was stopped for a few minutes, but every suburban road leading from the city was disabled; even the cable cars that cross at 7th and B streets were stopped by the tremendous flow of water at that point. The storm was a most unusual one and the water fell so rapidly and the streets filled so quickly that before one of the Metropolitan cars could get out of danger the entire street was flooded, covering the car motors and causing them to burn out. In this connection Mr. Coleman says: "I must say that this road fared much better than the others, as we had but one motor burned out, whereas I am told that many of the suburban motors were destroyed. After the storm ceased it was but a few minutes before our entire schedule was in operation as with the exception noted none of the cars were injured."

Within a brief period the Calumet Electric Railway Company of Chicago lost 3,000 ft. of trolley wire from unused portions of its lines. The Suburban and other companies on the south and west sides have suffered similar losses. Martin Chermavich and Vincent Novac had in their possession 75 lbs. of trolley wire cut in foot lengths when arrested by the police. It is thought they are a part of an organized gang of wire thieves.

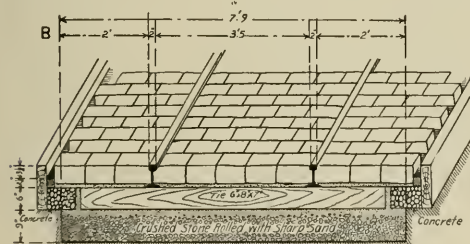
## COST OF TRACK CONSTRUCTION.

When the Denver Consolidated Tramway Company decided upon the reconstruction of its tracks, the consulting engineer for the company, John A. Beeler, prepared specifications for a number of methods of construction which, with the estimates of the cost, were submitted to the directors. Of the 11 sections which we publish, some are better than others; section M is considered the most durable and practicable, and therefore the most economical, though sections A, F and H are all first-class.

The estimates of cost are per mile of single track including pavement 7 ft. 6 in. wide.

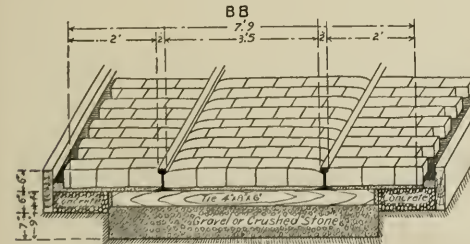


Section A. 72-lb. rail—plastic bonds—hewn red spruce ties, 24 in. center to center—hydraulic cement concrete foundation 6 in. deep under ties and between ties—basalt block pavement . . . . . \$26,940



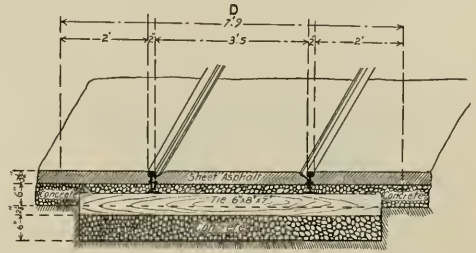
Section B. 72-lb. rail—plastic bonds—hewn red spruce ties—gravel foundation 9 in. deep under ties—hydraulic cement concrete 6 in. deep under blocks, between ties, and at ends of ties—basalt block pavement . . . . . \$23,000

Same section with gravel under and between ties and hydraulic cement concrete under blocks at ends of ties only . . . . . \$21,570

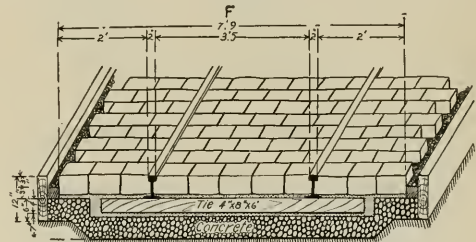


Section BB. 72-lb. rail—plastic bonds—creosoted ties, 4 in. x 8 in. x 6 ft., 24 in. center to center—gravel 9 in. deep under ties and between ties—hydraulic cement concrete

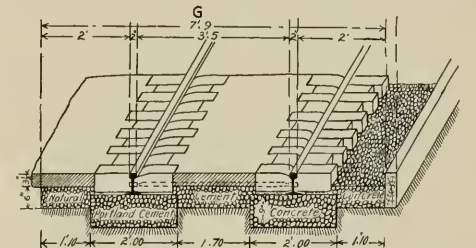
foundation for pavement 6 in. deep beyond ends of ties—basalt block pavement . . . . . \$21,500



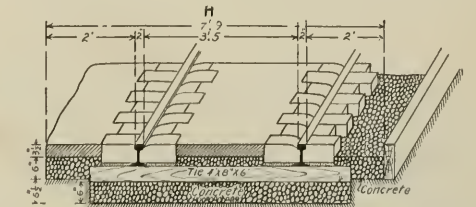
Similar to Section D. 72-lb. rail—plastic bonds—hewn red spruce ties, 24 in. center to center—hydraulic cement concrete 6 in. deep under ties—asphalt pavement with basalt block tothing (instead of steel flange as shown) . . . \$24,700



Section F. 72-lb. rail—plastic bonds—creosoted ties 4 in. x 8 in. x 6 ft., 24 in. center to center—hydraulic cement concrete foundation under ties and at ends of ties—1-in. sand cushion tamped under ties—gravel between ties—basalt block pavement . . . . . \$24,130.

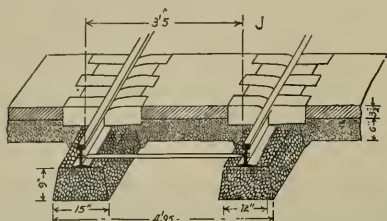


Section G. 72-lb. rail—plastic bonds—four creosoted ties, 5 in. x 8 in. x 5 ft. 6 in., and four tie rods to each rail—Portland cement concrete under rails—asphalt pavement with stone tothing . . . . . \$25,360.

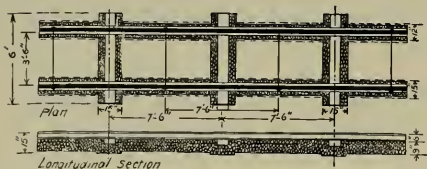
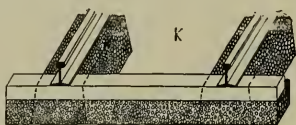


Section H. 72-lb. rail—plastic bonds—creosoted ties, 4 in. x 8 in. x 5 ft. 6 in., 24 in. center to center—hydraulic cement

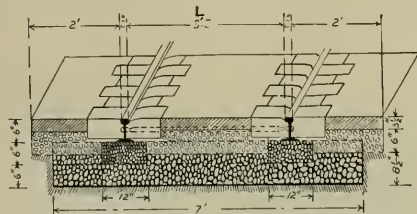
concrete 6 in. deep under ties—*asphalt pavement with stone tothing*.....\$23,950.



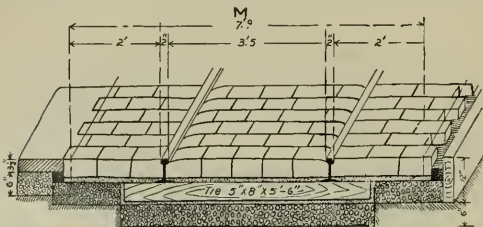
Section J. 72-lb. rail—*plastic bonds—all concrete construction—Portland cement concrete stringers under rails—tie rods 5 ft. apart—*asphalt pavement with stone block tothing**.....\$25,750



Section K. 72-lb. rail—*plastic bonds—four creosoted ties, 4 in. x 8 in. x 6 ft., and four tie rods to each rail—Portland cement concrete strips under rails—*asphalt pavement with stone block tothing**.....\$23,300



Section L. 72-lb. rail—*plastic bonds—hewn red spruce ties, 6 in. x 8 in. x 7 ft., 36 in. center to center—tie rods 6 ft. apart—*hydraulic cement concrete foundations 6 in. deep under ties—Portland cement concrete under rail between ties—*asphalt pavement with stone block tothing***..\$25,340



Section M. 72-lb. rail—*plastic bonds—creosoted ties, 5 in. x 8 in. x 5 ft. 6 in., 24 in. center to center—*hydraulic**

*concrete foundation 6 in. deep under ties and under pavement beyond ends of ties—*concrete between ties—1-in. sand cushion tamped under ties—*basalt block pavement,***.....\$26,280

## CHEAP FARES AT SAGINAW.

Since the Union Railway Company of Saginaw, Mich., went into the hands of a receiver the fare has been uniformly 5 cents. The question of rates of fare was brought up before Judge Snow of the circuit court at Saginaw. Then Receivers Loring and Morley presented a petition asking permission to issue regular tickets at the rate of six for 25 cents, and if this plan worked well labor and school children's tickets would be sold at reduced rates.

The court said he had been doing considerable corresponding of late relative to street car fares and had made up his mind that cheap fares were best both for the people and the company as the extra patronage on account of the cheap fares would increase the receipts. The court believed in educating the people to use the cars. He said it was no inducement for a poor man to invest 25 cents for six tickets. He then ordered that the receivers have tickets printed at once, the regular price to be seven for 25 cents; labor tickets, good for manual laborers only, until 8 o'clock in the morning and from 5 to 6:30 in the afternoon, to be sold at the rate of nine for 25 cents, and school children's tickets, nine for 25 cents. The fare to Riverside park will be straight 5 cents. It was embodied into the court's order that tickets should be placed on sale at prominent business places at the east, west and south sides. Conductors may handle them but that matter has not been decided.

The sale of labor tickets will be limited to actual wage earners not receiving more than \$2 a day, the name of the purchaser, his employer and the wages received shall be written on the cover of the book of tickets. The bond holders feel that the reduced fares will keep the road in a continued state of insolvency and will likely carry the matter to the state supreme court.

## THE TROLLEY DAY FAD.

"Trolley Day" was the invention of a bright Syracuse woman, as a novelty in the way of charity schemes, and was a great success there, as it has since been in nearly all the cities of the country. "Trolley Days" this year have been numerous, and the novelty of society belles and handsome young matrons collecting fares and ringing the front platform bell does not seem to lose its charm on the susceptible young man or the dignified paterfamilias.

One of the cities in which worthy charitable objects have been thus benefitted during the past month was St. Louis, and the receipts are reported to be highly creditable to the generous citizens of that place. The man who had the temerity to offer a pass or ticket was easily induced to change his fare to a coin of good size by the winning smiles of the young ladies, and no one could fail to decline when asked if he desired any change in return. One of these passengers after offering a pass, and substituting a half dollar net, spent his time the balance of the trip and evolved the following:

Oh, this is the day that the girls take the pay,  
 When you on the street car ride;  
 And passes don't go, but they take the dough,  
 And keep the change beside.



## STREET RAILWAY SERVICE REQUIRED BY THE MUNICIPALITY.

At first the street railway systems of America might have been said to be the direct results of the rapid growth of American cities, but that point was soon passed and the converse became true; street railways today are the cause of the rapid territorial expansion of municipalities. The position they occupy is a very important one, and without doubt must continue to become even more so; human ingenuity has as yet been unable to devise any other method of satisfactorily handling the large passenger traffic of cities with so little delay and inconvenience, and at so low a cost.

No other institution is subjected to the same extent to municipal supervision and control and no other franchise which involves such large interests is so made to depend upon the consent of local authorities; that such is the case is of course due to the fact that the railway and the municipality have each stimulated the growth of the other, but it is none the less unfortunate that street railway operation, a purely business matter, should depend to the extent that it does upon those who administer our municipalities, when that is the most conspicuous failure that we have made in government.

In the absence of constitutional restrictions the state legislature has such control over highways that it can authorize the construction and operation of street railways without the consent of local authorities. Eleven states have, however, constitutional provisions making the granting of franchises subject to the local authorities, and 15 others have enacted statutes to the same effect. The franchise being thus made to depend upon the consent of the city, an opportunity is given for the latter to prescribe all sorts of regulations, and these regulations have in some instances extended to nearly every branch of street railway construction and operation. Such attempts at regulation are natural, but they are not always wise; in fact, very seldom so. The reduction of fares, the paving of streets and the details of track construction are at the present time fruitful sources of trouble.

It is here the intention, however, to speak rather of some details of operation, such as the regulation of the headway, the hours during which cars must run and the rate of speed; that is, as to the service which city regulations prescribe.

The power to make regulations on these subjects is either reserved in and made a condition of the grant of the franchise or the attempt is made to exercise it as a "police power" delegated to the municipality by the state. Such regulations are valid if made in pursuance of statutory authority and not in violation of vested rights. Judge Cooley says: "The limit to the exercise of the police power where charter rights are involved must be this: the regulations must have reference to the comfort, safety or welfare of society; they must not be in conflict with any provision of the charters, and they must not, under pretence of regulating, take from the corporation any of its essential rights and privileges which the charter confers. In short, they must be police regulations in fact and not amendments of the charter in curtailment of the corporate franchise."

As to the attempt to prescribe the headway it was decided by the courts as early as 1863 that "an ordinance passed for the purpose of compelling a company to increase the number of or frequency of its trips daily can not affect either public or private rights under an existing charter or ordi-

nance." And even where the right to prescribe the number and frequency of trips has been expressly reserved the ordinance can not be enforced in case it should prove unreasonable.

Speed is a proper subject for the exercise of the police power, and most cities have passed ordinances; in the absence of action by the city the cars may be run at any safe speed, which they should be permitted to do in all cases.

With the object of ascertaining the extent to which cities attempt to regulate the operation of street railways with regard to speed and headway and the time of running the first and last cars, inquiries were sent to different companies asking for information on these points. The questions asked were:

Is a fixed headway required by franchise or city regulation?

Are there any regulations as to time of first and last car?

Are there any regulations as to night cars?

To what rate, if any, is the speed of cars limited?

Perhaps there is no better way of showing the diversity of the requirements than to give a number of the answers received.

Little Rock, Ark. On a portion of the lines the headway is fixed at 20 minutes; cars are to run from 7 a. m. until midnight; there are no regulations as to night cars or speed.

Nashville, Tenn. On one line of the Nashville Street Railway the headway is fixed at 30 minutes; no regulations as to time of running cars or night cars; the speed is limited to 9 miles per hour in the center of the city and 14 miles in other portions.

Memphis, Tenn. No regulations on these points except that the speed is not to exceed 15 miles per hour in the city limits.

Atlanta, Ga. The Atlanta Consolidated is not restricted on any of these points except as regards speed; a city ordinance provides that the speed shall not exceed 6 miles per hour within a quarter of a mile of the Union Passenger Depot and at street crossings, and aside from this is not to exceed 15 miles per hour.

Charleston, S. C. No regulation as to headway and time of running cars; speed is limited to 6 miles per hour on King street, a narrow crowded street about two miles long, and otherwise to 15 miles.

Wheeling, W. Va. No municipal regulations on these points.

Denver, Col. The Denver Consolidated is subject to no regulations as to headway and night cars, but is limited to a speed of 8½ miles per hour in the business section of the city and to 12 and 15 miles in the outside territory and suburbs.

Salt Lake City, Utah. No mention is made in the franchise of the Salt Lake City Railroad Company of headway or time of running cars; the speed is limited to 12 miles per hour.

New Orleans, La. On most of the lines of the New Orleans Traction Company the headway is fixed by the original franchises at 5 minutes from 5 a. m. to 10:30 p. m.; night cars run from 10:30 p. m. to 5 a. m. on varying headways of from 30 to 60 minutes on about two-thirds of the lines; speed limited to 12 miles per hour.

Kansas City, Mo. In the case of the Metropolitan the headway on most of the lines is fixed by the franchises at 5 minutes or less until after 10 p. m., when it may be 10

minutes; cars must run from 5:30 a. m. to 12:30 a. m.; on different routes the speed varies from 8 to 12 miles per hour.

Butte, Mont. At least four cars each way must be run daily, otherwise no headway or time limits are fixed; the speed is limited to 8 miles per hour.

Omaha, Neb. By the city charter of Omaha it is authorized "to regulate and prescribe the time and manner of running street cars within the city limits," but has not seen fit to exercise this power except by fixing the maximum speed in the business portion of the city at 8 miles per hour; other matters are left to the discretion of the company.

Los Angeles, Cal. The headway is fixed at not less than 15 minutes; cars must run as late as 11 p. m.; the speed is limited to 8 miles per hour.

Spokane, Wash. On some of the lines of the Spokane Street Railway the headway is fixed at 30 minutes, on others it is not fixed; the speed is limited to 8 miles per hour within prescribed limits and to 12 miles otherwise.

Oakland, Cal. On the lines of the Consolidated the headway is fixed at 10 minutes; there are no regulations as to the time of running cars; the maximum speed is fixed at 8 miles per hour by ordinance.

Duluth, Minn. On one line operated by the Duluth Street Railway, the Lakeside line, the headway was formerly 12 minutes, but has been changed to 40 minutes, otherwise no regulation; no time fixed for first and last cars; speed is limited to 12 miles per hour, except for nine blocks in the center of the city where it is 8 miles.

Toledo, O. Cars must be run at intervals of 30 minutes for 16 hours each day, the first to start at 6 a. m.; no regulations as to night cars or speed.

Philadelphia, Pa. The ordinance granting the right to use electricity for motive power provided that cars should be run at intervals of not less than 5 minutes between the hours of 6 and 9 a. m. and 5 and 8 p. m., and at intervals of not less than 10 minutes at all other hours of the day, except from midnight to 5 a. m., when it may be one hour; no limit as to speed.

Washington, D. C. The charter of the Metropolitan provides that during the day cars shall be run as often as every 4 minutes, as often as every half hour until midnight, and as much oftener as public convenience may require; there are no charter requirements as to the time of the last car; the speed is limited to 12 miles per hour within the city, 15 miles outside, and 6 miles at crossings.

Harrisburg, Pa. No city regulations on these points except that the speed is fixed at 8 miles per hour within the city limits.

Albany, N. Y. No regulations on these points except as to speed, which is 8 miles per hour in the center of the city and 12 miles in the outskirts.

St. Louis, Mo. All companies are required by city ordinance "to start one car from the terminus between the hours of midnight and 1 a. m. of each day and every hour and a half thereafter until the time fixed for the starting of cars on regular day trips, and the Broadway line shall run cars so that a car shall pass the Court House going north and south at 1 a. m. each day and every hour and a half thereafter until 5:30 a. m.;" otherwise there are no regulations as to headway; the speed permitted varies on different lines, the rates being 10, 12 and 15 miles per hour.

Quincy, Mass. Headway varies from 8 to 16 minutes on different lines; the last car must leave the city not earlier

than 11:30 p. m.; the speed is limited to that usual in other cities similarly situated.

Manchester, N. H. No regulations on these points.

Boston, Mass. In one or two isolated instances the minimum headway on the lines of the West End road is 30 minutes, and in these cases the cars must run between 6 a. m. and 9 p. m.; the speed is fixed at 7, 9 and 12 miles per hour in different parts of the city.

Holyoke, Mass. No regulations on these points.

New Haven, Conn. No regulations on these points except as to speed, which may not exceed 10 miles per hour within 1 mile of the center of the city and 12 miles elsewhere within the city limits.

Providence, R. I. The speed is limited to from 8 to 14 miles per hour according to the route.

Portland, Me. No regulations on these points except as to speed, which is limited to 10 miles per hour.

Erie, Pa. Headway fixed at 10 minutes; cars must run from 6 a. m. until midnight; no limit as to speed.

Montreal. Headway fixed at 5 minutes from 6 a. m. till 7:30 p. m., and at 10 minutes from then until midnight; may run after midnight and charge double fare; speed limited to 8 miles per hour.

Toronto. Service must be approved by the city engineer; first car at 5:30 a. m., last at midnight; speed, average for round trip, 10 miles; in certain parts of the city, 6 miles.

This may be summarized as follows: On 11 of the roads reported the headway is fixed by the city; on six roads the headway is so fixed for a portion of the lines only; on 15 there are no regulations as to the headway. When the headway is prescribed it is between certain hours of the day which also fixes the time of running the first and last cars. But three of the 32 companies report that they are required to run owl cars; these are in Washington, Philadelphia and New Orleans, and in New Orleans the requirement extends to but 10 out of 15 of the company's lines. The speed is regulated by ordinance on 25 of the 32 roads.

The subject of headway will always be taken care of by the law of supply and demand. When the traffic justifies the running of cars the company is only too glad to run them; when the traffic does not justify it any requirement on the part of the city is apt to be unreasonable.

The same may he said of the night service.

There is no reason to suppose that the street car service in Boston is not as satisfactory to the patrons as that of Philadelphia and New Orleans, though the latter require a short headway, and the former what is practically none at all. The example of Omaha is to be commended; while reserving the right to prescribe regulations it has been found that the best of results are obtained where the matter is left to the discretion of the company.

The Old Colony Trust Company of Boston, brought suit against the Allentown & Bethlehem Rapid Transit Company on a mortgage for \$200,000, which the defendant alleged was fraudulent. John Rupp, as referee, decided that the mortgage is valid.

The two street railway systems and the two lighting companies of Paducah, Ky., have been combined. The Paducah Street Railway Company absorbs the Peoples' and the lighting plants will be operated under the name of the General Electric Company. The consideration for the transaction is \$50,000 cash and \$85,000 in bonds.







Form 131B, 1500-7-97. **Material Slip.** No. **10100**

189

| QUANTITY | ARTICLES | Rate | AMOUNT |
|----------|----------|------|--------|
|          |          |      |        |
|          |          |      |        |
|          |          |      |        |
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Foreman will see that all scrap is reported to Storekeeper on this blank for credit.

Form 131B, 1500-7-97. **MATERIAL SLIP.** A. R. No. **10100**

189

Storekeeper: Please furnish and charge

| QUANTITY | ARTICLES | Rate | AMOUNT |
|----------|----------|------|--------|
|          |          |      |        |
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**FORM 7**  
*Regular Size with stub 4 1/2" x 12 1/2"*

Foreman will see that all scrap is reported to Storekeeper on this blank for credit.

Foreman Armature Room.

balance against the armature room, and to see that the material has been properly accounted during the month by the mechanic.

In the brass foundry the case is somewhat different. The material is delivered on a similar material slip, charged to the foundry and credited to the storeroom. When it comes back in manufactured form, the entries are reversed, allowance being made for the labor element in fixing an arbitrary

**TWIN CITY RAPID TRANSIT COMPANY.**

Requisition No. \_\_\_\_\_ Department, \_\_\_\_\_ 189

To General Storekeeper:—

*Please order for Storehouse stock the following:*

| Quantity. | Name and Description of Article. | For What Purpose. | Date Needed. |
|-----------|----------------------------------|-------------------|--------------|
|           |                                  |                   |              |
|           |                                  |                   |              |
|           |                                  |                   |              |
|           |                                  |                   |              |

Approved: \_\_\_\_\_ 189 Name \_\_\_\_\_ Office \_\_\_\_\_

G. M.

The heads of departments will fill out this requisition and forward to General Manager for approval.

FORM 8.—REGULAR SIZE, 8 1/2 x 9 1/4 INCHES.

uniform price, at which the manufactured article is credited to the foundry, the idea being to prevent the confusion which would naturally arise from fluctuations either in the price of material or labor. The profit or loss at this price is credited or charged to suspense account until the end of the year.

In securing new material to take the place of that which is out of service, the old material is first returned and inspected by the mechanical department, and then divided into two classes, scrap and second hand material. According to the class in which it falls, credit is allowed on the new material taken out, and new material, such as trolley wheels,

for example, to take the place of old can only be obtained by the return of the old, in whatever shape or condition it may be.

In this mere outline it will be seen that all possible holes for leakage are stopped, while at the same time the system offers every facility for reference, in order that all material may be followed throughout its entire course from the date ordered to the time when put in use. In fact, no material is paid for that is not received, none is paid for twice, and no supplies are delivered from the storeroom that are not accounted for and charged to some account.

**RAILS AND POLES TAXED AT TORONTO.**

Judge McDougal has decided that the Toronto Railway Company must pay the taxes on its rails, poles and wires, as assessed by the city.

The decision was in part: "It is now urged that the question to be determined, viz., the liability of the Toronto Railway Company to an assessment upon its rails, poles and wires, is res adjudicata, it having been decided in an appeal from the assessment in question heard before the Board of County Judges in July last that the railway company is not liable to such assessment. It is true that this is the effect of the judgment pronounced by the judges composing the board; but the question had been already decided by the same two judges in an appeal heard in 1896. But since that date a judgment has been rendered in the supreme court of Canada in the case of the Consumers' Gas Company v. Toronto, affirming the liability of the Gas Company to assessment for its mains; and the chief justice of the court, besides so holding, went on to point out that there was no distinction between gas mains and street rails, and stated expressly that the case of Fleming v. Street Railway Company, decided by the court of appeal, 37 U. C. reports, must now be held to have been wrongly decided. It was largely, though not entirely, upon the strength of this case of Fleming v. Toronto Street Railway Company that the two county judges decided, in 1896, that the rails, poles and wires of the Toronto Railway Company were not liable to assessment. In the later judgments of July last, Judge Dartnell says he expresses no opinion as to the effect of the supreme court decision in the Consumers' Gas cases upon the appeal then being considered, and reaffirms his former judgment on other grounds.

"The appeal will be allowed, and the original assessment made by the assessment department against the rails, poles and wires of the Toronto Railway Company be restored to the roll."

Form 131B, 1500-7-97. **MATERIAL SLIP.**

For what used \_\_\_\_\_ Station \_\_\_\_\_ 189 \_\_\_\_\_

| QUANTITY | ARTICLES | Rate | AMOUNT |
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**FORM 9**  
*Regular size 8 1/2 x 4"*

Signed \_\_\_\_\_

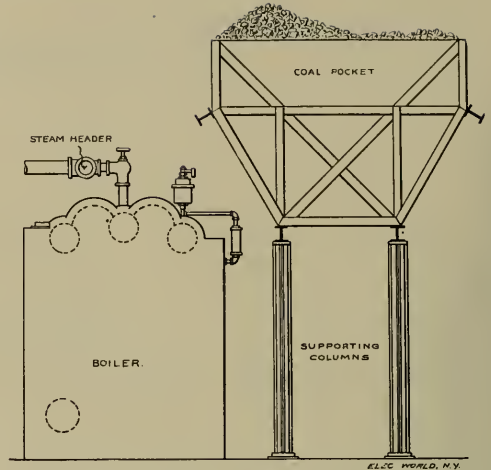
### FAILURE OF COAL POCKET AT PATERSON, N. J.

A very serious and singular accident occurred at the station of the Edison Illuminating Company at Paterson, N. J., on August 14, which compelled a complete shutdown for 31 hours.

This station was recently built and very carefully designed, the endeavor of the management being to make it a model in all respects. It is the only station in Paterson, a city of about 100,000 inhabitants, and therefore particularly important. The output consists of high-tension series arc current, direct current at 230 volts for interior lighting and power current at 500 volts furnished to the street railways.

The station equipment comprises six Stirling boilers, rated at 435-h. p. each, which supply steam at 150 lbs. pressure to nine vertical cross-compound Ball & Wood engines. All but two of the engines are direct connected to Edison multipolar generators. The aggregate capacity of the engines is 5,750-h. p.

A large V-shaped coal pocket was built over the front of the boilers. This pocket was of iron, 32 ft. wide, 20 ft.



SKETCH SHOWING COAL POCKET AND BOILERS.



POCKET PLATING RESTING ON TOP OF BOILERS.

deep and 105 ft. long, with its base 19 ft. above the floor. The sides were tied together with diagonal trusses of angle iron, as shown in the diagram, at intervals of 16 ft. The pocket was supported cantilever fashion on I-beams which rested on columns.

At 4:30 o'clock, August 14 (the pocket being filled with approximately 1,000 tons of buckwheat anthracite coal), the right hand side of the pocket, as seen in the sketch, bulged out and broke, dumping hundreds of tons of coal on the floor below. Almost immediately the entire pocket, relieved of its load on one side, canted to the left and fell on the tops of the boilers. The result was a complete wreck of the main steam supply system.

The 14-in. steam header was ripped out, and a part of it was thrown to the floor below. The nozzle of every boiler was parted, steam drums were driven in, flanges cracked, safety valves wrecked, and the system generally destroyed. In five minutes' time all steam had escaped, making a vent by bursting a section of the roof. A fair idea of the confusion may be obtained from the accompanying illustrations, which

were taken Monday, after two days had been spent in clearing up.

Fifteen minutes after the crash men were at work shoveling away the coal and running a new steam main. At 11:30 p. m. of the following day, the arc lights of the town were re-lighted, one of the end boilers having been put into operation. In another 24 hours a temporary 8-in. header had been erected, and the other end boiler of the battery fired up. These two boilers were obliged to carry the whole load for a week or 10 days, while the intermediate ones, which were more seriously affected, were repaired. During the day, August 16, three of the 650-h. p. engines were running heavily loaded and supplied by the one 435-h. p. Stirling boiler. No trouble was experienced from water in the steam or other causes. The output was over 1,000 amperes on each side of the three-wire system, and approximately 1,200 amperes at 550 volts.

The power station at Rutherford supplied current to the White line of cars and the Paterson & Newark line received a scanty supply from a small station at Nutley.



TOP OF BOILERS AND STEAM HEADER.



## CREATING TRAVEL.

H. Milton Kennedy, who is the resourceful general passenger agent of the Brooklyn Rapid Transit Company, in discussing the necessity of working up excursion business on trolley roads, said:

"On a steam road the company asks its patrons to spend dollars, while on a trolley system we ask them to spend nickels, so how much more will they be open to persuasion? A resort to which a steam road carries passengers costs at least a dollar to reach, and it is an excursion people think about before taking, and they do not take it very often. With a nearby resort, reached by a trolley line, a man will make up his mind on an instant, perhaps, on seeing an advertisement. He can reach there in an hour or less, and

## POWER HOUSE OF THE MARKET STREET RAILWAY, SAN FRANCISCO.

The Market Street Railway Company of San Francisco operates by far the largest system in the far west. It includes twelve transportation companies, which were consolidated under one management in 1893. At the present time the system comprises 190 miles of track, of which 26.9 are operated by horses, 60.5 by cable, 19.7 by steam and 82.9 by electricity. Prior to 1894 none of the lines were electrically operated; the work of changing the motive power began on the Metropolitan in that year and has been extended to the other lines as rapidly as circumstances would permit, until now over 40 per cent of the total mileage is operated by electricity.

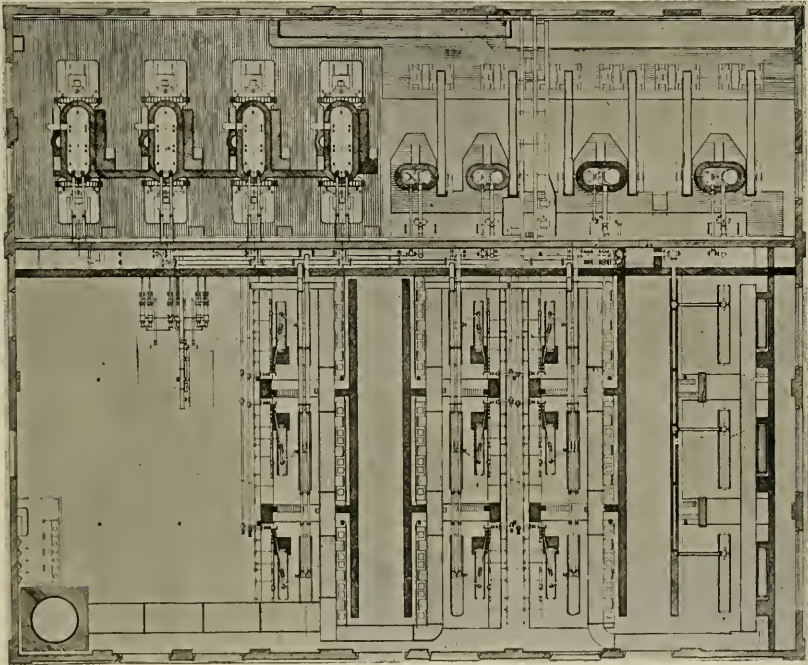


FIG. 1—GROUND PLAN, BRYANT STREET STATION, SAN FRANCISCO.

it only costs 5 cents, and with a few more nickels he can spend an enjoyable evening. There are thousands of people who have a quarter, or 50 cents to spend who will go to a nearby resort in the evening if they think they can have a good time, and many of them have families they will take with them. It is my business to tell them where to go and what to do when they get there. For that purpose I keep in touch with all the proprietors of the summer resorts around the city, and just as soon as a novelty is introduced I let the people know of it, either by means of placards on the cars or else I fix up some sort of an attractive circular, always striving to avoid the commonplace."

Torquay held a public meeting recently to consider the electric railway scheme.

The electric power station, known as the Bryant street power house, occupies a block 165x199 ft., bounded by Bryant, Alameda, York and Channel streets. Work was begun in 1893 and one-half of the present building finished in the following year; since then the building has been completed and its capacity quadrupled. With the completion of this station the one on Carl street, formerly used to supply the Metropolitan lines, was abandoned. The location of the station is near the center of the car district and favorably situated for supplying the new districts now being developed.

The building is of brick, one story high. The fire room fronts on Channel street and is alongside the steam railroad track and convenient for coal supply. The engine room is separated from the boiler room by a 24-in. wall, and fronts on Alameda street.

The roof of the engine room is supported on trusses which span the room and leave it clear for the operation of the crane; the boiler room roof is in three sections, the trusses resting on the side walls and two rows of columns.

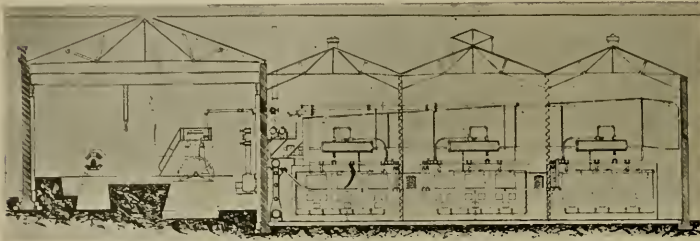


FIG. 2—CROSS SECTION—GENERAL ELECTRIC END.

When first equipped the capacity of the station was 1,800 h. p. The plant was started early in September, 1894, and was run non-condensing until the following April, awaiting the completion of the pumping station which was to supply the condensing water.

Fig. 1 shows the ground plan of the station, the right hand portion in the cut being that first built. Fig. 2 is a cross section through the General Electric end of the station, and Fig. 3 a cross section through the Siemens-Halske end.

The present boiler equipment comprises 36 boilers of the "elephant" type, arranged in batteries of three; all of them are 64 in. in diameter by 16 ft. long. Nine of these, those first installed, are designed to carry 130 lbs. working pressure and are fitted with the United States rocking grates and operated under natural draft. The other 27 boilers are designed for 160 lbs. steam pressure and are

equipped with the Roney mechanical stoker and operated on the Howden forced draft system.

The engines are eight in number, all built by the Union Iron Works, San Francisco; two vertical compound condensing 300-h. p. engines, cylinders 16 and 28x24 in., speed 160 r. p. m., with cranks 180° apart; two 600-h. p. engines of the same type, cylinders 22½ and 39x24 in., speed 160 r. p. m., with crank 180° apart; and four vertical triple expansion engines, with cylinders 20, 30 and 44x30 in., running at 150 r. p. m.

The compound engines were those first installed. The smaller of these have one and the larger have two fly-wheels, each 9 ft. in diameter and 25 in. across the face and weighing 12,000 lbs. Each fly-wheel is belted to the pulley of its generator by a 24-in. double leather endless belt. Each engine is equipped with independent condenser and air pumps, the circulating water being supplied from the

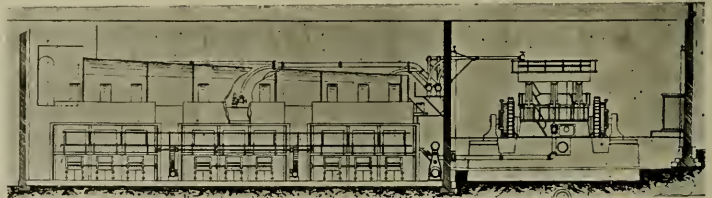


FIG. 3—CROSS SECTION—SIEMENS-HALSKE END.

pumping station under sufficient head to do away with the necessity of circulating pumps in the central station. Steam is furnished to each engine from a large receiver, the admission to the high pressure cylinder being controlled by a shaft governor of the 1de type; the cut-off on the low-pressure cylinder is fixed. Both cylinders are steam jacketed.

In the triple expansion engines, the receiver from which steam is drawn to the engine, is a part of the high pressure cylinder casting and acts as a jacket for that cylinder. The same method of governing is used for these engines as for the smaller ones; the cut-off on the intermediate and low pressure cylinder is fixed and a shaft governor used for the high pressure.

All cylinders and covers are jacketed and the valves are fitted with balance pistons on continuations of the valve stems. The air pumps for these engines are driven from the intermediate crossheads by rocker arms and the condensers are a part of the bed plates and have the circulating water outside of the tubes in contact with the bed plate. All the bearings and slides are arranged for water circulation, the supply being taken from the injector by a donkey pump, and the discharge from each bearing is in plain view from the back of the engine. The top platforms of these four

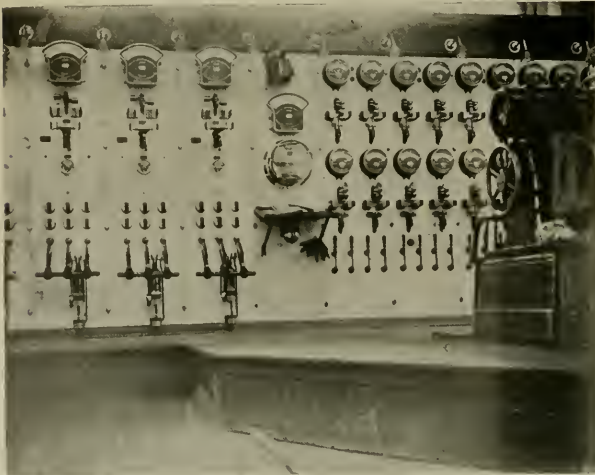


FIG. 4—CENTRAL PANELS OF SWITCHBOARD.



engines are connected by flying bridges so that there is a continuous path for the oiler from one engine to another. On these engines the cranks are at  $120^\circ$  and no fly-wheels are used, the Siemens & Halske armatures serving as such.

a ground return with an auxiliary wire so connected at the power house as to be inside the circuit breakers and fused at the pump station so as to be disconnected from the ground and used as a return in event of the main breakers going out.

There are 14 generators in the station all connected to the same bars in multiple, the necessary adjustments being made by shunts across the positive and equalizer wires at the back of the switch board, so that the load is equally distributed among the machines according to the capacity of each. There are six 200-k. w. G. E. compound wound railway generators, 500 to 590 volts, 480 r. p. m., belted to the four small engines, one to each of the 300-h. p. and two to each of the 600-h. p. Eight 400-k. w. Siemens & Halske external armature generators, 500 to 590 volts, are direct connected to the 1,300-h. p. engines, one at each end of the shaft. The leads to the switchboard are taken down through the engine room floor into the large conduits and up the back of the board to the terminals.

The switchboard, which is designed for a maximum out-put of 10,000 amperes, is of white California marble, 2 in. thick. It is 59 ft. long by 8 ft. high, and is set 5 ft. from the wall midway of the length of the engine room. There are 29 panels, 2 ft. wide; the 14 to the right of the center are connected to the generators and those at the left to the feeder circuits. The center panel is fitted with Weston illuminated dial ammeter and voltmeter, the latter on a swinging bracket and the former connected in the bus bar between the generators and feeders. A Thomson recording wattmeter and a log desk complete this panel. Each generator panel has mounted on its face a Weston illuminated dial ammeter, a Westinghouse circuit breaker, a shunt field rheostat, a cut-in voltmeter plug, a triple-pole main switch and a Siemens & Halske carbon shunt field switch, which

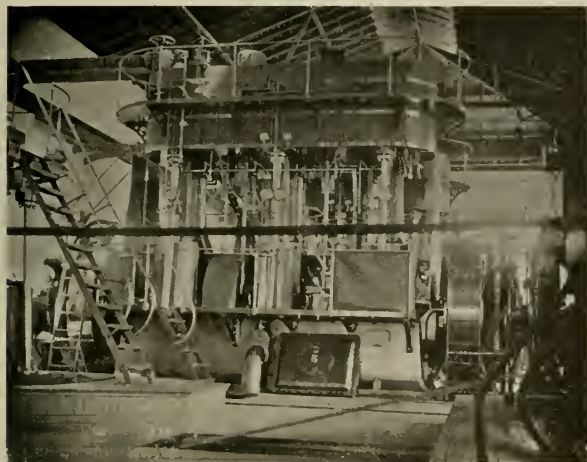


FIG. 5—1,300-H. P. UNIT.

The system of lubrication is very economical of oil, but 50 gallons per month being used for the eight engines. Reservoirs are placed about the engines, from which the oil is fed to the bearings by means of wicks, as is the common marine practice. The drip is returned to filters placed alongside the main supply tank, which is under the engine room floor, and when filtered the oil is pumped into the main tank under an air pressure of from 15 to 20 lbs. and thence carried to the reservoirs on the engines.

The water for condensing is drawn from San Francisco bay at a point about 6,000 ft. from the station and delivered through a line of 36-in. cast iron pipe. The pumping station is equipped with two centrifugal pumps, driven by 150-h. p. G. E. motors. These motors receive current from the power house and are controlled by rheostats in the field and armature circuits. Only one motor is used the other being held as a reserve. The water is supplied under a pressure of about 15 lbs., which is controlled by a stand pipe in the pump house.

The discharge from the condensers at the power house is through a system of piping connected to the street sewer. The arrangement is such that the pipes act as siphons and relieve the pumps to some extent. When starting in the morning one of the small engines is run non-condensing to start the pump motor. Salt water is used by the water cars for sprinkling, and the fire system is so arranged that the pump may draw from either the supply or discharge of the circulating pumps. The pumping station is operated on

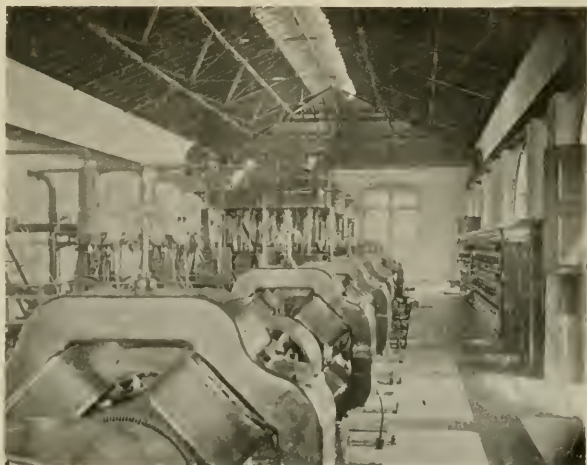


FIG. 6—GENERAL VIEW OF ENGINE ROOM.



opens the shunt circuit gradually through a pair of carbon points, slowly separated by means of a worm gear and crank. The generators being of different sizes the scales on the ammeters are so graduated that a correct distribution of the load is indicated when the pointers are all in the same angular position.

Each feeder panel is arranged to supply four circuits, each of 400 amperes, and has a round dial Weston ammeter, a Westinghouse circuit breaker, and a single-pole switch for each circuit. The top and ends of the board are finished with teak molding, and the illuminating lamps set along the top molding. The feeder wires lead from the bottom terminals of the switches through the floor and along the conduit underneath to the end of the building, thence up and out.

Figs. 4 and 7 show views of the switchboard. Fig. 5 is from a photograph of one of the 1,300-h. p. units and Fig. 6 a general view of the generating room. Fig. 8 shows the exterior of the station.

At the present time the maximum output of the station reaches 6,000 amperes and the average for 24 hours is 2,200 amperes.

### "WORKING RESULTS ON ELECTRIC TRAMWAYS."

(From the Electrical Review, London.)

It is always interesting to get plain talk from go-ahead tramway men, and the STREET RAILWAY REVIEW therefore does a good deed in setting up a "symposium" on the comparison of electric lines with one another, according to the cost per car-mile or per passenger. The symposium, however, is all one way, a practically unanimous opinion being expressed in favor of adopting the cost per car-mile as



FIG. 7.—GENERAL VIEW OF SWITCHBOARD.

a means of comparison. It is not very easy to see exactly what the contributors to, or the originators of, the symposium are driving at; for all practical value in comparison of lines they might as well take the average house rent paid by the respective motormen, or the comparative number of red-headed conductors. Cost per car-mile is readily arrived at; but where is the fairness of comparing line A, which runs through a scattered district, and has a passenger density of, perhaps, five per car-mile, with another line B, in a populous town carrying an average of 10 or 12 passengers per car-mile all the year round? Yet both may have the same working costs per car-mile, for everyone knows that, proportionally, it requires little, or no more, outlay of energy to run cars with a full load than those that are empty. There is all the difference in receipts and net balance however. This tends to show that it is of no value to take simply one side of the account without regard to other conditions, unless the idea is to limit comparison strictly to cost. Tramway shareholders are naturally anxious to see the costs reduced as low

as possible, but they also like to have the cars well loaded. It is not, however, any fairer to take the comparative number of passengers on different lines as a means of arriving at their prosperity or otherwise. Some of the passengers may be "dummies" or "dead heads," some half-rate; nearly all may be paying different fares according to length of travel; some may be counted twice over, if they pay for a continuation of route. Even adopting the car fare as a unit does not give satisfaction, for most lines have a variety of fares according to distance, and it would be difficult if not impossible to reduce them to a standard or typical fare representing the average passenger. It is, of course, easy to see the object of choosing either the car-mile or the passenger as a basis of comparison. In the first case, it costs a definite amount to run a car for a mile, and the less this amount the better the line; in the second case, increase of passengers means increase of receipts and therefore a better line also. A combination of the two seems advisable, but some difficulty will be found in effecting it.



FIG. 8.—EXTERIOR OF STATION.

Certainly it seems of no use taking the passenger unit, a fairer way to our mind is to average the passenger density per car-mile over the whole year. On English lines this varies from 5 to 12, or even more; and an equitable comparison can only be made between those lines which have approximately the same average annual density. Then the cost per car-mile gives a tolerably fair notion of the respective quality of management and design in any two tramway systems. Taken altogether, and regarded as a form of electricity supply, the operation of electric tramways occupies a very peculiar position. The cars have to be run in more or less complete system whether passengers and payment are forthcoming or not. It is equivalent to the position of an electric lighting company which has to keep alight a certain minimum number of its customer's lamps, which are only paid for when they are actually being used. We wonder what electric light supply engineers would say to such a method of obtaining revenue! If electric tramways were on a level with electric lighting companies, they would only be available to a favored group of season ticket holders who would pay a small regular annual fee, and in addition a reduced fare each time they used the cars. Dick, Tom and Harry in the street would have no chance of jumping on for a penny a ride. All which seems to show that electric tramways are even far greater public boons than electric lighting, also that the Wright maximum demand indicator may, bye and bye, have to be adopted also to purposes of a personal and portable nature in connection with the comparative use of electric trams by individuals!

#### PLEASURE RESORT OF THE NEW ORLEANS TRACTION CO.

Few visitors to New Orleans have not taken that most delightful ride out to the West End, where, surrounded by water on three sides, and with the attractions of the ever interesting Lake Pontchartrain, the New Orleans Traction Company has built one of the finest pleasure resorts in the country.

The program provided for the entertainment of the patrons of the road is surprising, both in the quality and quantity of the bill. There are afternoon and evening performances, the latter commencing at 7 o'clock, and lasting until 11:30, and as a sample, taken at random, the following will give a good idea of what is being furnished free to the citizens of New Orleans:

First, a concert of six selections of popular music by full band, followed by a fine acrobatic performance by a troupe of four people. Then the band plays again, after which six scenes are shown with a cinematograph just brought over from Paris. Six pieces by the band and another high wire and trapeze act in which three people occupy twenty minutes. An Edison vitascope presents six pieces, during and after which the band plays. The same amount of entertainment with different music and fresh views and new acrobatic performances follows for each day of that week, making an evening's entertainment fully equal to that provided by most roof gardens, and quite superior to many, which charge 50 cents admission. And yet this is all free and patronized by thousands of the best people of the city.

In reply to an inquiry as to his experience and the future of this feature of street railroading, C. Densmore Wyman, general manager, whose words and judgment will appeal to all in the business, writes:

"Our West End resort is doing finely. We have often on Sundays 12,000 to 15,000 people, and other evenings, when good weather prevails, our attendance is from 2,000 to 3,000. We have a fine band and other attractions, acrobatic and musical. At no place in the United States that I know of is so remarkable and excellent an entertainment provided absolutely free, except the cost of car fare, which is but 15 cents for a round trip of 12 miles, which the trains make in 40 minutes. The location itself is beautiful, being on the lake, and all the surroundings delightful.

"To an old time railroad manager, I imagine the statement that a street railway company should take upon itself a salary list of \$1,500 a week for music and attractions, to say nothing of the cost of the maintenance of hotels, pavilions and garden, and operation of trains, and rely for income upon nothing but car fare of patrons, who are transported such a distance for the small sum of 15 cents; and the company regard the operation as a good financial scheme; would be, to say the least, surprising and a knockout to his antiquated and conservative notions. The fact of it is my experience this summer in the management of a place like our West End has convinced me that ere long the amusement enterprises of the country, in the summer, will be practically conducted by railway companies, and railway managers will have to make themselves au fait with the business of an impresario and amusement purveyor, in all that pertains to the conduct, advertising, etc., of shows."

#### MORE AIR ON THE MANHATTAN ELEVATED.

A new air motor, the product of the American Air Power Company, is being tested by the officials of the Manhattan Elevated Railway Company. The locomotive, which was described in the REVIEW for May, has been in operation in Rome, N. Y., for some time, and it is reported that its work there, as well as the trial trip on the elevated, was successful. The motor in appearance closely resembles the steam locomotives now in service. The tubes are charged at 2,000 lbs. pressure from the compressor plant on Greenwich street and this charge will run the motor for one hour or long enough to make a round trip. The speed of the motor is about the same as that of the old locomotives and there is little noise in its operation. The officers of the railway company have nothing to say in regard to the merits of the machine.

Sanction for the Brompton & Piccadilly Circus Railway has been given by the select committee of the House of Lords. The line will be laid in a tunnel two miles in length, and will be operated by electricity. At South Kensington it will connect with the District Railway.

The line between Kensington Park and Washington street of the Atlantic Highlands, Red Bank & Long Branch Electric Railway Company was built across lots belonging to the Tradesman's National Bank of New York, without proper authority. Representatives of the bank were instructed to stop the cars from running across the lots, which was done effectively by tearing up the tracks and building a fence around the property of the bank. As the company had a terminus at Kensington Park and regular traffic was soon to begin, a conference was held to adjust the difference.

## SHAFTS.

BY E. DEBUS.

At the recent International Congress of Naval Architects and Marine Engineers, held in London during the Queen's Jubilee, a paper on the subject of "Shafts" was read by G. W. Manuel, and the subject was thoroughly discussed by some of the most prominent engineers of both this country and Europe. It was shown that shafts fail generally from two causes; either from flaws made in them during the process of manufacture, or from fatigue of metal due to the work put upon them in actual service.

It was stated that 26 large steamers in the North Atlantic alone had broken their shafts during the past year, and a great many smaller vessels had suffered similar accidents, of which no record was kept. The fact that during the progress of the meeting three of the large Trans-Atlantic liners broke their shafts gave the subject special interest, and many points of value were brought out in the paper and the ensuing discussion.

This subject of shafts is one of vital interest to the street railway engineer. The breakage of this part of the engine is a common accident, and is looked upon by many who have not considered the subject carefully, as unavoidable. Usually engines are bought in the market from the lowest bidder, the guarantee by the builder of perfect workmanship and high efficiency being all that is required.

When the shaft breaks it can be easily shown by the engine manufacturer that a few more miles of track, and a few more cars have been added, and that the service which the engine was called upon to do at the time of the break was more than was calculated when the engine was supplied, and there the matter rests. There are, however, shafts and shafts, and as there is no service, outside of that required by marine work, that is as trying as street railway work, we quote some extracts from the above mentioned paper, feeling that they will be noted by our readers with interest:

"Iron is now less used, especially for crank shafts; steel is gradually taking its place in ocean-going steamers, except for propeller shafts. Iron shafts are, I may say, made up of thousands of small pieces of selected iron, generally termed scrap, cuttings of old iron boiler plates, good navy ship iron, cuttings off forgings, old bolts, horse shoes, angle iron, all welded together, forged into billets, reheated and rolled into bars, cut into lengths, and formed into slabs of suitable size for welding up into the shaft. Before the use of steel generally, considerable improvement on the old method of faggoting, so-called, had been made, more powerful forging hammers used, along with more suitable furnaces and fuel; still, with all this care, I may say there is not an iron shaft without flaws or defects more or less, and when these flaws became placed during the construction of the shaft in proximity to the greatest strain, and though there was no hot bearing (which no doubt would have made matters worse) they often extended until the shaft became unseaworthy and, after all, the best wrought iron shafts that can be made of the finest scrap from the best qualities of selected brands are 60 per cent inferior in strength to the best mild cast steel made on the open hearth system, cast into ingots, and forged down under the hydraulic hammer or press.

"The term mild steel applied to shafts in a general man-

ner does not in my experience represent the condition of the shaft, for I have found there are very great differences in the value and quality of mild steel, even as much as I found in wrought iron, depending largely on the qualities of the iron used and the chemical and moulding operations of converting it into steel, and also the amount and description of mechanical work applied when being forged into shafts. Mild steel was first used by the P. & O. Company in 1880; the dimensions of the shafts were limited by the same rules as those for wrought iron shafts. The steel was made by the best makers, having a tensile strength of 24 tons per sq. in., it being then considered inadvisable to exceed this limit on account of former experiences with high tensile steel. The shafts made were crank shafts and are still running, having been in use 17 years. Up to the present date no flaws of any description have been seen. The engines have been tripled, using the same shafts and bearings, and the working power increased. The percentage above the Board of Trade and Lloyd's rules, which fix the minimum size, is 24 per cent; a percentage above must be allowed, and has been the experience of all ship owners, varying from their records of mishaps and losses and condemnations of shafts by the Surveyors of the Board of Trade and Lloyd's Registry. Since these shafts were first used the tensile strength of mild steel has been gradually increased, and we are now using it at 32 tons per sq. in., possessing equal, if not more, ductility and toughness, to endure even greater stresses than formerly. This has been arrived at by continued improvement in the manufacture by the makers so that the percentage allowed above the rules is now reduced to only 6 per cent, leaving a very slight margin. I mention this, as there is an opinion that the reason some shafts are so free from mishaps is owing to their dimensions being so much above the rules that regulate those sizes, instead of to the superior quality of the material used."

Although many engineers still adhere to wrought iron as a material for shafts, they are becoming fewer annually, and steel is now acknowledged to be the only material suitable for the purpose by those who are most progressive. The latter take great care to specify the quality of steel that shall enter into their shafts. They also go so far as to require that a prolongation shall be left on one end of each shaft from which a test piece can be cut after the forging is finished. Sometimes the chemical composition desired is specified, and sometimes the physical properties are mentioned instead. It is quite common to see the requirements that the sulphur and phosphorus shall be less than .04 of 1 per cent and that the carbon shall not be less than .50 of 1 per cent. This grade of steel has a high elastic limit and gives a very smooth hard surface.

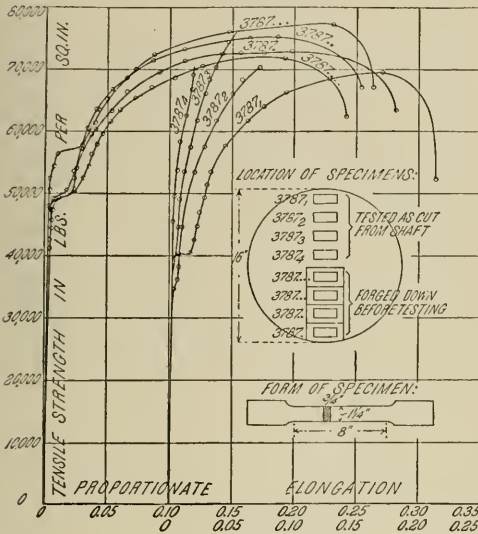
In order to be sure that the ingot from which the shaft is made has no defects in the nature of blow holes in it, best practice requires that it should be cast under pressure in a mould provided with vents to allow the escape of air and gases. This system is known as the Whitworth process of fluid compression, and "fluid compressed steel" is now acknowledged to be the most reliable material for shafts as far as solidity and homogeneity are concerned.

Mr. Seaton, the well known English engineer, who took part in discussing this paper, is quoted in Kent's Mechanical Engineers' Pocket Book, on page 807, as saying: "For wrought iron, the safe stress per square inch should not exceed 9,000 lbs. and when the shafts are more than 10 in. in diameter, 8,000 lbs. Steel, when made from the ingot



and of good materials will admit of a stress of 12,000 lbs. for small shafts and 10,000 for those above 10 in. The difference in the allowance between large and small shafts is to compensate for the defective material observable in the heart of large shafting owing to the hammer failing to affect it."

An instance of this effect of forging under too light a hammer is shown in the diagram given below.



This diagram was made by Prof. J. B. Johnson of St. Louis, to show a series of tests made at the Watertown Arsenal by the United States Government on a 16-in. shaft. This shaft was made of steel, under a 10-ton hammer, from a 30-in. ingot, which was very nearly the proper size, and after it was in service a short time it broke. In order to find out the cause of the break, test specimens were taken out of the metal at various distances between the surface and the center. Specimens 3787<sub>1-2-3-4</sub> were taken. The form of the specimens is shown. The tests are graphically shown by the curves. The test piece 3787<sub>1</sub>, nearest the surface, showed an elongation of 21.4 per cent, and a reduction of area of 32.8 per cent; 3787<sub>2</sub> showed an elongation of 7.2 per cent and a reduction of 5.5 per cent; 3787<sub>3</sub> showed an elongation of 4.9 per cent, practically 5 per cent, and a reduction of 5.2 per cent; and the one nearest the center, 3787<sub>4</sub>, showed an elongation of 2 per cent and a reduction of 1 per cent. In other words, the elongation varied between the surface and the center from 21.5 per cent to 2 per cent, and the contraction varied from 33 per cent to 1 per cent. It is evident, therefore, that the center metal in this forging was practically unworked. In order to be certain that there was nothing in the metal itself that would give this difference, specimens of a larger size were cut out from the opposite side and forged down until they were of the same size as the first. In other words, work was put into the metal that ought to have been put into it when it was first forged, and as a result an average of 25 per cent elongation and 55 per cent reduction was obtained.

To obviate such defects the hydraulic press is now considered the proper tool with which to forge large steel shafts. The pressure applied in shaping a piece of steel should be sufficient in amount and of such a character as to penetrate to the center and cause flowing throughout the mass. This flowing requires a certain amount of time and the requisite pressure should be maintained throughout a corresponding period. All of this is attained by the use of the hydraulic press.

Undoubtedly the highest type of shaft is the hollow shaft. It is lighter and stronger for the amount of metal than any other type. This is the kind of shaft that has been adopted by the various governments of the world for their respective naval vessels. Shafts of this kind are becoming popular in the merchant marine and for yachts. Stern-wheel steamers on the western rivers are also adopting this type of shaft in order to secure lightness and strength. It is getting into general use for commercial work and many street railways have adopted it.

At the last meeting of the Street Railway Association in St. Louis, a hollow shaft, 28 in. in diameter and 25 ft. long, made of fluid compressed steel, was exhibited by the Bethlehem Iron Company. This shaft was one of a large number furnished to street railways in Chicago for engines built by the E. P. Allis Company, the Corliss Steam Engine Company and William Cramp & Sons Ship & Engine Building Company.

Other street railways have also adopted these shafts, notably at Bridgeport, Conn., and the Consolidated Traction Company, at Pittsburg, Pa. These various street railways and engine builders can undoubtedly give full information regarding high grade shafts, and it will be to the interest of street railway engineers to investigate the subject carefully.

### A KAFFIR STREET RAILWAY.

The only street railway in the entire province of Mozambique, Africa, is located in the town of Beira, writes U. S. Consul, U. Stanley Hollis. This railway is about 2 miles in length, built on a 24-in. gage, and its entire rolling stock consists of one flat hand car capable of seating 1 people. Its motive power is from 2 to 4 stout Kaffirs. The Beira Tramway is owned by the Companhia de Mocambique, of that place. There has been some talk of a tramway at Lorenzo Marques, Delagoa Bay, but as yet nothing has been done.

### RAILWAY LINES DESIRABLE IN GALESBURG.

There is a great deal of agitation at Galesburg, Ill., on account of changes and extensions in the lines of the Galesburg Motor & Power Company. The city let contracts for paving the streets on the line running to Lombard University and then the company requested a franchise to relay its tracks on another street. This was vigorously opposed by the property holders along the line who asserted that the removal of the tracks would be highly detrimental to their interests. The company proposed to abandon the old line if the franchise was refused, and it passed the council. The property owners along the route threaten to begin legal proceedings to compel the company to operate over the old tracks.

## INDIANAPOLIS FILES ITS CROSS-BILL.

Our monthly installment of the serial story entitled "3-Cent Fares in Indianapolis," this month consists of an extract from the cross-bill filed by the city in reply to the supplemental complaint of the Central Trust Company, of New York, and the cross-bill of the Citizens' Street Railroad Company. The other defendants were C. S. Wiltsie, prosecuting attorney; E. E. Dill, Fred Wegener, S. R. Miller, Douglass Mitchell and G. L. Payne, who brought suits for damages against the company. The answers to both the cross-bill and the supplemental bill are alike in substance though differing somewhat in form.

These answers admit the incorporation of the street railway company under the act of 1861, the fixing of the fare at 5 cents and the execution of two mortgages on its property for \$300,000 and \$700,000, respectively. They also admit the passage of the Hugg bill, and that Indianapolis was then the only city in the state having 100,000 population.

The answer to the cross-bill of the street railway company denies that the 3-cent fare act is in violation of article 14 of the amendments of the constitution of the United States, or that such an enactment will deprive the company of its property, without due process of law, or deny to it the equal protection of the law.

The answer, continuing, says: "And said defendant avers and charges that said alleged and pretended mortgage indebtedness of \$300,000, \$700,000 and \$3,000,000, thus amounting in the aggregate to \$4,000,000, does not represent any investment whatever in the plant of said Citizens' Street Railroad Company, or its predecessor; that the total cost of the construction and equipment in every way, including the purchase of cars, the laying of tracks, the building of houses, the changing from animal to electric power, at no time exceeded the sum of \$1,000,000, as representing any sum of money placed or invested in said plant by any person or persons whatever; that the total cost of construction and equipment, including all expenses of every kind, character and description, growing out of or connected with the building, equipment and construction of said plant and its appurtenances, amounted in the aggregate to less than, to-wit, \$1,800,000, of which not more than \$1,000,000 was represented by moneys procured upon said loans, and the residue, to-wit: \$800,000 was paid out of the net receipts of said road, after defraying all operating expenses and making reasonable returns to the stockholders upon the investment in said plant.

"But that to the end that said Citizens' Street Railroad Company and its predecessor might exact from the traveling public unreasonable, unjust and exorbitant sums for the carrying of passengers, said Citizens' Street Railroad Company on or about the first day of May, 1896, executed its mortgages in addition to the two mortgages that had heretofore been executed to secure the payment of \$4,000,000 of bonds, and at the same time increased its capital stock to the sum of \$5,000,000, so that it might appear at all times that there was an outstanding bonded indebtedness of \$4,000,000 (\$1,000,000 of said last-named bonds never having been paid upon a mortgage) upon which the company was compelled to pay the interest, and that there was outstanding \$5,000,000 of stock upon which said company was authorized to declare dividends, but defendant avers that there never was any indebtedness or liability either through

bonds or stock issued in excess of \$1,000,000 on account of construction, operation and equipment, save and except as said company and its predecessor applied of its earnings to-wit: \$800,000 in the extension and increase of its plant."

It is further denied that the statement set forth in the cross-complaint as to the amount of the annual expenditure for the two years ending April 30, 1896, and April 30, 1897, correctly represents the expenditures of the company for those years. It is averred that the sum of \$50,000 mentioned as depreciation, is exorbitant. It is also averred that the sums named for repairs, amounting in the aggregate to \$148,000 for the fiscal year of 1896, and \$156,000 for the year 1897 are misleading, as only a small part, not to exceed \$15,000 of the sum in each year, was properly applicable to the repairs of the plant. The remainder of the amounts, it is averred, consisted of additional equipment and new property. It is averred that the operating expenses of the company for any year, independently of extensions and enlargements, do not and have not exceeded \$450,000.

It is pointed out in the answers that the reduction of fare results in a largely increased use of transportation facilities. It is averred that, wholly independently of any increase which will necessarily come as a result of a reduction in fares, the earnings of the company, upon a minimum fare of 3 cents, will realize an amount in excess of \$550,000, being a sum sufficient to pay all legitimate operating expenses and return 6 per cent interest upon the bona-fide actual investment in the plant.

## JOEL HURT RESIGNS "FOR SURE."

Joel Hurt, president of the Atlanta Consolidated Street Railway, who has been trying to resign for four years, did so on August 18, and was very reluctantly released by the board. He remains as director but retires from any active management. He desires to devote his time to important personal interests.



JOEL HURT.

Mr. Hurt became president in 1891 under the distinct condition he was not to be asked to serve more than two years. During his administration he consolidated six roads and made numerous extensions and improvements. On his invitation the A. S. R. A. held its 1894 convention in Atlanta, and he was made president for the ensuing year.

Mr. Hurt is president of the Trust Company of Georgia and of the East Atlanta Land Company. He is also secretary of the Atlanta Home Insurance Company, and will devote his time to these institutions in which he is largely interested. His many friends in the fraternity will learn with regret of his retirement from active street railway work.

Ernest Woodruff, general manager of the road will act as president until the election, which may not occur before January.

Robert Bolan laid down on one of the belts in the power house of the Citizens road of Memphis, and was caught between the belt and wheel when the machinery was started. Both legs were badly crushed.

## TROLLEYS IN NEW JERSEY.

A supplemental report of the State Board of Assessors, giving advanced statistics regarding the electric and street railroads in the state for the year 1896, shows the total receipts of all the street railroads in the state for the year to be \$5,770,171, against \$5,056,598 in 1895, an increase of \$713,573. The expenditures were \$3,546,168, against \$3,431,931 in 1895, an increase of \$144,236, and dividends paid \$124,220, against \$117,320 in 1895, an increase of \$6,900.

The number of miles of track in the state is 613; capital stock paid in, \$38,235,150; funded debt, \$36,420,493, and other debts, \$4,279,396; total of capital and funded and unfunded debt, \$78,935,039.

The total cost of the railroads, including the equipment and appurtenances, is put at \$80,011,559, an average of \$130,500 per mile of track. The total assessed valuation of all steam railroads in the state, including roadbed, equipment, depots and depot grounds, terminals, bridges, franchises and all other tangible and personal property, is less than \$95,000 per mile.

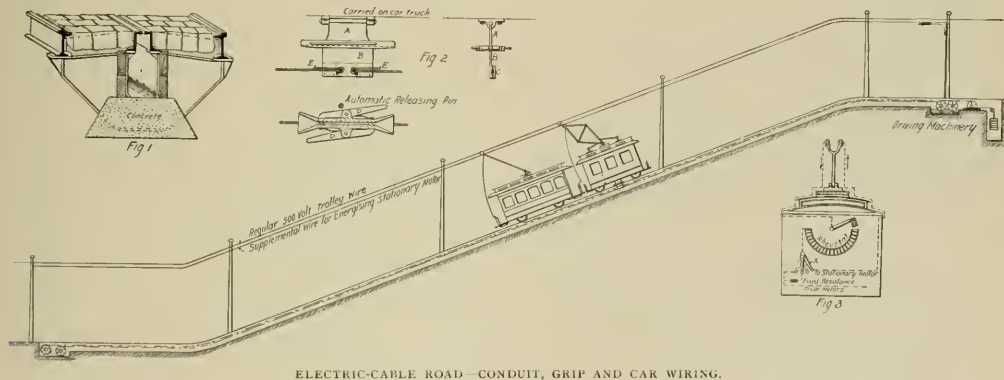
## AN ELECTRIC-CABLE RAILWAY.

### For Moving Electric Cars Over Steep Grades.

BY M. H. BRONSDON, CHIEF ENGINEER UNION RAILROAD COMPANY, PROVIDENCE, R. I.

The operation of electric cars over grades of more than 6 per cent has always been a source of anxiety to street railway managers during the fall and winter months, and instances of cars sliding on grades of less than 6 per cent are not uncommon; but few serious accidents have, however, resulted. Different mechanical devices have been designed and used, and in fact are being used at the present time; such devices as "inclined planes," "rack-rail systems," counterweight systems and cable railways, each having its advocates.

With a street railway manager, it is not a question of any particular form of device; his object is to find the method which will be the most successful and economical in point of construction and operation. Cable railways have been



ELECTRIC-CABLE ROAD—CONDUIT, GRIP AND CAR WIRING.

The reports of the different companies are uniform in style. The Consolidated Traction Company, which expects eventually to control the Plainfield Street Railway, has a mileage of 175 miles; capital stock, \$15,000,000; funded debt, \$14,515,000, and other debts, \$825,688; total, \$30,370,688. The cost of the road and equipment is put at \$35,582,648, an average per mile of \$202,700, more than half as much again as the average for all the roads in the state. The gross receipts of the Consolidated Traction Company for the year were \$2,800,582 and expenditures \$1,468,440. With the Consolidated Traction Company is included the mileage of the Jersey City & Bergen; Jersey City, Harrison & Kearney; Newark Passenger; Newark Plank Road and New Jersey Traction Companies. These companies have a capital stock and funded debt of \$19,788,000.

The average cost per mile as reported to the State Board of Assessors by the Consolidated Traction Company is \$202,700. The Trenton electric roads have a mileage of 34 miles at a cost of \$75,000 per mile. The Plainfield electric road has a mileage of nine miles at a cost of about \$20,000 per mile. This is the least cost of any of the roads in the State.

the most successful, mechanically, but their cost of operation has been prohibitory, excepting on long lines. It is needless to say that any street railway is better off without the use of mechanical devices on grades, but this article with the accompanying sketches is to describe and illustrate a system suitable for cases where it is thought desirable or necessary to have a safety device, and one which is applicable to any grade regardless of the inclination.

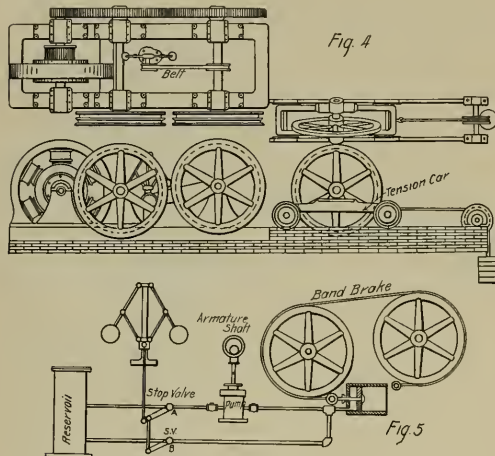
The fact that the cable railway will draw the cars up grades and lower them down at one steady speed without relying on traction, regardless of snow or ice or slippery rails, is what makes it desirable. Therefore, any system that combines the safety features of a cable railway and obviates the necessity of skilled labor and its attendant high cost for its operation, is suitable.

Referring to the sketches: Fig. 1 is a cross section of the track construction, showing 7-in. Z-bar slot rails, 9-in. girder wheel rails, heavy cast iron yokes set in concrete, and creosoted plank sides. This has been found to make a very good and substantial construction, costing about \$7 per lineal foot, aside from paving. It is not necessary, however, to use this form of construction with this system, as the "Electric-Cable Railway" has been designed so that it



can be adapted to any cable railway construction and to take the place of existing cable railways.

Fig. 2 is the gripping device which is entirely automatic in its operation. When nearing the releasing points of the road, the grip automatically raises the releasing pin, which in turn bears against the lever D and automatically releases the grip from the car. The piece A is carried on the truck frame about 2 in. above the track. The cable is made end-less by fastening at the grip in the manner shown, being firmly held by the clamp plate C. When it is found desirable to shorten the cable a tackle is fastened to one of the ends E, after removing the plate C, and the cable drawn tight, when the clamp plate is again tightened up and the cable cut off close to the grip. No attention on the part of the motorman is required to make the grip operate; it opens and closes automatically and positively. Two of these grips have been in operation for the past 22 months, making upward of 300 trips daily, and have given the best of satisfaction.



DRIVING APPARATUS AND GOVERNOR.

Fig. 3 shows the principle of the extra car wiring. The grip car is equipped with a double trolley, one trolley wheel conducting the current down into the car, where its pressure is reduced to the proper voltage, a part of the current shunted to the car motors, just enough being used to rotate the armatures, and whatever current is necessary is sent back through the other trolley wheel to the supplemental wire overhead, which is thus charged and in turn energizes the stationary motor at the top of the incline. This stationary motor being geared to the driving drums, it will readily be seen that the whole system is completely under control of the motorman, who starts and stops at will. By shifting the bipolar switch X into the position shown in dotted lines, the supplemental trolley wheel and fixed resistance are cut out, thus sending all the current to the car motors.

The safety device shown at Fig. 5 is to be set so as to admit of but a fixed speed for descending cars. The pump with its plunger and eccentric is set directly under the armature shaft, operating only on descending cars and after a certain fixed speed is attained. The governor is belted

from one of the driver shafts as shown in Fig. 4. When the limit of speed for descending cars is reached the governor raises, first closing the stop valve *b* and opening valve *a*, which allows the pump to draw fluid from the reservoir and force it into the cylinder, thus pushing out the piston and tightening the band brake. As the speed is reduced, the governor falls, closes the valve *a*, opens valve *b*, and allows the fluid to run back to the reservoir.

The driving machinery shown in Fig. 4 is all placed directly under the track, taking up a space about 6 ft. wide, 7 ft. high and 30 ft. long.

These sketches, it must be understood, are not from the working drawings, but were made simply to illustrate the principle of the system. Its particular advantages are that it requires no skilled labor for its operation, that it may be adapted to existing cable roads without interrupting traffic, and that it is simple, safe, and is placed under the track in the street.

### BRITISH STREET CARS.

William E. Curtis, in a recent letter to the Chicago Record, gives some interesting data regarding the street railway systems in various cities in the United Kingdom, which we give in part below:

There are only 153 street car lines in all Great Britain. In Blackpool, Huddersfield, Hull, Leeds, Plymouth, Sheffield and Glasgow all the street car lines are operated by the city authorities. In 30 other cities, including Birmingham, Liverpool, Manchester, Edinburgh and London, the municipal governments own or operate a part of the lines within their limits. In Cardiff and Southampton steps have been taken to municipalise the street railways, and will be completed during the present year. This leaves only 114 street railways under private control, and in several cities the tracks they use belong to the municipality and are leased for so much a mile—the price varies from \$5,000 to \$25,000 a year, or a percentage of the earnings, usually 6 per cent gross, or both.

Before a street car line can be constructed in any city in England a petition endorsed by the city authorities and a certain number of resident taxpayers must be filed with the board of trade, which makes an investigation, and, when satisfied that the improvement is desirable or necessary, issues a permit, which must be confirmed by Parliament. Ordinarily that is simply a formality, and the judgment of the board of trade is usually final. Charters are granted for 21 years. In some cases the cities named above have acquired roads on the expiration of charters; in other cases they have purchased the property under condemnation proceedings or by arbitration, but usually nothing is allowed for good will. It is assumed that it is exhausted when the charter expires. For example, in 1893 the London County Council confiscated or bought a private street railway four and one half miles long. The company demanded \$3,020,450. The condemnation proceedings allowed the company nothing for good-will and only \$648,740 for its tracks, rolling stock and horses, which was considered a fair apportionment.

In Liverpool, conductors are paid \$6 a week for 103 working hours, an average of 14 $\frac{3}{4}$  hours a day. Drivers are paid \$6.50 a week for similar service. In Edinburgh conductors receive \$4.50 a week and drivers \$4.75 for 10 hours a day, or an average of 56 hours a week. In London

wages are better, and conductors receive \$7.75 a week and drivers \$9.62½ for working an average of 12 hours a day. Conductors do not receive so much pay as drivers because they are supposed to have an easier time of it. They are allowed to sit inside of the cars in stormy weather.

In Glasgow, the municipal government pays \$5.75 a week to conductors and drivers for 10 hours' work a day, or 60 hours a week. The cars do not run on Sunday.

In Manchester, Birmingham and Leeds the rate is a little higher, being \$5.90 a week for conductors and \$7.25 a week for drivers for 12 hours' work a day, or 72 hours a week.

In Sheffield, Huddersfield, Plymouth and other cities boys from 14 to 16 years of age are used for conductors and are paid 10 shillings or \$2.50 a week. They take up a collection with a tin can that has a slot in the top into which each passenger drops his fare after change has been made for him by the conductor. At the end of the route the can is deposited with the cashier, who opens it and counts the money. In this way no conductor can "knock down" fares without collusion with the passengers. In other cities they require the conductor to give each passenger a slip of paper or ticket which he holds until he leaves the car, for an inspector is likely to appear at any moment to make an investigation and passengers who have lost their slips or thrown them away have to pay their fare a second time.

It is customary to charge by distance. There are 1-cent, 2-cent, 4-cent and even 10-cent fares, for which different colored slips are returned.

As a rule fares are lower in all the cities of Great Britain than in the United States, but the accommodations furnished are not very good. A single track, frequent switches, long waits and a maximum speed of four miles an hour is the usual rule. The cars are old-fashioned and go poking along, drawn frequently by a single horse, and wait patiently before the residence of a prominent citizen for him to kiss the children good-by. A friend in Birmingham told me that there had recently been a great improvement in the street car service between his place of residence and his place of business, which was thoroughly appreciated by the people. The cars were now running at intervals of 10 minutes instead of 15 minutes, as formerly, he said. Birmingham has been eulogized by writers on political economy and municipal reform. It is cited as a city that possesses a government that is absolutely honest and never indulged in a "job." The grossest case of corruption that was ever known in Birmingham municipal affairs is told of a member of the common council who interested himself in a speculation in land which was made more valuable by some public improvement. Such a flagrant violation of propriety could not be tolerated, and the offending official resigned his seat in the council at the request of his colleagues.

The Birmingham street cars are great double-decked affairs, which are run by steam at intervals of 10 minutes. They usually haul one or more trailers and accommodate as many as 200 or 250 people. They are regular trains. The locomotives are boxed in so that they do not look like anything else in the heavens above or in the earth beneath or in the waters under the earth. The passenger cars resemble those that are commonly used in other cities, except that they are larger and carry passengers inside and outside. The rate of fare is about 1 cent a mile and varies according to distance. They start late in the morning, stop early in the evening, and run at the rate of four miles an hour. Most of this

precious rolling stock is carefully housed away by 10 o'clock at night, but for the convenience of the public one train is held on each of the roads until the plays are over on theatre nights, and this is the most progressive city of England, with nearly 500,000 inhabitants. The municipal authorities of Birmingham will not permit street car tracks to be laid in the business portion of the city. There is an area about half a mile square in the heart of the city, where the principal wholesale and retail shops, the offices and public buildings, the hotels and amusements, are located, into which the Leviathans are not allowed to enter, so that if a person wishes to go from one end of Birmingham to the other he is compelled to walk or hire a cab to carry him for half a mile or so between the termini of the railways. In different parts of the city there are lines of penny buses, which act as feeders to the street cars, and bring passengers to their nearest stopping place.

At present there is a deadlock between the street railways and the common council of Birmingham over an effort on the part of the latter to modernize and improve the service.

Taking England as a whole, the street transportation system is about 30 years behind the times, but the people say that it is good enough for them. James Dredge, the eminent engineer, who was one of the British commissioners to the World's Fair at Chicago, declares that the British public is perfectly satisfied if it can ride at the rate of four miles an hour.

"We do not move quite so rapidly over here as you do in America," he said, "but we accomplish just as much. It makes very little difference whether I reach my office at 10 o'clock or quarter before 10, or whether I am 15 minutes or 45 minutes on the way. I have newspapers to read, or I can spend the time thinking over business affairs and preparing myself for the work of the day. When I reach my office my mind is in a state of composure, my nerves are not fluttering as they would be after a journey in one of your cable cars, and I am in a much better condition to transact my business than if I were hurried down to my office in a catapult. Rapid transit may be a good thing when people want to wear themselves out and rush through the world to an early grave, but four miles an hour is fast enough for the ordinary human being to travel in a crowded thoroughfare."

#### LIBRARY BOOKS FOR STREET RAILWAY MEN.

Largely through the efforts of Captain Robert McCulloch the employes of the street railways of St. Louis are to be furnished with library books at little inconvenience. The public library of St. Louis has branch depositories in drug stores and other convenient centers of business, but this is the first instance in St. Louis or elsewhere that street railway stations are to be distributing points for library books. This will be a great boon to the street railway employes and their families and be an incentive to study and read a good class of literature.

The Griffin Wheel Company suffered \$1,000 loss August 29 by fire in its Chicago foundry. Sparks from a locomotive ignited five carloads of light kindling wood. The flames communicated to the extensive woodsheds, destroying them and their contents. The foundry proper was not damaged, and the plant is running as usual, filling all orders.

## SERPOLLET MOTOR ON THE NORTHERN RAILROAD OF FRANCE.

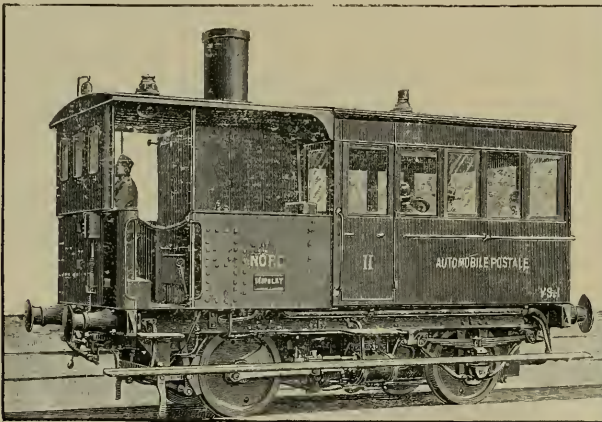
The Serpollet motor which was described in the REVIEW, July, 1896, page 417, has proved to be suited to widely varying conditions. This boiler was originally designed for a steam driven tricycle; in 1891 the inventor applied it to an autocar for four persons; in 1894 it was used on a steam tramway, and in April, 1897, some cars equipped with Serpollet generators were put in service for hauling light trains on the Paris, Lyons & Mediterranean Railroad. In June the Northern Railroad of France put in service a combination car called a postal autocar equipped on the Serpollet system. La Nature from which we reproduce the illustrations publishes the following data:

The car is used every night for carrying mail from Creil to Beauvais about 46.5 miles; it leaves Beauvais at 11:30 p. m. and arrives in Creil at 12:40 a. m., leaving on the

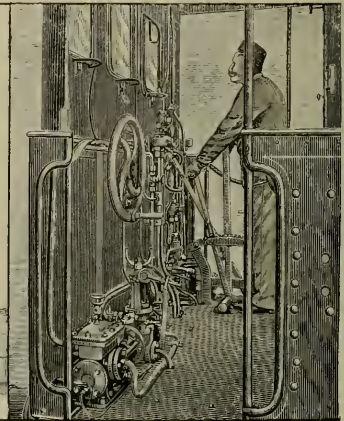
5 lbs. of briquette per mile not including that necessary to get up steam, and the water rate 33.3 lbs.

On the return, two trail cars were attached, making the total train weight 83,600 lbs.; the maximum speed was above 37 miles per hour; on grades of .8 and .3 per cent the speeds were 23 and 34 miles per hour respectively, the fuel consumption was 8 lbs. per mile.

The illustrations show a general view of the car and a view of the driver's platform. The car is 17 ft. 5 in. long and 8 ft. 2½ in. wide; the postal compartment communicates with the driver's platform by a glass door. There is also room in this compartment for 10 passengers. When loaded the total weight is 49,600 lbs. The steam generator has a heating surface of 121.8 square ft. and a grate surface of 4.95 sq. ft.; its weight is 6,270 lbs. Steam is furnished to two engines with Stephenson valve gear, which are both connected to the front axle, that one alone being driven. The steam pressure carried is 255 lbs per sq. in.



POSTAL AUTO-CAR, SERPOLLET MOTOR.



DRIVER'S PLATFORM.

return trip at 3:40 a. m. and arriving at 5 a. m. This insures a night postal service to all stations on the line. For some time this car has been drawing two express cars as trailers from Beauvais to Creil, returning with three, making the total train weights of about 74,000 and 92,000 lbs. respectively. This car seems to fulfill the requirements and enables the company to give this necessary but unremunerative service at a small cost.

The time required for getting up steam is 45 minutes and the fuel consumed amounts to from 90 to 100 lbs. For a round trip as scheduled above the fuel required is 418 lbs., distributed as follows: 110 lbs. for getting up steam and consumed prior to the start, 99 lbs. on the trip from to Creil, 77 lbs. during the wait at Creil and 132 lbs. for the return trip. The water rate is between 32 and 35 lbs. per mile run.

On trips between Paris and Beauvais, 49 miles, a speed of between 25 and 30 miles per hour were attained on heavy ascending grades. One of these is 1.1 per cent for 4.4 miles and another 1.3 per cent for 3.1 miles. For the trip to Paris with the motor car alone the average fuel consumption was

## KINETOSCOPE PICTURES AT COLUMBUS.

M. S. Hopkins, electrician of the Columbus Street Railway Company, has been experimenting with and perfecting an apparatus which combines the principal features of the Edison kinoscope together with some ideas of his own. Mr. Hopkins desired to take some pictures of local interest to exhibit at Olentangy Park. His most successful venture was one representing 10 years of progress on the Columbus street railway. An old 12-ft. mule car was passed before the camera, the driver being an employe of mule car days. Two women hailed the car by waving their sun-bonnets at the driver, the whole scene being typical of by-gone days. The car following was one of the latest patterns of closed cars. Then came the Electra, the company's fine party car, filled with a jolly crowd of young people. This series of pictures was received with enthusiasm at the park. Mr. Hopkins contemplates a series of pictures of Buffalo Bill's show and the Franklin Centennial parade. Although there are some imperfections still to be removed, the experiment has proven a success.



## STREET RAILWAY LAW.

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

*Duty of Motorneer when Vehicle is on Track.*

When a motoneer discovers a vehicle on the track a short distance ahead of him, it is his duty to have the power which propels the car under his control and to use it so as to avoid a collision with such vehicle if he can; and the fact that the vehicle can be turned off the track does not relieve the motoneer of the duty to use ordinary care to avoid a collision.

The opinion of the court is as follows: This was an action to recover for personal injuries received by plaintiff, and for damages to his property—the result, it was alleged, of the negligence of one of defendant's motoneers while running a street car operated by electricity on one of its lines in the city of St. Paul. In a trial to a jury, plaintiff secured a verdict, which was set aside by the court upon the ground of inadequacy in amount. By stipulation of the parties the evidence received upon this jury trial was then submitted to the court for a decision upon the merits, and subsequently the court made and filed its findings of fact, on which it ordered judgment in favor of the plaintiff for the sum of \$730. The injuries and damages resulted from a collision on a public street between the car and the plaintiff's hack or carriage, which was being drawn by a pair of horses, plaintiff himself being the driver thereof. The collision occurred about the center of a block, as plaintiff was attempting to cross the rails upon which the car was approaching. It is contended by defendant's counsel that there was no evidence to support a finding, made by the court, that defendant's employe negligently and carelessly projected the car upon and against the hack, and further, if there was, that the uncontradicted facts clearly establish that plaintiff was guilty of contributory negligence which would preclude recovery. We have very carefully examined the evidence upon which the court must have predicated the above mentioned finding. It is not very satisfactory, but we are of the opinion that the claim of defendant's counsel cannot be upheld, and that there was evidence which justified a finding that the motoneer did not exercise such care in the management of his car just prior to the collision as a man of ordinary prudence would have exercised under the same circumstances. When a motoneer discovers a vehicle on the track a short distance ahead of him, it is his duty to have the power which propels the car under his control, and to use it so as to avoid a collision with such vehicle if he can. The fact that the vehicle can be turned in either direction, and that the way is open for it to be turned, does not relieve the motoneer of the duty, to use ordinary care to avoid a collision. It must be remembered that the plaintiff was not a trespasser, but was rightfully upon the street. The testimony tended to show that before he came to the place of collision, the approaching car being about 250 ft. distant, he was compelled to turn to the right and drive partly upon the car track, because a pair of horses and a wagon with a large hay rack upon it had been left standing at that point; that, having passed the obstruction, he could not immediately return to the left side of the track, because of other horses and wagons which were occupying the space; that, all of this time, west-bound cars were moving on the north track about opposite him; and that they prevented for a time his crossing to the way north of the track just mentioned. It also tended to show that, just as soon as

the west bound cars passed ahead and the track was clear, plaintiff attempted to cross the rails to the right, and his hack was immediately struck by the east-bound car. This testimony had a tendency to show that plaintiff had gotten himself into a place of some danger, and was hemmed in by horses and wagons upon the left, and by the west bound cars upon the right. The motoneer, although denying that any part of the hack was upon or dangerously near the rails until plaintiff turned to cross to the north, admitted that he saw him with his horses and hack when about 250 ft. away; that he afterwards applied power, and increased the speed of the car, which was running quite rapidly; and that he made no effort to stop, or even to reduce speed, until the car was within 15 or 20 ft. of the plaintiff, the collision occurring almost immediately. Upon this state of the evidence, we are of the opinion that it was for the court, trying the case without a jury, to determine whether the motoneer exercised ordinary care to avoid a collision which might have been averted by slowing up his car. But, as before stated, it is urged that, conceding defendant's negligence, plaintiff ought not to recover, because he was guilty of contributory negligence. The rule is that, to constitute contributory negligence, there must have been a want of ordinary care, under all of the circumstances of the case, contributing to the injury, as an efficient and proper cause thereof, and that there is no want of ordinary care when, under all of the circumstances and surroundings of the case, the person injured did or omitted nothing which an ordinarily careful and prudent person similarly situated would have done or omitted. Tested by this rule, in view of the fact that plaintiff was lawfully driving upon a public street; that the evidence tended to show that he was compelled, when the car was more than 250 ft. distant, to turn out to avoid an obstruction, which brought the wheels of his hack upon the rails; that when he had passed the obstruction he could not promptly turn to the left and clear the rails, because of the horses and wagons which occupied the way, and was not able to immediately cross the rails on the right because of the cars running westerly in the same direction he was driving; and that there were other circumstances and surroundings which may have had a bearing upon the case—we are not prepared to hold that the plaintiff's contributory negligence was conclusively established. Order affirmed.

(Supreme Court of Winnetka. Flannagan v. St. Paul City Railway Co. 71 Northwestern Reporter 379.)

NOTE.—It is held in Witzell vs. Third Avenue Railway Co., *Street Railway Law*, page 270, 23 N. Y. Supplement 317, that the car companies have not an exclusive right to public highways on which their tracks run; and they are, through their drivers, required to exercise ordinary care and diligence in the management of their cars.

It is negligence in an electric street car company to run its car in a narrow and unlighted alley on a dark night so fast that it cannot be stopped within the distance covered by its own headlight.

(*Gilmore vs. Federal Street & P. D. Passenger Ry. Co.*, *Street Railway Law*, page 191, 25 Atlantic Reporter, 650.)

So long as a common user of streets exists in the public, it is the duty of street railway companies to exercise such watchful care as will prevent accidents or injuries to persons who, without negligence on their own part, may not, at the

moment, be able to get out of the way of the passing car. The degree of care to be exercised must necessarily vary with the circumstances of each case.

(Kestner v. Pittsburg & B. Traction Co., *Street Railway Law*, 315, 27 *Atlantic Reporter*, 1048. Ed.)

*Personal Injury—Liability for Future Loss of Time—Instruction not Supported by Evidence.*

This is an action brought to recover damages for personal injuries, sustained by the appellee while driving upon a public street, by being run into by an electric car operated by the appellant company, in South Chicago, and resulted in a judgment for \$3,500, entered upon a verdict for \$5,000 in favor of the appellee.

The case as made by the evidence was a close one, and demanded the giving of correct instructions to the jury. The third instruction, given at the instance of the appellee was in substance like the fifth instruction approved by the court in *H. & St. J. R. R. Co.*, 111 Ill. 219 at p. 227, and again approved in *City of Chicago v. McLean*, 133 Ill. 148, except the following addition: "And any future loss of time and inability to work, if any, resulting from such injury, which the jury may believe the plaintiff will sustain; and may find for him such sum as in the judgment of the jury under the evidence will be a fair compensation for the injuries, if any, which the jury may believe from the evidence he has sustained."

There is but very little evidence, and that is of uncertain and shadowy character, that appellant will suffer from loss of time or inability to work in the future because of injuries received.

The accident happened nearly three years before the trial took place, and at the trial appellee testified that six weeks after he was hurt he went to work again at his previous employment, and he worked ever since without the loss of a single day.

In the face of such evidence, and with no certain evidence that appellee had not entirely recovered from his injuries, it was error of a seriously prejudicial kind to instruct the jury that they might give the appellee compensation for such further loss of time and inability to work, as they might believe (without regard to evidence) he will sustain.

(Appellate Court of Illinois, *South Chicago City Railway Co. v. Walters*, 29 *Chicago Legal News* 334.

*Contributory Negligence—Any Degree of, Bars Recovery.*

This suit was for personal injuries, which resulted in a verdict and judgment for \$25,000.

The assignment of error which seems to us most serious, is for giving the second instruction for appellee. The part complained of is as follows: "In cases of this character there can be no recovery by the plaintiff, unless two things appear from a fair preponderance of the evidence:

"First, that the injury was occasioned through the negligence or want of ordinary care and caution by the defendant, as set out in the plaintiff's declaration.

"Second, that the plaintiff was not guilty of negligence on his own part, materially contributing to the injury."

The proposition of law embodied in this instruction is at least inferentially bad. It says by inference that if the negligence of plaintiff contributed to the injury in a degree which might be regarded by the jury as not "material," the plaintiff might, notwithstanding, recover. Such is not the law. If plaintiff's negligence contributed in any degree whatever, it barred his recovery.

Nor is the fault of the instruction to be ignored because the proposition is thus inferentially put: *Monongahela City v. Fisher*, 111 Pa., State, 13; also, *Mattimore v. Erie City*, 144 Pa. State, 23; *Artz v. C. R. I. & P. R. R. Co.*, 38 la. 294.

In a case of this nature, involving a sharp conflict upon the merits, it may not be safely presumed that this instruction worked no prejudice to appellant.

The facts as presented are such as must be submitted to another jury.

For the error in giving the second instruction for the appellee the judgment is reversed and the cause remanded.

(Appellate Court of Illinois. *Cicero & Proviso Street Railway Co. v. Snider*, 29 *Chicago Legal News*, 431.

## WILLIAM D. RAY.

Although William D. Ray is but 24 years of age he has had 10 years experience in the electrical business, beginning in 1887 as the junior partner of MacFadden & Ray, engaged in electrical construction at Oak Park, Ill. In 1889 he was with the Cicero Water, Gas & Electric Light Company of the same place as electrician's assistant. In 1890 and for two years thereafter Mr. Ray was electrician in charge of the 5,000-lamp lighting plant of the Chicago & Northern

Pacific at the Grand Central Station, Chicago; in connection with this he had charge of four miles of electric and pneumatic block signals and two interlocking signal towers. Later he was with the C. & C. Electric Motor Company installing motors and dynamos. In 1892 he was with the Chicago & Northwestern Railway as electric light inspector, having supervision of the steam and electrical apparatus at Milwaukee, Clinton, Chicago, West Chicago and Escanaba.



WILLIAM D. RAY.

In 1893 he was with the electrical department of the World's Fair as troubleman, inspector and foreman, and the following year with the Standard Electric Company, of Chicago, as assistant consulting electrician. In November, 1894, Mr. Ray was engaged by the Everett (Wash.) Railway & Electric Company as superintendent, and in the following May was promoted to the office of general manager, which position he resigned but a few weeks since.

Mr. Ray is the inventor of an electric arc lamp, which he patented March, 1896, and the author of "Practical Applications of Dynamo Electric Machinery," written in collaboration with C. K. MacFadden in 1893, of which 3,000 copies were sold. Since 1892 he has been an associate member of the American Institute of Electrical Engineers; in 1894 he was vice-president of the Chicago Electrical Association.

During the past summer Mr. Ray took an outing in the mountains and made the ascent and descent of Mt. Ranier, 14,525 ft. high, in one day, which is a record breaker, as the trip is usually counted a three days one. The trip is one of great danger, and one of the party lost his life.

**ELECTRIC RAILWAY IN ST. PETERSBURG.**

The management of the Soci t  des Tramways, St. Petersburg, Russia, intends to abandon animal traction and equip the lines on Liteinaya street electrically during the coming year, and requests bids at as early a date as possible. Propositions will be received for three systems, viz.: overhead trolley, underground conduit, and accumulators. From one extremity of the line to the other is 2.9 miles; there are 2.04 miles of double track and 1.50 miles of single track, one route being used going and another returning, making the total, 5.58 miles of single track. The line is level

2. For the line, including poles which must be of iron, or the conduit.
  3. For a system of ground return, the rails being bonded to the rails of the other track and to a copper conductor.
  4. For 40 motor cars.
- In addition to this, annual and daily estimates are requested:
1. Power station; wages, fuel, oil, etc.
  2. Repairs to line or conduit.
  3. Repairs to electrical equipment of cars.

Also the terms of payment, as this will be considered in letting the contracts. Address: Liteinaya street, No. 35.



THE STREET RAILWAY SYSTEM OF ZANESVILLE, O.

except for 280 ft. which is on a grade of 3 per cent; there are four curves, two of 70 ft., one of 175 ft. and one of 280 ft. radius. The power house is situated 2 miles from one end of the line measured along the track. The maximum number of cars on the line at one time is 36 motor and 36 trail cars; all are double deck cars accommodating about 60 persons. The headway is fixed at 1½ minutes and the hours of running are to be from 7:30 a. m. to midnight.

With the proposition there must be submitted plans and estimates:

1. For the power station equipment the building itself being ready; i. e., boilers, engines, generators, etc.

**ZANESVILLE RAILWAY & ELECTRIC COMPANY.**

The Zanesville Railway & Electric Company is the result of a reorganization of former companies for the purpose of consolidating the street railway and electric lighting interests. The electric railway is an old one having been in continuous operation since 1890. Being divided by two rivers as Zanesville is, the problem of planning a street railway to give the most satisfactory service to patrons with the least track mileage has been a difficult one. The company has studied the matter well and is still improving the routes as

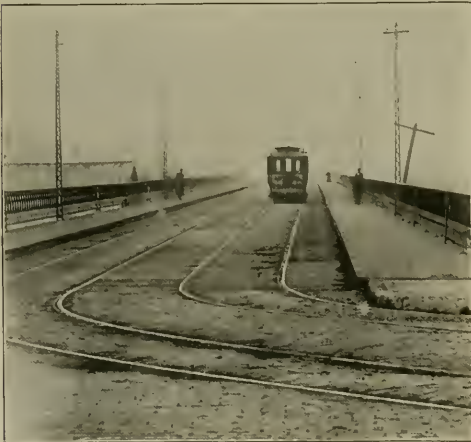




POWER STATION, ZANESVILLE, O.

the necessity of rebuilding the track affords opportunity. The lines cross three bridges, one of them being the famous "Y" bridge at the junction of the Licking and Muskingum rivers. Two of the bridges are covered, with only 14 ft. headroom, so that the trolley pole is bent down nearly parallel to the car roof when passing through. In these bridges the trolley wire is replaced by an iron plate.

With a view to encouraging traffic, the company acquired Gant park, one of the finest in that part of Ohio, and during last winter it was open as a winter resort, having a Casino with bowling alleys, skating park, theatre, etc. This proved to be an important source of revenue in the dull months and extensive preparations were made to provide attractions



CROSSING THE VIADUCT.

which should make it even more popular as a resort during the summer, with equally gratifying results.

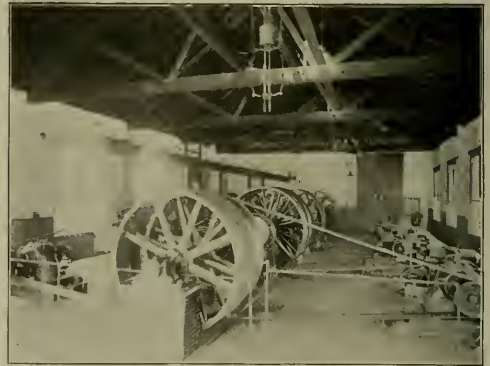
The electric lighting plant is in a healthy condition, there being a steady increase of business together with reduced

operating expenses, the result of consolidation. In the early part of the year the lighting plant was improved by installing \$15,000 worth of modern machinery.

The railway service as well has been improved by the new management, new cars put in service, and improved track and overhead construction put in at many points. The power house now contains eight Griffith & Wedge boilers, supplying steam to four engines aggregating 600 h. p. The generators are all belt driven and comprise five direct current Western Electric—three 100-ampere and two 80-ampere—machines. There are now 1,500 incandescent and 325 arc lamps in service.

The railway consists of 10 miles of single track of 5 ft. 2½ in. gage. The rails are 48-lb. girder and 48-lb. T-rails laid in 4½-in. steel bulb chairs on 5 by 7-in. ties 7½ ft. long. Brick pavement is used. The joints are 4-bolt with straight fish plates and bonded with No. 0 copper wire. The trolley wire is of No. 0000 copper and the feeders of No. 000 copper.

The car barn is of wood and iron, 75 by 170 ft. Four



INTERIOR OF POWER STATION.

tracks lead into it from the main line and there are two pits each 90 ft. long. The rolling stock consists of 20 motor cars, 9 open and 11 closed, and 11 trail cars, 7 open and 4 closed, of Stephenson make, one snow plow and one Trenton tower wagon. There are 11 complete car equipments of Sprague motors. The shops comprise an armature winding room and carpenter and blacksmith shops, and the company rebuilds its cars and makes all general repairs.

During 1896 the total number of passengers carried was, in round numbers, 1,250,000, the average per car-mile being 1.1; the car-miles per day averaged 100; and the operating expenses 12 cents per car-mile of which the motive power (leased) cost 2 cents.

The officers of the company are: John Hoge, president; W. Batemann, vice-president; K. B. Conger, secretary; H. B. Westcott, general manager.

The power house of the Union Depot Street Railway Company at Ferry and 20th streets, St. Louis, has been fitted with fire doors and windows. General Manager Scullin wished to take every precaution to prevent the spread of fire at this station, as it supplies current to several of the branch roads of the company.

## SIXTH PENNSYLVANIA CONVENTION.

The sixth annual convention of the Pennsylvania Street Railway Association was held at Allentown, Pa., September 1 and 2. The convention was called to order in the parlors of the Hotel Allen by Robert E. Wright, second vice-president, and after roll-call adjourned for dinner. When called to order in the afternoon a short address of welcome was made by F. E. Lewis, mayor of Allentown, and responded to by Mr. Wright.

Papers were presented as follows: "Relationship between Claim and Operating Departments of Electric Railways," by Richard W. Day; "Trolley Service in the Future," by R. M. Douglass; "Street Railway Legislation in Pennsylvania," by Dallas Sanders. The subject for general discussion was "Street Railway Taxation."

The officers elected for the following year were: President, Robert E. Wright, of the Allentown & Lehigh Valley Traction Company, Allentown; first vice-president, Frank Silliman, of the Scranton Traction Company, Scranton; second vice-president, Dallas Sanders, of the Schuylkill Traction Company, Girardville; secretary, S. P. Light, of the Lebanon & Annville Street Railway Company, Lebanon; treasurer, W. H. Lanius, of the York Street Railway Company, York; executive committee, Robert E. Wright, B. F. Meyers, S. P. Light, E. C. Felton, John A. Rigg.

The next meeting will held at Scranton.

The entertainments provided for the guests were a concert at Central Park on the evening of the first day and an excursion over the lines of the Allentown & Lehigh Valley Traction Company, followed by a banquet at the Manhattan Hotel, Manhattan Park.

### DELEGATES PRESENT.

- Robert E. Wright, A. F. Walters, James Uhl, Allentown & Lehigh Valley Traction Company.
- C. E. Flynn, Carbondale Traction Company.
- A. Markle, Clearfield Traction Company.
- F. H. Alleman, Harrisburg & Mechanicsburg Electric Railway Company.
- S. P. Light, C. H. Smith, Lebanon & Annville Street Railway Company.
- E. C. Felton, F. B. Musser, Middletown, Highspire & Steelton Railway Company. Harrisburg Traction Company.
- C. A. Bragg, Pennsylvania Traction Company.
- John A. Rigg, Norman M. Jones, I. C. Retter, James A. O'Reilly, United Traction Company, Reading.
- J. C. Lugar, Roxborough, Chestnut Hill & Norristown Railway Company.
- Frank Silliman, Jr., Scranton Railway Company.
- Dallas Sanders, E. W. Ash, Schuylkill Traction Company.
- R. M. Douglass, Schuylkill Valley Traction Company.
- John Graham, Col. W. J. Harvey, Wilkes-Barre & Wyoming Valley Traction Company.
- E. H. Davis, W. H. Lanius, C. H. Mayer, Williamsport Passenger Street Railway Company.
- D. K. Trimmer, York Street Railway Company.

### ASSOCIATE MEMBERS REPRESENTED.

- J. C. Brill Company, Wm. H. Heuhlings, Jr.
- Consolidated Car Heating Company, W. H. Ransom.
- F. W. Darlington.
- General Electric Company, R. E. Moore, H. J. Crowley.
- Peckham Motor Truck & Wheel Company, E. G. Long.
- Pennsylvania Steel Company, M. D. Pratt.
- John A. Roeblings Sons Company, R. W. Welsh, W. L. Doyle.
- Lobdell Car Wheel Company, F. A. Lex.
- Westinghouse Electric & Manufacturing Company, C. A. Bragg.
- Street Railway Journal, W. H. Taylor.

### OTHER COMPANIES REPRESENTED.

- Holmesburg, Tacony & Frankford Electric Railway Company, C. P. Holcomb.
- South Bethlehem & Hellertown Street Railway Company, John H. Pascoe, Hugh E. Crilley.
- Shamokin Street Railway Company, H. Rohrheimer.
- Mayer & Englund, A. H. Englund.
- Philadelphia Car Wheel Company, John Howard Yardley.
- John Stevenson Company, D. W. Pugh.
- American Car Company, E. J. Lawless.
- New Process Raw Hide Company, A. C. Vosburgh.
- Wendell & McDuffie.
- Taunton Locomotive Manufacturing Company, Jacob Wendell, Jr.
- Rochester Car Wheel Works.
- Western Gear Company.
- Wm. Wharton, Jr. & Company, R. K. Polk.
- Globe Ticket Company, W. C. Pope.
- Municipal Record & Advertiser, F. S. Beattie.
- STREET RAILWAY REVIEW, Fred S. Kenfield.

### Relationship Between Claim and Operating Departments of Electric Railways—The Prevention of Accidents and Disposition of Claims.

Paper read before the Pennsylvania Street Railway Association by Richard W. Day, General Claim Agent Wilkes-Barre & Wyoming Valley Traction Company.

Since the organization of the Pennsylvania Street Railway Association in 1892, the members have met in convention five times. At each of these meetings the following subjects, viz., Franchises, Right of Way, Construction, Operation and Maintenance have been fully discussed, and by the exchanging of views on the part of representatives of the different railways, valuable information has been given and knowledge gained. The evidence of this fact is noticeable in the improvement of our street railway systems throughout the state since that time. Having noticed the attention given to the above mentioned departments, it has many times occurred to the writer as strange that so important a matter as that of the Accident Department has received but little or no attention at these meetings. This failure to notice a matter of such interest to street railway companies is hard to understand, as it appears no mention of the cause or effect of accidents has been made in the reports furnished by the Association. The fact of this omission is hard to conceive, as one would think the accident department would be worthy of consideration as its cost is unknown to us, and we are thereby forced to constantly deal in unknown quantities. Consequently, no reasonable estimate can be made of the cost of accidents growing out of the operation of street railways. For comparison between the cost of the accident department and any other departments belonging to a railway corporation, the following statement is made to show the various differences: The actual cost of construction can be figured to a nicety, and the cost of operation can be so closely estimated that little or no difference in the amount is liable to arise, and, from past experience, the companies know just about what amount to set aside for the maintenance in the proper condition of the roadbed, overhead construction and rolling stock. The change from horse power to electricity having increased the different hazards to such an extent, we today find new liabilities arising caused by the power of electricity, and as we have every reason to expect, new elements of danger will arise in the future which are naturally unknown to us today. We are, therefore, confronted by the problem of how to best prevent, and in the event of occurring, dispose of the losses growing out of accidents.

To state that a certain company will lay aside a certain sum of money for contingent losses is well enough in itself, but at best it is purely a matter of guess work, for the reason that we have no precedent to govern us and no way of knowing what our future losses will amount to. As far back as we wish to trace history we learn of casualties having occurred which have resulted in the loss of life, injuries to persons and damage to property, and we have every reason to believe that just such will continue to happen in the future. Realizing this fact, our only hope to hold our losses down to a minimum is, first, to regulate our system so as to prevent accidents. This can only be accomplished by a close relationship between the management, the operating department and the claim department.

While it is not the intention of the writer to offer suggestions regarding the management of different roads, yet for the accomplishment of good results on the part of the claim department certain suggestions are herein offered which, if carried out by the operating department, will considerably reduce the number of accidents and the liabilities against the railway corporations. For the success of all roads, the different departments should work in harmony. This fact can be easily understood, for where contention and petty jealousy exist between operating and claim departments, the effect of any carelessness or misunderstanding on the part of one department naturally falls upon the other. It is well understood that where the roadbed, overhead construction and rolling stock are in good condition, the cars manned by competent motormen and conductors, an accident which shows liability on the part of the railway company is an unusual occurrence. But it must be remembered that as long as we are dependent upon human agencies to conduct our various operations, accidents will happen. Admitting that fact to be true, we are then confronted with the different elements which lead up to the cause of accidents, and afterwards devise a means to dispose of claims growing out of them when liability exists.

The cause of our most serious accidents on street railways is owing largely to the failure of the employes to first acquaint themselves with and carry out the instructions given by their employers. Whether this is the fault of the management or the employes is a question which can only be determined by the individual corporation. Where the management is good, such accidents as collisions between cars, cars jumping the track, cars jumping switches, cars colliding with steam trains at crossing, are in most cases owing to carelessness on the part of either motorman or conductor. In such cases the liability of the company is beyond question, and it then devolves upon the claim department to make settlement with those, if any one has been injured, or in the event of failure of that department to do so, it then usually rests with juries to assess the damages with results only too well known to us all.

Experience has taught the writer that care should be given to the construction and special care to the maintenance of overhead wires, as serious accidents have occurred caused by the failure to keep said wires in proper condition. There is a certain class of accidents which occur upon all railroads, such as passengers jumping on and off moving cars, unnecessarily standing upon the running board, standing on the front and back platforms when there is room inside of the cars, running into horses and wagons which unexpectedly turned directly in front of cars; persons walking upon the roadbed many times where it is the private property of the company. Such accidents are generally considered void of liability on the part of the company. But just this class of accidents require almost as much time and attention on the part of the claim department as accidents for which the company is legally liable, for the reason that claims are frequently made in such cases and the facts so tortured by the claimants into apparent liability that it is necessary for the adjuster to fortify himself with all the obtainable evidence to prove non-liability on the part of his company.

To adjust a loss where there is conceded liability is practically an easy matter for the adjuster, as he will first post himself as to the character of the injuries sustained, and following it up by learning the earning capacity of the injured one, and with the assistance of the examining surgeon approximate the length of time of disability. Having obtained such information, he is then in a proper position to decide upon a basis for compensation. But quite the contrary is the case when handling a claim growing out of an accident in which a person is injured or property damaged and the question of liability in doubt. It is in properly disposing of a case of the latter class that the judgment of the adjuster is shown.

The majority of deaths caused by the operation of the electric cars are brought about by contributory negligence on the part of the deceased. Notwithstanding this fact, a claim is usually made and the adjuster is confronted by a husband or wife, a father or mother, or a guardian in case of a minor, and they appeal to the company through him for assistance. Again, it is necessary for the adjuster to exercise good judgment and to bring about an understanding with the before mentioned representatives which will prove satisfactory to all concerned. Just whether to allow a payment or not in such cases is a matter which must naturally be governed by the local situation and surrounding circumstances. To explain how an accident case should be investigated and the losses growing out of it adjusted, is an impossibility, as no two accidents occur alike, and the

matter then solely depends upon the humor of the person or persons injured, together with the all around ability of the adjuster who undertakes the mission. The success of the operation of a claim department largely depends upon the man or men employed, and the secret of their success is regulated to a large extent by their past experience in this work, ability to correctly judge human nature and to maintain perfect control of their temper. For a man to properly handle a claim department, he should be placed in charge unrestricted, for if handicapped by restrictions from the management, his identity becomes insignificant, and the courage and nerve which govern him in a close quarter are lessened to such a degree that his general usefulness is impaired.

Following the suggestion already given for the prevention of accidents, it may be well here to say that the official in charge of operating department has it in his power to increase or decrease the number of accidents more than any other officer in connection with the company. It is within his power to enforce the rules and regulations formed by the management, he having the selection of the motormen and conductors, and the proper manning of the cars depends entirely upon his judgment. The inspection from time to time of the roadbed, overhead construction and rolling stock also being under his supervision, it can readily be seen what a factor this official becomes in the prevention of accidents. The selection of proper men to fill the positions of conductors and motormen should not be overlooked, as the management of the cars with which they are entrusted is solely in their hands from the time they start out on their run until they return to the car house. It is the firm belief of the writer that passengers should be excluded from the front platform of the cars; first, that the position of a motorman is such a responsible one that he should have sufficient room to operate his motor, brake, and bell, without interference of passengers crowding against him; secondly, by the absence of other persons from the platform with him, his sole attention is given to the streets before him and the crossings as he approaches them.

Many accidents have been occasioned through the attention of the motormen having been attracted by a passenger standing by him, and companies have paid large sums of money simply for such little acts of courtesy on the part of the motorman to passengers. The conductors and motormen should also be carefully instructed regarding the furnishing to the company of an intelligent narrative of any accident that occurs to any person upon or by their car. They should also be taught the necessity of furnishing the company with the names and addresses of all witnesses which they may be able to secure, as this is very important in assisting the claim department to get down to the bottom of all the facts which led up to the accident. Such a rule is generally enforced on all roads to a certain degree, but usually a conductor reports an accident simply because he feels he is compelled to do so, and any kind of a report will answer the purpose. These are some of the errors that should be corrected. To prevent discharged employes from becoming valuable witnesses for the plaintiffs in damage cases, the writer has for years pursued the following, which has proven a bar against them from testifying against their employers. An affidavit has been taken, or in the case of a removal, the deposition of any employe who has been in any way connected with an accident on the road. This method has been adopted for the reason that the largest amounts ever recovered in damage cases have been awarded by juries who have listened to detrimental statements made by discharged employes against their former employers.

Regarding the question of feigned injuries which have become so prevalent within the last few years, the writer has found it to his advantage to have associated with his company the most able physicians and surgeons in the locality, so that they may, by their learning, experience and upright character, overshadow the shyster element in the medical fraternity which usually follows up persons who have been injured, keeping them incapacitated so as to prolong their disability, thereby increasing their fees accordingly.

There is no doubt but this Association has been the means of strengthening railway companies in weak places and instilling confidence in the stockholders; and as this Association is the representative body of such a large amount of capital it would not seem to be unreasonable to expect that it should be instrumental in bringing about a change in some of our laws regulating the question of corporation liability, especially so as to the statute of limitation, which as it stands today is one year in the case of death and two years in the case of injury.



In conclusion, the prevention of accidents can only be brought about by a thorough understanding between all the departments of a railway and the settlement of losses growing out of them by the prompt attention of the railway adjuster.

### Street Railway Legislation in Pennsylvania.

Paper read before the Pennsylvania Street Railway Association by Dallas Sanders of the Schuylkill Traction Company.

In 1831 there was probably formed in Philadelphia what was called the first bus or omnibus line. That was the mode of transportation of passengers in that city at that time. This mode of conveyance which was called "Boxall" was started by James Boxall, December 7, 1831. James Boxall was an innkeeper at the Upper Ferry bridge (Callowhill street), and his "stage-coach" was like a chariot. It had about four or six seats running from side to side, and was set well up on its wheels, showing a broad back. It was painted a rich dark green color, and access into it was obtained by iron steps at the side. It was called 'Boxall's Accommodation,' and bore upon the back the words, in gilt letters, 'Fairmount Observatory,' in allusion to a request from the American Philosophical Society, which at that time proposed to erect at Fairmount an astronomical observatory. "Boxall's Accommodation" had a short life. Other omnibus lines in Philadelphia were afterwards established. Such was the means of street passenger transportation until 1857.

In 1857 street passenger railway companies began first to be incorporated. This was done by special acts of assembly giving the companies the right to the use of certain streets in certain cities, and authorizing them to have a certain capital and giving them corporate powers. Probably the first two passenger railway companies that were incorporated were the West Philadelphia Passenger Railway Company on Market street in Philadelphia, incorporated on May 14, 1857, and the Frankford & Southward City Passenger Railway Company, incorporated June 10, 1857, both in the city of Philadelphia, although there was another company incorporated as a steam railroad company earlier than that, which was afterwards given the rights of a street passenger railway company. Street passenger railway companies were incorporated from 1857 down to the adoption of the new constitution, in 1874, by special acts for each passenger railway company, giving it the right to the use of certain streets in certain cities throughout Pennsylvania. Some 65 of such corporations were incorporated during that time.

There was in 1857 opposition to street passenger railways by some of the citizens for reasons which at this day seem to be absurd, but at that time created great contentions and deep-seated feeling among the citizens in many of the cities. The first contest of a legal character arose probably when bills of equity were filed, asking for an injunction restraining the laying of rails on the streets, as it was alleged this would be a nuisance. When the companies endeavored to start Sunday travel in 1859 further litigation ensued. In 1866 a bill in equity was filed before Justice Strong of the supreme court at nisi prius, asking for a preliminary injunction to prevent the running of cars on Sunday, which he granted, but when the case came up before the supreme court in banc, in November, 1867, the injunction was dissolved and the cars were allowed to run on Sunday, and have done so ever since.

Another contest that the passenger railways had, was the admission of colored people to the street cars. This matter was carried on for a long time, until on March 22, 1867, an act was passed admitting colored people to the street cars on equal terms with their white neighbors.

The objection to allowing colored people to ride in the cars that was made so strenuously and fought for so bitterly for such a time in Philadelphia seems to us at the present day also absurd, and we can not see any reason why they should have ever been excluded.

The new constitution adopted in 1871 in Art. 17, Sec. 9, provides that "no street passenger railway shall be constructed within the limits of any city, borough or township without the consent of its local authorities." This was a proper provision, giving the local municipality the power to consent or not to consent to a street passenger railway company being authorized by the legislature in every locality.

From the year 1874, when the new constitution was adopted, there were no street passenger railways incorporated until the act of 1889 was passed. However, on May 23, 1878, the legislature passed a

street passenger railway act entitled "An act to provide for the incorporation and government of street railway companies in cities of the third, fourth and fifth classes, and in the boroughs and townships in this commonwealth."

On March 10, 1879, the legislature passed an act entitled "An act to provide for the incorporation and for the government and regulation of street railway companies now incorporated, or which may hereafter be incorporated in cities of the second and third class in this commonwealth."

The supreme court, in the case of Weinman v. the Wilkesburg & East Liberty Passenger Railway Company, 118 Pa. St., 102, decided in 1888, held this legislation unconstitutional and void under the provisions of Art. III, Sec. 7 of the constitution, prohibiting local and special legislation.

On May 14, 1880, the legislature passed a general act providing for the incorporation of street railway companies in Pennsylvania, by which any number of persons—not less than five—may incorporate a street passenger railway company and have the general powers of a corporation, which railway, however, can not be built without the consent of the local authorities.

Prior to that time, in 1887 and in 1883, motor companies for the construction and operation of motors and cable or other machinery for supplying motive power to passenger railways, had been authorized to be incorporated and they were given authority to invest their funds in the purchase of shares of stock and bonds of any corporation whose rails, railway motors or other property are leased, operated or constructed by them, and they were authorized to lease the property and franchises of passenger railway companies which they may desire to operate, and to operate said railways.

New street passenger railways have been numerous incorporated under the general street passenger railway law of 1889 and others under what are called the motor power or traction law of 1887.

The new system of locomotion by which electricity became generally used in 1892 added a new power by which the passenger cars were moved with great convenience and comfort to the public, giving them larger and cleaner cars, open cars in the summer, heated cars in the winter, and a rapid transit throughout the large cities, connecting smaller cities together and enabling the people at a moderate rate of fare to move from one place to the other with comfort and convenience, and also in the summer opening up many places, like public parks and sources of amusement which hitherto had not been within the purses of many people at which to visit or amuse themselves.

Like all other improvements in street passenger traffic, this met with earnest opposition from some citizens. Public meetings were held, showing the supposed danger of the electrical power, bills in equity were filed in the courts of common pleas in Philadelphia and taken on appeal to the supreme court, where, however, the right to use such a new and novel mode of transportation was upheld. Legal proceedings were taken also in other parts of the state.

This new inanimate power, placed upon the streets of the cities and boroughs and upon the highways of the townships what was practically almost a steam railroad in the rapidity with which it moved, brought about, until the people began to learn that it was not the old horse car, many accidents to people traveling on these roads or crossing them, but as the people have learned that the passengers desire rapid transit and that they must be more careful in crossing tracks of these roads, the accidents have become fewer and fewer. The supreme court of the state has applied to these trolley roads the well-known doctrine of "Stop, look and listen." This doctrine was first applied by the supreme court to steam railroads and was the subject of some criticism in some of the other states of the Union, but it is now being applied as a correct exposition of the law of negligence in many of the other states and is applied in Pennsylvania with limitations to the electric or trolley roads as a proper precaution for persons approaching one of these tracks, and adds to the safety of the many passengers who are carried in these cars, for a collision with a large beer wagon may be as dangerous to the occupants of the trolley cars as to the man who is driving the beer wagon.

By the act of May 21, 1895, street passenger railway companies were given the power to contract for and to regularly gather, carry and distribute the mails of the United States. This distribution of the mail by trolley cars had already been done in some of the other states of the Union and it was found a great convenience to the people. It has been enlarged, and Congress at its last session appropriated \$250,000 for electric and cable car service in the United States.

The second assistant postmaster general in his report for this service up to July 1, 1896, shows that there were 145 different routes throughout the Union, going over 353 miles of track. Since then this traffic has largely increased, and the appropriation made at the last session of Congress was for \$250,000—\$100,000 more than the previous year.

The legislation in Pennsylvania has been of a consistent character, but has been of a different character naturally for steam railroads, incline plane roads and lateral railroads, in connection with the steam railroads and for street passenger railways. The difficulty that the street passenger railways met when they first adopted the electrical or trolley system was, as I have said before, that the people did not realize the rapidity with which they were required to run and did not approach and cross the streets with such care as the supreme court properly decided should be used in such cases, and these roads have suffered from what are known as accident cases, by which endeavors have often been made to nullify them in large amount of damages when there was no reason for such suits.

Justice Dean of our supreme court, in an interesting address delivered last winter before the Law Academy of Philadelphia on "Jury Trials," gives a history of some of these accident cases.

"To sustain my proposition as to the growing tendency of juries in the teeth of evidence, to take from him who hath and give to him who hath not, it is hardly necessary to cite proofs within the knowledge of every judge and lawyer and many laymen. As just one instance, take the case of one private corporation in this city, the street railway companies. In 1886, when the cars were moved by horses, the verdicts in negligence cases were four, aggregating \$16,150. In 1892, before the change had been made to electric power, there were twelve cases, and the verdicts aggregated \$30,608. In 1886, when they paid \$16,150 damages, they carried 137,957,012 passengers, counting single fares. In six years, while still running cars by horse power, the damages almost doubled, increased nearly 100 per cent; the increase in passengers was, in round numbers, from 137,000,000 to 187,000,000, an increase of about 40 per cent. Then the new motive power was put on, and in 1896 the verdicts in negligence cases reached \$345,410.50, the number of cases being 118. The passenger fares increased, however, from 187,000,000 in 1892 to over 261,000,000 in 1896. The increase in travel was again about 40 per cent, in verdicts about 1,000 per cent. As to this last astounding increase, it may be fairly assumed that much of it is due to the fact that the more powerful motor is the more dangerous one, and that a higher degree of care is required on the part of those using it than was exacted in the use of horses. But, assuming that there was an absence of care according to the circumstances in many more cases when the new power came into use than in moving the cars by horses, there was, in any fair view, it seems to me, an increase in verdicts out of proportion to increase of passengers. The figures given I obtained from the department of internal affairs at Harrisburg, from the court records and from the officers of the railway companies. I have no reason to believe they are incorrect.

"As I have said, trial by jury, if it be a fair and impartial trial of disputes on evidence, must from its very nature strengthen the administration of justice and add to the stability of free institutions, but if it be perverted from its object, the ascertainment of truth, into a means of promoting a redistribution of property without regard to legal right, then eventually there comes revolution under legal forms and the institution will be abolished, thereby placing the administration of justice farther from the people and consequently weakening their attachment to its forms, a result to be deplored by every friend of government by the people."

The legislature in 1893 passed an act limiting for two years the right of action for any alleged injury, and they have required where the husband and wife have a suit for injuries to the wife only that the action shall be consolidated in one suit, and at the last session of the legislature in 1897, that an action for an injury to a child and for the father's right of action for such injury shall be consolidated in one suit.

An endeavor has been made in Indianapolis, Milwaukee and some of the southern cities to control the rates of fare when no such condition was placed in the charter, when no constitutional right could be found for such legislative action, but the populistic cry against corporations was the only motive that could have impelled or caused such action. However, the courts in these localities have taken these questions up and have determined them with a due regard to the obligation of contracts and to prohibit and prevent their violation. These instances were probably only caused by a temporary aberration

of the popular mind; but the courts wisely and sternly prevented any great wrong being done to invested capital, invested under the laws granted by these very states. In Atlanta the attempt was to compel a company which operated two distinct lines to give a free transfer instead of exchange ticket. The court said that when the fare was fixed it meant a fare on one route and not on two.

As the years roll by the people realize that they are given greater facilities by the street passenger railways, especially since the electrical system has been applied, where the cars can with ease run up and down grades and with rapidity, connecting places that had been heretofore almost inaccessible to each other and allowing the people freely to mingle at a moderate cost among their friends, neighbors and relatives. True it is, that on many highways of the state these roads have been allowed to run, but the advantage of prompt, convenient and frequent inter-communication is a satisfactory answer to the state allowing the use of its highways for this purpose.

In a report of the Ohio Road Commission, filed December 21, 1893, it is shown that the cost of transportation by horse power is the most expensive and covers the shortest distance; that is, it is shown that by horse power the cost of transportation per ton for 5 miles is \$1.25, while by electric power for the same cost a ton will be carried 25 miles, arguing thereby that the state would be wise in allowing its highways to be freely used by electric trolleys, as they would be a benefit to the farmers and those residing along the roads by cheapening transportation.

The following extracts from the report of the secretary of internal affairs for the year ending June 30, 1896, show the extent of the street passenger railways in Pennsylvania: "The total mileage of street railways reporting for the year ending June 30, 1896, was 1,561.89. These figures may not be absolutely correct, but they are as nearly so as it is possible to make them from the returns received.

"The extent of the street railway service in Pennsylvania is shown in the great number of passengers carried during the year, 376,502,551. These figures are approximately correct, although several companies have failed to report the number of passengers carried."

The Street Passenger Railway Act of 1889 authorizes such railways in their construction "to cross at grade diagonally or transversely any railroad operated by steam or otherwise now or hereafter built."

This apparent authority to cross at grade steam railroads made some persons imagine that it gave a general arbitrary power of crossing at grade whenever and wherever they pleased, but the supreme court of the state wisely determined that under the act of 1871 it had the authority as a court in equity to restrain crossing at grades where it was possible at a moderate additional expenditure of money to cross underneath or overhead. Although the able and careful Secretary of Internal Affairs recommends that grade crossings should be abolished entirely outside of the streets of cities or boroughs, it seems to me that under the wise construction of the supreme court it is better to leave this legislation and the decisions the way they at present stand and not attempt additional legislation on these questions.

The acts of May 15, 1895, and May 21, 1895, enlarge the rights of street passenger railways so that now they are authorized to sell or lease to traction or motor companies and contract for their construction, specify the manner of payments in bonds and mortgages and also authorize the traction or motor car companies to lease or sell to other companies.

The question of giving to street passenger railways the right of eminent domain and also the right of carrying freight is a question still in abeyance in Pennsylvania and will be left for further due consideration, as our legislature does not again meet until 1899. I have not found in this state, as far as I personally have had anything to do with trolley roads, that supposed antagonism between the steam railroads and the trolley roads, except where trolley roads attempt to cross the steam railroads at grade, where it was possible by the expenditure of a little more money to cross overhead or underneath.

Nearly all the litigation, and there is a great deal of it, unfortunately, which has arisen between the steam railroads and the trolley railways in this state is due to the obstinate determination of the parties on the one side that they should cross at grade and on the other side that they should not; but as I have said before, the supreme court has wisely determined this, and in some cases where it was impossible to make an overhead or an underground crossing have allowed grade crossings, and in the instances of other kinds, have properly refused grade crossings.

Any person who can remember what the discomforts of the omnibus

ride were in days gone by, any person who will remember the small, badly ventilated and slow horse street car, often drawn by mules although called a horse car, cannot but turn with pleasure and must appreciate the large improved, well-ventilated and well-lighted trolley car moving promptly and rapidly, and especially the open trolley car that gives fresh and cool air to all who ride in the summer months, so girls and boys, men and women do not want to go back to the old system, but are pleased and proud of Pennsylvania's improvements in having her people rapidly and comfortably carried on her streets and highways.

### UNIFORMS BY THOUSANDS.

Managers, employes and the public all unite in one expression as to the great improvement in the appearance of street railway car crews in these latter days, as compared with the garb which was passed without criticism when bob tail cars and horses were abroad in the land. Probably no one thing

has had more to do with the improved appearance of the men and the maintenance of a good discipline than the general order requiring the men to wear the company's regulation uniform while on duty.

The writer remembers well when the men raised all kinds of objections to getting the first brass button suit, but he has not forgotten that a year or two later, the new men when "turned in", were just as anxious to get their regulation suits at the earliest possible moment, so that the friendly



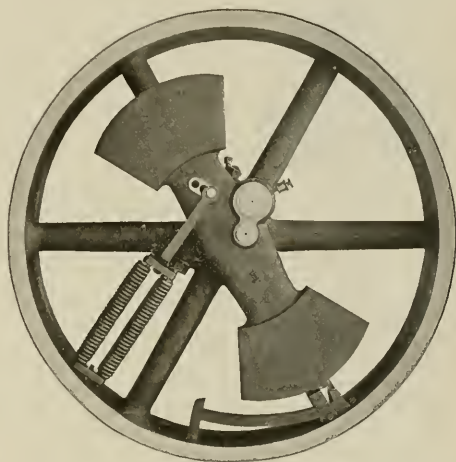
C. F. ORR.

garb might help conceal from the public the fact that they were green at the business.

The manufacture of street railway uniforms has grown to be a large industry, but the price secured for the men by the companies working through competition has been such that none but such concerns as have the facilities for operating the business on a very extensive scale are able to long continue in it. Such a survival of the fittest, is the concern of C. F. Orr & Co., Chicago, which undoubtedly makes more street railway uniforms than any other house in the world. And every garment is made individually to order from measure taken each time, and the same process of making, fitting and finishing is applied to every uniform that is given to a hundred dollar suit. The street railway uniform as made by them is fully equal to what the merchant tailor would have to charge at least ten dollars more for. During the past 15 years in which this house has been engaged in the manufacture of uniforms it has had competitors by the dozen, but in spite of cut prices which proved to result in poor work, it has kept steadily to the front until now it has the business of all the large roads in this city and nearly all the lines for several hundred miles in each direction. The steadfast rule has been that no man should be allowed to wear a uniform which did not fit, and which was not perfectly made, and the natural result has been that the business has grown until now it has assumed large proportions. The Chicago City Railway, which has divided its work among several concerns for years, has just closed an exclusive contract with Orr & Co., for all its uniforms.

### NEW GOVERNOR OF BALL ENGINE COMPANY.

The illustration shows the new governor recently designed by the Ball Engine Company, Erie, Pa., to fulfill the exacting requirements of electric lighting in the modern office building, where it is demanded that there shall be only the minutest variation in speed under widely varying loads and changing pressures. It is an adaptation of the Rites governor, and very simple in its construction. The entire governor comprises but one moving piece which is pivoted at a single point, thus doing away with the multiplicity of connections and joints (often but poorly lubricated) and making



a mechanism which not only regulates with the highest degree of accuracy but does so with extraordinary rapidity and without surging.

Technically stated, the centrifugal element upon which the degree of refinement of regulation in all governors depends is combined with an inertia element, relatively so great that instant and extreme changes of load are immediately provided for without waiting for the otherwise necessary manifestation of centrifugal force.

The suspension pin is made of hardened crucible steel and the suspension pin eye is of phosphor bronze. The little lubrication required is secured by forcing grease from a compression grease cup into a number of recesses in the bore of the bushing.

### ART IN ADVERTISING.

The Western Electric Company of Chicago is sending to its friends a series of half-tone illustrations of classic pictures with appropriate quotations. This month the picture is entitled "The Battle of Competition" and is from a famous painting, the Rape of the Sabines. It is a handsome half-tone; 8 x 11 in., and will prove an ornament to any office.

It is reported that another trolley line is to be built between Bethlehem and Allentown, Pa., being a continuation of the Easton line.



W. O. HANDS RESIGNS.

The directors of the Northeast Electric Railway Company of Kansas City, Mo., on August 19 accepted the resignation of W. O. Hands as superintendent and purchasing agent, to take effect October 1. Strenuous but unavailing efforts were made to have Mr. Hands reconsider his determination to leave. W. C. Weaver, auditor of the Northeast Electric Company, has been appointed superintendent temporarily and C. G. Adney, assistant superintendent and purchasing agent.



W. O. HANDS.

Mr. Hands has long been identified with electrical and street railway interests. From 1887 to 1890 he worked in the various departments of the Brush Electrical shops of Cleveland and was then employed by the Short Electrical Company. For the next two years he supervised or assisted in the installation of railways in Muskegon, Mich., Rochester, N. Y., Baltimore and Washington. After serving as electrician and superintendent of the Braddock (Pa.) Street Railway Company, Mr. Hands accepted similar positions at Beaver Falls. In 1894 he went to Kansas City to take up the duties of the offices he now holds. As an evidence of good will the company presented Mr. Hands \$100 and a memorial was given by the employees. Mr. Hands has accepted the position of construction engineer with the East Side Electric Company of Kansas City, which is soon to commence work on a new road.

STORAGE BATTERIES FOR TRAMWAYS.

The application of storage batteries to the street railway lines of Zürich and Remscheid was described in a paper before the Elektrotechnischer Verein by Ludwig Schröder. The experiment of connecting the storage battery directly across the terminals of the dynamo without using an automatic cell switch was tried on the Zürich-Hirslanden lines with success. Fig 1 shows the manner in which the 270 cells are connected in the railway circuit. The ammeter A

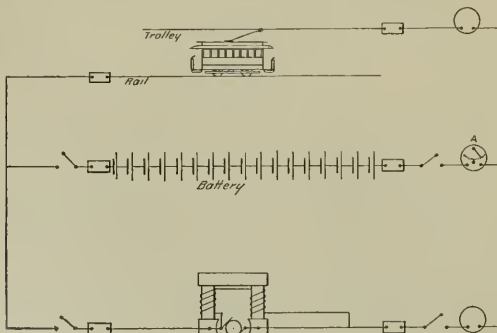


FIG. 1—CONNECTIONS FOR STORAGE BATTERIES.

reads either side of the zero mark so as to indicate whether the cells are charging or discharging.

The current and voltage curves are shown in Fig. 2, the

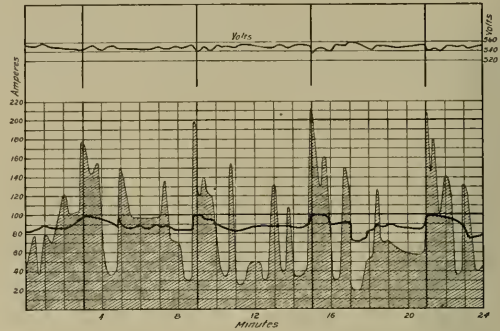


FIG. 2—CURRENT AND VOLTAGE CURVES—ZÜRICH.

shaded portion indicating the discharge of the batteries and the heavy line represents the current output of the generators. As may be seen the variation is only between 72 and 102 amperes in the dynamo circuit while the line fluctuates from 20 to 210 amperes. The voltage on the line circuit is quite constant, the maximum variation being between 535 and 560. The curves are plotted for 24 minutes, the time required for the cars to make a complete trip. The battery described has been in service for the past 2½ years, nine months of which it has been connected directly to the dynamo terminals, and as yet there is no trace of wear

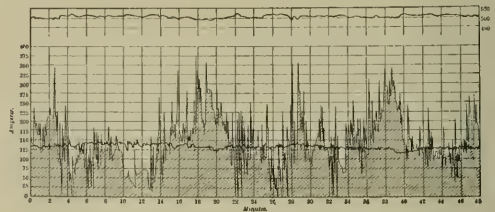


FIG. 3—CURRENT AND VOLTAGE CURVES—REMSCHIED.

reported. The coal consumption has decreased to 3.9 lbs. per car-mile, which is low considering the small installation, a 90-h. p. engine, and the hilly roadbed.

On the Remscheid Electric Tramway lines there are some heavy grades, in one place there being a difference of level of 350 ft. in 1½ miles with a maximum gradient of 10.6 per cent. The railway is 6.8 miles long and of this but 180 ft. is on level roadbed. Motors in 40 manufacturing establishments are also connected to the line circuits.

The power station equipment consists of three boilers working at 120 lbs. pressure, four McIntosh-Seymour 160-h. p. engines and four 100-k-w. generators. On account of the grades and the nature of the service the fluctuations in the current demand were enormous; on week days the railway service and the workshops required from 100 to 400 amperes and on Sundays from 0 to 450 amperes. The average demand for the railway service was 135 amperes and including the factories, 232 amperes. The increased demand for power for the factories required an enlargement

of the plant, but for average loads it was ample in capacity. A storage battery was installed, consisting of 250 Hagen cells, having a capacity of 648 ampere-hours with a rate of discharge of 216 amperes. The four compounded dynamos were connected as shunt machines in parallel with the battery, and a booster designed to give 600 amperes at 100 volts was placed in series with it.

The current and voltage curves taken on Sunday when the railway alone is operating are shown in Fig. 3. In the dynamo circuit the variation is between 115 and 150 while on the line circuit it increases from 0 to over 400. The voltage remains very nearly constant, 495 and 515 being the limits. In Remscheid there has been a saving of 11 tons of coal per week since the battery was installed and 200 h. p. of the dynamo output is also saved. The battery complete costs only half as much as the machines which are now available for any further increase in the load.

### THE INDIANAPOLIS, ANDERSON & MARION RAILWAY.

Plans have been matured by several railway promoters, principally Noah Clodfelter, for connecting by electric lines the industrial cities in the natural gas belt in central Indiana. The Indianapolis, Anderson & Marion Railway is the first interurban line upon which actual construction has commenced. The route runs from Marion to Anderson, 39 miles, by way of the Soldiers' Home, through Gas City, Jonesborough, Fairmount, Summitville, Prosperity, Alexandria, Linwood and North Anderson; later an extension of 35 miles will be made to Indianapolis. In construction and equipment this line was designed to equal any interurban in the country.

One power station is built at Alexandria and another at Fairmount, where the fuel, which is natural gas, has been guaranteed free for 15 years. The equipment of each station will consist of two 250-h. p. automatic, high speed engines belted to two 150-k. w. Westinghouse generators, and five 100-h. p. tubular boilers. The trolley wire is figure 8, No. 0000, the contract being placed with John A. Roebbing Sons.

In conception and design the road is an exceptionally fine one, but the greatest difficulty is in the lack of proper financial backing. Last May the company entered into a contract with Louis Enricht, of Chicago, for the entire construction of the railway, including roadbed, track, power stations and equipment, and all electrical appliances; everything was to be complete for operation, and the contractor was placed under \$20,000 bonds for the fulfillment of his agreement. Mr. Enricht let contracts for labor and materials, including rails, engines and electrical equipment. The contract stated that the company was to pay Mr. Enricht a certain amount of cash each month and notes of the company secured by gold bonds. No cash payments were made, but \$16,000 in bonds were turned over to the contractor. On account of some misunderstanding the company wished to cancel the contract and recover the bonds, but this Mr. Enricht refused to permit. Charges were filed and Governor Mount, of Indiana, was requested to begin extradition proceedings to bring Enricht to Indiana for justice. Governor Tanner investigated the case and refused to honor the requisition. Mr. Enricht states that he has complied with his contract so far and is ready to continue to do so and will insist on

carrying it out. He has made an offer, backed by Chicago capitalists, to take the issue of bonds at 90 and complete the road, provided the present company turns over 51 per cent of the stock. The capital stock is \$500,000 and there is a \$500,000 bond issue.

### VICTORY FOR THE AURORA & GENEVA.

As described in the REVIEW for January, 1897, there are two interurban roads connecting the towns along the Fox river in northern Illinois. One of these runs from Carpentersville through Elgin with the southern terminus at Geneva, and the other, the Aurora & Geneva, had at that time completed its line from Aurora as far north as Batavia, two and one-half miles south of Geneva. The intention was to build this short piece of track early last spring, thus permitting a through service from Carpentersville to Aurora.

In order to avoid the heavy grades and surface crossings with steam roads, which would have been encountered by following the highway from Batavia to Geneva, the company wished to secure a private right of way through this district. There were 13 property owners in the district and the company was able to settle with but three of them; after vain endeavors to secure consents condemnation proceedings were instituted in May last. The case came to trial in the circuit court of Kane county and after a hard contest for three weeks was decided August 27.

The property owners claimed heavy damages, but the company was permitted to show benefits as an offset. The aggregate damages to adjacent property claimed amounted to \$53,000; the jury awarded \$4,533, which is considered by disinterested parties to be fair to both sides. The railway company had offered considerably more in settlement of the claims and is in consequence well satisfied.

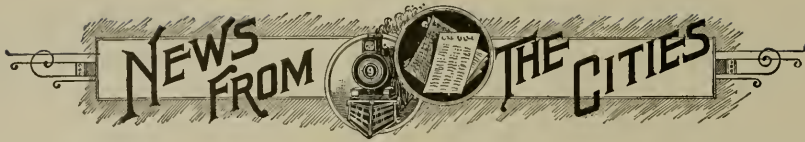
The property owners propose to appeal the case to the supreme court on the ground that a street railway organized under the "Horse and Dummy Act" has not the power to condemn private property and must confine itself to the highway throughout its entire route. Unless a supersedeas is granted by the supreme court the company will pay the amount of the verdict and proceed with construction at once, taking its chances of an adverse decision by the higher court.

### BICYCLES CARRIED AT ATLANTA.

The Atlanta (Ga.) Consolidated Street Railway Company has decided to permit bicycles to be carried on its cars. This is in the nature of an experiment and no permanent arrangements have been made and no special hangers applied to the cars. Only a very small revenue was expected from carrying wheels, the service being an accommodation to the public. The order to conductors is as follows:

This will be your authority to allow bicycles (not more than two at any time) carried on your car, if in your judgment the car is not too crowded, the bicycles to be hung on the brake handle over the rear dash or held by the owner in that position. You will be required to collect ten cents for each bicycle carried. Do not register such collections but make a special report on your trip sheet, giving the time of day such collections are made.

H. F. Pabish, general electrician of the Union Depot Street Railroad Company has fitted up a complete gymnasium in the power station of the Bellefontaine road.



### Alabama.

BIRMINGHAM, ALA.—The Birmingham Traction Company has been organized with \$50,000 capital stock to operate the East Birmingham & Gate City Dummy Line.

### Arizona.

FLAGSTAFF, ARIZ.—The Santa Fe & Grand Canyon Railway Company will build an electric road from Flagstaff to Williams. Charles E. Potter is treasurer; and the backers are Lombard, Goode & Co., of Chicago.

### California.

PASADENA, CAL.—Tracklaying has begun on all streets upon which the Pasadena & Los Angeles Electric Company holds franchises.

LOS ANGELES, CAL.—The Los Angeles Street Railway Company has contracted with the Southern California Electric Light & Power Company for power to operate its lines for 20 years.

OAKLAND, CAL.—F. C. Havens, representing the Realty Syndicate, bought the East Oakland Street Railway August 16 for \$60,500 at sheriff's sale. The syndicate controls a number of other local roads.

SANTA ANA, CAL.—The Santa Ana & Newport Railway Company has been incorporated to build a line. Capital stock, \$500,000; incorporators, Joseph McFadden, R. McFadden, M. M. Crookshank, W. H. Spurgeon and E. M. Smiley.

### Chicago.

CHICAGO.—A permit to erect a one-story brick power house, 199 x 112 ft. has been granted the South Side Elevated Railroad Company. It is to cost \$65,000.

CHICAGO.—During the next two months the street railway companies controlled by Charles T. Yerkes will expend \$1,500,000 in building new and relaying old lines. Nearly 30 miles of double track will be built. Five miles will be laid in Montrose boulevard, five miles in Lawrence avenue, 2.5 miles in Robey street, two miles in Crawford avenue, 2.5 miles in California avenue and four miles in West 12th street.

CHICAGO.—Work has begun on the stock yards line of the Chicago General Railway. The franchise for the building of the line to the stock yards on Throop and Morgan streets was obtained by the West Chicago Street Railroad Company and under an agreement turned over to the Chicago General, which, with the City Railway, will build the line, the whole to be operated by the Chicago General, independently of the other two companies.

### Colorado.

CANON CITY, COL.—The Canon City & Cripple Creek Electric Railroad Company has been incorporated to build a line. Capital stock, \$1,000,000; incorporators, James J. Cone, Lyman Robison, and Thomas S. Wells.

DENVER, COL.—Orman & Cook, contractors, of Pueblo, promise to have 25 miles of the Cripple Creek District Railway finished in less than five months. At Canon City the company will build a 4,000-h. p. electric plant to furnish light and power to the city as well as to the road. Another of the plants will be located at Marigold. At both of these places the company controls cyanide gold extracting mills. The route is almost an air line with a continuous grade. The Willow Creek Toll Road Company has been incorporated to build roads and electric railways. The main line will extend from the lower end of the Holy Moses tramway to the summit of the divide. Capital stock, \$500,000; incorporators, Henry C. Rowley, M. E. Chapman and L. C. Chapman. The El Paso Electric Railway &

Tunnel Company has been incorporated to build lines in El Paso county. Capital stock, \$1,000,000; directors, Charles Neff, Harry Gertig and D. A. Chapin. The Air Line Electric Railroad Company has been incorporated to construct an interurban electric railway from the suburbs of Denver north through Arapahoe, Boulder, Weld and Larimer counties. Capital stock, \$600,000; president, E. M. Hall.

### Connecticut.

SOUTHINGTON, CONN.—The street railway generator in the light and railway plant of the Southington & Plantsville Tramway was burned out recently and has not been replaced owing to the absence of General Manager L. V. Walkley on his vacation in Canada.

NEW HAVEN, CONN.—The Milford Street Railway Company has obtained practically all the right of way required for its ten miles of road. The whole plant is expected to be in operation before cold weather sets in. They will give a continuous ride from New Haven to Bridgeport. The president of the company is ex-Sheriff Charles A. Tomlinson, and one of the directors is S. Harrison Wagner, the New Haven attorney.

### Florida.

TAMPA, FLA.—Another company to compete with the consumers Street Railroad will be organized, it is said, by F. A. Solomonson, George T. Chamberlain and Edward Manrara.

PENSACOLA, FLA.—The Pensacola Electric & Terminal Company has been incorporated to build and operate an electric railway. Capital stock, \$200,000; president, W. H. Northrup.

GAINESVILLE, FLA.—H. E. Taylor, of the First National Bank, advises us that arrangements have been made for the installation of the proposed electric lighting plant, and that the railway may be put in later.

### Illinois.

WAUKEGAN, ILL.—Lightning ran into the Bluff City Electric Railway power house August 14 and burned out a generator. Until the afternoon car service was paralyzed.

ELGIN, ILL.—The Elgin, Carpentersville & Aurora Railway Company has been incorporated to purchase the Elgin City Railway and lighting plant, and the lines to Carpentersville and Geneva. It is proposed to extend to Lake Geneva, Wis. Capital stock, \$500,000; incorporators, William Grote, George P. Lord, David B. Sherwood, James B. Lane, F. Dunbar Waldron, George M. Peck and Alfred B. Church.

### Indiana.

JEFFERSONVILLE, IND.—Capt. E. K. Howard, of Jeffersonville visited Louisville recently in an endeavor to make a deal for the control of the City Railway of Jeffersonville, consisting of five miles of track, 11 cars and 35 miles.

MARION, IND.—Suit has been brought by the Indianapolis, Anderson & Marion Electric Railway Company against the Fidelity & Deposit Company of Maryland and Louis Enrich to recover \$40,000 for failure to carry out the contract to build 40 miles of road.

INDIANAPOLIS, IND.—The appointment of James L. Bradford as receiver of the Indianapolis, Anderson & Marion Electric Railway on August 30, by Judge Brownlee, at Marion, adds another chapter to the checkered career of Noah Clodfelter's railway enterprise. This receiver was appointed on the application of Ansel B. Smith, Thomas J. and Charles F. Haworth. Judge Baker of Indianapolis has taken no action on the application of Michael Malone of Chicago for a



receiver. The railway company's attempt to have Louis Enricht, the general contractor, tried on the charge of embezzlement has failed, owing to the refusal of Governor Tanner of Illinois to honor the requisition of the Indiana state executive.

## Kentucky.

PADUCAH, KY.—The People's Light, Power & Railway Company has been incorporated. Capital stock, \$50,000; chief incorporators, G. C. Wallace and W. F. Paxton. The new company will operate the reorganized and consolidated lighting and railway plants as reported in the BULLETIN.

## Louisiana.

NEW ORLEANS, LA.—The Orleans Street Railroad Company asks permission to erect a temporary barn. Plans have been drawn for a fine building to replace the one burned.

NEW ORLEANS, LA.—Compressed air traction is being investigated by Robert R. Zell, engineer of the proposed Orleans & Jefferson Railroad, which is to be built out Napoleon avenue through the territory of the new land company. Mr. Zell is visiting Washington and New York to inspect the operation of the systems exploited by the American Air Power Company and the Compressed Air Power Company. Contracts will be closed this fall for all the material necessary to complete the road before spring.

## Maine.

SACO, ME.—Permission to lay track through North and Elm streets has been granted a new corporation, the Saco River Electric Railroad Company. Oliver Downing, of Boston, who has taken \$100,000 of stock in the new road, says that if nothing prevents the cars will be running between Biddeford and Bonny Eagle before snow flies.

SKOWHEGAN, ME.—A syndicate composed of R. W. Brown, E. P. Page, J. P. Clark and A. H. Weston has bought the Norridgewock & Skowhegan Electric Railroad from the bondholders, paying \$15,000 therefor. The road cost, when constructed four years ago, \$55,000. It is proposed by the new syndicate to improve the line and to build a hotel in Norridgewock and a pleasure pavilion at the pines, about half-way between the two villages. It is expected that the improvements to be made will cost about \$40,000.

## Maryland.

BALTIMORE, MD.—The Baltimore, North Point & Bear Creek Railway Company has been incorporated to construct five miles of double track trolley line from East avenue and Monument Street in Baltimore to Bear Creek in Baltimore county. Preliminary surveys have been made. Work is to begin about September 18 and be completed within 90 days. Capital stock, \$300,000; incorporators, Daniel Teller, president; Robert H. Carr, Jr., secretary and treasurer; Samuel Greenwald, Sr., general manager, and H. Y. Bready, chief engineer.

## Massachusetts.

NEWBURYPORT, MASS.—The People's Street Railway Company has filed a \$10,000 bond to guarantee the completion of the road within 60 days.

NEWTON, MASS.—A line paralleling the Newton Street Railway from West Newton to Newton Corner will be built by the Wellesley & Boston Street Railway Company.

NEWTON, MASS.—The Newton Street Railway Company will ask for franchises to build a line from Waltham to Waverley and Belmont, with a view to ultimately extending to Cambridge, where a connection will be had with the West End Street Railway of Boston. Right of way for a line from Waltham to Lexington also is desired.

Haverhill, Mass.—A line from Haverhill to Salem Depot and Canobie Lake, N. H., is to be built by the Haverhill & Salem Electric Railway Company, recently organized with \$60,000 capital stock, by W. B. Ferguson of Malden; Frank E. Lowe of Greenfield; C. E. Barnes of Plymouth; T. C. White of Methuen; W. B. Robinson, Charles Burnham and E. B. Fuller of Haverhill. A franchise will be applied for.

SPRINGFIELD, MASS.—The Springfield & Southwestern Electric Railway Company, which has a charter to build a line from Springfield through Agawam, Suffield and East Granby to Rainbow, is showing signs of activity. It is said the line will be completed this year. Grading has been completed from the state line to Suffield Centre. Two power houses will be built. Horace T. Ford of Suffield, Conn., is president.

LEXINGTON, MASS.—An electric railway company will be incorporated to build a line from North Lexington to Arlington Heights to connect there with the West End Street Railway of Boston. It is also proposed to run branches to Woburn and Waltham, making a total of 15 miles. The probable directors are L. A. Saville and Alfred Pierce, of Lexington; C. E. Dresser, of Leominster; Charles Cummings, of Woburn; R. B. Tabor, of Cambridge; O. M. Gove, of Waltham, and N. H. Peirce, of Arlington.

## Michigan.

SAGINAW, MICH.—Homer Loring and George B. Morley, acting receivers of the Union Street Railway, were August 27 appointed receivers of the Consolidated Street Railway.

HOLLAND, MICH.—Work on the Holland & Lake Michigan Electric Railway has been stopped temporarily owing to a refusal of the Chicago & West Michigan Railroad to deliver more freight until a draft for \$300 for charges is paid.

BENTON HARBOR, MICH.—The Benton Harbor & Eastman Springs Street Railway Company has been incorporated with \$25,000 capital stock to operate the line being built by contractors Forester & Westcott. The incorporators are Seely McCord, Elbert C. Hurd and J. Stanley Morton.

## Minnesota.

BRainerd, MINN.—Operation of the Brainerd Electric Railway has ceased. The line has been losing money from the start.

BRainerd, MINN.—C. N. Parker offers to extend his street car line to East Brainerd and run it for at least one year more if the business men of the city raise a bonus of \$2,000. The committee has secured \$1,500.

STILLWATER, MINN.—The city has begun proceedings to annul the franchise of the Stillwater Street Railway and compel Flint & Scott to tear up the rails. The latter have sold the poles and wire to the Stillwater Gas & Electric Light Company and will be pleased to remove the track, which they purchased as junk.

## Missouri.

ST. JOSEPH, MO.—Material is being placed on the ground for the Union Line extension. While in New York recently Manager Van Brunt purchased a 750-h. p. engine. A new boiler is being set in the power house.

CARTHAGE, MO.—Directors of the Southwest Missouri Electric Railway have decided to put in a telephone system with instruments at each switch. A signal station will be placed in charge of a dispatcher. A steel bridge will be thrown over Turkey creek.

KANSAS CITY, MO.—The East Fifth Street Electric Railway Company has been incorporated to build and operate a line on Fifth street to Heim's brewery. The capital is nominally fixed at \$2,000. The incorporators are Joseph Heim, Ferdinand Heim, M. G. Heim and Clarence Palmer.

ST. LOUIS, MO.—The House of Delegates has placed the General Traction Company's bill on file, where it will probably slumber forever. President Meier has declined to sign the North & South Railway bill. The promoters of the bill plan to reintroduce and pass it in a regular manner.

ST. JOSEPH, MO.—Ferd Heim, a wealthy brewer of Kansas City, is said to be interested in a project to build several miles of electric railway from Lake Contrary to the stockyards at St. George, and by a circuitous route through the city to Krug Park. It is said St. Joseph capitalists will subscribe \$150,000.

KANSAS CITY, MO.—The Kansas City & Eastern Railroad Company has been incorporated to operate a new suburban electric line from Westport to Leeds, a distance of five miles. The company will run two cars at first. These will be of the combination type adapted to carry the produce of market gardeners to the city. Coal will also be transported from the mines at Brush Creek, where the company's power house is located. Capital stock, \$50,000, incorporators, George Hoffman, Charles B. Adams, John Hoffman, Henry Pfeiffer and B. F. Robinson. The chief backer is the Schaefer estate, represented by Pfeiffer and Hoffman.

### Montana.

MISSOULA, MONT.—An electric railway through the National Park to Cook City is proposed. D. B. May is interested.

BUTTE, MONT.—John R. Wharton, superintendent, was August 16 appointed receiver of the Butte Consolidated Railway Company on petition of the Massachusetts Loan & Trust Company, in behalf of bondholders.

### Nebraska.

OMAHA, NEB.—The city has granted the Omaha & Council Bluffs Railway & Bridge Company an extension of its franchise for fifty years to enable the company to raise money with which to carry out desired improvements, as well as to discharge the floating debt.

### New Hampshire.

PORTSMOUTH, N. H.—The Portsmouth, York & Kittery Electric Railway went into operation August 11.

EXETER, N. H.—To provide funds for the construction of three miles of track, the purchase of three more cars and the erection of a car barn in Exeter, the Exeter Street Railway Company has resolved to ask the state railroad commissioners for permission to issue \$25,000 bonds and \$25,000 stock.

### New Jersey.

JERSEY CITY, N. J.—The city authorities will require the Consolidated Traction Company to conform to the law requiring all cars to have vestibuled platforms.

ASBURY PARK, N. J.—Henry S. Terhune of Long Branch has been appointed receiver of the Asbury Park & Belmar Street Railway, to succeed William H. Dayton, who died July 28.

BRIGANTINE, N. J.—Stockholders of the Brigantine Transit Company have voted to make improvements, and have elected new directors.

JERSEY CITY, N. J.—The Columbia Company has been incorporated under the laws of New Jersey to build and operate street railways, electric lighting, water and gas works in Jamaica. Capital stock, \$80,000; \$14,000 paid up; incorporators, Elisha B. Hopkins, Wellfleet, Mass.; Warren F. Wiley and John J. Mulvaney, Jersey City, N. J.

NEW BRUNSWICK, N. J.—Right to lay tracks over the Albany street bridge has been given by the Brunswick Traction Company by the Middlesex county freeholders. The Piscataway township council has granted the company a franchise to the limits of Bound Brook. This system will connect with the Metuchen and New Brunswick route. Secretary Edward Radel says work will be prosecuted vigorously so that the new lines will be in operation by October 1.

### New York.

BALLSTON, N. Y.—A receiver is asked for the Ballston Terminal Railroad Company.

BUFFALO, N. Y.—The village board of Hamburg voted August 18 to grant a franchise to the Buffalo, Hamburg & East Aurora Electric Railway Company upon the commencement of work by the company on the proposed line.

FLUSHING, N. Y.—The Flushing & College Point Electric Railway Company has been notified by the village trustees that unless the improvement of the roadbed is begun within 48 hours the franchise will be annulled.

NEW PALTZ, N. Y.—The new trolley line is in operation between Lloyd and New Paltz. Considerable work remains to be done on other portions of the line, and the crossing of the West Shore Railroad has not been arranged.

LITTLE FALLS, N. Y.—An extension of time in which to construct the road is asked by John V. Quackenbush, of Mohawk, president of the Little Falls & Herkimer Electric Railway Company. The present franchise is about to expire.

STATEN ISLAND, N. Y.—The Staten Island Midland Railroad Company has obtained a favorable decision from the Supreme Court on the necessity of laying tracks through South street in order to get a station at the St. George ferry house.

LIBERTY, N. Y.—Five miles of the Liberty-Jeffersonville Electric Railway has been graded. Oliver Hofer, engineer in charge, says that the materials for construction are ready for shipment, and that the line will be in operation next summer.

NEW YORK, N. Y.—The state railroad commission has granted the applications of the Second Avenue Railroad Company and the Forty-Second Street, Manhattanville & St. Nicholas Railroad Company for permission to change their motive power to the conduit electric system.

NIAGARA FALLS, N. Y.—The Niagara Falls Park & River Railway Company will install more electrical machinery to generate the current for sale to power users. Until the Canadian Power Company has completed its Canadian works it will use a portion of the railway company's present surplus.

GLOVERSVILLE, N. Y.—The contract for grading the Mountain Lake Electric Railroad has been awarded to Alfred Keith of Oldtown, Me., a director of the company. No contracts have been let for cars or rails, and probably will not be until next year, when construction will be pushed so as to have cars running by June 1.

OLEAN, N. Y.—The Olean Terminal Railway Company has been incorporated to build 7,500 ft. of electric road in Olean, to connect with the Olean-Bradford Interurban. Capital stock, \$25,000; directors, F. N. Love, Greenfield, Mass.; Henry S. Sartwell, James W. O'Brien, George Forbes, Joseph L. Page, Fred D. Forbes, William L. Frazee and George Van Campen, of Olean.

NEW YORK, N. Y.—The New York and Brooklyn Bridge trustees have accepted the plans and contracts for the operation of elevated railway and trolley cars across the bridge. The Brooklyn Rapid Transit Company is allowed six months in which to make changes. The Kings County Elevated is given sixty days to begin and one year to complete work, and the Brooklyn Elevated is allowed ten months. A bond of \$100,000 is required from each company.

ONEONTA, N. Y.—The Oneonta Street Railway Company has consolidated with the Oneonta & Otsego Valley Railroad Company, which was incorporated two months ago, and which recently was granted permission by the state commission to build its proposed line. The directors are: Frank Gould, A. C. Moody, A. C. Lewis, Parker Wilson, A. D. Getman, C. Van B. Pruyn, H. H. Getman, Squire B. Gardner and D. W. Miller, all of Oneonta.

### Ohio.

NEWARK, O.—Receiver J. F. Lingafelter of the Newark & Granville Electric Street Railway is making extensive repairs to the roadbed. New switches will be put in.

TOLEDO, O.—The Toledo & Michigan Traction Company, recently incorporated by Detroit capitalists, has applied for a franchise to build. Surveyors are laying out the proposed route.

TOLEDO, O.—It is said that Leopold Freud and Hyacinth C. Burt have sold some of the bonds of the proposed electric railway between Toledo and Detroit. Engineer Mason L. Brown of Detroit is surveying the route.

**WARREN, O.**—The franchise of the Trumbull Electric Railway Company between Warren and Niles was extended recently by the county commissioners from 20 to 50 years, in consideration of \$2,500 worth of road work for the county.

**LIMA, O.**—Right of way for the electric road from Lima to Bellefontaine has been obtained for almost the entire distance between New Hampshire and the Logan County Infirmary. Farmers are deeply interested and \$41,000 of local capital is promised.

**BOWLING GREEN, O.**—Zeph Waltz of Tontogany is getting right of way for an electric road to be built from Bowling Green to Napoleon by way of Weston and Grand Rapids, by the Bowling Green, Weston & Napoleon Electric Railway & Power Company.

**CANAL DOVER, O.**—Control of the Tuscarawas Electric Company has passed from Tom L. Johnson by the transfer of \$50,000 of stock to L. P. Wentz of Sutton, Neb., Theodore Wentz, cashier of the First National Bank, and David King, a retired merchant. The road, which connects Canal Dover and New Philadelphia, never made any money. At times the line has been superintended by Robert Johnson and Tom J. Johnson. John B. Hoefgen, Tom L's confidential man, will be manager.

## Pennsylvania.

**CLEARFIELD, PA.**—Kittanning men have purchased at sheriff's sale the DuBois Traction Passenger Railway and the DuBois Electric Light Plant.

**CHAMBERSBURG, PA.**—Fremont Wilson, chief engineer of the defunct Chambersburg Electric Railway Company, says he has a company that will push the enterprise.

**PITTSBURG, PA.**—Electric motor street sprinklers will be placed on the lines of the Consolidated Traction Company. If possible all lines will be supplied with them this fall.

**PITTSBURG, PA.**—A franchise has been granted by the Braddock borough council to the Corey Avenue Street Railway Company, which is a branch of the Second Avenue Traction Company of Pittsburg.

**COLLEGEVILLE, PA.**—The Collegeville Electric Street Railway Company has been incorporated to build two miles of road in Collegeville. It is expected the line will be sold or leased to the Schuylkill Valley Traction Company.

**GREENSBURG, PA.**—The Greensburg & Mount Pleasant Street Railway Company has been incorporated to build nine miles of electric railway from South Greensburg to Mount Pleasant. Capital stock, \$75,000. W. F. Sadler of Carlisle, president.

**PITTSBURG, PA.**—The McKeesport, Duquesne & Wilmerding Street Railway was purchased August 4 at receiver's sale by Horace Crosby, assistant general manager of the National Tube Works, for \$175,000. Mr. Crosby is a heavy stockholder in the street railway.

**PITTSBURG, PA.**—The Pittsburg & Mount Washington Street Railway Company has accepted the contract with the city by which it agrees to pay 15 cents per car for each round trip over the Smithfield street bridge. The contract for the construction of the entire line has been let to Booth & Flinn, who begin work in September and finish by January 1.

**PITTSBURG, PA.**—The Second Avenue Traction Company has about closed a deal for the purchase of the line operated by the Versailles Traction Company between McKeesport and Versailles borough. The Versailles line will be operated in connection with the road which the Second Avenue Traction Company contemplates building to West Newton.

## South Dakota.

**STURGIS, S. D.**—Manager Wells of the Sturgis Light & Railway Company has received notice that the application of the company to build an electric railway on the Fort Meade military reservation has been granted by the war department. A franchise will be asked for a commercial lighting system.

## Texas.

**CUERO, TEX.**—R. A. Pleasants and others have been granted a franchise for a street car line. The line must be built within 12 months.

**SAN ANTONIO, TEX.**—W. H. Weiss, president, writes that the San Antonio Street Railway Company is in the market for a 5 or 6-ton road roller, operated by steam or gasoline engine. Give description and price.

**GALVESTON, TEX.**—The Galveston & Houston Electric Railway Company has been granted franchises on condition of selling one avenue. The grants have been accepted by the company. W. J. Hamlett is secretary of the company, Judge Norman G. Kittrell, of Houston, attorney, and R. E. Richardson, of Chicago, consulting engineer.

## Vermont.

**BARRE, VT.**—The city has accepted the \$10,000 guarantee bond of the Barre & Montpelier Traction & Power Company.

**ST. JOHNSBURY, VT.**—The St. Johnsbury Electric Railroad Company will begin work on the extension to Lyndon and Lyndonville as soon as the work on the Montpelier road is completed.

## West Virginia.

**CHARLESTON, W. VA.**—The city street car line, which has been in the hands of the court for two years, has been sold for \$21,000 to Cleveland, O., parties.

## Wisconsin.

**WAUKESHA, WIS.**—Stockholders of the Waukesha Beach Electric Railway have decided to issue 100 shares of preferred stock.

**RACINE, WIS.**—Judge Fish has confirmed the sale of the Belle City Street Railway and fixed the compensation of Receiver Smith at \$1,750.

**OSHKOSH, WIS.**—It is now said that negotiations for a consolidation of the electric and horse lines have failed, and that the Oshkosh Horse Car Company will independently equip with electricity.

**RACINE, WIS.**—The reorganized Belle City Electric Railway Company has selected Joseph Miller, president; H. M. Wallis, vice president; Jackson I. Case, secretary, and Frank J. Miller, treasurer.

**MILWAUKEE, WIS.**—The Milwaukee Electric Railway & Light Company has purchased the franchises, track and all interests of C. R. Gether in the Whitefish Bay Street Railway, and will proceed at once to connect the line with the Oakland avenue extension, with the intention of having both in operation by June 1, 1898.

**MILWAUKEE, WIS.**—While the officers of the Milwaukee Electric Railway & Light Company have taken charge of the Milwaukee & Wauwatosa Motor Road, the company has not acquired the line, and its officers are managing the property for its owners who are stockholders of the Milwaukee Electric Railway & Light Company.

**WAUKESHA, WIS.**—Stockholders of the Waukesha Beach Electric Railway held a special meeting to consider a sale of their property to the Milwaukee Electric Railway & Light Company. A committee was appointed to investigate the whole subject. The prospective purchasers offer \$62,500, and desire an option until September.

## Canada

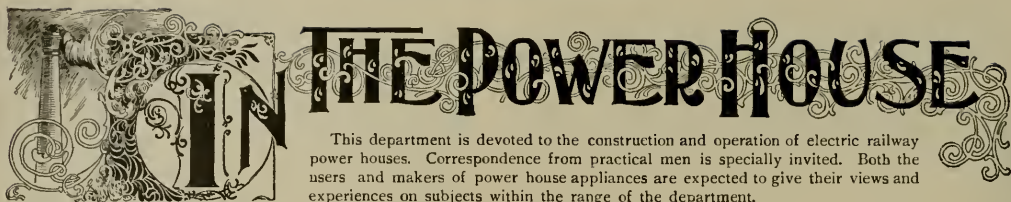
**LONDON, ONT.**—It is proposed to extend the London Street Railway to Pottersburg, and to connect the city with Lucan.

**CORNWALL, ONT.**—An extension 1.5 miles in length is to be constructed by the Cornwall Electric Street Railway Company.

**NIAGARA FALLS SOUTH, ONT.**—The council has granted a franchise over certain streets to the Lundy's Lane Electric Railway Company.

**EXETER, ONT.**—Local capitalists are promoting an electric railway from Grand Bend to St. Mary's, with a scheme for power distribution in connection.





# 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.

## A Possible Cause for Fly-Wheel Accidents.

In a paper on "Fly-Wheels and Why They Burst" read before the Electric Club of Cleveland and published in the REVIEW for January, 1896, page 17, Prof. C. H. Benjamin makes the following statement:

"A careful study of the fly-wheel accidents in power stations, as described in the technical journals for the last two or three years, will show that the blocking of the governor was a feature of nearly all of them; that the breaking of the generator pulley has been in several cases the direct cause of the bursting of the wheel and that the sudden shocks caused during a short circuit by throwing the load on and off are probably responsible for several more accidents. Racing of an engine caused by its generator changing into a motor is still a disputed subject, and as this paper is written from a mechanical standpoint I will not enter into the discussion."

While the latest fly-wheel accident, that at Tacoma, appears to have been due to the failure of the governor of the engine, we desire at this time to place on record a recent experience of the engineer of a large street railway plant. The fly-wheel, fortunately, proved equal to the stresses of an abnormally high rim speed and failed in its usual office of so completely wrecking the engine and building as to leave very little ground for the defence of that much maligned though ever consistent servant, the governor. Fortunately the damage, although slight, was so complete and evident that it left no cause for doubt as to the origin of the trouble.

In this particular power station there are four direct connected units, two of 500 k. w. and two of 800 k. w., all operated in multiple. The pressure at the bus bars is 570 volts. The normal speed is 100-r. p. m. The generators are compound wound.

On this occasion there were running two 500-k. w. and one 800-k. w. generators, carrying about 3,200 amperes collectively. Suddenly one of the 500-k. w. generators began to sing and spark at the brushes, the pitch of the screech becoming rapidly higher as the engine increased in speed. For an instant the engine seemed to be merely racing, the indications being the same as though the machine circuit breaker had opened the circuit. The action of the governor was perfect, and as soon as the engineer saw that the governor had completely shut off steam and that the speed continued to increase he realized that the fault lay with the dynamo, and signaled the operator to pull the switches. The engine had attained a speed of about 175 r. p. m. Just before going to the switchboard the operator heard a slight explosion and saw a flash beneath the engine room floor, where all the wires connecting the dynamos and switchboard are located. Immediately afterward the dynamo commenced to screech and spark. Upon reaching the switchboard he found the ammeter indicated 900 amperes, but dropped

steadily, and with the increase of speed just before the circuit breaker and switches were opened the ammeter registered 600 amperes. Upon the machine circuit breaker being pulled the engine immediately slowed down, proving conclusively that the machine was running as a motor. No damage ensued.

Investigation showed that the shunt field wire, running from the rheostat at the switchboard to the negative terminal at the dynamo, had grounded on the positive main machine cable, running from positive brush holders to switchboard, and the shunt field wire being practically a negative at the point of contact was quickly burned off, thereby opening the shunt field circuit. The shunt field coils thus becoming ineffective caused the electro motive force of the dynamo to fall at least 200 volts below that of the bus bars. Then the load on the dynamo, minus the shunt field, almost instantly fell from a load of 850 amperes to zero and still lower, to a point where it quickly changed from a compound dynamo supplying power to a series motor, the field being maintained by the heavy series winding. The friction of the engine and dynamo being the only load resistance opposed, and the potential at the brushes being unchanged, the motoring dynamo must have started to race with at least 1,200 amperes, which was gradually cut down owing to the ever increasing counter electro motive force induced by the phenomenal increase in speed. This falling off of the current was noted, as before stated, by the attendant at the switchboard.

Taking 700 amperes at 550 volts, about 500 h. p., as a conservative estimate of the average power consumed in speeding up the set, and remembering that the accelerating forces were applied almost instantaneously it is not at all remarkable that such a speed should be attained in such an incredibly short space of time. The average flow of current through the shunt field conductors is nine amperes, and as No. 8 wire is used the conductivity is ample.

As soon as the cause of the erratic behavior of the engine was ascertained the fault was remedied beyond all possibility of recurrence. As now arranged any leakage from the positive to the shunt field circuit would readily be discovered before starting the dynamo, by closing the field switch and throwing the equalizer in. Any leakage from the positive would be indicated by the voltmeter used in throwing the dynamo upon the bus bars. Of course it is to be conceded that a heavy ground would immediately burn itself out, but a slight leakage due to poor insulation or moisture would readily be discovered in the manner mentioned. The writer knows of a case where two shunt field circuits were thus affected, out of a total of five, and this was wholly due to poor insulation and a leaky steam pipe. By the discovery of a fall of potential of only 30 volts, with the machine at rest, and placing the cables and wires upon better porcelain insulators, all future trouble in that direction was avoided.

This should direct attention to a source of danger which we believe has heretofore been generally overlooked. There is a possibility of an accident from this cause in the great majority of street railway stations.

Generators with compound windings are universally used in this country for railway work and the best station economy demands that where more than one machine is used they shall be connected in multiple. There is no doubt that if the engine had been wrecked the true cause of it would never have been known and it would have been charged to the engine, the governor having failed to operate properly for "some unknown reason."

\* \* \*

### Why Economizers Are Economical.

On July 21 W. F. Gasche presented a paper before the Western Society of Engineers on the "Causes of the Variable Efficiency of Steam Boilers and Their Influence on Tests," in which were brought out several facts of great interest to those who have to do with steam boilers, either operating or testing.

In the course of an extensive experience in boiler testing Mr. Gasche has verified experimentally the formula deduced by Rankine in 1859. As usually stated this formula is  $E' = \frac{E}{S + AF}$  where  $E'$  is the actual evaporative value (from and at 212° F.) of 1 lb. of fuel,  $E$  the theoretical evaporative value,  $S$  the heating surface of the boiler, and  $F$  the number of pounds of fuel burned per hour. The constants

If we put the ratio of the fuel burned per hour to the heating surface equal to  $R$  we get  $\frac{E'}{B} = \frac{E}{1 + AR}$ ; since in a

given boiler the ratio of the heating surface to the grate surface is constant, and also for a given fuel the product  $EB$  may be taken as a constant, we may express the actual equivalent evaporation as  $E' = C \div (1 + ar)$ , where  $r$  is the fuel burned per sq. ft. of grate per hour. Fig. 1 shows the results obtained by Mr. Gasche with four kinds of coal burned under a battery of two return tubular boilers having the following dimensions:

|                                         |                     |
|-----------------------------------------|---------------------|
| Diameter of shell outside.....          | 6 ft. ¾ in.         |
| Length of shell outside.....            | 19 ft. 11 in.       |
| Number of flues.....                    | 50.                 |
| Diameter of flues.....                  | 4½ in.              |
| Length of flues.....                    | 19 ft.              |
| Diameter of stack.....                  | 54 in.              |
| Height of stack.....                    | 60 ft. above grate. |
| Diameter of steam pipe.....             | 8 in.               |
| Total heating surface.....              | 1,352 sq. ft. each. |
| Length of grate.....                    | 6 ft.               |
| Width of grate.....                     | 5 ft. 6 in.         |
| Total grate surface.....                | 33 sq. ft. each.    |
| Ratio of heating and grate surface..... | 41 to 1.            |

Having determined the rate of evaporation of each coal for the four rates of combustion, and assuming the curve showing the variation to have an equation of the form  $E = C \div (1 + ar)$ , the values of  $C$  and  $a$  were computed by the method of least squares and the curves themselves plotted as shown in Fig. 1. The 16 tests used to get the four curves were selected at random from 160 tests made on the same boilers, all of which gave consistent results. Below the lower limit, that is, where the supply of air is excessive, rational results can not be expected and the dotted portions of the curves are merely to indicate possible locations for them at low rates of combustion.

From this the conclusion is drawn that the performance of a boiler should be determined from a series of trials, in which the distinguishing feature is a deliberate variation of the rate of combustion for the successive tests. A few isolated trials will give no conclusive evidence of the evaporative value of a given fuel under a given boiler or the value of other quantities to determine which trials are made. While the formula as given above has been shown to be correct, it must be borne in mind that the use of the same coal under boilers varying widely in type or size will generally produce a different curve of evaporation, because such a change will involve important alterations in both amount and distribution of heating surface.

The next point made by Mr. Gasche is that regenerative devices such as feed water heaters or economizers effect a compound saving, which may be divided into two parts:

The heat actually recovered which has a fuel equivalent. If  $H$  denote the total (heat above 32° F.) of 1 lb. of steam at boiler pressure,  $q$  the "heat of the liquid" of the water at the initial, and  $Q$  the heat of the liquid at the final temperature of the feed water, the saving in per cent by raising the temperature of the feed is  $100(Q - q) \div (H - q)$ .

A further saving is effected, because to generate the same amount of steam after the attachment of the feed water heater less heat is required and the coal is burned at a lower rate of combustion, thus increasing the actual evaporative value of the fuel.

Let  $F$  equal the total fuel fired per hour and  $G$  equal the area of the grate.

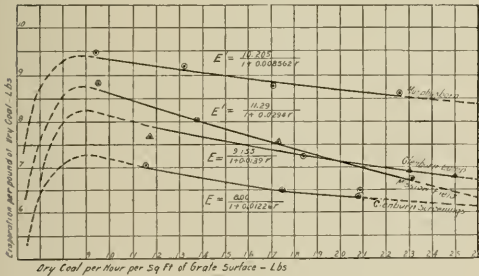


FIG. 1.

A and B are to make the formula applicable to different conditions. After studying the results of numerous boiler trials Rankine assigned various values to A and B which were to be used for different types of boilers. This formula is based upon two propositions: From experiments upon boilers the rate of heat transmission has been found to be directly as the square of the difference in temperature between the gases and the water in the boiler. The ratio  $E' \div E$  is largely dependent upon the efficiency of the heating surface, which is defined to be "the proportion borne by the quantity of heat transmitted to the whole quantity of heat which the hotter body must lose to reduce it to the temperature of the colder." Rankine states that the formula "was framed on the supposition that the admission of air and the management of the fire are such that no appreciable loss occurs, either from imperfect combustion or excess of air, the construction of the furnace and the mode of using it being the best possible for each kind of boiler."

Before the attachment of the feed water heater the steam evaporated (from and at 212°) is  $FE' = FC \div (1 + ar)$ .

The fuel equivalent of the heat returned to the boiler by the heater is  $F(Q - q) \div (H - q)$ .

The reduction in the rate of burning the fuel is,  $r(Q - q) \div (H - q)$ .

The formula for the evaporative value of the fuel at the reduced rate is  $E'' = \frac{C}{1 + ar [1 - (Q - q) \div (H - q)]}$ .

Were the same amount of fuel to be burned at this new rate the increased steam output would be  $F(E'' - E')$ , which has a fuel equivalent of  $F(E'' - E') \div E''$ . This reduces to  $Far(Q - q) \div (1 + ar)(H - q)$ .

When this is added to the fuel equivalent of the heat returned to the boiler we have as the total saving in pounds,

$$F \frac{(Q - q)(1 + 2ar)}{(H - q)(1 + ar)} \text{ or in per cent, } 100 \frac{(Q - q)(1 + 2ar)}{(H - q)(1 + ar)}$$

In the event that the equation of the curve of evaporation is of the form  $E' = C \div (ar - 1)$ , the saving in fuel is

$$F \frac{(Q - q)(2ar - 1)}{(H - q)(ar - 1)}$$

The correctness of this reasoning is verified in a series of tests made on a battery of three Stirling boilers with a Green

surface alone. From 1, 2a, 3a and 4a the equation of the curve was computed.

Tests 1 and 2 were made under as nearly as may be the same conditions, except that the economizer was not used in 1; the boiler pressure and the initial temperature of the feed were nearly the same in both and the total equivalent evaporation per hour differed by less than 3 per cent. The coal to evaporate 1,000 lbs. of water from and at 212° F. was 193.4 lbs. in No. 1 and 159.5 lbs. in No. 2, a gain of 17.5 per cent. The gain due to the heat saved by the economizer would be  $100(172.1 - 39.3) \div (1181.8 - 39.3) = 11.6$  per cent.

Comparing tests 5 and 6, it is seen that the saving by the use of the economizer is 21.2 per cent; the rate of combustion was practically the same in both, being 13 lbs. of dry coal per sq. ft. of grate in 5 and 12.3 lbs. in 6. The gain here is due to another cause. The rate of combustion was so low as to take the tests out of the range to which the formula is applicable, there being loss through excess of air, and consistent results can not be expected; but there is a reason why an economizer should prove more valuable under these conditions. An excess of air reduces the initial temperature of the furnace gases, and, assuming the temperature when leaving the boiler to be the same in both cases, the heat taken up in the economizer will be a greater per cent of the total.

The lower the initial temperature of the furnace gases the less will be difference in the heat transmitted by successive unit areas of heating surface, and if we imagine the abnormal condition where each square foot is equally efficient in transmitting heat, it becomes apparent that with the apparatus under consideration the economizer would transmit over one third of the total.

Another point not mentioned in the paper is the fact that it is more economical to have additional heating surface in the economizer than in the boiler itself even if the cost be the same. The circulation is such in a well designed boiler that the temperature of the contents may be said to be practically the same while in the economizer the circulation is slower and always in one direction so that the gases as they become cooled are always meeting tubes with colder water giving the ideal arrangement for transmitting heat.

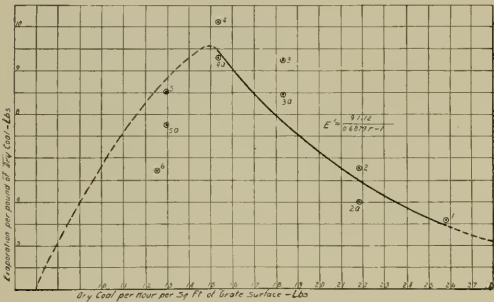


FIG. 2.

fuel economizer attached. The grate surface and the heating surface were as follows:

|                                   |               |
|-----------------------------------|---------------|
| Grate surface of 3 boilers.....   | 270 sq. ft.   |
| Heating surface of 3 boilers..... | 9,543 sq. ft. |
| Ratio G. S. to H. S.....          | 1:34.2.       |
| Number of economizer tubes.....   | 448           |
| Heating surface 1 tube.....       | 10.69 sq. ft. |
| Heating surface 448 tubes.....    | 4,749 sq. ft. |

The plant had been in operation about two weeks at the time the tests were made, yet it was subject to considerable losses from air leakage, and the departure of the observed results from the curve of evaporation for Ardmoor coal under a Stirling boiler of this size and type are attributed to this cause more than any other.

Fig. 2 shows the evaporation per lb. and the rate of combustion for the six tests which were made. Nos. 1 and 6 were made without the economizer in use, Nos. 2, 3, 4 and 5 with the economizer. The points in Fig. 2 which are marked 2a, 3a, 4a and 5a show the boiler performance alone for tests 2, 3, 4 and 5; that is, they show the equivalent evaporation due to the heat taken up by the boiler heating

\* \* \*

In the introduction to this paper Mr. Gasche criticises the "standard" method of conducting boiler trials and shows that serious errors in the evaporation per pound of coal result from following the recommended practice of the American Society of Mechanical Engineers. The errors result from drawing the fires at the start and letting them burn out at the stop, being in both cases such as to decrease the true rate of evaporation.

The idea in drawing the fire and rekindling it at the start is to ascertain the weight of fuel burned with greater exactness than can be done by measuring or estimating the thickness of the fire at the commencement and bringing it as nearly as may be to the same thickness at the close.

It is stated that in point of fact the heat lost by the boiler during the rekindling far exceeds the heat equivalent of the difference of the two estimates made in taking a "flying start."

When the fire is permitted to burn out at the close there is of necessity a decrease in the evaporation at that time and the apparent average rate of evaporation is lower than



the actual rate during the greater portion of the trial. The rate of firing is also reduced, but in a less degree, so that the evaporation per pound of coal computed for the whole test is lower than the actual performance.

\* \* \*

### Cost of Power House Operation.

With this issue we commence the publication of monthly reports of power house performance with the object of putting on record, so as to be easily available for reference and comparison, data as to the cost of operation. The value of such data regularly collected will be readily appreciated and we have received the assurance of their hearty coöperation from several general managers who have heretofore made a practice of exchanging such reports with each other.

The value of the data will be the greater as the number of stations included in the table increases and we ask each manager who is interested in such a comparison to contribute his share by sending us the report of his station.

#### COST OF POWER FOR ELECTRIC RAILWAYS.

| STATION.                           | MONTH. | Output Measured by | 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. Coal. per k. w. h. |
|------------------------------------|--------|--------------------|---------------------------------|----------------------------------------------------|--------|----------------------------|--------|-----------|--------|----------------------------------------|-------------------------------------------|---------------------------|-------------------------|
|                                    |        |                    |                                 | Fuel.                                              | Labor. | Supplies, Oil, Waste, etc. | Water. | Re-pairs. | Total. |                                        |                                           |                           |                         |
| 1.....                             | June.  | Wattmeter.         | 1,008,360                       | .193                                               | .214   | .020                       | .031   | .076      | .534   | 10.5                                   | .....                                     | 6.9                       | 3.3                     |
| 2.....                             | June.  | Wattmeter.         | 150,096                         | .522                                               | .264   | .112                       | .000   | .008      | .906   | 4.86                                   | 5.09                                      | 6.378                     | 4.28                    |
| 3.....                             | June.  | Wattmeter.         | 164,202                         | .550                                               | .301   | .054                       | .010   | .010      | .914   | 6.22                                   | 9.4                                       | .....                     | 4.4                     |
| 4.....                             | June.  | Wattmeter.         | 240,565                         | .461                                               | .249   | .039                       | .003   | .006      | .758   | 4.                                     | 7.                                        | .....                     | 3.67                    |
| 5. Metropolitan Elevated, Chicago. | June.  | Wattmeter.         | 850,400                         | .300                                               | .210   | .020                       | .010   | .050      | .590   | 5.8                                    | 2.5                                       | 5.61                      | 3.55                    |
| 6.....                             | June.  | Wattmeter.         | 490,580                         | 1.243                                              | .248   | .125                       | .....  | .098      | 1.714  | .....                                  | .....                                     | .....                     | 3.23*                   |
| 7.....                             | June.  | Ammeter.           | 712,800                         | .580                                               | .260   | .070                       | .010   | .....     | .920   | 2.                                     | 1.2                                       | 5.                        | 7.                      |

\*Oil used for fuel.

### LARGE CROWDS AT NIAGARA.

During the national encampment of the Grand Army of the Republic in Buffalo last month the trolley car service both in that city and at Niagara Falls was very much appreciated, as was evinced by the thousands of extra passengers. All who attended the encampment quite naturally desired to see the Falls, and the steam roads and trolley line to that city were all well patronized. Never before in its history

ment of the road that this enormous number of people was carried without accident.

The gorge road at the Falls also did a big business, and it was forced to borrow cars from the Niagara Falls & Suspension Bridge line to accommodate travel.

### CHICAGO SUBURBAN NOW A YERKES LINE.

It will be remembered that when undertaking the construction of the Suburban Railroad, Chicago, the line which embraces the suburban tracks of the Chicago & Northern Pacific Railroad and a short length of the Wisconsin Central main line, Naugle, Holcomb & Co. also contracted to operate the line for the period of two years if the Suburban Company so desired. On August 17, the contract as regards operation was terminated. The Suburban Company is controlled by Mr. Yerkes, J. M. Roach, vice-president of the West Chicago being the receiver.

It is quite probable that the power house of the company at 22nd street and Harlem avenue will be shut down for the present and power supplied from the Cicero & Proviso station, until such time as the increase in traffic shall make the use of the other necessary.

A moonlight excursion was given under the auspices of the conductors and motormen of the Chester (Pa.) Traction Company to Washington Park, September 2.



G. A. R. VISITORS AT NIAGARA FALLS.

### A NEW BRAKE SHOE.

The requirements for the ideal brake shoe may be stated as follows: It shall give a high coefficient of friction, in order that the train may be quickly stopped. The coefficient of friction shall be uniform throughout the entire application in order that the wheels be not skidded. It shall not roughen the wheel tread. It shall not wear rapidly. It shall be noiseless.

The latest and most complete data upon brake shoes are the result of the extensive shop tests made by a committee of the Master Car Builders' Association, at the shops of the Westinghouse Air Brake Company during the years 1894, 5 and 6; these results show that none of the metal shoes (there were 14 different kinds tested) fulfill the specifications for the ideal. Soft cast iron gives a high coefficient and a quick stop, but the coefficient rises rapidly as the speed decreases and unless the braking pressure be reduced toward the end of the stop there is great danger of skidding the wheel. In fact with all metal shoes there is a great increase in the coefficient of friction near the end of the stop. A cast iron shoe on a steel wheel roughens the wheel tread less, and on a cast iron wheel roughens the tread more than do the other shoes. Soft cast iron shoes wear very rapidly.

Steel or wrought iron shoes smooth the tread of cast iron wheels, but score steel tires badly; the harder the shoe the worse the cutting. They wear longer than cast iron shoes but have lower coefficients of friction. Shoes of cast iron with steel or wrought iron insets, and malleable iron shoes have lower coefficients than the cast iron shoes, and in general may be said to lie between cast iron shoes and steel shoes, the good and bad qualities of both being somewhat toned down.

The chilled iron shoes wear a long time but have a very low coefficient of friction and screech most abominably.

In the spring of 1896 a composition shoe, known as shoe "P" in the published reports, consisting of a cast iron shell filled with a mixture of which iron turnings, sawdust and plumbago are prominent ingredients, was tested and found to have a higher coefficient of friction than soft cast iron; further, the coefficient was practically constant throughout the application, the effect of the shoe was to give the wheel tread a high polish both on cast iron and steel wheels, and it was perfectly noiseless. In fact so far as a shop test could determine it was the ideal shoe.

Road tests of this shoe have since been made and it is reported that after a short time in service the composition filling the shell disintegrates and falls out, leaving only the edges of the shell bearing, so that notwithstanding the fact that this shoe has a high and uniform coefficient of friction, polishes the wheel and does not screech, its failure to stand up under service has prevented its extensive use, and for this reason our readers are probably not familiar with it, and do not appreciate the merits of composition shoes.

The most recent composition shoe is one which has been developed by A. J. Allen and J. F. Morrison, of the South Side Elevated Railroad, Chicago. It consists of a cast iron shell filled with a mixture of iron turnings and mineral cement put in under pressure. This mixture is comparatively soft; pieces of it may be dug out, but when replaced they are as much a part of the shoe as in the beginning. Shoes in which the filling was originally  $1\frac{1}{2}$  in. deep, after running 18,000 miles in this particularly severe service ( $2\frac{1}{2}$  stops to

the mile) wore down until the filling was only  $\frac{1}{8}$  in. deep but it shows no signs of disintegrating and falling out. A set of shoes put in service May 21, after running 16,066 miles showed wear of from 1 in. to  $1\frac{1}{8}$  in. each. The reduction in the wheel diameter in this time was  $\frac{1}{16}$  in. Aside from the good wearing qualities, which equal or excel those of the chilled shoes formerly in use on the Alley "L," they have a high and a uniform coefficient of friction, are noiseless in action and give the wheel tread a high polish. Further, the cost of the materials forming the composition is not great and the shoe can be sold at the same or even a lower price than many of the metal brake shoes now on the market.

The Allen-Morrison shoe was developed, not because of any desire on the part of the inventors to make a "new brake shoe", but as the result of an effort to find a shoe suited to the needs of the South Side Elevated Railroad, and its adoption by the company after making the service tests described calls attention to the merits of composition shoes.

We believe that this subject deserves the careful consideration of street railway managers. The higher speeds made possible by the adoption of mechanical motive power and the fact of operation in crowded streets require that cars be under the best possible control, that is, the brake shoes used should be capable of stopping the car quickly. The frequent stops make it desirable for the comfort of passengers that the brake shoes should be noiseless and smooth in action. Both of these qualities as well as the equally desirable one, from a financial standpoint, of a long life appear to be embodied in this brake shoe.

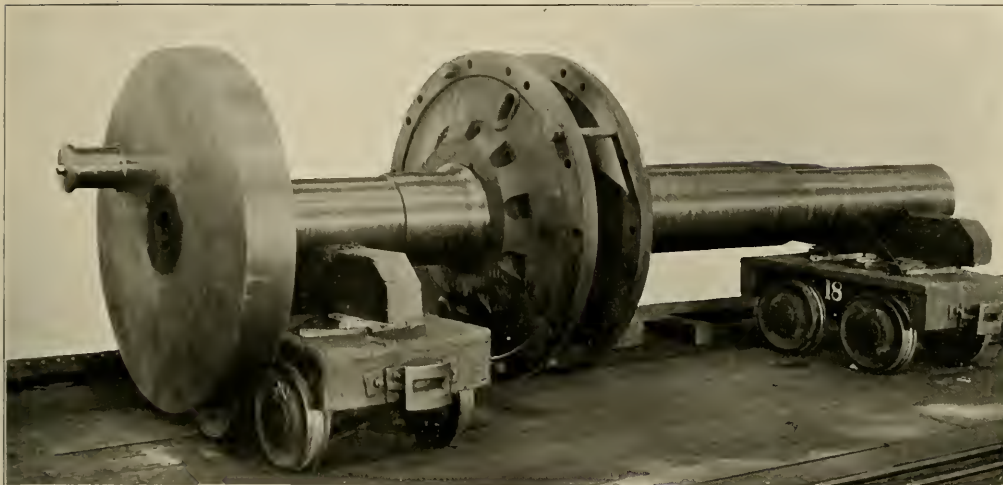
### MILLER-KNOBLOCK WILL MAKE ELECTRICAL SUPPLIES.

The Miller-Knoblock Company, South Bend, Ind., whose electric street sprinkling cars are well known, is adding to its already large business, an electrical department, which will be under the direct supervision of A. W. Morrell, an experienced electrical engineer and constructor, who has had years of experience in street railway motor work. It is the intention of the company to manufacture and carry in stock, ready to ship at a moments notice, Morrell's improved assembled motor commutators for street railway motors. The fact that street railway men can procure assembled commutators for any and all standard street railway motors will be appreciated. It will also carry in stock armature coils for all the standard motors. A complete equipment for the rewinding of armatures has been put in.

Mr. Morrell, who has charge of the electrical department has had long experience in electric street railway work and is well known at St. Louis, Minneapolis, Indianapolis and Cleveland, where he has had charge at different times of important works.

A young couple sought notoriety by being married on a trolley car in Hoboken, N. J. The ceremony was performed by a justice of the peace and the conductor acted as best man.

An ordinance has been passed imposing a tax of \$25 a year on each car operated by the street railway companies in Denver. This more than doubles the city's revenue from this source, as heretofore the license has been on the whole train.



HOLLOW FORGED SHAFT FOR UNION ELEVATED RAILWAY, CHICAGO.

This shaft is one of three built by the Bethlehem Iron Company of South Bethlehem, Pa., for the three 1,500-k. w. direct connected units now being installed in the power house of the Union Elevated Railroad of Chicago. The dimensions are: Diameter of fly-wheel hub, 28 in.; diameter of bearings, 22 in.; diameter of axial hole, 9 in.; length, 21 ft. 9½ in. The weight is 30,200 lb.

Three shafts similar to this were made at the same time for engines in the power house of the Chicago City Railway and four for engines built by the E. P. Allis Company of Milwaukee for the Northwestern Elevated of Chicago.

We regret that the photograph from which this illustration was made was received too late for us to place it with the article on page 578 of this issue.

#### WESTERN GEAR COMPANY OF MILWAUKEE.

The Western Gear Company of Milwaukee has been incorporated and has purchased the plant and business of the co-partnership which formerly existed under the same style. Herman W. Falk, who is so well known in the street railway world as president of the Falk Manufacturing Company, has purchased a large interest in the business and is president of the company. The other officers are Adolph Quentin, vice-president and treasurer, and Charles L. Jones, secretary.

The plant has been greatly increased and the company has now facilities for handling business and which will permit it to fill large orders promptly. Its specialty is the manufacture of gears and pinions for street railway motors. These are made by the new process, which is patented, the patents being the exclusive property of this company; the special machinery used is also patented. This process differs radically from those employed by other gear makers in that the teeth of the gears are formed in the casting before being cut, and are not cut from a solid blank or rim. The effect of this is to give a uniform and close-grained metal in the teeth, and, consequently, the gears have greater strength and a longer life. That such is the fact has been proved by tests of gears made by the ordinary process and by this method.

It is reported that a continuation of the Easton line is to be built between Bethlehem and Allentown, Pa.

#### WEST END ROAD, BOSTON, LEASED.

The West End Street Railway Company which owns 28½ miles of track in the city of Boston has leased its property to the Boston Elevated Railroad Company. The directors of the two companies have ratified the lease, a synopsis of the terms of which is given below:

On or before January 1, 1898, at least \$5,000,000 in cash shall have been paid in upon the capital stock of the Boston Elevated. Until such payment the West End is to remain in possession. The lease is not to be valid until the Board of Railroad Commissioners have given their approval of it.

The elevated company is to pay all expenses of the West End of every kind, including the maintenance of the corporation; also \$3,750 each six months, and 8 per cent on the West End common and preferred stocks. The West End turns over to the elevated everything, including cash on hand and the subway contract. The lease runs for 99 years. The elevated pays all West End indebtedness, except the schedule indebtedness, and all taxes and all expenses in connection with transfer or registration of West End stock.

In the case of any disagreement under the lease, or anything growing out of it, the issue shall be determined by arbitrators, each side selecting one, and they choosing a third. In case of failure to appoint an arbitrator or agree upon a third, the railroad commissioners or chief justice of the supreme court may appoint the same.

Three years ago the lighting company of Stevens Point, Wis., received a franchise for a street railway which was to be built within three years under a forfeit of \$2,000. Hard times and the use of bicycles made prospects very poor and the lines were not constructed. The city made a compromise with the company and accepted \$500 to cancel the franchise.





C. M. Boyce, for five years superintendent of the Hornellsville (N. Y.) Electric Railway, has resigned.

John Robinson has resigned the superintendency of the Bennington (Vt.) & Woodford Electric Railroad Company.

A. J. Cassatt has been elected a director of the Union Traction Company, Philadelphia, to succeed Caleb F. Fox, who resigned.

E. T. Birdsall of New York has been engaged as consulting electrical engineer for the proposed Springfield & Southwestern Street Railway, Springfield, Mass.

Charles R. Bishop, secretary of the American District Steam Company, Lockport, N. Y., made a pleasant call at the REVIEW office while in Chicago last week.

W. J. Hart, who has been general manager of the Union Street Railway, has accepted a flattering offer to manage the fine Inter-Urban Railway of Saginaw, Mich.

G. B. Lindsay, president of the Chester (Pa.) Traction Company, has sailed from New York on the Lucania to spend a vacation in Europe. He will return during the present month.

Geo. E. Randolph, general manager and superintendent of the Denver City Railroad Company, has resigned that position to accept the Denver agency of the State Mutual Insurance Company of Worcester, Mass.

David T. Bound, who was roadmaster of the Wilkesbarre (Pa.) & Wyoming Valley Traction Company has been appointed superintendent of the Wilkesbarre & Northern Railway to succeed A. A. Holbrook, resigned.

R. M. Douglass, general manager and purchasing agent of the Schuylkill Valley Traction Company, Norristown, Pa., has been chosen secretary and treasurer of the company, vice W. F. Kling of the West End Trust Company of Philadelphia, resigned.

It is stated that A. J. Cassatt, of the Pennsylvania Railroad Company, has decided to become identified with the Union Traction Company of Philadelphia and will serve on the board of directors, filling the vacancy caused by the resignation of C. S. Fox.

E. J. Wessels, general manager of the Standard Air-Brake Company, after a three months business trip in Europe, returned on the "Lucania," arriving in New York on August 27. While abroad Mr. Wessels attended the street railway convention in Hamburg.

P. A. B. Widener, of Philadelphia, who is largely interested in the street railways of that city and Pittsburg, is announced as a candidate for the gubernatorial nomination. He is said to be Senator Quay's favorite for the nomination, which means much in Pennsylvania.

Joseph Shabeck, division superintendent of the West Chicago Street Railroad Company, has received an appointment from Governor Tanner of Illinois. The motormen and conductors of his station presented him with a gold watch as a token of their friendship and esteem.

Edward A. Meysenburg and Francis B. Badt have associated themselves under the style Meysenburg & Badt, Incorporated, as brokers, contractors and engineers, making a specialty of consulting engineering and expert work in patent causes. Their office is 1522 Monadnock building, Chicago.

W. P. Buckner, superintendent of the 12th street division of the Metropolitan Street Railway Company of Kansas City, has resigned to accept a more lucrative position with the Kansas City Railroad. He has been an employe of the company for 11 years and no one has yet been named to fill his place.

C. F. Orthwein, who was chosen president of the Southern Electric Railway Company of St. Louis last March, has resigned to take a much needed rest and later a trip to Europe. He still retains his financial interest in the company and has consented to nominally act as first vice-president. Corwin H. Spencer, ex-president of the Merchants' Exchange and vice-president of the Southern company, was elected president. The other officials remain the same as before.

## NEW PUBLICATIONS.

Vol. 30 of the Proceedings of the Master Car Builders' Association, being a verbatim report of the Convention at Old Point Comfort in June last, has been issued and copies may be obtained of the Secretary, John W. Cloud, 974 Rookery Building, Chicago. Price to others than members of the Association, \$1.50, postage 20 cents additional.

The Money Question, by Henry V. Poor, H. V. & H. W. Poor, publishers. Octavo, paper, 202 pages. Price, 50 cents, postpaid.

The author states that all of our money other than gold is bad and advocates the funding of the entire national debt and the re-establishment of the National Bank. The name of the author is a guarantee that in this work on money, facts are not perverted.

Johnston's "Electrical and Street Railway Directory" for 1897. Containing lists of Electric Light Central Stations, Isolated Plants, Mining Plants, Street Railways (electric, horse and cable), Telegraph Companies, District Messenger Companies, Telephone Companies, Manufacturers and Dealers in Electrical and Street Railway Apparatus, Machinery and Supplies: The W. J. Johnston Company., New York. 752 pages, cloth. Price, \$5.00.

In preparing this directory the aim has been to secure reliable data as to street railway, electrical and other interests and classify it so that it is convenient for reference. The work has been brought up to date, and includes the United States, Canada, Mexico and Cuba. For street railway companies, the capital stock, names of officers, including manager, superintendent, electrician and purchasing agent, and mileage are given.

Poor's Manual, 1897. H. V. & H. W. Poor, publishers, 44 Broad street, New York; A. C. McClurg & Co., 117-121 Wabash avenue, Chicago. Price, \$7.50.

This is the 30th annual edition of Poor's Manual, the accepted authority on the railroads of the United States and allied interests. In the present edition, in pursuance of the policy of revising railway histories, there are given exhaustive reviews of the Erie, Illinois Central and Southern railroads. For the better comprehension of the mileage and ramifications of the larger systems the work contains a series of officially revised maps. The tables descriptive of the funded debts of the several companies are as complete as in former editions. The data concerning electric and other tramways first introduced in Poor's Directory of Railway Officials and Manual of American Street Railways is now incorporated in the "Manual of Railroads," 120 pages being devoted to street railways in all cities in the United States having a population of 25,000 or more. These statements show the history, mileage, equipment, operations, income and capital accounts, directors, officers, etc., and are as complete as for the steam roads.

## OBITUARY.

Thomas Startzell, an employe of the Buffalo Traction Company, was killed by an electric shock while stringing wires. He had the wire across his shoulder and with the assistance of another wireman was drawing it taut. The wire came in contact with a lighting circuit and killed Startzell but did not injure his companion.

Robert C. Shelmerdine, general receiver of the Union Traction Company, Philadelphia, died suddenly from heart disease at his summer home near Abington, Pa.

Charles H. Murray, who was interested in the street railway, electric light and water works companies of Larchmont, N. Y., died at the age of 80. He was a man of great wealth and many charitable institutions profited by his generosity.

## ALLOTMENT OF EXHIBIT SPACE AT NIAGARA FALLS CONVENTION.

At this writing the construction of the annex to the Armory in which the exhibits will be displayed, is progressing nicely, and Secretary Penington reports that about 2,500 sq. ft. in addition to what was expected, will be available. This extra space however, with what was first planned has all been taken, and it has been found necessary again this year to cut down the applications in making the allotment in order to have enough to go around. Fully 2,500 sq. ft. more space could have been sold if it had been available, and this in view of the fact that everything which can go out doors on tracks will be placed there. One or two are now contemplating the erection of large tents for such exhibits as require a great deal of floor space. The local committee promised to have the building ready for occupancy by October 1, and expects certainly to be ready 10 days in advance, at the latest.

From the list of exhibitors published herewith it will be seen that the display this year will be both large and interesting, and as in past years a credit to the association and the big feature of the convention.

The railroads have laid a side track into the building, and heavy shipments can be switched directly into the unloading place. The Adams Express Company promises a local office in the building.

Chairman Beardsley, Niagara Falls, of the local committee on exhibits, states he has made contracts for carpenter and similar work, by which exhibitors will not be overcharged, and also with local teaming companies.

To insure prompt delivery, all charges should be prepaid, and direct shipments made in care of H. W. Beardsley, Convention Hall, Niagara Falls, N. Y. All exhibits must be in place not later than Monday night, October 18 so that the building will be in order by Tuesday morning. Access may be had to the hall Monday, October 14, and the exhibits and building will be guarded so that nothing will be lost or stolen.

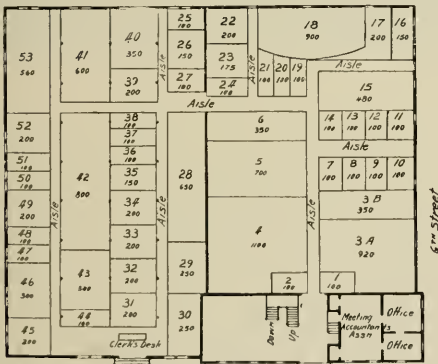
| No. of Space. | Exhibitor.                                               | Sq. Ft. |
|---------------|----------------------------------------------------------|---------|
| 3b            | Barney & Smith Car Company, Dayton, Ohio                 | 350     |
| 4             | General Electric Company, Schenectady                    | 1,100   |
| 5             | Walker Company, Cleveland                                | 700     |
| 6             | Wells & French Company, Chicago                          | 350     |
| 7             | Cambria Iron Company, Philadelphia                       | 100     |
| 8             | John T. McRoy, Chicago                                   | 100     |
| 9             | Paul Jones, Cincinnati                                   | 100     |
| 10            | Adams & Westlake Company, Chicago                        | 100     |
| 11            | Dilworth, Porter & Co., Ltd., Pittsburg                  | 100     |
| 12            | Trojan Button Fastener Company, Troy                     | 100     |
| 13            | Bridgeport Deoxidized & Metal Company, Bridgeport, Conn. | 100     |
| 14            | Corning Brake Shoe Company, Buffalo                      | 100     |
| 15            | Murphy Manufacturing Company, Pittsburg                  | 480     |
| 16            | Edison-Brown Plastic Rail Bond Company, New York         | 150     |
| 17            | Consolidated Car Fender Company, Providence              | 200     |
| 18            | Christensen Engineering Company, Milwaukee               | 600     |
| 19            | Cutter Electric & Manufacturing Company, Philadelphia    | 100     |
| 20            | American Railway Supply Company, New York                | 100     |
| 21            | Fuel Economizer Company, Matteawan, N. Y.                | 100     |
| 22            | Central Electric Company, Chicago                        | 200     |
| 23            | E. T. Burrows Company, Portland, Me.                     | 175     |
| 24            | Forest City Electric Company, Cleveland, Ohio            | 100     |
| 25            | Pomeroy & Fischer, New York                              | 100     |
| 26            | Cleveland Frog & Crossing Company, Cleveland, Ohio       | 150     |
| 27            | D. J. Sinclair, New York                                 | 100     |
| 28            | J. G. Brill Company, Philadelphia                        | 650     |
| 29            | Standard Air Brake Company, New York                     | 250     |
| 30            | William Wharton, Jr. & Co., Philadelphia                 | 250     |
| 31            | Ohio Brass Company, Mansfield, Ohio                      | 200     |
| 32            | Creaghead Engineering Company, Cincinnati, Ohio          | 200     |
| 33            | Falk Manufacturing Company, Milwaukee, Wis.              | 200     |
| 34            | R. D. Nuttall Company, Allegheny, Pa.                    | 200     |
| 35            | Clarence Whitman & Co., New York                         | 150     |
| 36            | W. F. Ellis, Boston, Mass.                               | 100     |
| 37            | Electric Mutual Casualty Association, Philadelphia       | 100     |
| 38            | Detroit Stove Works, Detroit, Mich.                      | 100     |
| 39            | H. W. Johns Manufacturing Company, New York              | 200     |
| 40            | Pennsylvania Steel Company, Steelton, Pa.                | 350     |
| 41            | McGuire Manufacturing Company, Chicago                   | 600     |
| 42            | Peckham Motor Truck & Wheel Company, New York            | 800     |
| 43            | Taylor Electric Truck Company, Troy                      | 310     |
| 44            | Forsythe Bros. & Co., Chicago                            | 100     |
| 45            | Rochester Car Wheel Works, Rochester                     | 200     |
| 46            | New York Car Wheel Works, Buffalo                        | 300     |
| 47            | New Haven Car Register Company, New Haven                | 100     |
| 48            | A. O. Norton, Boston                                     | 100     |
| 49            | Meaker Manufacturing Company, North Chicago              | 200     |
| 50            | International Register Company, Chicago                  | 100     |
| 51            | Paige Iron Works, Chicago                                | 100     |
| 52            | St. Louis Register Company, St. Louis                    | 200     |
| 53            | Johnson Company, Lorain, Ohio, and Johnstown, Pa.        | 560     |

### TRACK SPACE.

- J. G. Brill Company, Philadelphia.
- Duplex Car Company, Boston.
- McGuire Manufacturing Company, Chicago.
- Peckham Motor Truck & Wheel Company, New York.

## LOW FARES IN CLEVELAND.

The question of cheap fares is agitating the council and the Cleveland City Railway Company; in consequence an investigation has been made to ascertain what is the exact cost of carrying a passenger. A special accountant was employed to report the result of his investigations to a committee from the city council. It was reported that it cost on an average 3¼ cents to carry a passenger. Some members of the council desire to pass a low fare ordinance and watch the results. The expense of such an experiment would have to be borne by the stockholders of the railway company, but this carries little weight with the city council.



| No. of Space. | Exhibitor.                                               | Sq. Ft. |
|---------------|----------------------------------------------------------|---------|
| 1             | STREET RAILWAY REVIEW, Chicago                           | 100     |
| 2             | Street Railway Journal, New York                         | 100     |
| 3a            | Westinghouse Electric & Manufacturing Company, Pittsburg | 620     |

## ACCIDENT ON CHICAGO SUBURBAN.

On the morning of September 14, at 6:45 o'clock there was a collision between two cars on the Chicago Suburban Railroad at a point about 400 ft. north of the switch on 16th street leading into the yards and directly east of the Harlem race track. There was a very heavy fog which obscured the view and made the accident possible. According to the usual morning schedule the south-bound car was to be at the switch, on the side track, leaving a clear road for the north-bound car to pass over the three-quarters of a mile of single track.

The south-bound car had, however, been detained up the line by a derailed car, and was not on the side track. Standing near the switch and on the side track was a car that was being examined by a motor inspector. As the north-bound car approached the meeting point the motorman glanced at the side track and saw this car which he supposed to be the one he was to meet, and turned on the current to get over the stretch of single track as rapidly as possible.

Almost as soon as the switch was passed the south-bound

## WANT THE CONVENTION IN 1898.

The skirmishing to secure the convention of the American Street Railway Association for next year has already begun, and two active candidates are working hard for it.

Detroit was first in the race having put in its request last year at St. Louis, and having again followed it up in the spring when there was some prospect that Niagara might not conclude to carry out the plans there for an exhibit building which it proposed to erect. That matter was solved by securing the old armory in which, with the new annex, the convention will be held and the exhibits displayed.

Detroit offers many attractions and inducements, and the Convention League of that city has joined with the street railway companies in extending the invitation. The hotels are all that could be wished, the rates are reasonable, and good place for exhibits is offered in the large brick, steam heated building used for concerts, etc. It is on the ground floor and close to hotels. The local roads and natural attractions at Detroit would certainly make it an ideal place in which to meet.



AFTER THE COLLISION ON THE CHICAGO SUBURBAN.

car was seen approaching at full speed to make up for lost time. Both motormen shut off the current and applied the air brakes; the rails, however, were wet from the mist and caused the wheels to slide.

Almost before the motormen had realized their danger the cars met, breaking in the front ends, as shown in the illustration. Nearly all the passengers on the cars were bruised by being thrown against the seats or cut by broken glass, 21 being so injured, some quite seriously but none fatally. The two motormen were seriously hurt, and it is astonishing that neither was killed.

When the car bodies struck, the trucks were thrown forward, breaking or bending the center pins, brake rods, etc.; the trucks and motors were apparently little damaged. The total damage to the cars is estimated at \$500. That the accident was not more serious is due to the effective action of the Christensen air-brakes with which the cars are equipped. The fog was so dense that one could not see more than 20 feet.

Cincinnati is also after the meeting and sends out a warm invitation to come there. The meeting and exhibits would be held in the big Exposition building, which would afford more space for exhibits than has been available at any time in the history of the association. What the Cincinnati people can do is forcibly brought to the mind of all who were present at the meeting of the association in that city in 1886, on which occasion the entertainment fairly rivalled that of St. Louis, at which the previous meeting was held.

## SUMMER VESTIBULES IN NEW JERSEY.

A law was passed by the last legislature of New Jersey that all street cars in the state should be provided with vestibules from May 1 to November 1, the dates being evidently transposed. The police commissioners of Jersey City adopted resolutions to the effect that the law should be enforced and the Consolidated Traction Company is endeavoring to prove in the courts that the law is invalid.





CORRESPONDENCE

WHAT ONE SEES IN SHOPS.

EDITOR STREET RAILWAY REVIEW:

During the past month I have visited shops of seven of the largest street railway systems in the west outside of St. Louis, and think that your readers may be interested in learning of some of the things that came under my observation.

In the first shop, which I consider the best equipped street railway shop that I have ever seen, two men were at work putting a commutator on an armature with a 12-lb. sledge, while not 50 ft. away was a hydraulic press of the latest design. At the armature room I learned from the



man in charge that there had been considerable trouble due to broken wires; on walking to the other side of the room where they were making machine wound coils, I found that instead of using a weight or spring coil with a band in the grooves of the reel for putting the proper tension on the wire, it was drawn around a number of porcelain knobs, as shown in the sketch. Trouble from broken wires!

At the next shop, also very complete in its appointments, I watched the operation of changing armatures. The workman was very careful to place a cushion under it to prevent injury, but when it came to removing the pinion preferred to use a 14-lb. sledge instead of the clamp made especially for that purpose. I also saw a new bearing fitted to an armature shaft; the bore of the bearing was a trifle tight, and instead of being reamed to size, it was driven on with the sledge and then eased up by a few blows struck on the sides. At this shop I was told that with good luck a new pair of wheels could be fitted to an axle in four or five hours.

The third shop was a revelation. There all the latest labor saving devices were installed and used in an intelligent manner, so that they really saved labor.

In the shops of a very large system I found men in the paint shop graining with hand tools instead of by the roller process, which does the work in one-fourth the time. In the winding room the method employed when taking off the jam nuts from an armature was for one man to hug the core and keep it from turning while another slowly drove off the nut with a hammer and cold chisel. It might be suggested that a spanner and a clamp to hold the core would be better for this work.

I wonder how many street railways employ this class of mechanics, and whether they find that the saving in the pay roll is sufficient to pay for the effects of the poor work done by incompetent men. I venture the assertion that no road ever had trouble from broken wires in the armatures unless it came from a loose commutator, and that usually results from a sledge-hammer fit, or from a method of winding

similar to that described as obtaining in the first shop mentioned. In this same shop I learned that they had trouble from the hinge pins on the motors becoming loose and letting the pole pieces nose back and forth, injuring the armature. This is caused by the failure to tighten up the hinge bolt. As yet on my own road there has not been a case of this kind, though 90 of the motors have been in use for six years. S. J. G.

MOTOR WINDINGS AND GRATES.

EDITOR STREET RAILWAY REVIEW:

My weakness for trying to solve puzzles in electrical and mechanical fields leads me to offer the following as a possible solution of the puzzle in motor winding, propounded in the last REVIEW. Substituting the larger size wire brings the outer layers or coils farther from the core, thus decreasing the strength of the fields and reducing the counter electro motive force at full speed, permitting more current to pass through the motor. This has the same effect as cutting out a part of the field winding as practiced a few years ago by the Thomson-Houston Company on its railway motors, usually styled "running on the loop." I think that if ammeters and voltmeters were placed in the circuits it would be found that the motors with No. 6 wire use more current than can be accounted for because of the slightly smaller resistance in the field windings.

I am interested in the remarks, credited to W. M. Barr, concerning the proper height above the grates at which to set return tubular boiler and should be pleased to hear from some one who has made careful tests with a view to showing the difference in economy with the height above the grates varied from 28 to 48 in.

And in connection with grates I note that Professor Whitham states that the air space should be 40 to 70 per cent of the total; a professor in the Michigan School of Mines states in Engineering Magazine for July, from 25 to 30 per cent is more than sufficient. "You pays your money and takes your choice;" I wonder how much longer it will be before we shall get facts. R. B. HOLBROOK.

WHO USE ANIMATED PICTURE MACHINES?

KINGSTON, ONT.

EDITOR REVIEW:

We purchased an animated picture machine for use in our park this season and it has proved the best attraction we have yet put on. We have found, however, that exchanging films frequently has proved very expensive, and as there may be other companies who own machines some plan might be adopted such as an exchange bureau and thus a change of views might be effected at small expense. We would be glad to hear from any who own machines their opinion of the plan suggested.

Kingston, Portsmouth & Catarqui Electric Ry.

(We shall be very glad to publish the names of any companies using machines of this character, and the suggestion seems a most excellent one. There is no reason why such an exchange cannot be arranged, and by establishing a circuit a large range of views secured for the season at much less expense than under the present method. In sending names of companies it will be well to state the make of machine used, size, etc. EDITOR.)

## POWER HOUSE ACCIDENT IN PITTSBURG.

On Aug. 28 traffic was suspended for a time on three important electric lines of Pittsburg and the local press stated that the interruption was caused by the bursting of a fly wheel in the power house of the Pittsburg & West End Passenger Railway. The true state of affairs was briefly as follows: On Tuesday Aug. 24 a 110" x 21" pulley weighing 400 lbs. mounted on a jack shaft driven at 140 r. p. m suddenly burst and was thrown to the end of the engine room opposite to the pull of the belt. This did no damage but threw one generator out of operation. The remaining five generators continued to supply current for the lines until the following Thursday when a similar pulley mounted on the other side of the room gave way and was thrown in the direction opposite to that taken by the first pulley. The switchboard was partially demolished and slices cut from the pulleys on the generators upon either side of the path. With the aid of feeder lines from the power house of the Allegheny-Manchester Railway the operation of the road was continued. On Saturday it was found that so much current was being carried through these feeders that the insulation was gradually burning and dropping off causing such a loss that it became necessary to suspend until other feed lines could be laid. Fortunately no one was hurt in either accident.

## STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

The arrangements for the program of the coming convention have been completed; those assigned to papers have all accepted and everything is promising for a very enthusiastic meeting. The success of the association is assured and it will undoubtedly be of much benefit to all street railways as well as the companies represented.

There have been added to the membership since the last issue of the REVIEW the Lindell Railway Company and the Missouri Railroad Company of St. Louis.

The papers to be read are as follows:

"The Care and Handling of Fares from Passenger to Bank"; C. L. Wight, auditor, Toledo Traction Company, Toledo.

"The Handling and Checking of Transfers from Printer to Furnace"; J. F. Calderwood, auditor, Twin City Rapid Transit Company, Minneapolis.

"Pay Rolls—Time Keeping and Method of Paying"; Frank R. Henry, secretary, Missouri Railroad Company, St. Louis.

"Material and Supplies Accounts from Purchase to Use"; W. G. Ross, comptroller, Montreal Street Railway Company, Montreal.

"Car Mileage—How Arrived at and its Use"; H. J. Davies, assistant secretary, Cleveland Electric Railway Company, Cleveland.

"Statistics—Their Use and Abuse"; E. D. Hibbs, auditor, Consolidated Traction Company, Jersey City.

C. N. Duffy, J. F. Calderwood and W. F. Ham constitute the committee on standardization of accounts and will present an elaborate report.

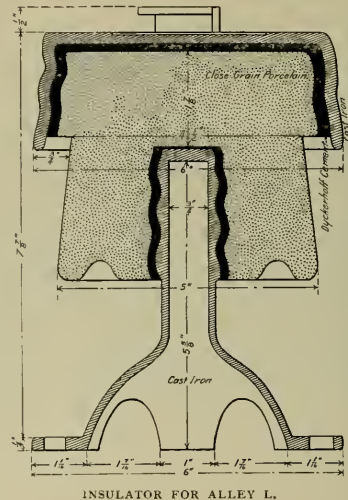
The official programme and circular will soon be issued and will give full particulars of the program and details of the meeting.

Any company which for any reason does not receive the circular will be supplied by addressing the secretary, W. B. Brockway, Toledo, O.

The Traffic Association has authorized the sale of tickets at the rate of one and one-third fares for the round trip on the certificate plan. When buying tickets ask for the American Street Railway Convention certificates; these certificates must be presented to the railroad agent at the convention building October 19 in order to secure the one-third rate for the return.

## PROGRESS ON THE ALLEY L.

The contracts for building the power station of the Alley L of Chicago have been let and the site at the corner of State and 40th streets is being prepared for the foundations. Rapid progress is being made in putting down the third rail and bonding the track. In boring the rails a Stow drill is used to advantage, power for operating the motor coming from the lines of the City railway. The whole apparatus is portable and can easily be moved out of the way of passing trains.



INSULATOR FOR ALLEY L.

The illustration shows a cross section of the third rail insulators. The stand and cap are of cast iron and the insulating portion is close grained porcelain with coarse threads and fastened with the best quality of imported cement. The General Electric Company designed the insulators especially for this road and is to deliver 20,000 at the rate of 2,500 a week.

The Detroit & St. Clair River Electric Railway Company has let contracts for rails and spikes to W. H. Doyle, Detroit; rail joints, American Rail Joint Company, Cleveland; overhead material, Ohio Brass Company, Mansfield, O.; engines, Russell Engine Company, Massillon, O.; pumps and condensers, Laidlaw-Dunn-Gordon Company, Cincinnati, and cars, Wells-French Company, Chicago. The road is to be 47 miles in length. F. T. Ranney is president, T. N. Fordyce, secretary, and C. H. Lawrence, superintendent.

**NEW YORK STATE CONVENTION**

**Fifteenth Annual Convention Held at Niagara Falls—Large Attendance—Excellent Papers Read—Numerous Excursions.**

The fifteenth annual meeting of the Street Railway Association of the State of New York was held in the International hotel, Niagara Falls, N. Y., on Tuesday and Wednesday, September 14 and 15. As of the former meetings of this association, it can be said this was the best both in attendance and interest in the history of the organization.

The president, G. Tracy Rogers, president of the Binghamton Railroad Company, presided, and opened the program with the annual address. This was followed by reading of minutes and report of the executive committee read by Secretary Robinson. The treasurer's report shows:

|               |             |
|---------------|-------------|
| Receipts..... | \$ 7,687 62 |
| Expenses..... | 6,326 24    |
| Balance.....  | \$1,361 38  |

**President's Annual Address.**

The president announced the presence of a delegation of prominent tramway officials from abroad, welcomed them in the name of the association, and extended an invitation to participate in the discussions. The program was then taken up.

In behalf of the Street Railway Association of the state of New York, it is my privilege to extend to you all a cordial welcome to this, our Fifteenth Annual Convention. It seems most fitting that we should meet here at Niagara, if for nothing more than to observe the object lesson which nature unfolds before us. The power exhibited here in Nature's workshop is awe-inspiring and could it be utilized would propel every street car in our state.

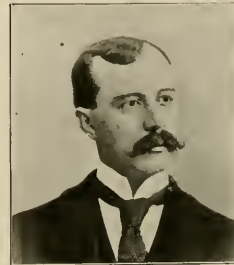
This year, which encloses a decade of electrical traction, has been one of steady advancement on old lines; while no startling developments have been obtained during the year, it seems almost impossible that the next to years should witness so many radical changes of benefit and advantage to us and the public. The past year will long be remembered by those connected with street railroads, in many cases, as one of the most discouraging since the adoption of rapid transit. Trade and commerce have, we hope, reached their lowest ebb. The bicycle is now our too successful competitor. It operates without franchise or track, and pays no taxes. On the contrary, cinder paths are constructed, pavements laid down and in many cases pavements changed for its benefit. As a means of locomotion the bicycle has come to stay, but as a novelty it is being overdone and will share the fate of other novelties, and I believe has reached its zenith.

It has taken an almost superhuman effort during the past year on the part of a manager to keep the receipts of his road up and the operating expenses at a minimum. The populist element in our midst has attacked us on every line and it seems as if the accident lawyer has been more vigilant than ever before, if that were possible.

But the dawn of good times is here and we have reason to believe we shall receive our share of the good things to come. It is evident that investors believe in the future of street railroads, for during the past year there have been expended over one million dollars, in Brooklyn alone, in extensions, new equipment and track. There have been 1,000 miles of electric railroads built, and 5,000 motor cars added to the equipment in the United States, amounting to an investment of \$35,000,000. Many new roads are being built in our state, connecting towns and villages with cities. Notable improvements have been made recently in motors and car construction, especially for the suburban and interurban roads. Cars, with all the comforts and conveniences of a steam passenger coach, are now in operation on some lines.

The legislature and New York City officials have been dawdling with the question of rapid transit for a number of years, but whatever

results have been accomplished in this direction may be attributed to the enterprise of the railroad companies. They have recently obtained the consent of the state Board of Railroad Commissioners to



G. T. ROGERS.

adopt electricity, instead of horse power, over a distance covering 110 miles of track. This change involves an expenditure of \$12,000,000, and I am informed that contracts have already been made for a large portion of the work. Contracts have recently been closed between the Brooklyn Bridge Trustees and the Brooklyn surface roads by which the trolley roads of Brooklyn will extend their lines across the bridge. They propose to carry a passenger for a single 5 cent fare from New York City to any portion of Brooklyn reached by their lines, thereby saving the passenger

the usual 3 cent bridge charge and the annoyance of changing cars. This great improvement will cost the Brooklyn roads half a million dollars. These improvements, costing millions of dollars, now about to be made in rapid transit for Greater New York cannot help but meet the approval of the public and the advantages to be derived therefrom by the people of the metropolis are incalculable.

Nothing has been done within the past ten years which has insured more to the benefit of the people of our state than the adoption of rapid transit and the consolidation of street railroads in cities, both large and small. Consolidation, which was at one time regarded as a menace to public welfare, is now universally recognized as redounding to its advantage. Since the development of rapid transit the areas of our cities have extended to a marvelous extent. This rapid growth could have not been attained but for our street railroad systems and the adoption of electricity, furnishing a cheap, flexible and easily controlled motive power. It is far within the bounds of truth to say that for every dollar invested in a street railway, another dollar has been given to the people through the resulting increase in property values alone. The street railways have handsomely repaid the public for their franchises.

The populist element, with its plans for obtaining cheap fares and its ideas of municipal ownership, together with high taxation of railroads, if allowed to be successful, will materially cripple street railways. Such dangerous methods, if adhered to, will wreck the property of investors in street railroads, and turn over to duly appointed receivers the street railroads' properties of our state. It will paralyze the splendid suburban growth, which is the munificent payment being daily made to the people by the street railroads for whatever benefits they may have received. The American system of uniform fares is intended to stimulate this growth and to put the whole municipal area and its environs on an equality. It secures to the common people freedom from the tenement and a basis of calculation in changing of homes or places of labor. Free transfers and numerous other advantages have been given to the people by the street railroads without compulsion by the legislature, or municipalities. The free transfer system has been so liberally adopted in this state and the margin of profit is already so small that any legal reduction in fares, however little, would compel a complete abandonment of the far sighted policy which is building up the cities of our state. Our street railroads are earning less per mile than they earned under the horse car period. This is due to several causes, the generous building for the future in suburbs, the increase of interurban traffic and the generosity of the street railroad management in giving the people a better car service by increase in car speed or greater frequency of cars.



Vested right is the last remedy we should seek in order to protect our franchise rights, but in many instances such measures must be resorted to in order to protect us against the clamor of the socialistic element. A number of decisions have been made of late which should be very gratifying to us. Millions of dollars of street railroad securities are held by the masses, and the legislature and municipality cannot afford to allow this vested right or earning power to be interfered with. Our securities rank higher each year in the financial world and are more acceptable as collateral for loans or investments.

It has been my experience that the majority of people appreciate and are ready to reciprocate any improvement or benefit extended to them. The roads with which I am connected have enjoyed the hearty co-operation of the public, the press and officials of our city and it is an obvious fact that the nearer we can consistently conform to the wants of the people, the less trouble we shall have in getting what we ask of them.

More bills affecting street railroads were introduced in the legislature last year than ever before; no doubt, a majority of them at the request of constituents. Had they become laws and been put in operation, the public, as well as ourselves, would have suffered. We found the members ready to listen to our arguments and anxious to enact such laws as would be of service to the public good.

During the past year there has been organized an association of street railroad accountants. This association should have a cordial and hearty support. Next to the manager of a road I consider the accountant the most important official; in fact, the successful manager must rely upon him largely as a guide in the management of the road. The manager and the accountant must act in harmony in conducting the policy of the road, and in order to make any street railroad a success, all heads of departments must be interested and act in unison.

An important advance made by the street railroads since the adoption of rapid transit is the improvement in the character of employees. Better discipline is now maintained and more courtesy shown in catering to the public. As our business grows in technical and scientific requirements, it naturally attracts a class of men to whom there was formerly no call or inducement to enter its service. Those are facts to be considered in selecting our employees. The street railroad companies of this state are taking great interest in their employees. Nearly every road has a mutual benefit or employees' club connected with it. Each has a plan agreeable to the ideas of the employees, and in nearly all instances the management has not only endorsed, but become a part of these societies. A number of roads have furnished club rooms and other substantial assistance for them. We can not take too much interest in the men connected with the operation of our roads.

The organization of Mutual Indemnity Insurance Companies for electric railways has been suggested as a protective measure against the prohibitive rates we are now charged. For years, insurance companies have been experimenting with insurance upon street railroads. From the results obtained I should judge the business was not satisfactory. The insurance companies have either refused to write this class of risk or have established, in many instances, prohibitive rates. In a measure, this may be the fault of the street railroad manager, who feeling the responsibility in part removed may have been more careless in the handling of his road. A number of roads still have low rate policies, but they are based upon the record of the roads' casualties. Not long since, the rate for fire insurance was almost prohibitive, but I am pleased to state that we are now being insured at a fair rate, as compared with other business risks. Owing to the insurance regulations we are now debarred from the sale of power, which, in many cases, would be a large source of revenue, and under the present restrictions commercial lighting from the electric railway circuit will have to be confined to out of doors.

The rapid increase in the number and size of parks and pleasure resorts owned by street railroad companies and operated by them as traffic promoters has been one of the striking developments which has accompanied the introduction of electricity as a motive power on street railroads. The general opinion of street railroad managers, who have had experience in this direction, is that such pleasure resorts properly conducted, with a judicious selection of amusements and entertainments, tend to increase the ordinary traffic of a road. But in some cases, where the character and class of people to be served has not been studied, parks owned and operated by street railroad companies have not been successful adjuncts to the road. An amusement league for the interior cities of the state have

been suggested. The idea is worthy of consideration and, if properly handled, should be a saving and convenience to the roads in such cities.

The experiment of carrying U. S. mails has proved a success, and the postal car service on our roads is appreciated by the public and accepted by the Government. New freight and express routes are being established, which operate not only as a convenience to the people but as feeders to the steam roads.

The application of electricity to the existing steam roads is, today, a question of great importance to the practical railroad man. They are still in search of Aladdin's lamp, but they do not seem to have made any decided advance during the past year. We have, no doubt, made inroads into their local passenger receipts and probably will continue to do so. Our roads are so situated that in most instances we are at an advantage. We can operate at a much less cost than they and our depots are at our patrons' door steps. The convenience and cheapness of our transportation recommends itself. I believe there is room for us both, and, in a measure, the electric roads are a feeder to the steam roads and the more closely they are allied the better for both.

Considerable progress has already been made in the utilization of the different water powers in which the state abounds, notable the Falls of Niagara, the St. Lawrence river, the Hudson river at Mechanicsville, Oriskany Falls near Utica, and several others which are worthy of mention. It has been suggested that the latent power now contained in the large culm piles of Northern Pennsylvania be also made available. The increased facilities resulting from new class of machinery and inventions for power transmission, the development of the alternating current, the multiphase system and the creation of the induction motor have become actual facts and practical long distance power transmission is within our reach.

It is still a question as to whether the storage battery is becoming a practical factor in the operation of our roads, and whether at the present cost we can use it to advantage in our central stations and at the ends of our feeders, thereby assisting in maintaining the potential on the trolley lines. Compressed air and the many other powers now being tried may have some surprises in store for us. The results of these experiments and inventions may be the beginning of a new era in the street railroad world.

I congratulate you upon the financial and physical conditions of your roads, for notwithstanding that the past year has been the most depressing in our history, it is the first year for some time during which a receiver has not been asked to take charge of some road of our state. Many of the improvements I have referred to have been very materially promoted by the intelligent discussions they have had at the meetings of our association. I am a believer in the importance and good results that can be accomplished by united action. I know from personal experience for the past two years that this association has been a tower of strength in protecting the legitimate rights of the street railway interests of this state and I hope that the same earnest and energetic support it received during that time will continue to be given it by all persons charged with the duty of looking after such properties.

The growth of our association and the interest taken in it by nearly all of the roads are subjects of congratulation. It is the desire of the management that the active men connected with our roads take more interest in the association and especially in the convention work. I desire to thank you for the interest you have taken and also for your earnest co-operation in the affairs of the association and the prompt response which I have always been accorded. I sincerely believe in the future of the association, but it will become whatever we make it. Thanking you for your kind attention, I wish you, one and all, a large share of the prosperity, which I believe is in store for you.

#### How Can We Increase the Efficiency of Our Employees?

W. W. WHEATLEY, BROOKLYN.

The term "efficiency" implies the existence of a standard of excellence. To speak of increasing the efficiency is only another way of speaking of a nearer approach to that standard. Briefly outlined, a high standard of railway service may be described as safe, regular, frequent, rapid, clean and comfortable. Any near approach to that standard will be found to depend largely upon the human element in the service.

In order to divest the subject of any uncertainty and to confine its consideration within definite limits, the writer assumes that it refers principally to those employes who operate cars, in other words, to conductor, motormen or gripmen. They are the employes who come into direct daily contact with the public, and whose bearing and conduct, in the public eye is, to a great extent, the embodiment of the efficiency or inefficiency of the service rendered by the company. Our problem therefore is, how can we manage to secure in the personal and in the conduct of our employes, the nearest possible approach to a higher standard of service, public and private.

For the safe, economical and efficient operation of a railway, there are three essential conditions:

1. A good track and motive power.
2. An attractive and comfortable car equipment.
3. Faithful, capable and well trained employes.

The first and second requisites may be obtained by a reasonable expenditure of money assisted by a high degree of mechanical skill. Money alone cannot buy the third requisite, because character and faithfulness upon which alone conscientious, capable and trained service depends, must be cultivated and developed. Of course it pays to give a good price for brains, but brains alone will not make faithful, capable and well trained employes. Good materials bring a high price and intelligent men are worth more, because they are more likely to become competent than ignorant ones.

A simple and direct solution of our problem may be indicated under two headings:

1. Improve the personnel by the selection of better men.
2. Improve their conduct and increase their faithfulness by a better system of discipline and training.

Let us consider first how we are to obtain better men. The man becomes the employe not entirely upon his own volition, but through the process of selection by one of the company's officials. Whatever official is charged with the duty of selecting conductors, motormen or gripmen bears a heavy weight of responsibility. To a large extent he is responsible for efficient service on the road, for upon him depends the selection of men who in their habits, education and tendencies are fitted for the work. Unfit men once in the service may become very grave factors in the attainment or non-attainment of good results. The very best mechanical and engineering talent is engaged at great expense for the purpose of selecting and testing the materials used in the construction, repairs and maintenance of roadway, power plants and equipment, and watching the results obtained from them. The utmost care is exercised before any device or material is selected for temporary or permanent use, but what methods do we pursue, and how do we assure ourselves of the fitness of the men in whose hands are to be placed expensive property and human lives? Are they not often hurriedly selected to meet some pressing temporary requirement or what is worse, are they not often permitted (without regard to their fitness) to enter the service at the behest of some politician whose friendship may become useful?

The officer who is to select the men should himself be selected with great care, and he should be protected from any influence likely to prevent him from selecting the best material. His field of choice will be limited largely by the wages paid to employes. If only such wages are paid as will suffice to command the service of inferior and therefore incompetent men, he should not be blamed for his frequent failure to select good men. No definite rules can be laid down for the selection of better men except to say that good character and fitness for the work should be the sole requirement for entry into the service. An ignorant, talkative blackguard should under no circumstances be permitted to enter because he is not built right for the business, and by no system of discipline or training can a man of this character be fashioned into a gentlemanly, courteous employe. The writer believes it is best, as a rule, in selecting new and inexperienced men to take those who have had more or less of mechanical training either on the farm or in the workshop, provided, of course, they are suitable in other respects; and preferences should be given to married men beyond the age of 25, because as a rule they are more steady, reliable and more amenable to discipline. Professional floaters who go from place to place, often under assumed names, are always to be avoided. This branch of the subject is too large to be compassed in a few paragraphs. Suffice it to say that success in selecting good men is largely a question of being a good judge of human nature, aided by careful methods of looking up the antecedents of applicants.

To improve the conduct and increase the faithfulness of our

employes, a better system of discipline and training is demanded. It is the policy of railroad managers to bring their equipment, track and power up to the highest state of efficiency, but do they know that their men have a clear and practical knowledge of their rules and of the proper operation of their equipment?

Do they know that their rules are habitually observed and that their equipment is operated in the manner prescribed?

Experience has taught the leaders of military organizations that it is one thing to make a rule or give an order, but quite another thing to know that it is enforced. They have learned that efficiency of discipline can be obtained only by close inspection, and it is so in railway service. Inspection should be made not by secret service detectives, but by trained inspectors, as is done in military organizations. In discipline, as in some other things, an ounce of prevention is worth a pound of cure.

Discipline consists not merely in administering punishment for offenses, but in a broader sense it consists in educating and training the men, so that it will not often be necessary to administer punishment. We may have the best roadway and equipment, but unless we are able to properly control and guide the intelligent human machines through whose agency results are to be accomplished, we may never have a higher standard of efficiency.

Efficiency of service comes only as the result of long and persistent training, education and experience, and is therefore incompatible with short tenure of position. Is it not a conspicuous fact in street railway operation, that there is a comparatively short tenure of service of conductors, motormen or gripmen? Are we not continually discharging one set of men and employing new and inexperienced men to take their places, and if so what is the underlying cause and what the remedy? Passing hurriedly over these very suggestive and interesting questions regarding tenure of position, it may be profitable to briefly review our present methods and opportunities of training new and inexperienced men.

In steam railroad practice, before a man is permitted to act as conductor or engineer in charge of a train with valuable property and human lives, he is subject to several years of education and training in one or more subordinate positions. Opportunity is thus afforded to study his character and temperament, observe his methods and measure his fitness for promotion, but in street railway practice there are, as a rule, no subordinate positions in which men are required to serve before being placed in charge of a car. New and inexperienced men are inducted into the service in large numbers, and after being schooled for a few days are given exclusive, absolute and independent control of a car running through crowded city thoroughfares and populous suburbs. Is it to be wondered at that costly accidents are the result?

It will be generally conceded that the position of motorman or gripman is vastly more important and responsible position than that of conductor, as it concerns safety in operation. Why then should not all motormen or gripmen be required to serve an apprenticeship of three to six months in the shops, or as conductors, during which time they could become perfectly familiar with the roadway, equipment and the rules and regulations, and during which time the officers could become better acquainted with them? After having served such an apprenticeship would they not naturally be better qualified for the more responsible position? Men often blunder because they know no better. Some know they are ignorant and try to learn, while others do not try to learn. Some know they are ignorant and try to learn, but they do not know how, while there are still others who think they know it all and are entirely unconscious of their ignorance. In either case the officers of a road are more or less culpable if they do not take the measure of the men, and not only give them the opportunity to become competent, but insist upon their becoming so before being placed in positions of responsibility.

But after all has been said about obtaining better men and training them to become more proficient in their duties, it still remains to make them faithful and attach them to the service. This point needs no emphasis when we remember the exactions of the service and the influences that are continually at work to degrade and mislead them, and prevent the proper and faithful discharge of their duties. There is no other calling which makes heavier demands upon the mental and physical endurance of men, and they should not be surrounded by demoralizing conditions which unfit them for the best service. Every company should take some interest in the social surroundings of its employes. They should be given some opportunities of enjoyment as well as self improvement. We must remember



that the chief end of their existence is not work, and when their work for the day is done we should offer them some counter attraction to the street corner, the saloon or the gambling den. We should try to lead the men to feel that the company takes an interest in their welfare, and wishes to improve their social condition. By so doing we shall more surely attach them to the service, and make them more faithful and efficient.

Minor mistakes and blunders there will always be, but men do not as a rule make serious blunders with deliberate intent. In order to avoid blunders some incentive should be held out to make the men more careful. It is indeed questionable whether the fear of punishment is always the best incentive to offer, and yet how many of us offer anything else? The disgrace of suspension and the loss of wages may often be a deterrent, but what kind of an impression does it leave on the man's mind after it has been inflicted, especially so when it comes after a long term of faithful service? Well may we raise the question whether our system of discipline is not wrong, when we hold out no other incentive to efficient faithful service than the fear of punishment.

Many of the principal steam railroads throughout the country are making a distinct advance in their system of discipline, which is more in keeping with the progressive enlightened spirit of the age. They are trying to abandon the "Master and Man" idea and are seeking to attach men to their service by treating them "Like Men," and by giving some recognition and credit for varying terms of faithful efficient service. Instead of fines and suspensions, which often beget a sullen, revengeful spirit, many roads are adopting what is widely known as the "Brown system of discipline, without suspension," which consists in keeping a debit and credit account with each man and advising him personally as the entries are made. Suspensions are made only nominally—that is, they are entered against the man's record, but are not actually enforced. Geo. R. Brown, general superintendent of the Fall Brook Railway, who first inaugurated this system, says concerning it in substance as follows:

"Penalties are imposed for two purposes:

"First, to uphold the law and prevent its further violation; and second, to reform the violator. Punishment inflicted indirectly benefits many who do not violate the law as well as to the one who does. It often occurs that the disgrace and injury occasioned by a strict enforcement of a sentence does more to ruin the guilty than anything else, and a wise provision has been made, allowing courts to use their judgment as to carrying out punishments; this is known as 'suspending sentence.' If the same time offender does better and is not guilty of the same or other offenses, the judge conveniently forgets the sentence hanging over him, but should be go on committing one misdemeanor after another his 'record' rises up to condemn him. I believe in the practice of suspending sentence with railroad employes."

Under this system a man's position depends on his "record," and a long term of faithful service entered to his credit counts for something every time the account is balanced. That is undoubtedly the correct principle which teaches the employe that he will as surely receive credit for his good work as that he will be charged with his errors and faults, and he will certainly become a better man when he learns that his final success depends solely upon the "record" that he makes. The writer suggests that it may be possible to embody into practical methods adapted to street railway service the principle herein briefly outlined, but it should be undertaken only by those who are in sympathy with it, and whose experience in dealing with men has fully convinced them that harshness is less powerful than kindness, and that just, humane treatment of men will bring about a closer relationship and more perfect confidence between employer and employe.

J. B. Cahoon: I agree most heartily with all that Mr. Wheatley has said, but I do not think he has carried the matter far enough; not as far as we have carried it on our road in Elmira. We not only go into the subject of a thorough examination of the man as to his personal character and habits, etc., but as far as possible have conformed to the law of the state and placed him in the power house and given him a thorough training there, and followed that up with a course in the machine shop and car house, and endeavored in that way and through careful training on the cars to put him in a position to understand what his duties are. Of course we have a small road, but we have the good fortune to retain our employes for longer terms of service than is usual. A man in starting in goes on as an extra man and remains an extra man, as we find by experience, for about a year and a half. He only runs on the lines of smallest travel. In

this way by the time he gets a regular run he is pretty thoroughly educated in his duties, and we can see whether our judgment has been right in regard to the man and whether he is a competent employe or not.

We have also taken up the social side of the life of the conductors and motormen and established a club room for them with the daily papers, electrical papers, prominent magazines and various games and things to amuse them when off duty. This is located at a very convenient point where all our cars meet, and we hire a room for that purpose solely, on one of the principal streets of the city. In addition to that we have taken the men into our confidence, so to speak, and when there has been a falling off in the earnings we have talked with the men in a general way and explained to them how our daily receipts depended upon them; how if they are not polite to ladies and do not help them on and off the cars and answer inquiries politely and promptly they are hurting the road, and not only the road, but themselves; because if our earnings decrease it means we have to decrease our operating expenses and be compelled to economize, taking cars off and putting the men back on the extra list where they will get less pay. We have also adopted the service stripe system. We give a man for each five years of service a gold stripe on his sleeve, with an increase in pay of 5 cents a day, which is not much, but it serves as an incentive to the men and shows that they are considered, and that we are trying to do what is right by them. I have told them that if our earnings pick up so that we can do better than that we will be glad to do it. We have some 14 men who wear the five years service stripe and four or five who wear two stripes on their sleeve, indicating 10 years of service, and who get an increase of 10 cents a day. We have found that by taking this personal supervision of each man and looking after his comfort, etc., that our earnings are picking up, that the men are more attentive to their duties and more careful of the property of the company and work with the management of the road in operating it on an economic basis.

The President: Can we not hear from some other roads, giving their experience? Will Mr. Murphy or one of our friends from across the water tell us what they do there?

Mr. Murphy: Mr. President and gentlemen: I thank you for the opportunity given to me of saying a few words. As a tramway manager for 20 years I have had some experience in this line and fully approve with the sentiments expressed in the paper which has been read, in fact it is quite in accordance with my own views. We have a rather different class of people in Dublin from what you have in this country; the men are apt to keep their positions longer. We have many men in our company who have been with us a great many years and a service stripe for 10 or 15 years would be quite common. We look after the comfort of the men as far as we possibly can and increase our efforts each year. We have a road 45 miles long, with 1,600 horses. We are about to adopt the electric system, and it is with that object in view that the committee has come over here, consisting of two directors and myself.

The next paper was entitled "A Decade of Electric Railway Development," by W. J. Clark, General Electric Company, New York.

Adjournment was then taken to 2:30 p. m.

#### Tuesday Afternoon.

The afternoon session opened with the reading of the following paper:

#### The Influence of Accurate Measurements Upon Economic Operation.

BY CARYL D. HASKINS, BOSTON.

In no branch of commerce, save perhaps in some of the industries dependent upon the generation of electrical energy, is it considered sufficient to know only what raw material is used and what revenue is received. Nor is this information actually regarded as sufficient even in these industries.

Until very recently, however, there has been no satisfactory method of actually determining how much electrical energy has been produced during any given period.

Many generating stations in the early days followed a system of frequent readings of ammeters and voltmeters, basing their assump-



tions as to actual output on the product of coincident readings multiplied of course by the time factor, thus obtaining an approximation of the kilowatt hours output per day and therefore the approximate cost of generation per k. w. hour.

Many, however, abandoned these frequent readings of instruments, feeling that the approximations of true output measurement were too unreliable to be of real value, because of the constant fluctuation of load between readings.

The conditions just described are in reality those of yesterday rather than today, and they existed only up to that time when it became possible to obtain output meters of sufficient capacity to measure in an accurate and proper manner the true output.

Such meters as these to which I refer are now readily obtainable and are being rapidly adopted, not only by street railway companies but by lighting companies also.

Electrical engineering skill has responded to the needs of the industries to which it is tributary, and standard designs now exist up to capacities as high as 8,000 amperes. Whilst special instruments have been designed large enough for 16,000 amperes.

These total output meters are accurate to a high degree, not only upon steady and normal loads but upon rapidly fluctuating loads as well, giving a true account of all energy output through them on loads ranging from 5 or 6 per cent of their rated capacity up to about 15 per cent above their rated capacity. The reliability of the record being unaffected with the rapidity of fluctuation of current between these points.

It is doubtless needless for me to emphasize the real economic value of the reliable data which can be obtained by the use of these total output meters.

Knowing the efficiency which is to be expected from the generator, engine, and boiler equipments, it is a simple matter to determine just how much coal and water should have been expended for the run of any given day to generate the indicated k. w. hours output.

Thus it not only becomes possible to determine just what it is costing to generate a k. w. hour, but it also becomes possible to check the inefficiency of the equipment and to locate trivial faults which might otherwise have escaped notice.

For example, should the indicated output fall 10 per cent below what ought reasonably to be expected from the known input of coal and water, an effort would at once be made to determine where the trouble lay. Whether in uneven firing of the boilers, ill-set valves on the engine or some minor fault in the generator.

In no other way known to me can this positive means of check upon a generating system be maintained than by the use of total output meters.

Important as is the measurement of the total station output there is yet another application of positive measurements, which, whilst it has been long appreciated by many, has not been applied in practice at all up to the present time, simply because the necessary meter was not available. I refer to the measurement of the energy used daily to operate each car.

Every street railway management realizes that a quite large proportion of the total energy generated is wasted by the careless and improper use of the controller and the brake, and where the old rheostat method of control is used the opportunity for waste on the part of the motorman is yet greater.

Almost every street railway superintendent makes a different estimate of the percentage of power wasted upon the system under his charge, for there can be no positive knowledge upon the subject nor can the conditions be regarded as at all stable.

An average drawn from the opinions which have been expressed to me would, however, indicate that not less than 20 per cent of the total energy generated is wasted by improper manipulation of the handles upon the part of the motor man. This improper manipulation being due to some extent to ignorance, but more generally to carelessness.

A meter has now been designed which will, I believe, change all of these wasteful conditions. This meter is intended for permanent installation upon the car, and its indications show accurately the consumption of energy in k. w. hours for any desired time.

Grave difficulties surrounded the designing of a satisfactory meter for this purpose, and the perfecting of the device has only been accomplished by sustained effort extending over a long period. It was necessary not only that the meter should be accurate under the extremely unfavorable conditions of heavy vibration and shock to which it has to be exposed, but also that its construction should be of

such a character as to endure these rough conditions for long periods without damage to the mechanism and without the impairment of accuracy.

Such a meter as that which I have described is now obtainable and has been successfully operated in actual service over an extremely rough piece of track for many months.

With a street car meter permanently installed on every car the street railway management at once has the same means of checking the motorman as is provided by the cash register for checking the conductor.

Assuming that the energy wasted is actually 20 per cent of the total, as I believe it to be, it is, I think, fair to expect a saving of at least half the present waste, or 10 per cent of the whole amount of energy generated as a result of the knowledge on the part of the motorman that the management has absolute means of ascertaining how much power he uses per run, or per passenger, or per mile. For under this system he cannot fail to realize that the management has in its possession adequate and reliable data upon which to base promotions or encouragement, reprimand, or discharge.

Many steam railroads have long made a practice of offering annual prizes to the engine crew doing the most work with the least coal and water, and I anticipate that a similar system of reward may be found advantageous and profitable in street railway practice.

Cutting down the waste of energy 50 per cent means saving 10 per cent of the total output, and it therefore means to the street railway management either the saving of 10 per cent of the coal and water which is being used today, or the ability to operate 10 per cent more cars with the same central station capacity. In which ever way the matter may be viewed—whether in the light of a saving of raw material, or an increase in service without increase in expense at the station—the economy accomplished is very great, and you will all, I am sure, agree with me when I venture to assert, that the influence of accurate measurement upon economic operation is of the first importance, provided proper use is made of the data thus obtained.

In reply to a question Mr. Haskins stated the meters had not yet been placed upon the market, but soon would be.

Mr. Nichols stated that the paper he was about to read had been prepared by his mileage clerk, Charles J. Ingalls, to whom any credit which might attach to the paper, was due.

Then followed a paper "The Advantages of a Car Mileage Record."

Mr. Cole: My system is similar in detail to the one which Mr. Nicholl describes; the motorman turns in a report which is taken off by the starter, and in all its details it is similar to the Rochester system.

Mr. Cole, of Elmira, who read the next paper, prefaced it with the remark: "In the preparation of my paper I have been guided, to a great extent, by the nature of articles which have appeared in the public press. The public are being educated in the belief that the nickles taken in by street railroads are by some miraculous process being turned to gold and the gold is used in the corruption of public men. Such assertions are an obstruction to the liberal policy of a street railroad and binders its good service; and at the same time it is an insult to public men. I believe public officials and railroad men should educate the people as to the facts and dissolve the fancies."

#### Facts and Fancies Concerning Street Railroads.

W. W. COLE, ELMIRA.

Today, if you pick up the Review of Reviews, the Forum, or any of the leading magazines or daily papers, you are confronted by writings as significant as the writings on the wall. Everywhere we read articles on municipal ownership and state government of railroads, committees of investigation, and the introduction of restrictive laws. These articles are nearly all of a socialistic tendency, and conceived in fancy dreams, and like Pygmalion's Galatea, the Statue of Liberty becomes charged with magnetic life and lightens and carries the world—for love and 3 cent fares. In the many discussions of the distribution and gifts of franchises it may be well to define that a franchise is the right bestowed upon some party or parties to do something; that something to be of benefit to the general public, and

it is always understood that if the parties obtaining the franchise have made intelligent calculations, and conduct with experienced and economical management, that they are entitled to remuneration, for first their service to the public, second for the intelligent application of their services and money.

The municipality is a public business corporation; the railroad a private business corporation; but both are in the service of the public with this distinction—if the municipality makes mistakes in its management, the public must pay; if the railroad company is mis-managed, the individuals pay, and the public is still carried for the same price. Now, if any large manufacturing corporation should approach the Board of Trade of any city in the United States, and make a proposition to locate interests that would increase the comfort and possibilities of usefulness of many citizens, make suburban homes available, and values of real estate higher, make houses rent more readily and for greater values, and homes in the city to become more desirable, and homes in the country of easy access, increase the trade of the various business interests, and to open up parks and furnish free amusements to the public, to guarantee that they would employ a certain number of men at wages generally higher than paid by the local mercantile interests, and that they would give constant and permanent employment at all times to a large number of men, to such a concern the business men of any city in the country would offer a bonus in cash, land for a site, and concessions in taxes; and should such an industry meet with reverses, it would be the common interest to give it general aid. Yet all these things have been done by the average railroad company; but when a railroad is once located and established, it cannot move its interests to a more favorable community, and thereby hangs the tale!

I will now quote from a current number of a magazine:

"Every legislator who, during the past winter, voted to give the enormously valuable street franchises of the cities of Chicago and Boston to private syndicates and corporations committed a crime against the living and oncoming generations. Massachusetts gave the special privileges of the city of Boston away for a quarter of a century, and the state of Illinois gave to a millionaire street car magnate the privileges of the city of Chicago for half a century. The city of Glasgow, Scotland, gives street car service for less than half the amount our citizens have to pay, and yet last year that city netted over \$400,000 above her expenses. The street franchises belong to the citizens, to the society which makes the life of the city, and the giving of those franchises to private individuals is plundering the people of their own to enrich a few multi-millionaires. Our prisons are thronged with people who have been incarcerated for deeds essentially less criminal in nature and essence than those of many men who are now placid Honorable before their names."

It hardly seems possible that such an article can be written in good faith, for if such conditions really exist, what benefit would really accrue from municipal ownership of street railroads, when these city officials whom we are led to believe are more criminal than the inmates of our state prisons would be the very men to guide and manage the public corporation. Under such specious argument it is not surprising that it is further asserted "that corruption can be removed by doing away with franchises, or that when no valuable privileges are to be had, there will be no powerful organizations to corrupt the city, and that no good reason exists why the railroad should not be as well managed under public as private ownership of railroads."

If such statements are the facts and not fancies, is it possible, that in spite of inefficiency and corruption, that the net financial result would be more favorable than any which could be obtained from franchises? I would suggest to writers of such articles that they reform the cities first, and the railroads next, as corruption is a disease that cannot be cured by scattering it or driving it in.

The Citizens Committee of Boston in its report states:

"Public ownership enjoys the benefits arising from the increased efficiency of contented, well paid labor, the economies of combination with other public departments, and the diminished cost per unit that accompanies the enlargement of business, consequent upon lower rates and the larger interest and patronage extended by the people to an undertaking of their own. Combination of the street railways with the gas and electric light plants would lead to large economies, and further co-ordination with highway, police and fire departments would increase the efficiency, safety and economy of all the services involved."

I believe this has been the experience of all trusts, whether formed

by public or private business corporations, and like any other labor saving machine, a combination of effort well directed and guided must lead to success, whether conducted by public or private corporations; but why should a railroad controlled by a municipality receive greater co-operation from police and fire departments more than the private corporation? As tax payers we are entitled to all the protection and assistance to serve the public interests that could be rendered the public corporation.

Again this committee states: "The change from private to public ownership of a great monopoly means a change of purpose from dividends for a few to service for all. This change of purpose is the source of the improvement under public ownership in respect to cheaper transportation, a better paid and more contented ownership, a fairer diffusion of wealth and power, etc. This change of purpose will accompany the change to public ownership here as well as in Europe or Australia, and therefore public ownership of the railways here will cause a movement in the same general direction as in Glasgow."

We will compare Glasgow with Boston. In Glasgow motormen and conductors are paid from 85 cents to \$1.12 for a day of 10 hours; in Boston they are paid \$2.25 for a day of 9 hours; and if Glasgow had brought the employes to the same state of contented citizenship, and made a fairer diffusion of wealth as they already obtain in Boston, the vaunted \$400,000 net would have been "nit."

The value of franchises, the possibility of lower fares or better service, the advisability of city ownership, and all such problems can only be answered intelligently by the results already obtained. In Huddersfield, England, the financial statement does not indicate any great diffusion of wealth from municipal ownership of street railroads. The operation of the lines for the year ending March 31, 1895, resulted in a deficiency of £2,473. Each year of the 14 years of its history this tramway has run at a loss varying from £671 to £16,626 in 1893, involving a total loss of £62,220. This has been met by transferring £20,982 from depreciation account, leaving only £340 to represent the depreciation of 14 years. The remainder of the deficit has been made up by special taxes ranging annually from ½ of a penny to 5 pence in the pound, and costing the rate payers £41,238.

In Leeds the enterprise cost £131,305. For year ending March 25, 1895, tramways show a profit of £133 7s. 5d., after paying expenses, which include interest and sinking fund.

In Plymouth the enterprise cost £50,000. After providing for interest and sinking fund, the tramway in the last fiscal year lost £1,086. In December, 1896, the system had only just been completed. And the employes of these roads are contented citizens at very low wages. A factor which plays an important part in European schemes of municipal ownership is the low rate of interest which they would have to pay on the money spent in purchasing the railroads. This low rate of interest is the will-o-the-wisp, which will lead these advocates of municipal ownership into financial quagmire. The majority of persons urging the public ownership of railroads are moved by a desire to have the city receive large franchise returns; but these desires will not materialize from the facts. In the cost of labor as an index of the cost of city management, we find a situation that is if possible less promising in the matter of street railway operation than that of other managements. About 70 per cent of the operating expense of a street railroad company goes to pay labor—what could the city pay for the same wages? The general experience has been that policemen and firemen are better paid than the average railroad employe, and in many cities after 20 years of service, they can look forward to the retired list. Under municipal control, the railroad employe would not throw away votes, and as for the value of his services, he should certainly receive as much as a policeman. The management of street railroads requires qualities of the very brightest order, and a deficit in these qualities is generally followed by a deficit in the ledger. Most of our managers have grown up in the service, and have served a long apprenticeship in the various departments before attaining their present positions, and if experience counts for anything, they are professionals.

Our city officials are not professionals, as a rule, in matters pertaining to private corporations, and the committee of investigation is straining after an assumed standard of perfection, defective in theory and practice. The city officials serve a composite personality which recognizes neither gains nor losses. On account of the short time of service of the various officers of a municipality, it is impossible for them to acquire more than a superficial knowledge of



the intricate duties and methods of economical administration in serving the wants of the public.

The Englishmen secure poor service at low cost, and all Europe observes a policy which retards the rapid development that all America demands. In this country the street railroad has made it possible for the workingman to own a cheap, comfortable country home, and he can reach his work within the city in 20 or 30 minutes for 5 cents, with a ride of seven or eight miles. In Europe the workingman for 2 cents is transported perhaps a mile in 10 or 15 minutes from a congested tenement house to his work in a thickly populated district, and with an inherited ox-like patience, he waits until a car comes along that has the prescribed amount of room. There is an impression that railroads are generally over-capitalized, but when a real knowledge of facts is obtained, it is found that all roads constructed in the earlier days spent vast sums in the purchase of apparatus, and again, on the reconstruction which was necessary, to give the public the benefit of rapid improvements. This money was honestly expended, and today the public has the benefit of a liberal policy in the clean, well-kept, up-to-date service generally rendered. And the men who have spent their money and time in perfecting this service are entitled to remuneration for both the service in actual operation and those benefits they have made possible throughout the land.

Today every city has its Board of Trade or Chamber of Commerce, composed of men who have the city's best interests at heart. I think that the relationship between the City Council and the Board of Trade should become close, and in all matters pertaining to investment of the city's funds for a financial return, that a committee be appointed from the Board of Trade to advise with the city officials.

The prevalent desire for improvement in all things pertaining to public service will doubtless bring out many advantages not now clearly apparent. But conclusions cannot be jumped at, nor can the end be reached by the action of any one man, or body of men, as conditions are nowhere the same. Even the wind sent by God, which turn our windmills and carry our laden ships o'er the water, at times do us an evil, yet they are, nevertheless, a public benefit.

#### Advantages of Up-to-date Street Railroad Service. Why the Rate of Fare Should Not be Reduced.

BY C. L. ROSSITER, BROOKLYN.

One has only to recall the wretched transportation facilities of horse car days to appreciate the advantages of an up-to-date street railway. We remember the small dimly lighted horse cars, so cold in winter that straw was placed in them to keep the feet warm, and so poorly lighted that it was impossible to read in them. Insufficient horse power frequently made it necessary for passengers to get out and assist the horses on the steep grades. Today over 80 per cent of the street railways in this country are operated by electricity, and millions of new capital have been expended in constructing the necessary new tracks, cars, electric equipment and expensive power houses, so that to ride in one of the modern cars of an electric railway today is a positive pleasure, and thousands of dollars of the income now received by the roads come from this pleasure riding.

The electric street railway today is essential to every city, not less so than its departments of sewers, water and street lighting, and in fact the railroad in nearly every case is the pioneer in all the improvements and building up of the city. The railroad corporations are very frequently looked upon as being antagonistic to the city's interests and both the public and the city are oftentimes inclined to impose unjust burdens and hardships upon the roads; when in fact the capital to construct the railroads is furnished by banks, trust companies and organizations having in their trust the savings of the people. The purchase of a piece of farm land for building purposes in the suburbs of any of our cities is followed immediately by a request upon the local railway to extend its line, and without such extension it will be found that the city itself will be very slow to make expenditures for the improvement of the streets and sewers, water mains, etc., and next to impossible to get the gas and other companies to extend. In support of this statement some figures in regard to Boston are very instructive showing as they do in the case of Brookline, a suburb of Boston, that in the 30 years from 1855 to 1885 the increase in value was from five and one-half millions to sixteen millions, while in the next five years, with the introduction of the street rail-

way, the values increased to thirty millions. Another case that will illustrate this has occurred in Brooklyn. During the year 1896 one of the roads constructed an extension some three miles in length through an entirely new territory where the streets for blocks had not been cut through and no improvements whatever made to the adjoining property. Today, less than a year since the road was opened, there have been over 500 houses constructed, (nearly all of them being occupied as soon as completed) on the line of this street and adjacent side streets. If it had not been for the railroad extension not one of these houses would have been built, and it can be readily seen that it is not the railroad company which will reap the first advantages but the city, which will have increased its assessment roll not less than \$3,000,000 in the present year and the opportunity given to hundreds of individuals of finding comfortable homes. If the city and the public treat the railroad companies justly and fairly there will be no trouble caused by the policy that the companies pursue, as nothing pays better to the owners of the railroad property or to the city itself than to have a railway, up-to-date in its cars, equipment, tracks and facilities. The roads can be trusted as they continue to be prosperous to give the greater part of every nickel that is taken in, to the public, in the shape of good wages to their employes, thus securing competent and reliable men, and also expending, as it can afford to do so, the necessary money for extensions as required, and for new cars and equipment properly maintained, and the companies will continue this policy so long as the public show appreciation of it by patronizing the cars. On the other hand if the earnings of the road are not sufficient to properly and well maintain the property the spectacle of old cars and equipment and negligent employes will be seen, and while this means loss to those who have invested, it is no less a direct loss to the city and the public which has such a railroad. To secure the needed funds for extensions and improvements of our electric roads there must be a perfect understanding between the city and the owners of these properties. If the city places unnecessary burdens and taxes on the roads that can not be met, then those who are called upon to furnish the capital will refuse to do so and the city will be the loser tenfold over what it could possibly gain in any other way.

I believe the street surface railway to be as necessary to a city as its street, sewer, water and gas systems; and if the railways to-day can maintain friendly relations with the city's representatives and give to them and to the public full information as to the financial and physical condition of the properties a much better understanding will be had and the final result will be to secure the good will of those on whom the success of the railroads depend. An up-to-date street railway service pays the company itself, particularly if it has a competitor who is not up-to-date; it pays the city and the public in the immediate benefits they receive in clean, attractive cars, good service and freedom from accidents, and it pays the employes of such a company to be identified with it and to assist in bringing such a result about as well as in good wages promptly paid.

In regard to the matter of fares and why they should not be reduced I want to say at the outset they have been reduced and today the street railways of this country are carrying passengers a longer distance and at cheaper fares than in any other country in the world. The distances in the 10 largest cities in this country where the public is carried for a single fare of 5 cents range from 9.9 miles to 18 miles; this latter in Brooklyn. In horse car days a ride of five miles for a single fare was a long one and the average was below this. The railways in Glasgow, Berlin and some other foreign cities are frequently referred to as furnishing lower rates of fare. This is not so. On the contrary, they are not only much higher, but have many disadvantages which would not be tolerated in this country. The average and usual rate in England is 2 cents for the first mile and 1 cent for each mile thereafter, and this works injury to the laborer and artisan classes. In this country the average rate is from  $\frac{1}{4}$  to  $\frac{1}{2}$  cent per mile and in many cases less than  $\frac{1}{2}$  cent per mile. Abroad five representative cities average 11,000 population per mile of track. Seven of the largest cities in this country average 2,127 population. This means that the laboring classes and artisans abroad are compelled, on account of the high rates of fares of the suburbs, to live in the crowded quarters of the city, to the menace of their health, and this overcrowding and density of population is causing much concern to the cities; while the railroads in this country with five times the track and facilities to the same population give to those who desire it the opportunity of finding comfortable homes in the suburbs where their families can be properly brought up. In the matter of



wages of conductors and drivers, in England they receive 85 cents to \$1.12 per day of 10 hours. In this country the conductors and motormen receive from \$1.75 to \$2.25 per day of ten hours. Very many trips are run on all our roads for the accommodation of the public, on which the revenue taken in does not equal the wages of the conductors and motormen, and the average street railway, with the luxurious and comfortable electric car well lighted and well heated in winter, gives the cheapest transportation in the world.

It has been said that it would be an ideal condition to have the street railways all confined to some lonely field in the remote country where they could be run on time, never crowded, and quite unobjectionable, but quite useless also; but as crowded thoroughfares are unavoidable in a large city and means of transit indispensable, the problem is, how best to accomplish it to the benefit of all concerned. Complaints are made too often without cause and without reason. The fact is that most of the roads are giving better service to the public than they can afford, the trouble being that the people expect too much for 5 cents.

### The Prevention of Accidents; The Best Method to Accomplish this End.

BY H. S. COOPER, SCHENECTADY, N. Y.

If the cause—or causes—of the majority of accidents on street railways be thoroughly and critically examined and analyzed, it will be found that directly or indirectly the personal, human element very largely predominates among them. From an examination of these causes and from my own experience in the matter of handling employes, I have been led to practice the belief that in this personal element lies most of the danger from accidents, and also the means of their prevention, according as to how it is managed.

I do not mean to say that the remedy lies entirely with the human element unassisted, for no matter how good the workman is, he must have tools—and good tools—before his work can be his best. We must supplement our human nature with the most perfect "safety appliances," moral, mental, and material, if we wish to obtain anything approaching entire immunity from accidents for which we are really responsible, or are held responsible. But we may equip our roads from the bottom of the substructure to the top of our poles with the most approved safety apparatus and still have our "holocausts" (as the lay press so appropriately calls them) if we do not give full consideration to the personal element.

By the personal element I mean the whole personnel of the company; not only the motormen and conductors, not only the starters and switchmen, not only the inspectors and repairers, but every one connected with the company; the foremen, superintendents, managers, clerks, counsel, executive officers, board of directors—and I do not know but what I would include the stock and bondholders.

That may seem far-fetched, but let us look at it. If a company inaugurates or perpetuates a policy by which it hires the "cheapest" kind of men regardless of the duties they are to be made to perform; if it pays them only what is compelled by law, by trades-unions or by the competition of other labor-employers; if it works these men longer hours than human beings can endure and remain well balanced; if it works them in unnecessarily uncomfortable, exposed, or dangerous situations; if it gives them difficult and delicate duties to fulfill, and inefficient means or apparatus to perform them with; if it shirks the use of improved safety appliances or methods, and only installs them when the loss from accidents, the force of public opinion, or the hand of legal authority forces it to do so; if it treats its employes merely as a minor and necessary adjunct of its machinery and apparatus; if it does any, or most, or all of these things do you not suppose that the personal element will be a danger element?

On the other hand, let a company hire men of habits and intelligence suitable to the duties that they will be required to perform; let it take care of them in such manner that they will at all times be in condition to exercise their faculties of mind and body to the fullest advantage of their duties; let it give them the proper means and facilities for performing those duties in a perfect manner; let it give them every tried so-called "safety appliance" before adverse circumstances force it to; and I will guarantee that the personal element will be a safety element.

Why? Because the men are better men? Not all that. Because they are more comfortable in the performance of their duties? Not

all that. Because they feel more secure in their positions and the fulfillment of those duties? Not all that either. While all these points have a bearing (and a great one) on the safety element, the real reason, the soul of the whole matter, lies in the fact that one company does not seem to care for immunity from accidents if that immunity causes more trouble and expense, the other proves that it does not want accidents at any cost. The one shows that it does not care for accidents, the other proves that it does not want them. In the first the employes feel that the company does not "back them up" in any safety efforts, in the second one, they feel that the company is "right behind them" in any efforts that they may make for safety, and, conversely, that it is "right on top of them" for any neglect of safety.

That is the real "safety appliance," the feeling that pervades the company from the highest officer to the lowest employe, that the spirit of the company as evinced by all its actions is for *safety*, first, last and all the time. Let that spirit be shown, that policy carried out, in deeds as well as by words, by those officials who are regarded as "the company" and it will permeate not only every employe but the public as well. It will act not only as a preventative of accidents, but as a corrective of their effects when they do occur. With every possible care taken by the company for the safety of its employes and the public will come a greater care of the employes and the public for the company. For what is "the public"? It is you and I! We are the public to anything we are not directly interested in. Who are "the employes"? Just you and I! We are all employes in anything we are directly concerned in!

Now, as the public, how would we act with respect to these two companies? We would believe everything bad that was said or published about the first one and would add our little mite to its damnation whenever possible; on the streets of its routes we would be obstructive; on its cars we would be kickers, obstinate and subversive of its rules; as tax-payers we would be against any concessions to it; as plaintiffs we would be vindictive; as witnesses we would be biased; as jurymen we would be prejudiced. If we were in the "fake" accident business, either as counsel or client, we would pick it out as a "soft thing". It would be "the public be damned" against "the company be damned" and we all know from past experience which can stand that fire the longer.

As to the other company, we might feel all the above, but the facts would be against us, and our adverse feelings and actions would only rebound on us. As a matter of fact, however, we would not feel that way, for you must remember that the public is you and I and better men than any of us. We will probably feel "anti-corporationy", we think we have had good reason to do so in the past, but we are American citizens (actual or in embryo) and as such have very fair average intelligence, therefore when we get it "rubbed into us" that this company is trying to carry us in safety to ourselves, our walking and driving neighbors and the employes, we will—slowly, and perhaps grudgingly—acknowledge the fact, and act upon it. And the difference will thereupon be very evident, to the company.

Now,—as employes—how will we act towards these two? You must remember that as employes we are apt to gain a knowledge of our employer's affairs and actions, that is, as a whole, pretty correct, and we always discuss them thoroughly among ourselves. If any one thinks we don't and won't he will be badly mistaken. Tom may just have been dismissed for leaking information from the office, Dick may have been suspended for being too "informative" to a passenger and Harry may have been bounced for cussing and discussing the company and its affairs in public, but all the same the information will still leak out and the discussion among us will still go on. And what will we say and do in the case of Company No. 1? We will have borne in upon steadily—and perhaps unconsciously—what I heard a motorman in an up town line in New York City say, a few weeks ago:

"We don't give a damn if the company don't! It isn't such a soft job that a man should kill himself to hold his 'posib.' Mebbe they'll learn some sense when the courts an' legislature sock it to 'em a little more!"

You can see that in a company like that the personal element might be a little adverse to safety.

But with Company No. 2 how would we act. Our feeling would probably be that the company was dead in earnest in regard to its determination to avoid accidents at any cost, and, to quote another remark I heard on a street railway:

"If we want to keep in the procession we'd better be gettin' a

move on us an' fall in line or the ol' man 'll be chasin' us with our last pay envelope."

Needless to say that this was not on the same road as the first remark I quoted.

I have spoken before of equipping with "so-called" safety appliances. Now, what are safety appliances? Do they consist simply of the fenders, brakes, switches, signals, etc? Do they not consist of much more than these? Turn the thing around and look at it! Is not every single article we own and operate a "danger appliance?" Is there anything from the cap of our power station chimney to the bottom of our pole-holes that is not a menace to safety if not of the proper material, properly made, and properly operated? Is there a single article in our power houses, car barns, repair shops, lines, tracks or cars that has not at some time or in some place killed, maimed or injured somebody? And what prevents these articles doing so all the time? What prevents our having "holocausts" at the rate of one a minute for the whole 24 hours? What is it that acts as a safety appliance against this mass of "danger apparatus?"

It is the "personal element," that made, that bought, that erected, and that repairs, renews and operates them with a first, if wholly unconscious, thought of safety. Metaphorically speaking, the "personal element" is a chain—the brake chain which our energetic friends the air-brake men are trying so hard to throw into "innocuous desuetude." Like that chain its strength is measured by that of its weakest link. For that chain you do not buy up a scrap of mixed metals because you can do so at a bargain; you buy the very best metal you can obtain for that purpose. Now why not do so in the human chain? From president clean through all the officers and officials down through the employes to the very wipers, we need the very best of the kind. Therefore the first and most important requisite is good men, men who are sober, industrious and reliable in word and deed. These you can not buy in a scrap heap; they are standard goods and have a market value, so if the price you pay for your labor is below the market, don't hug yourselves with the idea that you have struck a bargain, ten to one it is "scrap" and at the first "emergency stop," bang! will go a link or two!

If lead were selling at a cent a ton would you buy it to make brake chains of? No! Why? Because it is not suitable for the purpose, Make your links of suitable metal; fill your positions with suitable men; don't put round men in square holes, or vice versa. If you want the best results in safety the men must be a good fit in their holes. If you find misfits among good men see if the fault is not in the hole. I have seen holes of such a peculiar shape that nothing short of a jelly fish could fill them, and a jelly fish is invertebrate; it has neither backbone nor brains.

See that your chain is a chain and not a handful of loose links; weld link to link with the fire of self interest and the hammer of discipline; make every link feel not only that its safety is dependent on every other link, but that on its integrity depends the safety of every other link and of the chain as a whole. Lubricate the chain; see that there is no unnecessary friction at any point, and especially between links. Friction between links wears two links and is doubly dangerous. Watch, examine, and overhaul your chain; throw out any links that show any undue wear, defects or weakness; remember that the strength of the whole chain depends on that of its weakest link. Keep it bright, free from rust and dirt. Nothing is more dangerous than these two. The depth of the rust is an unknown quantity; from the outside it may seem only a coating and yet be eating clean through the link, and as for dirt, it hides all sorts of defects.

You all have rule-books and bulletin boards. Now, both of these are good when they are good and when they are bad they are the very devil; and nothing will render them so quickly bad as to have dead rules or orders in them. It is very strange, but there is nothing on earth that smells so badly and so quickly and is so contagious as a dead rule, so, if you and a dead safety rule cut it out as quickly as possible; if you don't it will start rust spots on the links sure. If you find a good rule or order dying—as rules will do—of inanition caused by negligence, rub the links briskly with it; that will clean and brighten the links and resuscitate the rule. See to it that the rules and orders are alive in every part of their being. They are part of your safety appliances and are subject to wear, decay and breakage the same as the other parts. Overhaul them, renew, repair, mend and amend them as you would any other part of your machinery or apparatus. Don't let them either wear or decay unnecessarily.

Put up a big blackboard in every department; put one up in the directors' room and in the officers' offices, and when a

safety rule is being slighted, when it is being overstrained, when it has been re-vamped, changed or repaired put up a big "Notice" on the board and call attention to it.

You can go farther than this; if you are about to have something something extra in traffic or in operating; if your city is to have some event that will greatly increase your traffic; if the winter season is coming on with its attendant snow, sleet and ice; if the summer season is approaching with its increase in traffic—seize the opportunity to put a little blood into some of the anemic rules, give them an outing on the blackboard, rub up the links with them, it will do them both good.

In fact it is wise to go even farther than this. Make it a point to see that the safety rules and orders all get an airing once a season or so. If neither regular traffic nor extraordinary events give you an opportunity to give them exercise, do it anyway. "Out of sight, out of mind," is a wise adage!

Now, lastly, don't overstrain the chain or any links of it. If you were buying the material for an actual chain, one on which your safety would absolutely depend, what would you do? You would ask the manufacturer for a guarantee of strength per square inch, of elastic limit, etc., all with the idea as to how much it would stand, and then you would give it a duty far inside of its limit, for you want a "factor of safety"—and a large one. Now when you deal with the material with which our chain is formed, that most sensitive of all materials, human nature, do you do the same thing? If not, why? Probably because you do not like to go to the manufacturer and will not do so even when you die.

It is true, if we want to build an edifice, a machine, a bridge, a car, anything at all on which profits or people are to depend, we require at the hands of the builder or maker a constant factor of safety, and yet when we put into these articles their souls—the human element which is to repair or operate them, which thus holds in its hands the power of life and death, of ruin or success—we treat it as if it were the ultimate ether, without weight, form or physical properties, infinitely strong and elastic! Else why are the employes often worked regularly, hours longer than nature will stand and be recuperative; why are they often worked in positions so uncomfortable, locations so exposed that they can not use their muscles or their minds to any advantage; why are they paid so poorly that their whole waking thoughts are merely schemes to piece out their wages so that they will cover their needs; why are they often treated so unfairly that they lose interest in their work and in their employer; or so unjustly that their interest changes to ill will?

We instinctively allow a factor of safety to everything else—even to so homely a thing as a camel's back, we give the margin of a "last straw" and yet we deny it to the personal element, which needs it most! Is this done from thoughtlessness, or carelessness, or because we honestly believe that this factor is so infinitely great that we may disregard it in our calculations? If the last is the true reason for our neglect how mistaken we are! For there is nothing so capricious, so sensitive, as the personal element, nothing with which we deal has so small and changeable a factor, and the best results as regards safety will be to the company that carefully keeps it a maximum.

Dropping metaphor, the personal element is the danger element. Ninety-nine one-hundredths of the accidents come—not by some *thing* that failed—but by some *one* that caused it to fail by neglecting at some time his safety duty. It may have been the board of directors who were niggardly in their policy; it may have been the president who knowingly carried that policy into effect; it may have been the purchasing agent who bought because "it was cheap;" it may have been some one in the supply department who failed to properly inspect the goods when received; it may have been the heads of any and every department who were lax in discipline, inspection or correction, it may have been the sub's in these departments who took their tone from their superiors, it may have been the men who repair or renew and who did a "that-will-do" job instead of a "that-is right" job, it may have been one of the "operating" men who "forgot" or "didn't think," but it was some one and not some thing that did it.

Some one once wrote something about the "cussedness of inanimate objects," and I have heard that phrase in various forms given as an excuse for accidents. Don't take any stock in it, it is a bald-headed old fraud! If there is or was cussedness in an inanimate object it was induced by an animate object; the "personal element" was getting in some of its bad work.



Ninety-nine out of every hundred accidents which we have had to father, would not have occurred had not some one failed in his safety duty. We may spend any amount of money on improved sand boxes, controllers, switches, signals and the thousand and one new safety devices now being exploited, and the personal element can render them nugatory at the very minute we need them. We can brand our motormen as butchers and the public as blind idiots by putting a contraption of steel springs, canvas and tarred rope on the front ends of our cars and danger will quietly walk in at the rear end in the shape of some small neglect of safety committed long ago by some one at the other end of the line!

The question is how can we change this personal "danger element" into a personal "safety appliance?" The answer is "with good men, suitable men, well paid, well cared for, well equipped, well watched, well disciplined and permeated, saturated, soaked, with what should be the instinct of every member of the company from the president to the track-greaser—the idea of safety as a first thought in every duty they perform!"

### Electric Street Railway Repair Shops.

BY ROBERT DUNNING, BUFFALO.

The equipment of the repair department of the modern street railway is of necessity governed by the same conditions which will obtain in the various other departments. There is, of course, much in common whether the road be of electric, cable or horse power, but as this paper is limited to the electric railway I will confine my few remarks to what in my experience has proved to be the most practical for the proper maintenance of the repairs of that style of road.

The repairs of the electric road which operates twelve or fifteen cars, are, generally speaking, as varied in character as those of a much larger road, but it would be impossible for the small road to maintain a repair equipment equal to that of the large road, so much of their repair work must of necessity be done outside. But it is of the larger road which I speak. The road which operates from 100 to 400 cars.

In the lists of machinery and tools which I have prepared I have aimed to give only those which are most generally useful as the volume of work increases. Many little conveniences for its quick and easy handling will suggest themselves and can be added to the equipment.

The machine shop with its auxiliaries the blacksmith shop, truck shop, and armature room, naturally takes precedence in repair work. The value of a convenient arrangement of those departments and the proper location in each of work-benches and machinery to give full working space cannot be over-estimated. To find that you cannot operate your speed drill press at times, on account of work in the shaper or planer being in the way, is aggravating and unprofitable. In a factory where new work is being turned out, space may be economized, but in a repair shop you know not what a day may bring in to you. A good rule to observe in this matter is to take as much room as you think you will need and then double it.

A lathe equipment consisting of one 24-in., one 20-in. and one 20-in. speed lathe will meet all ordinary requirements of that class of work. The larger lathes should be provided with gib crane fitted with differential air pressure lifts for the safe handling of heavy work.

Two large drill presses 22-in. and 26-in. and one speed drill press will do the work of that department.

The other machinery may be listed about as follows:

- A good milling machine (not necessarily universal).
- A shaper with 16-in. stroke.
- A hydraulic wheel press.
- A pinion press.
- A vertical wheel boring machine.
- An axle lathe.
- A power shearing machine.
- A power hack saw.
- A power thread cutter, right and left.
- A power punch.
- And the necessary bending and shaping machines for sheet iron and tin work.

The grinding work can be done with one dry and one wet grinder, a fine and coarse emery wheel, and there should also be a set of buffing wheels for finishing car and electric fittings.

A babbling furnace and suitably arranged gas or charcoal stoves

are a necessity. The air for blowing these fires may be provided by a tank and pump, operated from a special pulley on the overhead shafting.

The necessary vises and hand tools must be according to the men and work, but in the matter of wrenches I prefer the solid jaw fitted to standard nuts to the screw or set wrench. A good arrangement with regard to tools is to have a special tool room in charge of a competent tool maker, and a check system for the purpose of making the workmen responsible for tools drawn.

In the armature room, besides the necessary work benches and armature stands, a binding machine, a field winding machine and bake oven are essential. A jib crane or overhead trolley with chain falls are necessary for the proper handling of armatures, and a full outfit for testing work completes the outfit.

Have system in the arrangement of work benches. Keeping the different kinds of work separate you will thus avoid the delay and trouble of hunting for mislaid pieces.

The truck shop, besides the usual assembling tools, should have an overhead hand power crane of from 4 to 6 thousand pounds capacity for the safe handling of motors, etc.

The carpenter shop next claims our attention. The same rules which apply to space and arrangement in the machine shop apply here.

The following outfit of machinery will do for all ordinary work:

- 1 planer.
- 1 resurfacing machine.
- 1 jointer.
- 1 mortiser.
- 1 boring machine.
- 1 shaper.
- 1 wood turning machine.
- 1 band saw.
- 1 emery wheel.
- 1 good grindstone.

A first-class man should be in charge of the machinery, who thoroughly understands the grinding and sharpening of tools, and it should be his work to see that not only the machines were kept in order, but also that tools owned and used by workmen were in proper shape.

In the space devoted to work on car bodies see that there is plenty of room for necessary trestle benches and the convenient handling of work. Pit room for half a dozen cars is a necessity. As a means of moving cars an I trucks between carpenter, machine and truck shops, an electric transfer table will be found most convenient.

The paint shop should be constructed so that it will have good roof light, and the width between the tracks should be sufficient to allow the work to be performed on cars standing parallel and not to crowd the workmen; in other words, the gauge lines of tracks should be between 7 ft. and 8 ft., and should be of such capacity so as to have the cars pass through regularly every 9 or 10 months.

The floor should be of concrete with a smooth surface, so that it would be easily kept clean and free from dirt, and should also be graded to be easily drained.

The power for operating the machinery can generally be best furnished by motors in each shop conveniently located, and so set up as to permit of quick substitution in case of a burn out or break down.

Many small repairs which can be done by hand, such as the replacing of trolley wheels, switches, bell or register cords, etc., can be as well done in the car house proper as in the shops, and result in a considerable saving of time, and I think it well to have tracks set aside for this work and have the conductors of cars instructed to run cars in need of certain repairs on to those tracks when coming into the barn, and to leave a note on file in the barn foreman's office stating repairs needed.

In the whole general scheme of repair work there are minor but yet important parts which go to round out and complete the whole. Among these is the pattern maker, a visit to whose den shows many minute reminders of the transitory state of affairs even in the street railway business, and the draughting room where a look through the drawers and pigeon holes reveals many ideas "born to blush unseen" by the outside world.

The management which has the interests of its road constantly in mind will keep ever closely in touch with the repair department. Do not be afraid of doing too much for it. The fault is generally the other way, for though it works in dirt and as a rubbish producer is



unequaled, it is but performing the vital work of renovation, and removing that which is dead and is acting as a clog to the whole system.

I do not wish to create the impression that repair work is the one great and vital factor in street railway economy, but I do wish to claim a high place for it.

Look well to the repair department.

### Street Car Wheels; Shall They Be Made Heavier?

BY F. D. RUSSELL, ROCHESTER.

It seems to me this might be better handled by some practical street railway man, the user of the wheels, than by the maker, for the one knows from actual experience what is needed, while the other can only get his knowledge second-hand, as it were, from observation and by keeping in touch with what is going on. However, to see what can be done with the subject by the maker, suppose we first glance at the motors, beginning with the earliest, their weight and power, and then at the character of the service, and see what is now required of wheels.

Mr. Sprague's Richmond motor, of the summer of 1888, which I understand is the same as Edison No. 6, had 15 nominal horse-power and could work up to about 23 under favorable conditions. Its weight was about 1,700 lbs. and it required a  $3\frac{1}{4}$ -in. axle. The F. 30, another double reduction motor of 1888, was rated at 20-h. p., could develop 30 and weighed 2,200 lbs. The S. R. G. of 1891 and the W. Ps. 30 and 50 of 1892, as also the G. E. 800 and G. E. 1,000, which brings us to the spring of 1896, together with the Westinghouse motors of corresponding period, are so well known to all of you that I will not go into detail regarding them, further than to say, that by the spring of 1896 we arrived at 35 to 50-h. p. motors, nominal capacity, and weight of 2,100 to 2,400 lbs., using  $3\frac{1}{4}$  or 4-in. axles. I understand the Westinghouse Company has made a special  $6\frac{1}{2}$ -h. p. motor for Pittsburg, using 4-in. axles, and that there is a G. E. 51 rated at 80-h. p., competent to work up to 120, and weighing nearly 4,000 lbs., this uses  $4\frac{1}{4}$ -in. axle. Of course there are larger motors, but this is about the limit at the present time for street car service. I confine myself for purposes of illustration to these two lines of motors, and no neglect is intended toward any other makes.

With the development of the motors the possibilities of electric traction have appeared and been realized, and it is literally beyond the power of anyone to foresee to what extent the electric motor will further revolutionize travel within the next to years. I speak of a period of 10 years to come, because 10 years ago, beyond some cable lines in big cities, storage battery experiments in New York and Philadelphia, and some few overhead lines, the "Hay" motor reigned supreme. At the 1888 Convention of the National Association at Washington, although everybody was on the qui vive on mechanical traction, the principal power was still horse or mule. I well remember how Mr. Sage, of Easton, Pa., amused everybody, and also voiced the general sentiment, when, after listening the better part of two days to papers and discussions on all sorts of mechanical traction, he suddenly came to his feet with the demand for information on what he and others actually had to deal with, viz., the horse and how to use him. Cable, he said, was only for big lines, and electricity for those who could afford to experiment. For himself, he wanted to compare notes about feed, stable, harness, and horse matters in general, whereas he had not heard a word about horses since he arrived, and that was what he came for.

That is nine years ago next month. Now, if you please, just look for the horse railways, and see how many you can find. Outside of New York city, practically all the lines have been changed over, one of the last to reconstruct being Charleston, S. C., this season, and I may add, we furnished the wheels and axles.

In addition to the general change, an entirely new class of road has come into existence. I refer to interurban lines, making fast speed, and competing successfully with the old established steam roads.

While, of course, the motor car required at the outset a different wheel from the horse car, the change would not be so marked if motor cars, as in horse car days, remained within corporate limits, within which it is necessary to run at moderate speed, but now they either lead to suburbs or from town to town, and it is in the outside limits or between places where the speed is made, and the speed a wheel has to make has much to do with the kind of wheel required.

Of course motor wheels have been undergoing during the last nine years a somewhat similar development to that of the motors, trucks and cars, and may be said to have kept pace with what has been required of them. Our first 30-inch motor wheel weighed about 250 or 260 lbs., and our first 33-in. was a 300-lb. wheel, and, I may add, this is a good pattern yet, for moderate sized cars at not over 15 or 18 miles. These photographs show both sides of this wheel. Next we came to 280 lbs. for the 30-in. and 335 lbs. for the 33-in., and then, which was about four years ago, to 300 lbs. and 350 lbs. respectively, and remained at that for a couple of years or so, with the exception, of course, of special lots from time to time. These photographs show the latter.

About a year and a half ago, at the desire of our general sales agent, George G. Morse, of Taunton, Mass., I made with him a tour of discovery through Maine and other parts of New England. Mr Morse was supplying our wheels to practically all that section, and I may say that the visit was a revelation to me as to fast interurban service. Although our wheels were performing the work well and satisfactorily, we added on my return about 30 lbs., to wheels for that kind of service, which brought us to 370 or 380 lbs., and these are photographs of a very competent wheel of that weight. We also brought out a 400-lb. wheel, having eight spokes or arms instead of the usual number of seven, for fast, long runs, also snow plow and snow sweeper and sprinkler service.

These are all 33-in. wheels. On 30-in., we now run about 325 lbs., sometimes to 335 and 350 lbs., but 335 is probably heavy enough for a 30-in. wheel.

I do not wish to be understood that more weight is in any sense desirable. The lighter the wheel, in fact the lighter the whole equipment within limits, the better it is for the roadbed. The service is bad enough for the tracks as it is, without adding any more weight than is absolutely necessary. A comparison of the weights of the motors will show that the increase has been mainly in capacity. Take for example, two Westinghouse motors, viz., the 15-h. p. of 1890, and the 50-h. p. of 1896. These both weighed 2,400 lbs. And so it has been with us to an extent. There is a great deal in the manufacture of a wheel besides the mere question of weight. The question of the pattern, the careful proportionment of all parts to obviate strains in cooling, the mixture, and treatment of the iron, as well as the annealing of the wheels, not to mention any number of minor things, which have to be watched carefully, all these must be combined to produce a thoroughly reliable wheel.

For instance, here is a photograph of a solid plate wheel, weighing 450 lbs, this style of wheel, which is known as a single plate, being preferred in certain quarters. Now I have practiced on plate wheels to my heart's content, and I am satisfied that the pattern shown in this other photograph, viz., our special eight spoke, open-plate wheel, is infinitely stronger and better in every way on 400 lbs. of weight than any form of single plate wheel weighing 50 lbs. more.

To sum up briefly, and taking the 32-in. wheel for a standard, our conclusion is that 380 lbs. to 400 lbs. on  $2\frac{1}{4}$ -in. and  $2\frac{1}{2}$ -in. tread is not any too much for the present service.

There are two factors which try the very withers of cast iron wheels. One is the twist or torsional strain as the motor drives the wheel, and the other is the heating of the periphery of the wheel from the friction generated by high speed, or continued application of the brakes. This latter I firmly believe is the hardest part of the service required of a motor wheel, because it tends to expand the rim, and set up a severe stress where the arms, which remain cool, unite with the rim. All our patterns are designed to resist this strain.

Now, gentlemen, if you will allow me a moment or two longer, I wish to say a few words on the subject of standards, axle standards, I mean, for the wheels, in tread and flange, are gradually approaching as near to a standard as the varying conditions of service will admit.

Perhaps some may think I am going beyond my province in touching upon axles, but let us see.

Lately we purchased about 1,000 bars of steel for axles, partly to protect our present requirements, and partly because the advance agent of prosperity had taken so long to come around that we thought he might actually do so, and run up the steel market for us. We know how you all like to have any of the supply men raise prices, and we know, also, that when you want axles, you want them at once. You do not like to wait a fortnight, or three weeks while we send to the mill for the necessary steel. Hence, we try to anticipate what our friends are likely to want, and, I do assure you, it was

nothing short of a Chinese puzzle to make up a list which would properly cover our needs.

Taking the trucks in order of length of axle, (then no one need object to the order in which he is mentioned,) we have

|                   |      |                                                                                 |
|-------------------|------|---------------------------------------------------------------------------------|
| Taylor            | axle | .....6 ft. 3 in. long.                                                          |
| Peckham           | "    | .....6 " $4\frac{3}{8}$ " long, and he also has a<br>6 " $6\frac{3}{8}$ " axle. |
| Brill             | "    | .....6 " 5 " long.                                                              |
| McGuire           | "    | .....6 " 5 " and also 6 ft. 6 in.                                               |
| Bemis & Baltimore | "    | .....6 " $5\frac{1}{2}$ " long, and                                             |
| Diamond           | "    | .....6 " $5\frac{1}{2}$ " long.                                                 |

I have not at hand the lengths of the Dupont, or Dorner & Dutton, or any other axles not mentioned in above list, but you can depend upon it, they are different.

The foregoing lengths are on standard gauge and usual tread, which means not exceeding  $2\frac{1}{2}$  in. All, I believe, are subject to variation where wheels have tread wider than  $2\frac{1}{2}$ -in., and, of course, far wider and narrower than standard gauge.

My idea in speaking of these varying lengths of axles is to suggest whether you cannot get together and establish a standard axle, and by amicable arrangement with the various truck makers, bring about the adoption of a standard length of axle, a standard journal, a standard brass and a standard box.

The Master Car Builders of the steam railroads long ago took exactly such action, and it is nothing new which I suggest. They have a uniform standard. Their axle is 6 ft.  $11\frac{1}{4}$  in. long, and the journals and boxes and brasses are interchangeable the country over. If they could establish such a standard, why cannot street railways arrange for the same? Instead of interfering with the interests of any truck maker, it seems to me it would benefit, and it certainly would simplify matters enormously for everybody concerned.

#### The Banquet.

The banquet at the International was a very enjoyable affair and the toasts bright and witty. Hon. W. Caryl Ely, of Niagara Falls, presided. The program was as follows:

|                                                      |                                    |
|------------------------------------------------------|------------------------------------|
| Welcome.....                                         | Hon. Arthur C. Hastings.           |
| The Empire State.....                                | Hon. James M. E. O'Grady.          |
| Street Railroads from the Consumers' Standpoint..... | John Kendricks Bangs               |
| Our Hosts.....                                       | Hon. Edmund O'Conner.              |
| The Railroad Commissioners.....                      | Hon. Ashley W. Cole.               |
| Niagara of Today.....                                | Hon. Thomas V. Welch.              |
| Our Trans-Atlantic Visitors.....                     | { William Murphy.<br>J. B. Cannon. |
| The Association.....                                 | John W. McNamara.                  |
| The Railway Press.....                               | J. H. McGraw.                      |
| The Ladies.....                                      | J. H. Stedman.                     |

#### DELEGATES OF STREET RAILWAY COMPANIES.

Boyle, John W., Pres. Utica Belt Line St. R. R., Utica.  
 Brewster, J. C., Supt. N. F. & S. B. R. Co., Niagara Falls.  
 Cahoon, J. R., Geo. Mgr. Elmira & Horseheads Ry. Co., Elmira.  
 Clark, J. P. E., Gen. Mgr. Binghamton Railroad Co., Binghamton.  
 Cooper, H. S., Schenectady Ry. Co., Schenectady.  
 Cole, Wm. W., West Side R. R. Co., Elmira.  
 Cleminshaw, Chas., Pres. Troy City Ry., Troy.  
 Danforth, R. E., Buffalo, Bellevue & Lancaster Ry., Bellevue.  
 Deming, Peter C., Supt. Buffalo Railway Co., Buffalo.  
 Ely, W. Caryl, Pres. N. F. & Buffalo Ry. Co., Niagara Falls.  
 Evans, H. C., Nessen Electric R. R., Brooklyn.  
 Feeley, Thomas H., Buffalo, North Main St. & Tonawanda Ry. Co., Buffalo.  
 Haveon, Wm. E., Supt., Citizens St. Ry. Co.; Fishkill-on-Hudson.  
 Heller, W. A., Lewiston & Youngest Frontier Ry., Lewiston.  
 Hill, Chas. B., Niagara Falls & Susq. Bridge Ry.  
 Johnson, A. L., Pres., Nassau R. R., Brooklyn.  
 Johnson, Henry A., Metropolitan St. Ry. Co., New York City.  
 Morgan, Godfrey, Buffalo St., Main St., & Tonawanda Ry. Co., Tonawanda.  
 Marshall, C. K., N. F. & B. Ry., Niagara Falls.  
 McCabe, Ambrose P., Metropolitan St. Ry. Co., New York.  
 Mooney, F. P., C. & H. Traction Co., Cortland.  
 Maloney, F. G., Electricia, Elmira & Horseheads Ry. Co., Elmira.  
 Maffitt, John H., Rapid Transit Ry. Co., Syracuse.  
 McCormack, J. H., Gen. Supt. Brooklyn Heights Ry. Co., Brooklyn.  
 McNamara, John W., Albany Ry. Co.  
 Newton, Henry S., Syracuse Rapid Transit Ry. Co., Syracuse.  
 O'Connor, Edmund, Att'y of Association, Binghamton.  
 Porter, B. W., Saratoga Traction Co., New York.  
 Porter, Alex. J., Director, N. F. & S. B. R., Niagara Falls.  
 Penington, T. C., Sec'y Am. St. Ry. Assn., Chicago.  
 Rogers, G. T., Pres. Binghamton R. R. Co., Binghamton.

Slifey, Geo. H., Nassau R. R. Co., Brooklyn.  
 Smith, Chas. H., Supt., Troy City Ry., Troy.  
 Stedman, J. H., Rochester Ry. Co., Rochester.  
 Story, C. B., Hoosick Ry. Co., Hoosick Falls.  
 Seixas, E. F., Amsterdam St. Ry. Co., Amsterdam.  
 Van Horn, Hart, N. F. & B. Ry., Niagara Falls.  
 Van Etten, Amos, Kingston City Ry., Rondout, N. Y.  
 Wheelley, W. W., Brooklyn Heights R. R. Co., Brooklyn.  
 Watson, Henry M., Pres. Buffalo Ry. Co., Buffalo.

#### OTHERS PRESENT.

Anderson, Edger P., Dublin United Tramways Co., Dublin, Ire.  
 Beeton, S., Dick, Reese & Co., Hove, Sussex, Eng.  
 Anderson, Wm. Sec'y and Man'g'r Dublin United Tramways Co., Dublin, Ire.  
 Baker, Frank M., R. R. Commissioner, Owego, N. Y.  
 Cole, Ashley W., R. R. Commissioner, Albany, N. Y.  
 Coonan, J. B., Dublin, Southampton, Barcelona & Tramway Union Co., London, Eng.  
 Donn, Geo. W., R. R. Commissioner, Binghamton, N. Y.  
 Dickinson, Alfred, European Tramways, Birmingham, Eng.  
 Flett, George, Managing Director, Dick, Kerr & Co., London.  
 Morphy, J. F., Dublin Tramways, Dublin, Ireland.  
 Murphy, Wm. Martin, Dublin & Belfast Tramway, Dublin, Ireland.  
 Nicholl, T. J., Rochester Ry., Rochester, N. Y.  
 Phillips, W., Niagara Falls Park & River Ry., Niagara Falls, Ont.  
 Read, John A., Tonawanda R. R. Co., North Tonawanda, N. Y.  
 Esteb, F. A., Pres. R. D. Nuttall Co., Allegheny, Pa.  
 Sharp, Edward P., Manufacturer's Agent, Buffalo, N. Y.  
 Smith, Pemberton, N. Y. Car Wheel Works, Buffalo, N. Y.  
 Shippy, H. L., John A. Roebings Sons Co., N. Y.  
 Waite, E. B., Tonawanda R. R. Co., North Tonawanda.  
 Wood, Chas. N., R. D. Nuttall Co., 31 State St., Boston, Mass.

#### REPRESENTATIVES OF MANUFACTURERS.

Allison, Giles S., St. Louis Register Co., 18 Broadway, New York.  
 Aeb, A. E., Pennsylvania Steel Co., 2 Wall St., New York.  
 Adams, H. E., Central Electric Co., Chicago, Ill.  
 Beach, R. H., General Electric Co., No. 41 Broad St., New York.  
 Clark, Wm. J., General Electric Co., New York.  
 Duell, C. H., Vice-Pres., Peckham M. T. & W. Co., New York.  
 Dutton, W. A., Cleveland.  
 Evans, H. C., Johnson Co., New York.  
 Feeley, Thomas H., General Electric Co., Buffalo.  
 Grenger, J. A., New York Car Wheel Works, New York.  
 Hanna, J. A., Peckham M. T. & W. Co., Chicago.  
 Haskell, G. W., J. G. Brill Co., Philadelphia.  
 Hollbrook, Percy, Weber Joint Manufacturing Co., Cotton Exchange, New York.  
 Jackson, Geo. J., Sec'y National Conduit & Cable Co., New York.  
 Lawless, E. J., American Car Co., No. 115 Broadway, N. Y.  
 Long, E. Y., Peckham Motor Truck & Wheel Co., New York.  
 McTigue, J., General Electric Co., New York.  
 Merens, H. T., Gen. Sales Agt. Corning Brake Shoe Co.  
 Morris, Elmer P., McGuire Mfg. Co., No. 35 Cortland St., New York.  
 MacGovern, Frank, Roessler, MacGovern & Co., New York.  
 Morrell, Frank A., Sterling Supply & Mfg. Co., New York.  
 Mason, Geo. T., The Okoite Co., New York.  
 Peckham, E., Pres. Peckham M. T. & W. Co., New York.  
 Potter, D. F., Gen'l Electric Co., Buffalo, N. Y.  
 Pugh, D. W., Stephenson Co., New York.  
 Polk, R. K., Wm. Wharton, Jr., & Mfg. Co., Philadelphia.  
 Racson, H. N., Consolidated Car Htg. Co., Albany, N. Y.  
 Randall, T. C., Eastern Agt. Christensen Eng'ng. Co.  
 Sheble, Franklin, Edison-Brown Rail Road, Philadelphia.  
 Swao, O. W., John A. Roebings Sons Co., New York.  
 Teobroek, Wm. H., Diamond Truck & Car Gear Co., Kingston, N. Y.  
 Vosburgh, A. C., New Process Rawhide Co., Syracuse, N. Y.  
 Vincent, C. A., Vice-Pres. Ball & Wood Co., New York.  
 Walsh, C. N., McIntosh, Seymour & Co., New York.  
 Watson, H. D., Edw. P. Allis Co., Milwaukee.

#### REPRESENTATIVES OF THE PRESS.

STREET RAILWAY REVIEW, F. S. Kenfield.  
 Street Railway Journal, James H. McGraw, W. H. Taylor,  
 Electricity, Charles D. Shain,  
 Electrical Engineer, T. C. Meritt,  
 Electrical Review, Chas. W. Price,  
 Electrical World, L. H. Parker,  
 Western Electrician, J. B. O'Hara,  
 Stenographer, T. E. Croesman.

Wednesday was chiefly spent in inspection of the various electric lines and power plants, the party taking special cars, crossing to the Canadian side and passing down the river returned via the Gorge Route. The cars used on this trip were equipped with Christensen air brakes, and the numerous curves and heavy grades afforded ample opportunity for the excellent demonstration which was made. The trip was a highly enjoyable one, and no effort spared by the local roads and officers in the entertainment furnished their guests.

G. Tracy Rogers was re-elected president; all the other officers were re-elected except that J. T. Dunning, of Rochester, who succeeds Mr. Beckley as second vice-president. The next meeting will be held in Brooklyn.

**\$2,000,000 IN FOREIGN ORDERS.**

American street railway supplies to the value of \$2,000,000 are being purchased for shipment across the water to be installed on the new electric lines at Barcelona and Madrid, Dublin, and other places. The delegation of visiting engineers and tramway officials who are here for that purpose include A. Dickinson, a well known tramway engineer; George Flett, joint managing director, and Walter Rutherford, manager of the electrical traction department of Dick, Kerr & Co., London, and William Anderson, managing director of the Dublin Tramway Company.

Mr. Dickinson is consulting engineer for the Madrid and Barcelona roads, and has already placed several large orders. Among which may be mentioned Brill trucks for both lines; and five 750-h. p. Allis engines. At this writing the order for 160 motors and five 500-k. w. generators has not been closed. Mr. Anderson will do the buying for the Dublin road.

It is significant that these large orders are sent to this country, and is evidence that the constructing engineers across the water are pursuing the wise policy of profiting by the experience of American roads instead of experimenting, and that they are buying here in the full assurance that they are securing apparatus which is true and tried and on the performance of which they can absolutely depend. It is but reasonable that our American builders which have spent hundreds of thousands of dollars perfecting their apparatus, and with thousands of miles of electric lines in operation on which to study conditions and early failures, should have worked out all the weak points, and arrived at a position of par excellence, not possible to foreign manufacturers.

**MORE EXHIBIT SPACE AT NIAGARA.**

As we go to press we learn of the return from Niagara of Secretary Penington, of the American Street Railway Association, where he secured an enlargement of the exhibit building by which 2,400 square feet additional space is made available. Mr. Penington states every inch of it has been taken and that the display will be very large and interesting.

It is stated that the Realty Syndicate, which has consolidated three of the street railway systems of Oakland, Cal., is now negotiating for the Piedmont and Broadway lines.

A heavy wire guy rope of a derrick fell across the trolley wire on one of the lines of the West End Street Railway of Boston and was melted in two by the arc formed.

The Englewood & Chicago Electric Company and the Calumet Railway Company have each issued orders that bicycle riders and their wheels may be carried for one fare at the discretion of the conductor.

The City of Atlanta, Ga. has given notice that application will be made to the state legislature for an amendment to the city charter, so that it will be empowered to regulate transfers and other street railway questions.

E. R. Robinson has filed a bill in the United States circuit court for an injunction restraining the Chicago City Railway Company from using car wheels which he alleges

are similar to the pattern upon which he has applied for a patent. There are 6,500 such wheels in use on the City railway.

New tickets have been issued by the Cleveland City Railway Company as the old tickets were being counterfitted in great numbers. It is supposed that some one had stolen a plate in Chicago where the old tickets were printed.

The Anderson Street Railway Company had a well sunk beside the power station in hopes of striking gas, but salt water was the only product when Trenton rock was reached, and the company abandoned the attempt to secure cheap fuel by drilling.

George B. Pennock, the professional inventor, has turned his attention to street railway lines and with his "voltage distributor" will do about 1,000 times as much work as the ordinary system. We have yet to hear of a company which wishes to effect this great saving.

E. C. Crosby, principal owner of the electric railway at Springfield, Vt., has refused to continue as president of the Battleboro Street Railway but his successor has not been chosen. There is considerable friction between the railway officials and this was the cause of Mr. Crosby's resignation.

A train of six cars of the Zanesville (O.) Railway & Electric Company speeded down the incline from the "Y" bridge and struck an approaching train, injuring five passengers, two of them were fatally hurt. An hour later a car jumped the track maiming two passengers so that they will die and seriously injuring two others.

The Lorain (O.) Street Railway Company is to have some high speed motor cars, equipped with four 50-h. p. motors. A trip was made over the tracks of the Cleveland & Elyria Railway Company by one of the new motor cars and a speed of 40 miles an hour was attained. It is expected that this can be increased to 50 miles per hour.

Six Manayunk, Pa., boys played a joke on the Wissahickon Electric Railway Company by greasing the tracks for a considerable distance but the boys see no humor in the trick now, as they are in jail. One of the cars began to slip backwards on the greased rails and it was with difficulty that a collision with a passenger train was prevented.

The office force of the Twin City Rapid Transit Company took their annual outing, the trip being a trolley ride to Fort Snelling, Como Park, Minnehaha Falls and Lake Harriet. At the latter place the party, numbering about 50, enjoyed a sumptuous repast. Instrumental and vocal music was furnished by the Apollo mandolin trio, and the whole trip was full of enjoyment.

John B. Hoefgen has commenced suit against the East Liverpool & Wellsville Street Railway Company, et al, in the common pleas court at Cleveland, O. He alleges that the interest was not paid on the bonds April 1, 1895 and the stockholders declared the bonds due and foreclosed the mortgage. On 249 \$1,000 bonds Mr. Hoefgen received \$79,630, and having sold the bonds for \$249,000 there is due him the sum of \$169,370 and interest, \$37,350. The plaintiff asks that all stockholders be made responsible for the debt.



## BRILL "UNIVERSAL" TRUCK.

The ordinary four-wheel non-pivotal truck, when used at high speeds under large cars, is destructive to the track and roadbed and uncomfortable for passengers on account of its excessive and violent motion, besides being exceedingly noisy. It is also severe on the car body, which is rapidly shaken to pieces.

The truck illustrated is a new form of the pivotal type, designed to take the place of four-wheel non-pivotal trucks on long car bodies. It is called the "universal," and is a modification of the "perfect," or No. 27, and also has certain features of the maximum traction truck. It is intended for use under cars of all kinds where a pivotal truck is an advantage. The objections to pivotal trucks of the usual patterns are numerous, and, being very difficult to meet, really prohibit their employment in most cases for street railway service.

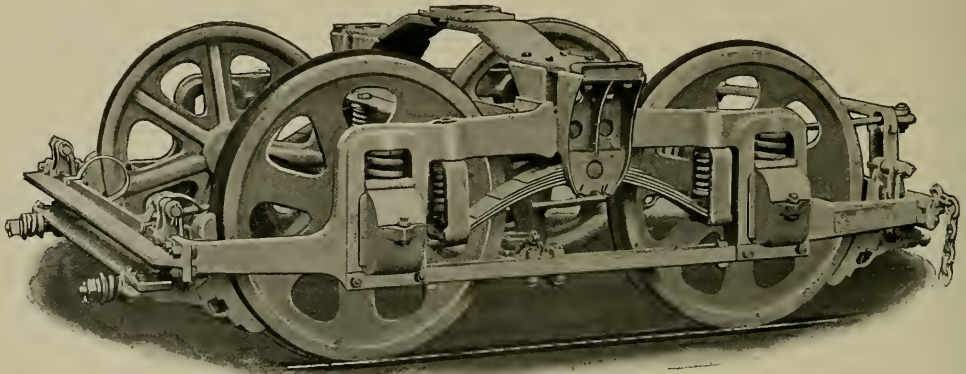
A long wheel base has been considered necessary in

or closed, without adding to the height of the car, there being ample space to swing on the shortest curves.

A long half-elliptic spring on each side of the truck acts as an equalizing bar, the ends being carried in the spring swinging link cases, which are hung from the frame by ball and socket joints. All the weight except that of the wheels, axles and boxes is carried on the springs on the journal boxes, and this together with the arrangement of the bolster and equalizer makes an easy riding truck.

The braking apparatus has been designed with a view to prevent the kicking up under the action of the brakes which is characteristic of the ordinary equalized swing beam truck. Also, the braking pressures are graduated to the weights on the wheels to prevent skidding the non-driven wheels.

The "universal" truck was first adopted by the Consolidated Traction Company of Jersey City, which ordered 50 trucks at first and soon followed with an order for 100 more.



BRILL NO. 27-D.—THE "UNIVERSAL" TRUCK.

pivotal trucks in order to give the motors space between the axles and the bolster transoms. If the wheel base is made short the motors come under the bolster, and it has to be greatly elevated to obtain proper clearance. These conditions prevent a pivotal truck of the ordinary form being used, because, in the case of the closed car, the swing of the truck brings the wheels against the sills, and with the open car the swing interferes with the steps. Such trucks can, therefore, only be employed when the cars are very wide or when they are placed very high, so as to necessitate the use of two steps. There are but few places where such cars can be used successfully.

Certain valuable features have been taken from the maximum traction truck and combined with others of the No. 27 truck, thus obtaining the great convenience of the first with the easy riding qualities of the latter.

The weight of the car is carried on side bearings, as shown in the engraving. The truck draws from the centre by means of an elevated plate steel bolster. This bolster is so designed that there is ample room for the motors.

Having thus made space for the motor, there is no difficulty in shortening the wheel base to 4 ft. This makes the truck short enough to use upon narrow cars, whether open

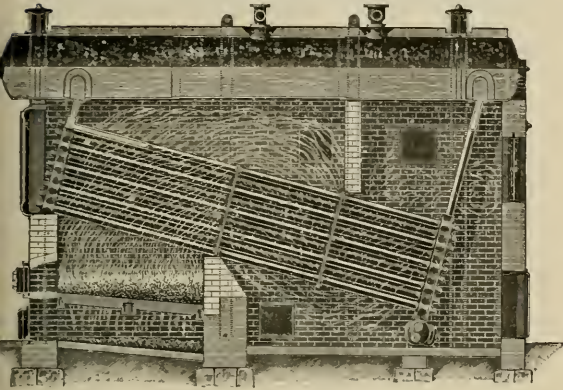
## FORECLOSURE SUIT AT BLOOMINGTON.

The Bloomington (Ill.) City Railway was one of the first to adopt electric traction, and was equipped with Westinghouse apparatus in 1892. J. J. Patterson, the president of the company and his son, who is general manager, were instrumental in building the system and supplied most of the money. First mortgage bonds to the extent of \$100,000 were due June 1 and \$73,000 in second mortgage bonds in July. An agreement was made with the bondholders for an extension for six months without any further action, and later they were notified that arrangements has been made with eastern capitalists to supply the money when the bonds came due in December. After this agreement the foreclosure suit, filed September 1, was unexpected by the Pattersons. It is thought that the bonds can be paid off when the fall term of court opens. No delay in traffic and improvements going on will be occasioned by the prospect of the suit.

A steam header in the power house of the Louisville (Ky.) Railway Company exploded on August 10, doing damage to the amount of \$200. No one was injured.

**CAHALL BABCOCK-WILCOX BOILERS  
CHOSEN.**

The Cahall Babcock-Wilcox boilers, made by the Aultman & Taylor Co., are crowding their namesakes in many



SECTIONAL VIEW OF CAHALL BABCOCK & WILCOX BOILER.

places. A recent instance may be cited in the case of the Staten Island Electric Company, which had been using Babcock & Wilcox boilers and did not wish to change the type, but was not averse to getting what it considered

equally as good for less money. In the recent installation the Cahall B.-W. was installed to the extent of 2,500 h. p. The Union Traction Company, Philadelphia, which has 23,000 h. p. of Babcock & Wilcox has just ordered 500-h. p. of the improved Cahall B.-W. boilers. Some people even go farther and insist that the Cahalls are even superior to the B. & W.'s of the same type, as evidenced by the following letter written to the manager of one of the largest roads in the country, in response to an inquiry as to what had been the experience of the writer in using this boiler. The Pittsburg Wire Company wrote as follows:

"During the past five years we have put in at our works, 2,500 h. p. of Babcock & Wilcox boilers, manufactured by the Babcock & Wilcox Company in New York. We have just put in 500 h. p. of Cahall Babcock-Wilcox boilers, manufactured by the Aultman & Taylor Machinery Company of Mansfield, Ohio, for which Thayer & Co. are general eastern agents.

"We have been requested by the manufacturers of the Cahall Babcock-Wilcox to write you, giving our opinion of the comparative merits of the two makes. We wish to state without hesitation that the most careful scrutiny and examination on the part of our engineers and superintendent reveal the fact that the Cahall Babcock-Wilcox boiler is much better built, more carefully made, and is in fact, superior in design, workmanship and material to the boilers that have been furnished us by the other company."

That the Babcock & Wilcox boiler was and is one of the best of its type, there is no question, and the prices received during the past 15 years have made the owners immense fortunes; but the time has come as it comes to all monopolies, when "there are others," and buyers rejoice and get the advantage.

THE  
**Lake Shore & Michigan Southern Railway**

WILL RUN SPECIAL CARS

On its Limited, leaving CHICAGO

at 5:30 P. M., October 18th,

FOR THE BENEFIT OF DELEGATES AND OTHERS ATTENDING THE

Convention of the American Street Railway Association

AT

NIAGARA FALLS, OCTOBER 19TH-22D.

NO EXTRA FARE ON THIS TRAIN.

This Train Arrives at NIAGARA FALLS in time for Breakfast the following morning.

In order that ample accommodations may be provided and proper assignments made, reservations should be made at an early date.

NEW RECORDING INSTRUMENTS.

A SHORT DESCRIPTION.

The Siemens-Halske Company of Berlin has introduced some new types of recording ammeters and voltmeters, which were described in a paper read before the Elektrotechnischer Verein, and reported in the London Electrician. In Fig. 1 an outline is given of the moving parts of the instrument. A represents the armature pivoted between the

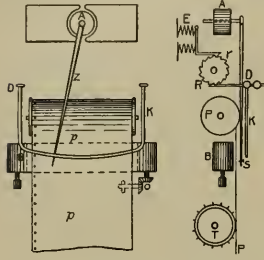


FIG. 1.

two poles, the construction and connections being similar to that of the Weston instruments. The recording mechanism is a unique feature. A strip of plotting paper p is unrolled from the drum P by the wheel T. A point S is fixed to the pointer Z, and is normally at a short distance from the paper so that the movements of the pointer are not impeded in any way. Above the pointer is a hammer K which turns about the bearing D. By means of the electromagnet E and a toothed wheel r and the ratchet wheel R on the same spindle the hammer K is allowed to drop for an instant on the pointer once every two seconds. Beneath the paper is an ink ribbon B and when the paper is

A short description of the Lake Shore & Michigan Southern Railway will not be uninteresting to any one who is thinking of taking a business or pleasure trip from New York, Boston or Buffalo, to Chicago.

This railroad is the only double track line between Buffalo and Chicago, and in connection with the New York Central and the Boston & Albany railroads, forms the only double track route between Chicago, New York City and Boston. It is the most interesting route between the East and West, traversing the richest and finest portion of the Middle States. In the opinion of those experienced in travel, it has no superior in perfectness of roadbed, punctuality and elegant service and the comfort and care of its patrons.

Leaving Buffalo the line traverses the picturesque south shore of Lake Erie through the Western Reserve, passing on its way a large number of very interesting points until it reaches Elyria, O., a city 25 miles west of Cleveland. Here the tracks diverge; the southern line passing by way of Oberlin, O., and the northern line going by way of Sandusky, O. The two lines meet a few miles east of Toledo, O., but make another divergence about 3 miles west of Toledo. One of the lines runs north through the most pleasing portion of Southern Michigan, and the other turns south, traversing Ohio and Indiana, through northern parts. At Elkhart, Ind., the lines meet again and continue west through a rich farming country, past South Bend, La Porte, with its lovely lakes, and traversing the south shore of Lake Michigan, terminate at Chicago.

Wagner vestibule sleeping cars, complete in every detail for comfort, pleasure and safety, are run through between the above mentioned cities. The meals and service of the dining cars are all that can be desired, equalling that at the leading hotels.

Detailed information about the various cars, connections and time tables, will be furnished on application to A. J. Smith, General Passenger and Ticket Agent, Cleveland, O.

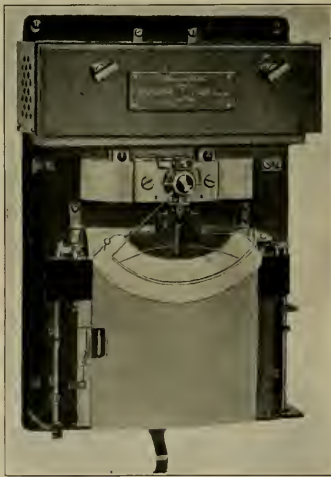


FIG. 7.

pressed against it by the pointer a mark is made on the inside which is visible from the front as the paper is translucent. The ink ribbon is moved by means of the gearing O. The recording mechanism, including the paper, ribbon and clock work can be drawn out from the rest of the instrument without removing the cover. Fig. 2 shows the instrument with the cover removed.

Fare boxes have been permanently adopted by the Tenth Street Cable and the Northeast Electric Railway of Kansas City, after a 30-days' trial.

**\$9.00 ONLY \$9.00.**  
**EXCURSION TO NIAGARA FALLS, ONT.**

Account of opening of the Grand Trunk New Single Arch Double Track Steel Bridge, September 23, 24 and 25.

Three days free open air entertainment. Illumination of the Bridge and Falls and magnificent pyrotechnical display under direction of Prof. Paine of New York.

Tickets on sale September 22 and 23. Good for return until September 27, 1897.

For information as to reservations, etc., apply to L. R. Morrow, C. P. & T. A., No. 103 Clark street, Chicago.

**KLONDYKE. KLONDYKE. KLONDYKE.**

The latest and most reliable information regarding this remarkable region, gleaned from returned miners and others, can be obtained by forwarding a 2-cent stamp and address, to Chas. S. Fee, general passenger agent Northern Pacific Railway, St. Paul, Minn. There are two routes to this region: one via Dyea and Juneau and over the mountains; the other via ocean steamer to St. Michaels, thence via river steamer up the Yukon river. The sailing ports of the steamers in either case are Seattle, Tacoma and Portland. The Northern Pacific through trains carry first-class and tourist sleeping cars and through dining cars.

The West Chicago Street Railroad Company has been selling 11 tickets for 50 cents or 22 for \$1, the conductors having them on sale on the cars. An order has been issued that these tickets henceforth will only be on sale at the office of the company.





Funkhouser & Coates have received the sub-contract to build four miles of the Riverview Electric Railway at Beaver Falls, Pa.

G. S. W. Brubaker, of Lancaster, has received the contract to build four miles of road for the Newtown Electric Street Railway Company, Newton, Pa.

Thomas Dempsey has been awarded the contract to grade the line of the Michigan Traction Company between Battle Creek, Gull Lake and Kalamazoo.

The Tennis Construction Company, E. A. Tennis, president, has been awarded the contract to build the Montoursville (Pa.) Passenger Railway, five miles in length.

The Union Elektricitäts Gesellschaft, Berlin, has published a small pamphlet, illustrating the exhibit of the company at the Hamburg convention of street railway men.

L. G. Hallock has been awarded the contract to rebuild five miles and electrically equip 15 miles of road for the Wheeling & Elm Grove Railway Company, Wheeling, W. Va.

The Parrish Signal Company has been incorporated with \$100,000 capital stock at Jackson, Mich., to manufacture the Parrish electric railway signal, invented by Homer Parrish.

The new catalog of Gisholt tools recently issued by the Gisholt Machine Company, Madison, Wis., is a handsome book of 40 pages, which will be sent to those interested on application.

Vandergrift & Jacobs, of Philadelphia, have been awarded the contract to build five miles of road at Wilmington, Del. for the Wilmington & Brandywine Springs Electric Railway Company.

Macartney, McElroy & Co., of New York, have received the contract to supply overhead material, rails and all iron work for the Brunswick Traction Company's extensions at Bound Brook and Metuchen, N. J.

Construction will be resumed immediately on the Baltimore & Washington Electric Railway. The receivers of the Baltimore & Catonsville Construction Company have been discharged and the company declared to be solvent.

The Western Electric Company's standard trolley wheel has been meeting with great favor among street railway men owing to its careful design and the superior composition of the metal having exactly the right wearing qualities.

Because of the continued increase in the demand for its cut pinions and gears the R. D. Nuttall Company of Allegheny, Pa., has added to its equipment four more new gear cutters, one of which is a bevel gear planer of the latest type.

The Canon City & Cripple Creek Construction Company has been incorporated at Chicago to build an electric railway between two Colorado cities. The capital stock is \$100,000 and the incorporators are Paul E. Hirsch, Henry Frantzen and Sigmund Zeisler.

The Empire Electrical Traction Company has been incorporated at New York, N. Y., to manufacture street railway appliances. The capital stock is \$100,000, and the directors are William W. Doty, William Reinhart and others of New York.

The American Air Power Company is negotiating with the Compressed Air Power Company for a consolidation of the two, which, by their combined ownership of the Hardie and Hoadley patents, would control the manufacture of air motors for street cars.

The Sherbrooke Electric Street Railway Company, Sherbrooke, Que., has let contracts for generators to the Canadian General Electric Company, for closed cars, to Rhodes, Curry & Co., Amherst, N. S., and for open cars to Ahearn, & Soper, Ottawa, Ont.

Simon Harold has received the contract to build two miles of road for the Riverview Electric Street Railway Company of New Brighton, Pa., a new company organized with E. L. Hutchinson, president; F. W. Walker, secretary, and F. G. Barker, treasurer.

The Automatic Life Saving Car Guard Company has been incorporated at Kingston, N. Y., to manufacture fenders. The capital stock is \$25,000, and the directors are John N. Cordts, A. H. Clark, Daniel R. Gillee and G. D. B. Hasbrouck, all of Kingston.

The Standard Underground Cable Company announces that it has opened an office in rooms No. 1225 and 1226 Betz building, Philadelphia, which will be in charge of T. E. Hughes who was formerly manager of the wire department of the company, in New York.

While abroad General Manager Wessels of the Standard Air-Brake Company closed several important contracts for air-brake outfits for use in Continental cities. Among other recent orders are one for 60 equipments for one of the Colonies and a further order for 15 complete outfits.

The American Air Motor Company has been incorporated at Bayonne, N. J., to purchase and control patents on air, steam and electric motors for street cars. The capital stock is \$75,000 and the incorporators are Lucius T. Gibbs and Robert M. Thompson, of New York, and C. C. Garrison, of Bayonne.

A. H. Englund of Mayer & Englund attended the Allentown convention of the Pennsylvania Street Railway Association, and gave to each of his friends a neat box of lead pencils as a souvenir. These are something novel and neat and the firm will be glad to send them to its friends who will write for them.

The new catalog of the Ball & Wood Company, 120 Liberty street, New York, is a very handsomely illustrated book of 60 pages. The demand for its engines has led the company to build them in all the various forms which are used in general manufacturing work, as well as for railway

and lighting service. They include the simple and compound horizontal engines, both tandem and cross-compound types and vertical engines of all sizes. They are built for belt or rope drives and also for direct connected sets. There are included in the catalog several pages devoted to the details of construction and also a description of the method of testing the governors for regulation.

The Cincinnati Street Railway Company has just placed an order with J. A. Hanna, western agent of the Peckham Motor Truck & Wheel Company, for 100 trucks of the 7D type, Excelsior. Less than a year ago the Peckham Company received an order for 175 trucks, and this makes a total of 350 trucks now running on the Cincinnati Street Railway.

Mayer & Englund, Philadelphia, have obtained for Albert & J. M. Anderson of Boston, a large contract for knife switches from the Union Traction Company of their city. These switches are for the switchboard of the new 13th and Mt. Vernon street station. When completed this board will have nearly 300 switches, of capacities varying from 600 to 3,600 amperes.

The Western Electric Company has removed its New York offices to 57-67 Bethune street. Besides the offices this magnificent building will contain stores for the sale of its manufactures and other electrical supplies. The present store in the Thames street building will be continued. Friends of the company are receiving in their mail a good map of lower New York with the location of the new building clearly indicated.

Additional agents for the Standard Air-Brake Company has been appointed as follows: Dick, Kerr & Co., Ltd., the well-known tramway supply people at 101 Leadenhall street, London, E. C., will hereafter be sole agents for the United Kingdom. E.H. Cadiot & Co., 12 Rue St. Georges, Paris, have the agency for France. The Bergische Stahl-Industrie of Berlin, which represents the Standard on the Continent, has already inaugurated a very good business in air brakes.

After a careful investigation of the question, including personal visits to the factory by the master mechanic of the company, the West End Street Railway Company, of Boston, has placed an order for eight double-track snow plows with the Taunton Locomotive Manufacturing Company, of Taunton, Mass. The Taunton Company reports that the snow plow business has opened up this season in a more promising and satisfactory manner than ever before, it having already sold more plows than during the whole of last season.

F. W. Bunts, formerly assistant secretary and treasurer of the Walker Company, has bought out the Cuyahoga Supply Company, dealer in electric street railway and lighting supplies, and general selling agent for Eugene Munsell & Co. and the Mica Insulator Company in Cleveland and northern Ohio. Mr. Bunts will continue the business under the same title as formerly, occupying the offices at 102 Superior street. Mr. Bunts is a young man who has a large acquaintance in the city of Cleveland and vicinity, and his association with the electrical trade will, no doubt, bring to his company a large business. His leading lines, to which he will devote his special attention, will be the "micanite"

specialties as manufactured by the Mica Insulator Company, of New York, Chicago and London, and Eugene Munsell & Co.'s India and amber mica in all of its various forms. The electrical trade of Cleveland and vicinity will find it to their interest to consult the Cuyahoga Supply Company as to their wants, as a large stock of the above lines will be carried ready for immediate delivery.

F. E. Triacca is now associated with J. C. Dolph, as the representative of several large manufacturers of street railway supplies. The name of the firm is J. C. Dolph & Co. and his offices are located at 126 Liberty street, New York. Mr. Triacca is widely and favorably known among electrical men in New York, and Mr. Dolph's acquaintance among street railway men is wide. The company will sell the rail bonds and commutator bars manufactured by the Forest City Electric Company of Cleveland, O., and will represent the Sterling Varnish Company, the Catskill Foundry & Machine Company and the Standard Gate Company.

E. B. Hatch of Hartford, Conn., representing the H. W. Johns Manufacturing Company, has recently returned from a European trip. While in England, he called upon Bergetheil & Young, 12 Camomile street, London, E.C., the foreign representatives of the Johns Company for vulcabeston, trolley line and other insulating materials, and the "H. W. J." electric street car heaters. During the past year the electrical export business of this company has considerably increased, several large orders having been filled for the insulating materials used in the construction of tramways in South America and in Europe.

The Consolidated Car-Heating Company, Albany, N. Y., hands us the following: "On August 25, Judge Putnam, of the United States Circuit Court for the District of Massachusetts, rendered a decision in favor of the complainant, with an order for an injunction and accounting, in the suit of the Consolidated Car-Heating Company of Albany, N. Y., against the American Electric Heating Corporation and the West End Street Railway Company, of Boston, Mass. This is the suit for the infringement of the patent to James F. McElroy, covering the Consolidated Car-Heating Company's spiral coil construction of electric heaters, which is now used in the majority of street cars operating electric heaters in this country. It is considered a most important victory."

Another company has entered the street railway field and is competing for liability insurance covering street railway risks. The new concern is the American Mutual Indemnity Company of Scranton, Pa. The promoters are wealthy bankers, coal operators and manufacturers of Scranton. The concern will transact a general casualty insurance business and it is said that considerable money has been put into the business. The directors are: C. H. Zehnder, president Dickson Manufacturing Company; Charles Robinson of E. Robinson's Sons, brewers; R. G. Brooks, vice-president West Side Bank and Dime Deposit Discount Bank, also a coal operator; W. W. Watson, vice-president Traders National Bank; Elmer H. Lawall, general superintendent Lehigh & Wilkes-Barre Coal Company; E. P. Kingsbury, director Scranton Savings Bank & Trust Company and secretary and treasurer of the Enterprise Powder Manufacturing Company; Alfred Harvey, silk manufacturer and coal operator; A. C. Fuller, vice-president and treasurer of the

Scranton Stove Works; W. S. Diehl of Watson, Diehl, Hall & Kemmerer, attorneys; F. W. Lange and T. R. Brooks, coal operator. The officers are: W. W. Watson, president; Elmer H. Lawall, vice-president; E. P. Kingsbury, treasurer; T. R. Brooks, secretary; F. W. Lange, medical director, and Newton Jackson, general superintendent of agents.

Wendell & MacDuffie, 26 Cortlandt street, New York, report the following sales of snow plows, manufactured by the Taunton Locomotive Manufacturing Company, of Taunton, Mass.:

|                                                     |   |        |
|-----------------------------------------------------|---|--------|
| Brockton, Bridgewater & Taunton Street Railway..... | 3 | plows. |
| Brockton & East Bridgewater Railway.....            | 1 | "      |
| Bridgewater, Whitman & Rockland Street Railway..    | 2 | "      |
| Worcester Construction Company.....                 | 3 | "      |
| West End Street Railway of Boston.....              | 8 | "      |
| New London Street Railway.....                      | 1 | "      |
| Hingham Street Railway.....                         | 1 | "      |
| Norwich Street Railway.....                         | 1 | "      |
| Buffalo Traction Company.....                       | 1 | "      |

This is evidence of the good standing which the Taunton plow has among street railway people, and before the time snow flies, it is not unlikely that this firm may double this list.

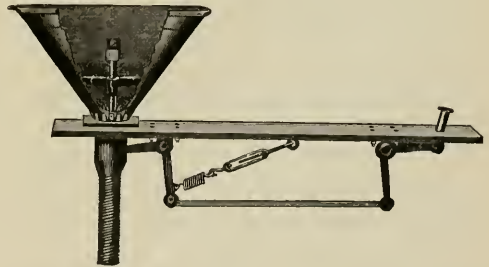
The Hoppes' Manufacturing Company, of Springfield, O., reports quite an improvement in business, within the past few weeks having received orders from the following: Union Traction Company, Philadelphia, three exhaust steam feed water heaters, aggregating 8,000 h. p., for the Mt. Vernon station of this company that was recently destroyed by fire; Henry R. Worthington for the Ridge-wood pumping station, Brooklyn, N. Y., 500-h. p. live steam feed water purifier; Flushing, L. I., 400-h. p. purifier and 400-h. p. exhaust steam feed water heater; East St. Louis (Ill.) Ice & Cold Storage Company, 500-h. p. heater; Kirkhoff Bros., Indianapolis, Ind., 400-h. p. heater; Live Oak (Fla.) Manufacturing Company, 100-h. p. purifier; Argentine (Kan.) Water & Light Company, 150-h.p. heater; Ames Estate Building, St. Louis, Mo., 150-h. p. heater; Miami Valley Railway, Piqua, O., 200-h. p. heater; Bettendorf Metal Wheel Company, Springfield, O., 100-h.p. heater; Excelsior Milling Company, Yankton, S. D., 100-h. p. heater; Taggart & Son, Knoxville, Iowa, 75-h. p. heater.

Recent tests of the plastic bonds that have been in service two or three years at Denver, Col., Newark, N. J., and Richmond, Va., have resulted in several large orders for new work in these cities. The superiority of this bond is further attested by the fact that after long service abroad the bond is specified for the important new lines of the Central London Underground Railway and the Manchester, England, and Sydney, Australia, tramways. Many of the leading American engineers are beginning to realize that an ordinary copper bond fastened mechanically to a steel rail, is more wasteful and unscientific than an overhead line of wire with unsoldered joints. Harold P. Brown of New York who put the plastic rail bond on the market some years ago, reports also a good demand for the E.C.A. bond used to rebond old roads without disturbing the pavement. For roads that wish a reliable copper bond at a low price, he has introduced the Welded Flexible Bond, whose peculiar method of manufacture permits him to sell at more favorable prices than any other type of copper bond with equal conductivity. This bond is quite a novelty in copper work; samples will be sent on application.

C. K. King, secretary of the Ohio Brass Company, Mansfield, O., has just received official notice from the Patent Office, that a patent has been allowed him on a new and improved method of attaching hangers and ears to the trolley wire by the use of rivets or similar means; also on a specific form of a trolley wire splicer. This patent relates particularly to the devices which are adapted for use with figure 8 and similar design of conductors. The Ohio Brass Company has manufactured and sold, under this patent, to electric railways in the United States only, since the first of the year a sufficient quantity of overhead construction devices for figure 8 trolley wire to build 300 miles of single track line. These are giving such universal satisfaction that they are being recognized as a standard by the leading engineers of this country, and are being called for by them in their specifications. This company recently secured through its new Canadian agent, the Northern Electric & Manufacturing Company, Limited, of Montreal, an order for the entire lot of track bonding and overhead construction material, which will be used in the electrification of the Sherbrooke Street Railway Company, Sherbrooke, Que. The other foreign agents of the company are: Edge & Edge, Sydney, N.S.W., Australia; Norsk Elextrisk Aktiebolag, Kristiana, Norway; Scandanavia; E. H. Cadot & Co., Paris, France, France; Naglo Brothers, Berlin, Germany, Germany; Vereingte, Electricitats Actien Gessellschaft, Vienna, Austria, Austria, Roumania & Italy; Sheriff, Swingley & Co., Johannesburg, South Africa, South Africa.

## THE COLUMBIA MACHINE WORKS.

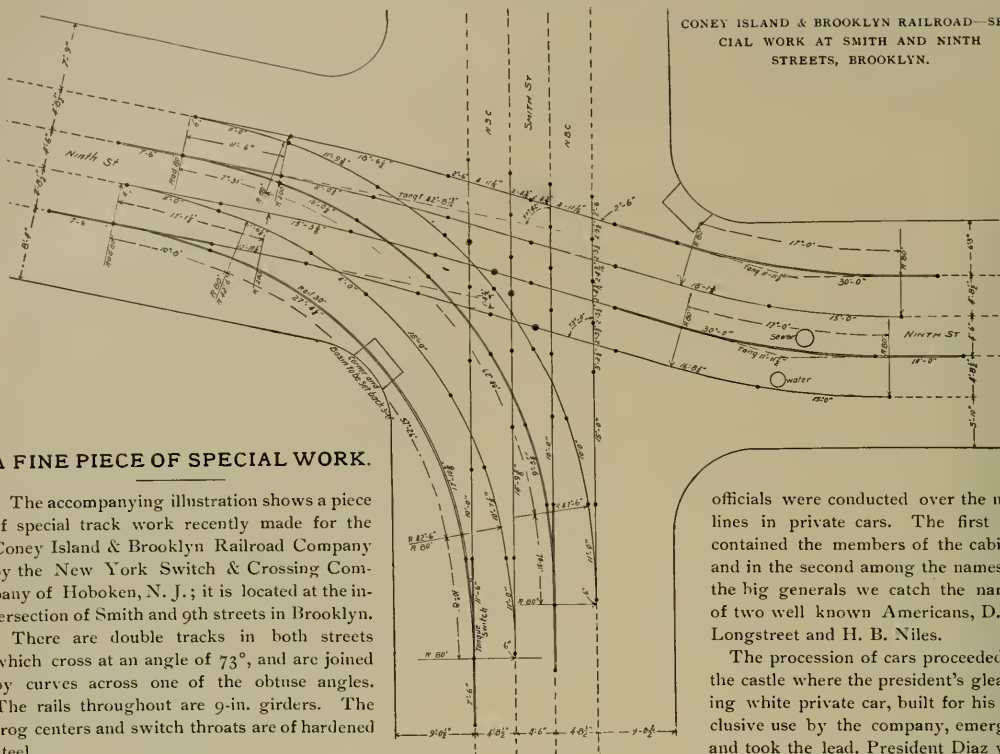
The Columbia Machine Works, Buehler & Platt, of Brooklyn, have taken a new four story building on the corner of Fulton street and Columbia Heights. The machinery formerly belonging to the Scott Electric Lamp Company now out of the business, has been installed here and further additions of new and improved machinery also made. The Columbia Machine Works have thereby removed a com-



COLUMBIA MACHINE WORKS SAND BOX.

petitor and at the same time increased the capacity of their factories. The factory covers an entire block on Doughty street, from Columbia Heights to Furman, and also embraces the numbers 2 to 18 Columbia Heights. The firm manufactures electric railway supplies, which if separated would constitute 12 different lines, all necessary. Among the specialties are commutators, drop forged copper segments, armature windings, trolley wheels, bearings, sand boxes, fuse boxes, switches, brake and controller handles and car trimmings. The office has been removed from 18 Columbia Heights to 18 Fulton street.





CONEY ISLAND & BROOKLYN RAILROAD—SPECIAL WORK AT SMITH AND NINTH STREETS, BROOKLYN.

### A FINE PIECE OF SPECIAL WORK.

The accompanying illustration shows a piece of special track work recently made for the Coney Island & Brooklyn Railroad Company by the New York Switch & Crossing Company of Hoboken, N. J.; it is located at the intersection of Smith and 9th streets in Brooklyn.

There are double tracks in both streets which cross at an angle of  $73^\circ$ , and are joined by curves across one of the obtuse angles. The rails throughout are 9-in. girders. The frog centers and switch throats are of hardened steel.

The "chrome" steel used for this purpose is the best wearing steel known. The fished joints are indicated in the drawing by the solid circles. The four which are marked by double circles are 6-bolt joints 20 in. long.

The method of constructing the work with steel centers is to place the centers and the ends of the rails in sand and pour molten cast iron around them which forms the binder and enables the most complicated pieces of work to be made without bolts.

When the company first began to use chrome steel for centers considerable difficulty was experienced in getting it of the proper temper, so as to be neither too hard nor too soft, but this was soon overcome and the work so made is giving excellent satisfaction. The strong point of the hardened center construction is that the material of greatest resistance is placed where it is most needed.

### PRESIDENT DIAZ INAUGURATES A NEW LINE.

The inauguration of a new street railway line in the city of Mexico is made the occasion of an official and military display which may well fill with envy the heart of an American manager; and judging from the several column account of the event as related in the Mexican Herald, Thos. H. McLean next to the president himself, is about the biggest dignitary in the republic.

The event occurred on Sunday in accordance with the custom of the country, and a large party of military and state

officials were conducted over the new lines in private cars. The first car contained the members of the cabinet and in the second among the names of the big generals we catch the names of two well known Americans, D. F. Longstreet and H. B. Niles.

The procession of cars proceeded to the castle where the president's gleaming white private car, built for his exclusive use by the company, emerged and took the lead. President Diaz was escorted to his car by Mr. McLean,

who with several members of the cabinet entered the president's car. The new line extends several miles out to the suburb of Santa Fe, and during the passage of the excursion cars a good portion of the route was guarded by infantry and cavalry of the regular army. The Herald says:

"The road has very many picturesque features. Yesterday the country looked beautifully green and fresh after the long rains. The view from kilometer 5 is perhaps the most picturesque of any along the entire line. From the windows of the car the passenger commands an immense stretch of country dotted with haciendas, villages and churches and in the far distance, backed by the silver streak of Texcoco, the City of Mexico lifts her diadem of towers. An adventurous feature made this spot still more picturesque yesterday. A party of cavalymen were making a short cut on the hill side and their bright uniforms and gleaming sabres seemed to give just the finishing touch that the eye demanded to the foreground of the picture.

"Each kilometer too has its history for those engaged in the construction of the road. At kilometer 2 Paymaster Smart was bound and robbed in his tent one night by daring miscreants. At kilometer 6 two of the peons fought one morning on coming to work, a step-father and a step-son. The latter hurled a rock at his step-father striking him on the head. The father thereupon ran his step-son through with a maguey leaf, showing the immense strength and penetrating force of that leaf. And so on, Contractor McGavock perhaps and those who worked under him could tell a story about every inch of the road.

"Work was begun on the Santa Fe extension on the 19th of January of this year and was completed on the 20th of July. From Tacubaya to Santa Fe there is a rise of 170 meters. This necessitated in construction a large number of curves or development, as the company was restricted to a  $2\frac{1}{2}$  per cent grade. There are only two level pieces on the entire extension, one of 400 meters and another of 250 meters. The maximum grade as above stated is  $2\frac{1}{2}$  per cent, and the average grade is about 2 per cent. The length of

**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.**

the line is  $8\frac{1}{2}$  kilometers. The longest cut is 1,260 meters, averaging about 4 meters in depth. The deepest cutting is 6 meters. The longest filling is 600 meters, averaging about 3 meters in depth. The deepest filling is 4 meters. The contractor was W. J. McGavock; Juan Mendoza y Roca, chief engineer; D. A. Fletcher resident engineer; J. W. Rogers, superintendent of construction, and Engineer Mariano Tellez Pizarro government inspector. The rock to be handled was tetepate the whole distance, with the exception of about  $1\frac{1}{2}$  kilometers of hard conglomerate in the neighborhood of kilometer 7, which made the work there very hard.

"The president dismounted at the entrance to the village of Santa Fe, where the houses were all gayly decked and their inhabitants showed their enthusiasm by gathering en masse to catch a glimpse of the president, ringing their church bells and letting off sky-rockets and fire-crackers without a moment's cessation from the time that the president set foot in their town to the moment when he reached the grove where the dinner was to be served. The president was received at Santa Fe by the prefect of Tacubaya, Francisco Martinez, by the mayor of that town, Manuel Palafox, by Major Enrique Mondragon, principal of the powder factory, by Colonel Juan Quintas Arroyo, inspector of the powder factory, by engineer Jose Mondragon, by engineer Toribio Liebana and by others of the local authorities.

"The president walked in the direction of the old church, on one side of which is a steep path leading down to the grove where the banquet was to be served. At one point of the route the artillery band was stationed and as the president approached it struck up the national anthem, which was also sung by the young children of the public schools of Santa Fe, who were drawn up in line. The entrance to the grove was guarded by soldiers of the Battalion de Tiradores. Ahead of the president, secretary Felix Reyes of the Santa Fe town council carried a tricolor banner with two hanging ribbons held by little girls, Anita Cutierrez and Sara Castallo.

"The beautiful grove had been tastefully adorned with bunting and flowers and the table was laid alongside the limpid stream which flows through it. The spot is a delightful one, cool and sequestered,

while the imposing old ruins of the hermitage on the hill-side above, with their legends and associations, give a historical interest to the spot."

A magnificent banquet was served at the destination, during which the artillery band discoursed the choicest Mexican selections, and then followed the speeches. Mr. McLean occupied the head of the table with President Diaz. To his many friends by no means the least interesting feature of the banquet was the toast given by Mr. McLean, in Spanish, which greatly pleased the banqueters and caused President Diaz to shake his hand and congratulate him on his good Spanish. Diaz also spoke at considerable length congratulating the citizens on the enterprise of the company and wishing the latter large returns on its investment.

The town of Santa Fe, now numbering some 30,000 residents was founded in 1531, some of the original buildings still remaining in good repair and use.

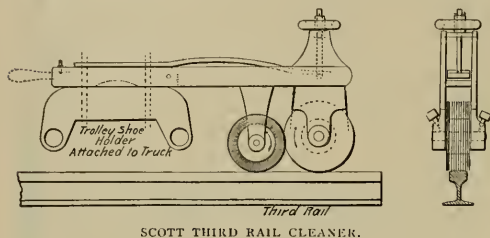
#### A RUNAWAY CAR IN SAN FRANCISCO.

The brakes of one of the Mission street cars refused to act when the car was coming down College Hill. The trolley wheel soon left the wire and the motorman had no possible means of controlling the car, which ran with increased velocity at every turn of the wheels. The motorman remained at his post ringing the gong. The car barely missed a freight train on the San Jose railroad tracks and crashed into the rear of a car at the corner of Mission and 17th streets. Of the 12 passengers aboard seven were more or less seriously bruised or cut.

## REMOVING ICE FROM THE THIRD RAIL.

During the severe storms of last winter the elevated railroads operating by electricity experienced difficulty in making schedule time by reason of the third rails becoming coated with ice, and are now making preparations for effectually eliminating delays from this cause.

The illustration shows a track cleaner patented by Millard J. Scott, a railroad man of extensive experience, which is now being given a trial on the Metropolitan Elevated of Chicago. It consists of an arm bolted to the truck side and



SCOTT THIRD RAIL CLEANER.

projecting over the rail. At the end it carries a cutter, consisting of seven steel disks placed quite close together, to break the ice, and just behind this a wire brush to remove particles thus broken. The tension placed upon the cutting disks is regulated by the hand wheel. When it is desired to throw the cleaner out of action the handle, shown dotted in the illustration, is inserted at the rear end of the beam and by moving a cam the tension is removed from the spring, thus lifting the cutters and brush from the track. When out of action it is locked by a wooden plug. The great advantage of this method of handling the cleaner is that the men are protected against all danger of being burned.

## A GOOD PUNCH.

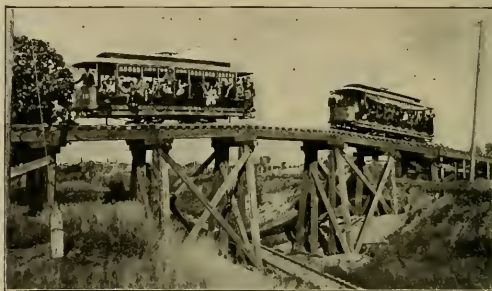
The illustration shows a punch, known as the '98, manufactured by Warren Hill & Co., Hartford, Conn., which is designed for special orders where a long reach is desired; it is made with any reach from 1 in. to 2½ in. and will punch any form of duplex, commutation or transfer ticket. The object which the firm had in view was to produce a punch of an entirely new design and mechanism, and at the same time one adapted to any and all tickets in use, without imitating other makes, and it makes the claims of originality, simplicity, durability and the best workmanship for its goods. The dies are protected by a steel stripper which covers the male die and is arranged so as never to get out of order. The screw at the joint is large and carefully fitted, making a strong fulcrum subject to little wear. Several types of these punches are fitted with magazines for collecting the pieces punched out, thus preventing the by now means uncommon fraud, worked by plugging punched commutation tickets. Any die will be made to order and over 300 designs are carried in stock. John B. Holaday, 174 Pearl street, Hartford, Conn., is the manager to whom inquiries should be addressed.



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## EXTENSION OF MADISON, WIS., LINE.

The Madison City Railway of Madison, Wisconsin, has added to its lines an extension of about two miles from the original terminus on University avenue to the cemeteries. The first car was run on the afternoon of August 9, with Superintendent George H. Shaw, acting motorman. Major F. W. Oakley, receiver, and a party of prominent citizens occupied the car, and the round trip was made as smoothly as if a regular run. The line after leaving University avenue, runs across Breeze Terrace and Monroe road to the pretty little suburb of Wingra Park, located on Lake Wingra. Turning here to the north it passes through private right of way to Mineral Point road, crossing the Illinois Central Railroad on a viaduct and thence to the Protestant and Catholic cemeteries, which are located opposite each other on the Mineral Point road. The route is beautiful, present-



VIADUCT, MADISON CITY RAILWAY.

ing as it does at several points charming vistas of Lakes Monona and Mendota, bordered with fine trees, and dotted with sailing yachts and other pleasure craft. The view from the viaduct is especially interesting, showing the city lying between the two lakes, with the white domed state capitol rising grandly in its midst.

The track is laid with 50-lb. T-rail on 6 x 8 in. x 7-ft. cedar ties, with oak ties of the same size under special work and curves. The curves are all long radius transition, and there are five long radius diamond switches. The overhead line is built of No. 0 copper trolley wire with soldered ears.

The entire work, both track and overhead, was built by the Falk Manufacturing Company of Milwaukee, which also built all of the special work, and furnished all materials. The fine construction of this line is in harmony with the excellent equipment of the Madison City Railway, which under the management of Receiver Oakley, and Superintendent Shaw, maintains its plant in unexcelled condition.

## A FISHING TRIP.

"Along the lines of the Chicago, Milwaukee & St. Paul Railway" is the title of a beautifully illustrated pamphlet of 32 pages, the contents of which are devoted to practical methods of fish-catching in nearby lakes and streams.

One copy will be sent to any address on receipt of 2-cent postage stamp. Geo. H. Heafford, General Passenger Agent, 110 Old Colony Building, Chicago, Ill.



## NIAGARA FALLS CONVENTION.

The Cataract and City of its Name—Their Early History and World-Wide Fame—Romantic Legend, All Surpassed Now Quite, By Recent Miracles in Dazzling Light—How the Resistless Current of the Rushing Stream at Last is Harnessed, Takes the Place of Steam: What the Convention People Hope to Do—What They Will See, Where They Will Go—All This and Many Pages More, Our Readers Here Will Find in Store.

October 19th is the day; Niagara Falls is the place; and the 16th annual convention of the American Street Railway Association is the event, which will call in council the street railway managers of the land.

An ever increasing army these, with wives, and daughters, and supply men, all of whom no sooner depart from one convention than they turn their eyes in pleasant anticipation of the next. The constantly increasing attendance; the new ideas gained, and old ones exploded; the social features; the magnificent exposition of street railway appliances; and the meeting of old friends and the making of new acquaintances, all combine to augment the value and importance of each succeeding gathering.

All the world has traveled to worship at the shrine of Niagara Falls, that magnificent cataract whose glories ever grow upon the visitor; and it is particularly fitting that in its journeyings about the land the American Association should one year pitch its tents upon the banks of the mighty torrent. Especially so at this time when that torrent has been fairly harnessed, and a little of its power turned into those channels which most interest us. The electric power and railway features of the outside work of the convention, combined with the excellent program prepared, offer unusual attractions to the delegate; and we anticipate a large attendance and a profitable meeting.

In the following pages our readers will find a complete and concise account of what will be done and what will be seen, thus preparing in advance, each delegate for an intelligent and profitable visit to the various points of interest.

### Headquarters.

While there are several other hotels at the Falls, the executive committee has selected the International Hotel as headquarters, and it will be at that house that the majority will be found. The hotel is large, and special arrangements will be made to care for the comfort of guests. A description of the house will be found elsewhere in this issue.

\* \* \*

### Meetings and Exhibits.

The sessions of the convention will be held in Convention Building, now used specially for that purpose, and belonging to the local board of trade. The meeting room is on the second floor, while the entire lower floor will be occupied by exhibits, thus placing everything under one roof. The building is steam heated and well lighted. Wires for power are run into the building from the circuit of the local company. A detailed plan and description of the convention building appears on another page.

\* \* \*

### Accountants' Association.

The first regular meeting of the Street Railway Accountants' Association convenes in Convention Building on the same dates as the American Association. Program and full particulars on another page.

\* \* \*

### Railroads.

The usual special rate has been made by the railroads. Pay full fare going, taking a certificate receipt, presentation of which to the secretary in Niagara will secure return home at one-third fare.

### Excursions.

The natural attractions and the remarkable electrical plants at Niagara present unusual opportunities for pleasure and inspection trips, and the local committee has arranged a series of excursions in special cars which will take the visitors to all the points of interest on both sides of the river, and an opportunity afforded to study both water power stations under the most favorable conditions.

\* \* \*

### Banquet.

The annual banquet will occur at the International Hotel at 7 p. m. Thursday, October 21. Speaking and music will be a feature of the dinner. Tickets, \$7; to be had from Secretary Pennington.

\* \* \*

### The Ladies.

A large number of ladies will accompany delegates this year, and special provision has been made for their entertainment by a local committee of 25 ladies of Niagara. While the gentlemen are in attendance upon the sessions the visiting ladies will be entertained.

\* \* \*

### Register.

As soon as possible after arrival go to the local secretary and register your name, your road and city, and hotel at which you are stopping. You will receive a button, which is the insignia of the Association, and which will be good for transportation on any street car you may wish to use. These buttons will be in four colors: one color for members, one for ladies, another for supplymen, and one for members of the Accountants' Association.

## EARLY HISTORY OF THE FALLS AND CITY.

As early as 1535 the French explorers learned of the existence of a great waterfall at the head of Lake St. Louis, as Ontario was called, and mention of it is made in nearly all the published accounts of voyages to New France; the early maps show a river with the Falls indicated, but its location is only approximate in all of them until Sanson in his map of Canada, published in 1657 correctly locates the great lakes and the Niagara river, which appears under the name of Ongiara. The first white man, however, who is known to have seen Niagara Falls is Father Hennepin, who was a member of La Salle's party in 1678. He describes them as a "vast and prodigious Cadence of Water, which falls down after a surprising and astonishing manner, insomuch that the Universe does not afford a Parallel \* \* The Waters which fall from this horrible Precipice do foam and boyl after the most hideous manner imaginable, making an outrageous Noise, more terrible than that of Thunder; for when the Wind blows out of the South, their dismal roaring may be heard more than 15 leagues off." The sketch which he made of the Falls, the first known picture of them, shows several points of difference from their present state. Father Hennepin was the first to adopt the modern spelling of Niagara, which is said to mean "thunderer of waters."

The territory about the Falls was occupied by the Neuter nation of Indians, so called because the warriors

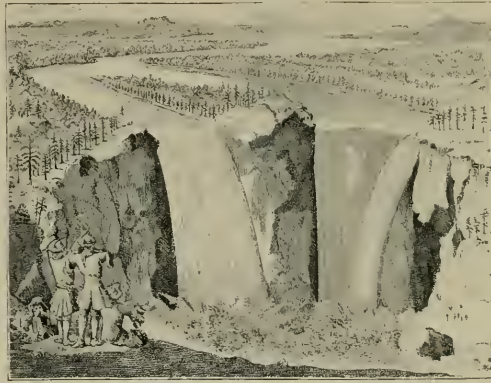
of the two neighboring nations, the Hurons and the Iroquois, which were tribal enemies of each other, could meet in peace and safety when visiting the Neuter nation. Eventually the neutrality of the Neuters with the neighboring tribes disappeared, and after almost complete annihilation at the hands of the Senecas, the tribe became merged into the Iroquois. The Neuters saw in the Falls their tribal divinity to which they made sacrifices; individuals also made offerings, as they had pressing need of divine assistance.

La Salle saw the military advantages which a command of the territory contiguous to this connection between the great lakes would give and established a trading post on the point of land at the mouth of the river, and at the head of navigation, the site of Lewiston, built a fort or stockade. Carrying cordage, anchors and tools with him up the mountain and through the forest to a point five miles above the Falls, where the town of La Salle now is, he built the Griffon in 1679, which was the first vessel to navigate the upper lakes. The trading post at the mouth of the river was fortified in 1687, and abandoned the following year, but rebuilt in stone by the consent of the Indians in 1725 and afterward maintained, the post being known as Fort Niagara.

The portage around the Falls began at the present site of Lewiston, and had its upper terminus at about one and one-half miles above them. The upper terminus of the road was fortified in 1750, and called Fort de Portage or Fort Little Niagara; this fort was destroyed in 1759 to prevent its falling into the hands of the English, who had already captured Fort Niagara. After the defeat of the French in the short and decisive campaign of 1759, they practically surrendered all their territory to the English, and the latter in 1761 built Fort Schlosser to replace Fort Little Niagara. At the Devil's Hole about three miles below the Falls on the American side, the Seneca Indians in 1773 ambushed a supply train and also the relief party sent to its rescue, only 11 out of the two parties escaping.

The Niagara region was not the scene of any more hostilities until the war of 1812.

The Americans were defeated on Queenston Heights, the battle in which General Brock lost his life. Early in 1813 Fort George, built by the British at the mouth of the river on the Canadian side, was captured by the Americans, and the English abandoned their other posts, Fort Erie at the source of the river and Chippawa just above the Falls. In December, 1813, the British took the offensive, recaptured all the posts taken from them, captured the forts on the American side of the river, and sacked and burned Youngstown, Buffalo and the smaller



Fac-simile of first engraving of Niagara Falls. From Hennepin's "New Discovery," published in 1697.

towns in the vicinity. The turn of the Americans again came in 1814; Fort Erie was recaptured on July 3 and the British defeated in the battle of Chippawa July 5. On July 25, General Scott met the enemy at Lundy's Lane and the fighting was continued until late in the night, by the light of the harvest moon; this was regarded as a substantial victory by the Americans though still annually celebrated as such by the Canadians. Fort Erie was occupied until November, 1814, and blown up by the Americans when they withdrew; it is still in ruins.

Navy Island was at one time the principal rendezvous of the insurgents in the Canadian rebellion of 1837. On the night of December 29 of that year a British force crossed to Schlosser in boats and captured the steamer Caroline, which had been chartered by Buffalo parties for the purpose of carrying excursion parties to visit the camp on Navy Island; the boat was set on fire and forced over the Falls. This was regarded as a breach of international law and was the subject of much correspondence between the two governments.

In 1866 the Fenian invasion of Canada was made at this point and the battle of Ridgeway fought. With these exceptions peace has reigned at Niagara since 1815.



AMERICAN FALLS FROM GOAT ISLAND.



The township of Niagara dates back to 1800. The original village was known as Manchester and was incorporated as the village of Niagara Falls in the early 30's. In 1892 the two villages of Niagara Falls and Suspension Bridge were consolidated and made a city, which then had a population of about 12,000. Because of the power development and the rapid growth of manufacturing enterprises the population of the city has increased to 23,000 as given by the directory census.

☐ One of the prettiest and sweetest legends connected with

the fall, the Indians of the tribe watched its course with eager gaze. Suddenly they were startled by seeing another canoe, propelled by a powerful hand, leap out from the bushes and speed toward the maiden. Onward it darted, and just before her canoe passed over the brink of the precipice the Indian maiden recognized her father. His glance told her that his love for her was uppermost, while those on shore realized that their chief and his daughter would not be separated even in death. He met death by passing over the Falls a few moments after her. This reci-



the Falls of Niagara is that which has to do with the old Indian tradition that it was the custom of the red men of the forest each year to sacrifice the fairest maiden of their tribe to the Great Spirit of the Falls by sending her over the cataract in a white canoe laden with fruits and flowers. The Spirit of the Falls called for unbounded homage, and on one occasion the daughter of the chief of the tribe was selected for the annual sacrifice. To the maiden thus selected it was deemed an honor to be chosen. The old chief loved his daughter, the fairest in the tribe, but he betrayed no feelings of sorrow that his daughter was to be given up to the Great Spirit. As the white canoe, guided by the fair maiden's hand, swept down the rapids toward the brink of

tal is the red man's fact, of the maiden's sacrifice, but the white man has a fancy of the Maiden of the Mist. This fancy portrays the real spirits of the Indian maidens sacrificed to the spirit of Niagara, in days gone by, as idealized into the Maiden of the Mist—a mythical and typical maiden dwelling at the base of the falls, and continually, by day and by night, disporting herself in the ever-rising and never-falling clouds of mist or spray, awaiting and greeting the spirits of those victims who yearly yield up their lives to the "Thunderer of Waters." At the Cataract House are to be seen two large oil paintings by James Francis Brown, of which the cuts used herewith are reproductions.

THE FALLS.

In no place does nature reveal herself in greater majesty than at the Falls of Niagara. The usual observer is spell-bound with awe and wonder at the impressive sight. The effect upon the engineer is the same for a time but he soon begins to marvel at the energy here dissipated. The volume of water passing over the falls is estimated at 275,000 cu. ft. per second and were it utilized would generate 5,800,000 horse-power. These figures in themselves mean little because the mind does not grasp them; to put it in another way, if the potential energy of the waters of Niagara were converted into work, it would probably exceed the sum of the efforts of all mankind, for to replace the water above the falls each man, woman and child would have to carry 1,100 lbs. of water up 165 ft. every 24 hours.

The Niagara river is the outlet for the waters of four of the five Great Lakes, the largest bodies of fresh water on the globe; the total area of these four lakes is about 85,000 square miles and all the overflow finds its way over the Falls where the channel is but about 3,550 ft. in width. The total fall between Erie and Ontario is 333 ft., 55 ft. of this is in the half mile of rapids above the Falls, the Falls themselves are some 165 ft. high, and in seven miles below there is a further fall of 100 ft.

In the early sketches of the Falls a third fall is shown on the Canadian side. This was called the Lateral Fall; it has long since disappeared. Table Rock probably formed the bed of this fall. Large portions of this rock fell in 1818, 1828, 1850 and 1886, and the fragments are still visible scattered on the slope on the Canadian side.

Geologists and other scientists find in the Falls a favorite theme for theorizing. One of the interesting opinions advanced a few weeks ago was by Prof. John Level, of Niagara, who holds that the recession of the Falls is chiefly caused by the breaking of the rock from explosions of air which becomes compressed beneath the falls until it explodes, tearing off fragments of rock.

One or two writers hold that the gorge was originally a crack in the earth violently wrenched apart, and others that it was washed out by ocean tides; but the prevailing opinion is that the gorge was cut out by the river itself and this view is substantiated by so much evidence that Professor C. K. Gilbert of the United States Geological Survey does not deem the others worthy of serious consideration.



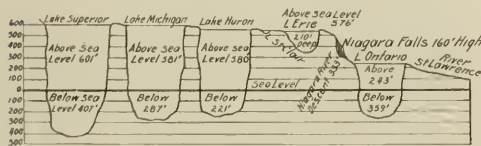
WINTER SCENE FROM GOAT ISLAND.

Niagara Falls. He has determined that there is a change of level taking place in the great lakes, involving an elevating in the northeast and a depressing in the southwest, the eventual result of which will be the lakes emptying into the Mississippi instead of the St. Lawrence. Incidentally Chicago is to be inundated and become a new-world Venice. Our readers need not be alarmed, however, for the REVIEW will have reached its 500th volume before the dire catastrophe takes place.

There has been complaint that the diversion of water for power purposes has already detracted from the beauty of the Falls but as the amount so taken is less than 1 per cent of the total it does not appear that the injury can be serious. When the plan of Government Reservations was first broached it was with the idea that the Falls should be preserved in all their grandeur and free from the spoiling hand of the engineer (another name for vaudin) as a heritage for future generations. In contrast to this view as to what should be the future of Niagara Falls the following remark of Lord Kelvin may be quoted:

"The originators of the work so far carried out and now in progress hold concessions for the development of 450,000 h. p. from the Niagara river. I do not myself believe any such limit will bind the use of this great natural gift and I look forward to the time when the whole water from Lake Erie will find its way to the lower level of Lake Ontario through machinery doing more good for the world than that great benefit which we now possess in the contemplation of the splendid scene which we have presented before us at the present time by the waterfall of Niagara. I wish I could think it possible that I could live to see this grand development."

In answer to a question he added: "No, I do not hope that our children's children will ever see the Niagara Cataract."



CROSS-SECTION OF GREAT LAKES.

The method by which the gorge has been cut away differs from the normal process of erosion, by the rubbing and pounding of rock fragments carried along by the stream; Niagara carries no such rock fragments. Here the lower strata of shale are cut out by the rolling about of large masses of limestone at the base of the precipice allowing the limestone at the crest to break off.

Professor Gilbert predicts the time when there will be no

## INCIDENTS OF INTEREST.

From 1833 to 1873 a tower 45 ft. high, 12 ft. in diameter at the base and 8 ft. in diameter at the top, stood on the rocks at Terrapin Point. It was round in shape, and was built of stone gathered in the vicinity. It was a rough



TERRAPIN TOWER (DESTROYED).

structure quite in harmony with the wildness of its surroundings, and had a lookout gallery at the top. Some of the then owners of Goat Island pretended to feel that it was unsafe, and in respect to the wishes of a majority of them it was blown up in 1873. This work was done by Thomas Conroy, one of the famous Niagara guides, who now has a place in the paid fire department of the city of Niagara Falls. To destroy it he used 75 lbs. of gunpowder. About 6 ft. of the spiral stairway was cut out from the bottom of the tower, and in this space the powder was buried, the place being tightly boxed with 2-in. oak planks. When the powder was exploded the spiral stairway was sent through the top of the tower to a height of about 50 ft., and a good portion of the tower was blown over the precipice, while the



MAID OF THE MIST LANDING.

remaining portions were torn down, thus removing a charming feature of Niagara.

It is related as a matter of history at the Falls that in 1852 a gentleman from West Troy, N. Y., while crossing to the tower fell into the current and was carried to the edge of the fall, from which point of danger he was rescued from apparently inevitable destruction, by life lines passed to him by a party of rescuers. The effect of the shock on his nervous system was so great that he remained speechless for several hours after being taken to his hotel.

The famous Blondin was the first man to cross the Niagara gorge on a tight rope. Blondin was a Frenchman, and made the claim of being the originator of the horizontal tight rope. Blondin's acts at Niagara undoubtedly made him the wonder of the world, but it is a fact that since his



BLONDIN CROSSING NIAGARA.

time others have repeatedly crossed the gorge on wire cables of much smaller dimensions than Blondin's rope cable. It was in the spring of 1859 that Blondin first took steps to erect a cable on which to cross the mighty chasm. This cable was located very close to the spot on which the gorge road car barns now stand in what is known as the old Pleasure Ground. His first trip was made June 30, 1859, and, being a success, won for him much fame. In 1860 Blondin erected his cable farther down stream over the Whirlpool Rapids, just north of where the new steel arch now spans the gorge. He walked this rope with stilts, with baskets on his feet, blindfolded, and also carried a man across on his back. This man was Harry Colcord. Blondin also took a small stove out on the cable and cooked there. His performances drew great crowds. His wheelbarrow act was especially commended. It was in 1860 that Blondin crossed the gorge before the Prince of Wales. The prince and party were located in a shelter at the Canadian end of the cable, and in order to heighten the effect, Blondin put in a few extra feats. When Blondin was presented to the prince his royal highness said, "Thank God it is all over." To this Blondin replied by offering to carry the prince





GRAHAM AND HIS BARREL.

across the rope blindfolded, but the prince declined the invitation. On November 29, 1895, Blondin married Catherine James in the Brantford, Eng., registry office. He has since died, but the story of his wonderful performance at Niagara still lasts. Collections and an entrance fee to an enclosure at either end of his rope is what paid Blondin for his performance.

The first man to attempt to win fame by a trip through the Whirlpool Rapids was when Joel K. Robinson and his two associates, McIntyre and Jones, voluntarily made the trip on the steamer "Maid of the Mist," June 6, 1861. Next came Capt. Matthew Webb, the famous English swimmer, who lost his life in an attempt made July 24, 1883. Webb's only protection was a bathing suit. Three years later Carlisle D. Graham, a cooper, made the trip successfully in a barrel of his own make on July 11, 1886. Graham's feat made him a hero, and he is justly entitled to credit for his act. Undaunted by the perils of the fierce waters he made a second trip on August 19, 1886, this time with his head protruding from the top of the barrel. His third trip was made June 15, 1887, and his fourth on August 25, 1889. On the second trip he stopped at the Whirlpool, and on the fourth trip his barrel was much smaller than the one he first used. Several other people have since made the voyage, but Sadie Allen is the only woman who ever made the trip and lives to tell the tale. She made the journey on November 28, 1886, in company with George Hazlett, who had made the trip in the same barrel in company with William Potts on August 8, 1886. Charles A. Percy has twice

defied the rapids in a boat, but Robert William Flack lost his life while endeavoring to make the passage in a boat of his own construction on July 4, 1888.

Measurements taken by the United States government show that the water under the upper suspension bridge is about 194 ft. deep. The American Fall has a height of 165 ft., and the Horseshoe Fall a height of 158 ft., it will thus be seen that the water in the river before them is deeper than their height.

Despite all stories to the contrary, it may be stated as fact that no human being has ever, so far as recorded, passed over either of the falls of the great cataract and lived to tell the tale. The Falls of Niagara thus remain unconquered.

The danger line above the falls is a little below Port Day. Men have come down the river and made the landing on the head of Goat Island, but this is a dangerous feat. When a boat gets much below Port Day, its occupants realize that the danger of being swept down stream on the current is very great, and when once in the grasp of the current below this point it is almost resistless, and the chances of life are the chances of landing on one of the islands or rocks above the falls and being rescued.

One of the grand sights of Niagara is the wreck of the old Lewiston suspension bridge. This structure was destroyed by a high wind on April 16, 1864. Some days previous to the disaster a big run of ice down the river made it necessary to loosen some of the guys from their fastenings. During the quiet weather which followed, the bridge attendants were unmindful of the danger to which the structure was subjected by the loose guys, and a big wind storm came up and swept the suspended structure away. It was never rebuilt, and all these years the cables have been suspended over the water unused.

Report has it that a few years ago, a desperate criminal having escaped from prison, made his way to the boundary with the intention of getting into Canada. He did not dare to venture on the bridges, and in the darkness of a terrific storm crept across one of the cables and reached the other



OLD BRIDGE AT LEWISTON.



RAPIDS ABOVE FALLS.

side in safety. When our readers come to visit the wrecked bridge they will appreciate the courage of the act, although it is a fact that in daylight men have crossed on the cables from bank to bank. This wreck is soon to be replaced by a new bridge, or rather by the removal of the upper suspension bridge to this site.

One of the very interesting incidents about the Falls of Niagara which has been almost forgotten, was the sending of a vessel loaded with wild animals down the upper rapids and over the great precipice. The vessel did not, as many now suppose belong to the government, but it was a merchant vessel condemned as unfit for service on the upper lakes. She was named the "Michigan," and the trip is evidence of the early day enterprise of the hotel keepers of the Falls to draw a crowd to that resort. One of the most interesting souvenirs of this memorable trip is one of the small handbills, which at the time was sent in all directions from Niagara Falls to draw a crowd by stage. The REVIEW has discovered what is supposed to be the only existing copy of one of these bills, and now presents its text for the perusal of its readers, as follows :

THE PIRATE MICHIGAN,  
with a cargo of ferocious animals, will pass the  
Great Rapids and Falls of  
NIAGARA,

8th of September, 1827, at 3 o'clock.

The first passage of a vessel of the largest class which sails on Erie and the upper lakes, through the great rapids, and over the stu-

pendous precipice at Niagara Falls, it is proposed to effect on the 8th of September next.

The Michigan has long braved the billows of Erie with success as a merchant vessel; but having been condemned by her owners as unfit to sail longer proudly "above," her present proprietors, together with several public spirited friends, have appointed her to convey a cargo of living Animals of the Forests, which surround the upper lakes, through the white tossing and the deep rolling rapids of the Niagara, and down its grand precipice into the basin "below."

The greatest exertions are being made to procure animals of the most ferocious kind, such as panthers, wild cats, bears and wolves; but in lieu of some of these, which it may be impossible to obtain, a few vicious or worthless dogs, such as may possess considerable strength and activity, and perhaps a few of the lesser animals will be added to and compose the cargo.

Capt. James Rough, of Black Rock, the oldest navigator of the upper lakes, has generously volunteered his services to manage this enterprise, in which he will be seconded by Mr. Levi Allen, mate of the steamboat Niagara. The public may rest assured that they will select none but capable assistants. The manager will proceed seasonably with experiments to ascertain the most practicable and eligible point from which to detach the Michigan for the rapids.

It is intended to have the Michigan fitted up in the style in which she is to make her splendid but perilous descent at Black Rock, where she now lies. She will be dressed as a pirate; besides her menagerie of wild animals, and probably some tame ones, it is proposed to place a crew (in effigy) at proper stations on board. The animals will be caged or otherwise secured and placed on board the "condemned vessel" on the morning of the 7th, at the ferry, where the curious can examine her "cargo" during the day at a trifling expense. On the morning of the 8th the Michigan will be towed from her position at Black Rock to the foot of Navy Island by the steamboat Chippewa, from whence she will be conducted by the manager

to her last moorings. Passage can be obtained in the Michigan from Black Rock to Navy Island at half a dollar each.

Should the vessel take her course through the deepest of the rapids it is confidently believed that she will reach the Horse Shoe unbroken; if so she will perform her voyage to the water of the Gulf Basin beneath, which is of great depth and buoyancy entire, but what her fate may be the trial will decide. Should the animals be young and hardy and possessed of great muscular powers, and, joining their fate with that of the vessel, remain on board until she reaches the waters below, there is great probability that many of them will have performed the terrible jaunt unhurt.

Such as may survive and be retaken will be sent to the museums in New York and Montreal, and some perhaps to London.

It may be proper to observe that several steamboats are expected to be in readiness at Buffalo, together with numerous coaches, for the conveyance of passengers down on the morning of the 8th. Coaches will leave Buffalo at 3 o'clock on the afternoon of the 7th for the Falls on both sides of the river, for the convenience of those who may be desirous of securing accommodations at the Falls on the 8th. Ample means for the conveyance of visitors will be provided at Tonawanda, at Lockport, at Lewistown, at Queenston and at Fort George to either side.

As no probable estimate can now be made of the numbers which the proposed exhibition may bring together, great disappointments regarding the extent of our accommodations, may possibly be anticipated by some; in respect to which, we beg leave to assure our respective friends and the publick in general, that in addition to our own, which are large (and will on the occasion be furnished to the utmost limits), there are other publick houses, besides many private ones, at which comfortable entertainment may be had for all who may visit the Falls on the present occasion, an occasion which will for its novelty and the remarkable spectacle it will present be unequalled in the annals of internal navigation.

This bill is signed by P. Whitney, keeper of Eagle Hotel United States Falls, August 2, 1827, and by Wm. Forsyth and John Brown, keepers of the Ontario House and Pavilion, Canada Falls.

One of the most interesting incidents of the Falls is the construction of the basket cable railway. A company to build a bridge for the accommodation of the Great Western Railroad was chartered by New York in April 23, 1846, and in Canada, June, 9, 1846. Charles Ellet, Jr., (afterward General Ellet) of Philadelphia, was the engineer who had the contract for building the bridge and desired first to provide a cable suspended from towers erected on either side of the river and a basket in which men and tools might be

operation of the cage and cable are thus described by Mr. Hulett:

“The first thing to be settled was the size, form and the material of which this cage should be constructed. The engineer proposed that the cage be made of wood, and instead, I suggested iron. The engineer’s objection to iron was its weight. In answer, I suggested that I thought one of iron could be made of less weight and more secure than one of wood. To test this proposition, the engineer made a plan of his wooden cage, and carefully estimated its weight. I then made a plan of a basket made of iron, which was also weighed and found to be 10 pounds lighter than that of wood. ‘We will have it iron’, exclaimed the engineer, provided we can get it made. I assured him that getting it made would present no difficulty, as I would make it with my own hands. The next interrogatory of the engineer was, ‘What shall be its form?’ We both at the time were sitting in rocking chairs of the same pattern. I requested the engineer to arise, and these two rockers were drawn close together, the



CROSSING IN BASKET IN 1848.

engineer exclaiming, ‘That is just what we want and will have.’ Next in order was the construction of the cable upon which the basket was to travel. This cable was to be constructed of 36 strands of No. 10 wire, each strand to be subjected to a uniform stress, and the 36 strands bound into a round form by being wrapped by a transverse wrapping of a small annealed wire at intervals of 8 in.; each wrapping being about 4 in. in length. This cable was formed around an iron yoke or clevis at either end as a means of fastening to the rock. After the detail of making the cable was disposed of, came the question of how to get it over. The engineer suggested offering a premium of \$10 to the first boy who should successfully fly over the Gorge his kite string and fasten its ends to a tree on either side. The premium brought a score of lads into the contest, and a boy by the name of Homan Walsh (who now resides in Lincoln, Neb.) was the successful winner of the prize, which was paid as soon as the kite string was secured on each bank of the stream. The following day a stronger line was drawn over by the kite string, and a rope of sufficient strength to haul over the iron cable was substituted. By means of this rope the iron cable was hauled across the river and its ends secured to the solid rock and placed upon the wooden towers, with a deflection of about



BASKET FOR CABLEWAY.

hauled across, thus saving a journey of 10 miles for each crossing that must be made, the ferry being five miles below the site of the bridge. Mr. Ellet finding it necessary to spend a portion of his time elsewhere, secured the services of Theodore G. Hulett (afterward Judge Hulett), who is still living in Niagara Falls, to superintend the construction and erection of the necessary ironwork. The design and



25 ft. between the towers. I made the iron basket and its attachments with my own hands, and it was placed upon the cable. A strong windlass was made of a wooden drum of about 4 ft. in diameter, and so geared that one man at the crank could haul over any required load. One of these



THEODORE G. HULETT.

windlasses was placed on each bank, the draft rope passing around these drums at one end, and the other attached to the yoke from which the basket was suspended. This yoke was made of iron, with a grooved roller at either end that it ran upon, the flanges astride the cable.

"The first passage of this basket was attempted (March 31, 1848) to be made empty, but when almost across it suddenly stopped and the windlass on the opposite side would not bring it ashore. It could be drawn back, but not forward, and the basket was drawn back to the American shore. Mr. Ellet mounted the car, which was let loose from the tower, and descended the down grade with great velocity until its momentum was arrested by the up grade on the opposite side, when the windlass on the opposite side was set in motion and hauled the basket with its passenger to the point of obstruction, which was found to be a spot in the cable that had been flattened when the cable was being hauled across, and to such extent that it exceeded the width of the groove in the roller, which caused the flange of the forward end of the roller to rise upon the cable and its edge to sink between the expanded strands of the cable. The engineer saw the difficulty at a glance, and he soon remedied it by contracting the width of the cable, and the rollers passed over, and the first passenger landed in safety across the Gorge in this fairy basket. It was found that the groove in the rollers was too shallow and the tread too narrow to prevent undue friction on the transverse wrapping of the cable and new and deeper-grooved rollers were substituted. This change made this mode of transportation complete, and

it was used for that purpose for more than a year, and carried across the Gorge more than 2,000 passengers, there having crossed in one day 125 persons, 90 of them ladies. The round trip fare was one dollar.

"This cable was used until the preliminary bridge structure was completed, and then removed."

Several persons each year lose their lives at the Falls, either through accident or with suicidal intent, the opportunities and certainty of the latter being unequalled. People have even traveled hundreds of miles for the express purpose of throwing themselves into the water at the crest of the falls. To the casual visitor the safeguards and protection provided, especially on the islands, would seem to be almost criminally deficient. While the bridge leading to the islands is always closed before dark, there are places where a horse taking sudden fright might easily precipitate a carriage into the rapids a few rods above the falls, and from which escape would be absolutely impossible. Visitors can not exercise too great care. A particularly sad case a few years ago was the death of a young bride, who stooped to fill a small pail with water and the force of the current was sufficient to overcome her balance and she was swept over the brink before her companions could comprehend what had happened.

As a rule bodies going over the Falls are held down by the pressure of the water, often for several days or weeks, before floating down the river. On a few rare occasions bodies have been recovered which did not show the slightest scratch, one such case having occurred in May of this year, but usually the body is terribly crushed and disfigured by being dashed against the rocks. In August of this year two men and a boy who were crossing the river in a small boat were drawn into the current and in spite of every effort to escape were swept over the brink before the eyes of spectators helpless to render any aid.



WHIRLPOOL RAPIDS FROM BRIDGE.

THE FALLS IN WINTER.



Niagara is ever changeful, and there are those who have lived beside its banks a score of years that insist it never twice presents the same appearance. But by far the most pronounced change is, when the Falls put on their winter garments, and are clad in a solid garb of purest ice and snow, in which the tints range from spotless white to deepest sky blue. The effect is one impossible to imagine in October by those who have never witnessed one of the famous ice bridges. The swift, turbulent current prevents the early formation of ice even in cold seasons, and not until midwinter, or later, with its most intense cold, does the Water King consent to the ice carnival.

The ice floes coming over the precipice are dashed to atoms, and gradually these fragments gather, and are frozen into a solid mass, extending out from either shore until a connection is made in midstream. With this foundation to build upon the snow and spray willingly form an alliance, and steadily night and day, build up fantastic shapes like miniature mountains, while from the rocks depend gigantic icicles, weighing hundreds of tons. The spray bedecks the trees, and shubbery, and bridges on the islands, which in the sunlight present a picture of rarest beauty.

Residents at the Falls hail the cold weather with joy, and the daily press heralds the announcement throughout the land. Excursionists flock from every direction to witness the most wonderful winter scene upon the globe.





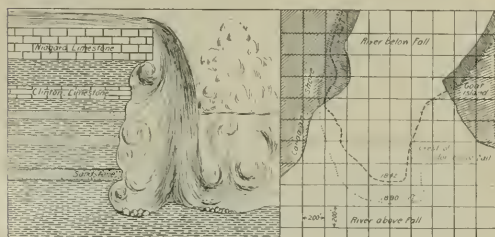
### FEATURES OF THE FALLS.

The Falls are on the Niagara river 22 miles from the head in Lake Erie and 14 miles from the mouth in Lake Ontario. The total descent in the 36 miles is 333 ft. For two miles after leaving Lake Erie the current in the river is quite swift, then the channel broadens and is divided by Goat Island, below which it is two and one-half miles wide. Fifteen miles from Lake Erie the channel again narrows and the rapids begin. In the last three-quarters of a mile above the Falls the fall in the river bed is 55 ft. At the brink the channel is divided by Goat Island which occupies about one-fourth of the total width, 4,750 ft. At the Falls the river bends from west to north; on the right of Goat Island is the American Fall, 1,060 ft. wide and 167 ft. high, and on the left the Canadian or Horseshoe Fall, with a contour of 3,010 ft. and a fall of 158 ft. The water is much deeper over the crest of the Canadian Fall so that while only three times as wide as the American Fall, fully nine-tenths of the total water flows over it. One cubic mile per week for the volume flowing over the Falls is sufficiently accurate for general purposes; a more exact figure is 1.13 cubic miles per week. The international boundary line is in the middle of the so-called Canadian Fall. Below the Falls the river is from 1,000 to 1,200 ft. wide, but two miles below narrows to 800 ft. and farther down at the Whirlpool Rapids to 250 ft. Within seven miles below the Falls the

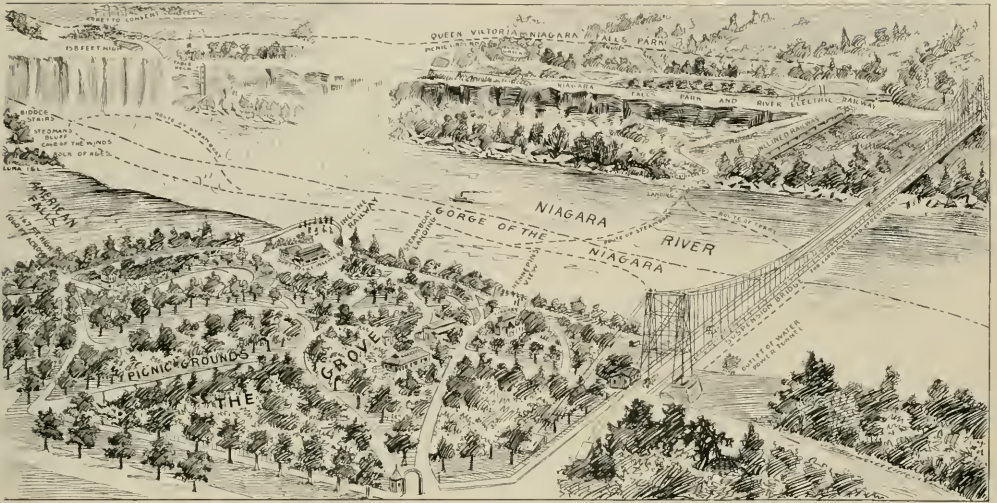
total fall is over 100 ft. The several strata which are exposed in the gorge are gray quartzose sandstone, red shaly sandstone, gray mottled sandstone, green shale, compact gray limestone, soft shale and limestone in the order named. Because of the dip in the land from north to south the water in cutting out the gorge has encountered in succession strata of varying degrees of hardness and the rate of recession of the Falls had varied in consequence. From 1842 to 1890 the average rate of recession was 2.2 ft. per year on the Canadian side and 2½ ft. per year on the American side. At present the rock at the crest is limestone with shale about 90 ft. below. Geologists state that a farther recession of two miles will cut away all the limestone and leave the Falls stationary on sand stone with the height reduced 50 per cent; the fall when the river first took its present route to Lake Ontario was about 300 ft. or twice as much as at the present time.

To properly "do" the Falls one should start from Prospect Park, a part of the New York Reservation. From the "point," which is protected by a stone wall, a fine view is obtained of the American Fall from the very brink; farther to the right is Hennepin view. Near here is the superintendent's office and the inclined railway and stair leading to the dock of the "Maid of the Mist." From the bridge leading to Goat Island there is a fine view of the upper rapids on the American side. Goat Island is about 80 acres in area; near this island is Luna Island, so-called from the lunar rainbows seen from that point of view, which separates the American from the Center Fall. On the American side there are several small islands which takes their names from some incidents or persons prominent in the history of the Falls.

At the lower end of Goat Island one may procure a guide and descend Biddle stairs (built in 1829 by Mr. Biddle, president of the Bank of the United States) to the Cave of the Winds. A path leads over gangways and bridges among the rocks at the foot of the Center Fall to the "Cave" behind it where the choking, blinding and deafening tumult of wind and water defies description. The "cave" is about







100 ft. long, 130 ft. high, and of varying width, there being in places but 3 ft. between the wall of rock on one hand and the water on the other. The trip to the Cave of the Winds cannot be undertaken without a guide and is sufficiently dangerous with one. All members of the party are clad with water proof suits which have only the face exposed and after being roped together, slide along a narrow ledge with the perpendicular wall of rock in front, and the mighty volume of water thundering in the rear. It is the most exciting and pleasurable experience of a visit to the falls.

To the left from the Biddle stairs is Porter's bluff from which one obtains the best view of the Horseshoe Fall from the American side; a tower formerly on Terrapin Rock, a small island at this point, was blown up because deemed unsafe. The path on Goat Island continues along the south side where there is a group of four islands known as the Three Sisters and Little Brother; from here is the best view of the Canadian Rapids.

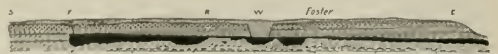
About 250 yards below the Falls is the suspension bridge crossing to the Canadian Park. Here there are several points of interest, Ramblers Rest, Inspiration Point, Table Rock, Cedar Island and the Burning Spring. From Table Rock there is an indescribably grand view of the Horseshoe Fall. This rock which formerly overhung the cauldron close to the Horseshoe Fall has been greatly reduced in dimensions, by pieces falling and finally by blasting off a large portion because it was unsafe.

In addition to visiting the two parks one should see the Cave of the Winds, the Grand Rapids from the Canadian side, and take a trip on the Maid of the Mist. The first boat of this name was of 170 tons burden, driven by a 100-h. p. engine and followed the same route as her successors do today; she did not pay, however, in the early days and was sold on condition that she be delivered at Lewiston. She was taken through the rapids in 1861 by J. R. Robinson and two assistants and safely delivered at Lewiston thus proving what the courts have since held that Niagara is a navigable stream.

The present suspension bridge just below the Falls was built in 1889 to replace the one carried away by the storm January 10 of that year. The first bridge at this point was completed in November, 1868. The span of the new one is the same as that of the old, 1,268 ft.; the bridge is 190 ft. above the water.

Two miles below Suspension Bridge is Cantilever Bridge built in 1883, and one of the first of its kind. It is of steel, 900 ft. long; the two arms are 395 and 375 ft. long respectively, connected by a central span of 130 ft. This bridge is 245 ft. above the water. One hundred yards below this bridge is the new steel arch bridge built in 1897 to replace the one which was known as the Railway Suspension Bridge, and used by the Grand Trunk road. The suspension bridge at this point was of iron built by John A. Roebling of Trenton, N. J. Work was begun in 1852 and March 8, 1855, the first steam train crossed on it. A carriage way was provided 28 ft. below the railroad tracks. This bridge was rebuilt in steel in 1880 and in 1886 the stone towers were rebuilt in steel. The new bridge has two decks; on the upper are two railway tracks and on the lower a carriage way, two trolley tracks and foot ways.

A short distance below the new bridge, on the Canadian side, is the so-called Rapids Park, which afford the best view of the Whirlpool Rapids. It is reached by an inclined railway. At this point the river channel is less than 300 ft. wide; the surface of the water is from 20 to 30 ft. higher at the center than at the sides. Webb lost his life in an attempt to swim through these rapids in 1883; since then others have passed through safely in barrels. Blondin and others have frequently crossed the gorge on hemp ropes or wires.

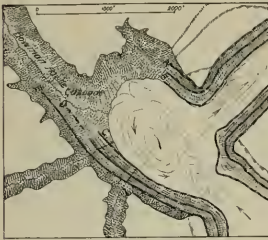


LONGITUDINAL SECTION OF NIAGARA GORGE.

Base line is at sea level. It is divided into miles. Water, black; drift, dotted; Niagara line-tone, block pattern; shales, broken lines; F, falls; R, railway bridges; W, whirlpool; Foster, Foster Flats; E, escarpment.

On the American side there are three elevators running down to the water. One mile below the Rapids Park is the Whirlpool. At the Whirlpool the water describes a loop. In the diagram of the Whirlpool (which, together with the sections showing the Falls and river and the outlines of the crest of Horseshoe Fall, are reproduced from a geographic monograph by Prof. G. K. Gilbert, of the U. S. Geological Survey), the direction of the surface currents is shown by arrows. On the north side the Niagara limestone can be traced to A and the Clinton limestone to B. On the south side the Niagara limestone is visible as far as E, the Clinton bed and the quartzose sandstone disappearing under the drift at D and C, respectively. Because of the course of the river making the sharp bend, and because of the incoming current meeting drift instead of stone on the far side, the Whirlpool basin has been hollowed out. The drift contained many boulders, and these were sorted out and accumulated until they formed a sloping wall covering the sand and gravel below the water level, and preventing further encroachment.

At the bottom of the cliff are the double tracks of the "Gorge" electric road which is built on a shelf blasted out of the rock, and only a few feet from the water. The view here, especially when coming up stream, is superb, and affords a comprehension of the magnitude and power of the water not obtained in any other way.



PLAN OF WHIRLPOOL.

Access to points on the water's edge is given by numerous inclined railways and elevators. In the very early days a tramway was constructed at the head of navigation, for the purpose of hauling goods up onto the high bank for portage around the Falls. The cars were lifted by means of a windlass turned by Indian labor. The first mechanically operated inclined way was built just below the Falls in 1844, to connect with a ferry to Canada. The road was 330 ft. long, the inclination being  $31^{\circ}$ ; there were two tracks with a stairway between them. The power was furnished by a water wheel.



BRIDGE, LAGOON AND ROADWAY.

## THE PARKS.

Ever since the discovery of the Falls they have been regarded as, in the apt language of Father Hennepin, without a parallel in the universe, and as the transportation facilities of the country became developed to such an extent that traveling with comfort became possible they have been the Mecca for tourists in America. By the action of the State of New York and the Province of Ontario in establishing reservations the visitor to the Falls has to a great extent been delivered out of the hands of the avaricious hackman who formerly roamed abroad, and can now enjoy the Falls without losing his money and temper.

The first practical step toward the establishment of a state park at the Falls was embodied in a message from Governor Robinson to the legislature, January 9, 1879, recommending that a commission be appointed, although the subject had been much discussed prior to that time. After several attempts to secure legislative action favorable to the project, a bill, was passed and received the approval of Governor Cleveland, April 30, 1883, under which a commission



BRIDGES BETWEEN ISLANDS IN THE STATE RESERVATION.





NEW BRIDGE TO LUNA ISLAND.

was appointed to select lands for a state reservation. The commissioners selected some 107 acres in the vicinity of the Falls, the land taken embracing all of Goat Island and the adjacent islands, Prospect Park, from the brink of the cataract to the new suspension bridge, also a strip of land running from Prospect Park to Port Day, bordering the river and containing the buildings which marred the beauty of the natural scenery. The property condemned was valued at \$1,433,429.50; the legislature in 1885 made the necessary appropriation and the reservation was opened to the public with imposing ceremonies on July 15, 1885. The buildings along the river bank above the Falls have been removed, leaving the view of the rapids and cataract unobstructed.

In 1885 and 1886 the reservation was maintained by the receipts from the inclined railway, the rental of buildings and the sale of old material. Since 1887 the receipts of every kind are required to be paid into the state treasury, and annual appropriations of from \$20,000 or \$25,000 have been made for the care and maintenance of the park. The receipts range from one-third to one-half of the state appropriation. When the property was taken in hand the numerous bridges and buildings were greatly in need of repair and large portions of the annual appropriations have been so spent.

The reservation is visited by about half a million people annually, about one-half of whom are residents of New York. The tolls formerly charged on the grounds (Prospect Park, 25 cents; Goat Island, 50 cents, and the inclined railway, 25 cents) aggregated one dollar for each person, so that since 1885 there has been saved to the public more than the cost of the park to the state.

The state commissioners are Andrew H. Green, president, New York; John M. Bowers, New York; Robert L. Fryer, Buffalo; William Hamilton, Caledonia, and George Raines, Rochester. The Reservation is in charge of Thomas V. Welch, superintendent.

When governor-general of Canada Lord Dufferin made urgent recommendations to the Dominion Government look-

ing to the establishment of a park on the Canadian side of the Falls. No action was taken on this, however, and the provincial legislature of Ontario finally decided to assume the responsibility, and March 30, 1885, passed an act similar to that of New York. The territory marked out by the commissioners of the province is described in the report of the park authorities as follows: From the Clifton House southwards, following the general direction of the river, and at a distance of about 300 yards from the edge of the rocky wall of the gorge there is a beautifully wooded escarpment rising 100 ft. above the general level of the plateau immediately adjacent to the gorge and leading to the general level of the table land between the two lakes. This escarpment is clearly defined up to and beyond the head of the rapids, and it was decided that a better boundary could not be chosen to delimit the territory reserved for a park. The intention of the commissioners was at first to select a line embracing the whole of the escarpment, but it was found that the adjoining proprietors put a very high value upon the land forming the very edge of the bluff, and in consequence a line a little below the top of the escarpment was chosen; thus securing to the park the slope with its wealth of foliage, while at the same time all commanding views from the table land above were retained by the owners and their demands for compensation for the portion taken below the table land made less onerous. The lands thus selected comprised a total area of some 154 acres and embraced all the land from the escarpment described to the river, including Cedar Island, the Dufferin group of islands, the talus under the cliff from the Clifton House southwards to the margin of the Horseshoe Fall.

The value of the lands so chosen was determined by arbitration, the awards and expenses amounting to \$136,813.24.

In 1887 the "Commissioners for the Queen Victoria Niagara Falls Park" were constituted a corporation and authorized to issue bonds for the purchase of the park lands. This park was formally opened May 21, 1888.



STONE BRIDGE OVER THE OLD MILL RACE.



Other property, including the Military Reserve at Queenston, has been placed under the control of the commissioners, so that the Canadian park system comprises the following: Queen Victoria Park at Niagara Falls (the park proper)... 151 acres. Chain reservation along the river from Chippawa to Fort Erie..... 106 acres. Accretions at Fort Erie..... 70.75 " Chain reserve and land on top of the high bank of the river northerly from the park to the Military Reserve at Queenston..... 70 " Talus and lands below the cliff from the park to Queenston..... 255.75 " Lands at Queenston, including portion of the Military Reserve..... 35 " Reserve along water's edge from Queenston to Military Reserve at Niagara-on-the-Lake..... 43.5 " Total, not including lands under water..... 675 "

The cost of the lands which were purchased was \$154,104.71. The cost of maintenance and the interest charges on the bonds issued is derived from moderate tolls levied upon visitors under the falls and carriages over the islands.

The present commissioners are John W. Langmuir, chairman, Toronto; George H. Wilkes, Brantford; Benjamin E. Charlton, Hamilton, and James Bampfield, Niagara Falls. The superintendent of the park is James Wilson.

## CONVENTION PROGRAM.

Following is the program of the four days meeting :

### Tuesday, October 19.

10 a. m. Meeting called to order by Robert McCulloch, President. Address of Welcome.—Hon. A. C. Hastings, Mayor. Calling of the Roll. Invitation extended to join the Association. Address of the President. Report of the Executive Committee. Report of the Secretary and Treasurer. Reading of Paper.—Municipal Ownership of Street Railways; P. F. Sullivan, General Manager, Lowell & Suburban Railway Company, Lowell, Mass. Reading of Paper.—Some of the Difficulties Existing in the Construction and Operation of Electric Street Railways; G. W. Knox Electrical Engineer, Chicago City Railway Company, Chicago, Ill.

### ENTERTAINMENT.

2:30 p. m. A visit will be made to the power house of the Niagara Falls Hydraulic Power & Manufacturing Company, after which the cars of the N. F. & S. B. Railway Company will convey the party to the power house of the Niagara Falls Power Company, and the factories of the Niagara Falls Paper Company and the Carborundum Company.

Pleasant entertainment will be provided in the evening at the hotels—music, dancing, etc., and if weather is pleasant, trolley party excursions to visit the Rapids, etc.

### Wednesday, October 20.

Convene at 9:30 a. m. Reading of Paper.—Application of Storage Battery to Electric Traction; Charles Hewett, Electrical Engineer, Union Traction Company, Philadelphia, Pa.

Reading of Paper.—Power Distribution and Use of Multiphase Current Transmission for Ordinary Street Railways; Maurice Hoopes, Electrical Engineer, Lynn & Boston Railroad Company, Lynn, Mass.

Appointment of Committee on Nomination of Officers and Next Place of Meeting.

2:30 p. m. Party will walk across the upper Suspension Bridge to the Canadian side, where the cars of the Niagara Falls, Park & River Railway will convey party to Chippewa and Queenston, where the steam ferry of the Niagara Falls Navigation Company will be taken to Lewiston, thence by the Niagara Falls & Lewiston Railway Company (Great Gorge Route) through the Gorge to Niagara Falls.

The committee will provide pleasant entertainment in the evening.

### Thursday, October 21.

Convene at 9:30 a. m.

Reading of Paper.—Discipline of Employees; Geo. H. Davis, Superintendent Canal & Claiborne Railroad Company, New Orleans, La.

Reading of Paper.—Application of Electricity to Railroads now Operated by Steam Power; H. N. Heft, President Meridan Electric Railroad Company, Meridan, Conn.

Reading of Paper.—Best Method of Settling Damage Cases and Prevention of Accidents by Use of Fenders or Otherwise; C. G. Goodrich, Vice-president and General Manager Twin City Rapid Transit Company, Minneapolis, Minn.

Election of Officers.

9:30 a. m.—A trip will be arranged for the ladies to Youngstown and Fort Niagara over the Great Gorge Route and the Frontier Railroad, in charge of Ladies' Reception Committee assisted by gentlemen of the Reception Committee.

7 p. m.—Annual Dinner at the International Hotel.

### Friday, October 22.

Convene at 9:30 a. m.

Unfinished Business.

Installation of Officers.

Adjournment.

### Local Committees.

#### GENERAL.

Hon. A. C. Hastings, Mayor, Chairman.

Hon. W. C. Ely, President Buffalo & Niagara Falls Electric Railway Company.

Charles B. Hill, Treasurer N. F. & S. B. Railway Company.

Capt. John M. Briaker, President Niagara Falls & Lewiston Railway Company.

W. A. Heller, Superintendent Lewiston Frontier Railroad Company.

John Foy, General Manager Niagara Navigation Company.

Col. Henry M. Watson, President Buffalo Railway Company.

H. H. Littell, President Crosstown Street Railway Company, Buffalo.

J. M. Bostwick, Treasurer Niagara Falls & Clifton Suspension Bridge Company.

W. Phillips, Superintendent Niagara Falls, Park & River Railway.

Burt Van Horn, General Manager Buffalo & Niagara Falls Railway Company.

Frank LeBlond, Manager Maid of the Mist Steamboat Company.

Hon. Thomas V. Welch, Superintendent State Reservation.

James Wilson, Superintendent Queen Victoria Niagara Falls Park.

Hon. Arthur Schoellkopf, Secretary and Treasurer, Niagara Falls Hydraulic Power & Manufacturing Company.

W. A. Brackenbridge, Engineer Niagara Falls Power Company.

Joseph P. Devine,

L. W. Pettibone,

Hon. James Low,

A. H. G. Hardwicke,

Wm. Richmond,

Benj. F. Thurston,

Wm. S. Humbert,

W. H. Barnes,

Walter McCulloch,

Eugene Cary,

Thomas McDowell,

D. Isaacs,

Gen. Benj. Flagler,

Richard Williamson,

Lawrence Davis,

Andrew Dickey,

John M. Hancock,

James Simmons,

H. W. Beardsley.

#### COMMITTEE ON BANQUET.

Hon. A. C. Hastings,

Hon. W. Caryl Ely,

Hon. T. V. Welch.

#### COMMITTEE ON EXHIBITS.

H. W. Beardsley,

W. Phillips.

W. A. Heller,

#### COMMITTEE ON ENTERTAINMENT.

W. S. Humbert,

Hon. James Low,

James S. Simmons,

Mrs. W. C. Ely,

Mrs. W. S. Humbert,

Mrs. A. G. Hardwicke,

Mrs. George Nye,

Mrs. Burt Van Horn,

Mrs. F. A. Dudley,

Miss Bessie Low,

Miss Grace Cuddaback,

Mrs. J. M. Hancock,

Mrs. M. Cohn,

Mrs. Eli Nichols,

Mrs. F. K. Paddock,

Mrs. H. W. Beardsley,

Mrs. W. W. Reed,

Mrs. W. D. Hough,

Mrs. E. H. Stewart,

Walter McCulloch,

David Isaacs,

H. W. Beardsley,

Mrs. A. C. Hastings,

Mrs. H. E. Woodford,

Mrs. F. W. Oliver,

Mrs. H. A. Francis,

Mrs. N. L. Benham,

Mrs. F. E. Johnson,

Mrs. E. O. Babcock,

Mrs. C. W. Dill,

Mrs. J. C. Morgan,

Mrs. W. Richmond,

Mrs. W. R. Campbell,

Mrs. A. Thibaudau,

Miss Rose,

Mrs. Thomas McDowell,

Mrs. W. L. Lamont,

Mrs. W. C. Johnson.



Supplement Street Railway Review.





## CONVENTION BUILDING.

Again this year the association is fortunate in having the meeting place and the exhibits under one roof, and the announcement that the building is steam and electrically heated will be hailed with joy. When the invitation was extended the local committee expected to erect a structure for the use of the convention, but the problem was solved by the purchase of an armory by the Board of Trade, for convention purposes. The committee enlarged this by the addition of a one-story annex, 77 x 126 ft., which gives a total floor space of nearly 20,000 sq. ft. The assembly room for the American Street Railway Association is on the second floor, where a commodious room, seated with chairs is sufficiently removed from the exhibits to secure quiet, and yet make them accessible. The Accountants' Association will meet in the smaller parlor on the first floor. Both meeting rooms can be reached only by passing through the exhibit hall.

The building is at the corner of Walnut and 6th streets, on the line of the city road, which will run special cars between the International and the hall. The ride occupies but six minutes; or the distance makes a pleasant walk of about 12 minutes.

There will be a practically unlimited amount of power; two circuits will be run from the station of the Niagara Falls Hydraulic Power & Manufacturing Company, one supplying alternating currents at 104 volts and 125 cycles per second for light, and a direct current of 500 volts for the use of exhibitors. A track 300 ft. long has been constructed in front of the hall, where cars and other large exhibits will be accommodated. Railroad connections have been made direct to the convention building, so that heavy shipments can be unloaded from the cars into the building. Where

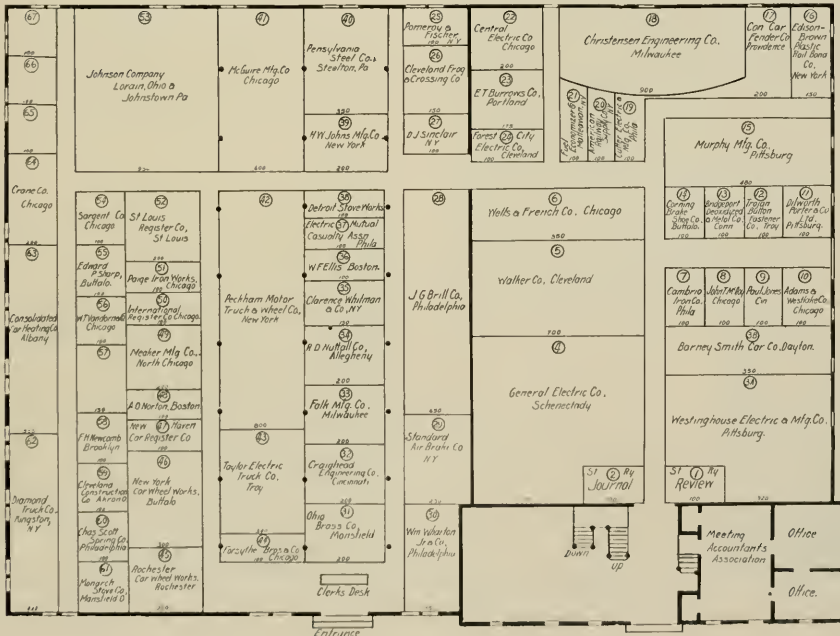


CONVENTION AND EXHIBIT HALL AT NIAGARA FALLS.

teaming is required special rates have been secured, as well as for carpenter and other necessary work of installing exhibits. The building will be open to receive shipments 10 days in advance of the meeting, and exhibitors are urged to have everything complete by the morning of the 19th.

Cars, sweepers and other large equipments suitable to go outside, will be placed in front of the building on a special track. Such exhibits will be arranged in the order of their arrival. Track space has been taken by the following:

- J. G. Brill & Co., Philadelphia.
- Peckham Motor Truck & Wheel Company, Kingstong, N. Y.
- McGuire Manufacturing Company, Chicago.
- Taunton Locomotive Manufacturing Company, Taunton, Mass.
- Taylor Electric Truck Company, Troy, N. Y.
- American Car Company, St. Louis.
- G. C. Kuhlman Company, Cleveland.
- Dupont Car Company, Boston.





# Street Railways of Niagara

Few places are as favorably situated for the construction and operation of electric railways as the two cities of the same name. A resident population of goodly size, with the thousands of visitors, combine to make a steady business throughout the year for the roads, which have almost entirely displaced the old-time and avaricious hackman. Not only can the visitor reach the desired points of interest without any loss of time, but is transported in comfort and rides farther for a nickel than he formerly could travel for a dollar. The production of power by the great water plants has also greatly simplified construction, obviating the time and money necessary to erect stations, and reducing that feature to a simple question of monthly rental.

On the American side are five roads, and on the Canadian two. These lines have 127 miles of track upon which are operated 166 cars. The line to Buffalo has very largely diverted the passenger traffic from the steam roads, the frequent service and delightful ride making the trip enjoyable.

The various electric lines on both sides the river are creditable examples, both in construction and operation, and will be found highly interesting to the railway visitor. All the roads are operated from current generated by water power, the only road having its own station being that of the Park Railway on the Canadian side. During the convention visitors will be conducted over the whole or portions of all these lines.

### Niagara Falls & Suspension Bridge Railway.

The growth and progress of the city of Niagara Falls during the last seven years are in no way better illustrated than by the development of the Niagara Falls & Suspension Bridge Railway and its connections. In the year 1890 the system consisted of 15.8 miles of single track, connecting the business centers of what were then the villages of Niagara Falls and Suspension Bridge. The rail weighed 38 lbs. to the yard and was the old fashioned center bearing strap rail, and the equipment consisted of four 12-ft. bobtail cars, each drawn by one horse, supplemented in the summer season by a few open cars.



CHARLES E. HILL.

This answered the requirements of the locality at that time, but simultaneously with the embarkation of outside capital in the scheme of utilizing, on a large scale, the water power of Niagara Falls, the stock of this railroad was purchased by parties residing at Niagara Falls and Buffalo, who saw the importance of the promised development. From that time, in order to keep pace with the progress of the city, the company has

constantly extended and improved the system, until now it claims to give to the city of Niagara Falls better street railroad facilities than are enjoyed by any city of the same population in the country. In 1891 the main line above mentioned was entirely rebuilt and double-tracked, using a 63-lb. girder rail with Samson joints, and newly equipped with 18-ft. and 22-ft. cars of the best pattern, made by the J. G. Brill Company. At this time the road was also electrically equipped, a temporary power house being installed in anticipation of the company subsequently procuring its supply of power from one of the two large companies. In 1892 the road was extended two miles up the river to what is now the beautiful settlement called "Echota" on the lands of the Niagara Falls Power Company. In 1893 a five mile extension was added, covering Pine street, Sugar street and Ontario avenue. In 1895 the line to "Echota" was rebuilt and double-tracked with 72-lb. girder rails, and extended one mile to the city line for the purpose of accommodating the cars of the Buffalo & Niagara Falls Electric Railway, which use these tracks of the local road, and bring into the city annually 350,000 passengers; and in 1896, an arrangement was made with the Niagara Falls & Lewiston Railway Company, known as the "Great Gorge Route", under which the cars of that company are brought into Prospect Park over part of the main line. The total length of the road is about 10 miles and of track 17 miles. This company was one of the pioneers in heating its cars by electricity, having used the electric heating system ever since the road was electrically equipped.



W. B. RANKINE.

The development of the system may perhaps be better gathered from the statement of the number of passengers carried each year since the present management acquired the road, which is shown in the following table:

|                             |           |
|-----------------------------|-----------|
| 1890.....                   | 426,025   |
| 1891.....                   | 444,045   |
| 1892.....                   | 785,454   |
| 1893.....                   | 1,237,405 |
| 1894.....                   | 1,234,978 |
| 1895.....                   | 1,539,317 |
| 1896.....                   | 2,135,740 |
| 1897..... (6 mo. estimated) | 2,400,000 |

In the year 1896 the company abandoned its power house and began taking its supply of power from the Niagara Falls Power Company. This power is part of the product of a 5,000-h. p. dynamo which is operated by means of a 5,000-h. p. water turbine. The turbine is 140 ft. below the

floor of the power house of the Niagara Falls Power Company, the generator being located on the floor and connected with the turbine by a shaft 130 ft. long in the clear. An alternating current is taken from the dynamo at a voltage of 2,200 and passed through a transformer which converts

it into a direct current of 550 volts. This current is carried to the feeder system of the railroad, which passes the power house, the switchboard apparatus being located inside the power house. An interesting feature of the installation is a device invented by Paul M. Lincoln, electrical superintendent of the Power Company, which was improvised to meet the conditions of the agreement upon which the power is supplied, viz.: that the railway company shall not exceed a certain specified consumption for a greater space of time than two hours each day for a given number of consecutive days in any calendar month. The meter provided by Mr. Lincoln is so arranged that the excess of power used over the limit agreed upon, is registered each day by an ordinary clock, so that at the end of the day the space of time during which the over-use has been indulged in by the railway is accurately shown upon the dial of this timepiece. To insure regularity in the supply, the transforming machinery is in duplicate, so that in the event of the breakdown of one machine the other can instantly be put into use. The officers of the company state that the continuity and regularity of the supply of power is all that could be desired, and the advantage of such a connection, doing away entirely with a power house, will be instantly appreciated by all railroad managers.



J. C. BREWSTER.

The officers of the company are: president, J. T. Jones, Buffalo; vice-president, Wm. B. Rankine, New York; secretary and treasurer, Charles B. Hill, Buffalo; superintendent, John C. Brewster, Niagara Falls, N. Y.



LOOKING UP FALLS STREET, NIAGARA FALLS, N. Y.

## The Niagara Falls & Lewiston Railway.

The Niagara Falls & Lewiston Railway, better known as the Gorge Road, is one of the most beautiful routes that can be imagined, passing as it does along the very edge of the Whirlpool Rapids and through the wild scenery of the Gorge. The engineering difficulties to be overcome were unique if



WHIRLPOOL BEND, GORGE ROAD.

exception be made of some of the railroad construction in the Rocky Mountains, and its cost per mile probably exceeded that of any electric line.

What is perhaps the best view of the cataract is obtained from the steel tower built and owned by the Niagara Falls & Lewiston road. This tower is 300 ft. high and is located on the high bank opposite the State Reservation Park.

Starting at the Tower Hotel in Niagara Falls the line runs through Falls street to 3rd and down 3rd, which has a grade of 5 per cent, for 1,600 ft. From this point there is a cut through the solid rock for 300 ft. until the New York





FALLS FROM THE GORGE ROAD.

Central tracks are reached; this cut is on a grade of 9 per cent and is 50 ft. deep at the lower end; it is 22 ft. wide at the bottom and the walls have a slope of .2 in. per foot. From here the line descends to and down the face of the cliff to the foot of the cantilever bridge; the grades are, first, a short one of 2 per cent, then 6 per cent for 1,000 ft., 84 per cent for 2,500 ft., and 5 per cent for 500 ft. From here to Lewiston the track is along the water's edge and from 20 to 30 ft. above it.

Work was begun April 10, 1895, and a construction train was run to the Buttery elevator, 5 miles and 700 ft. 84 days later. This point was the southern terminus for over a year. The line is seven miles long. The track is laid with 60-lb. T-rails on white oak ties, 6 x 8 in. x 8 ft. At curves the inner rail is protected by a guard rail and a stringer 6 x 8 in. is laid outside of the outside rail for the entire distance that the route is along the river. The most interesting section of the track from a constructive point of view is that between

the bridges and the Tower Hotel. At the Michigan Central cantilever bridge the piers are located on rocks projecting from the talus, the most southerly one being but 15 ft. from the shore; there are also large boulders along the talus. Blasting was prohibited by the bridge company for fear that the structure might be injured. The method adopted was to



TOWER OWNED BY GORGE ROAD.

build three piers which carry two plate girder trusses, one 54 ft. and the other 72 ft. long, over which the tracks are laid. The north pier is on the bank, but the footing courses of the other two are under water, being laid on bags of hydraulic cement carefully placed and rammed into the crevices between the boulders. The center pier is protected by riprapping and the south one by a heavy sea wall, which in turn is pro-



CURVE AT BRINKER PARK.



LITTLE ROCK, GORGE ROAD.

tected by riprapping. Iron rods also were drifted into the rock and built into the piers, and on the shore side of the sea wall tie walls were built into the bank for 20 ft.

At the Grand Trunk bridge the railway company was not permitted to remove the badly weathered sandstone and shale covering the limestone, the only solid stone in the neighborhood, and accordingly built two walls. The upper one prevents the earth from above from falling upon the electric tracks and the lower one prevents the earth under the roadbed from sliding into the river.

On the ascent up the talus, the slope of the debris was increased by filling in with rock. Here the 6 x 8-in. guard stringer is some 4 ft. from outside edge of the slope and a further guard is provided near the edge. This latter is a stringer made up of logs 14 in. in diameter and 16 ft. long, which are laid on posts 14 in. high set at intervals of 10 ft.

The overhead line is of No. 00 wire with Billings & Spencer hangers, divided into sections of 1,000 ft. Power is furnished by the Hydraulic Power Company.



UNDER THE CANTILEVER BRIDGE.

The road operates 30 cars of the 14 bench open type, 31 ft. over all. The cars were furnished by the Brill Company, which also furnished the maximum traction tracks. Each car is equipped with two 50-h. p. Westinghouse motors and provided with Standard air-brakes. Bars are provided on the water side, and heavy curtains for the shore side for inclement weather.

The officers of the company are: J. M. Brinker, president; F. C. M. Lantz, vice-president; H. P. Bissel, secretary; R. W. Jones, treasurer; J. K. Brooks, superintendent; G. A. Ricker, chief engineer; D. B. Worthington, general passenger agent.

#### Lewiston & Youngstown Frontier Railroad.

This road passes through the Niagara fruit region and connects the villages of Youngstown and Lewiston. Local capitalists were interested in building a road through this region and a company was organized in the summer of 1895. Franchises were secured to lay tracks in Lewiston from the New York Central station to the town limits and in Youngstown along Church and Main streets to Fort Niagara, and it was decided better to purchase a private right of way between the villages rather than build along the River road. A strip of land, 30 ft. wide was purchased some 400 yds. east of the River road and fenced in. It is a single track railway of standard gage with five turnouts and end switches, also a branch in Lewiston to the New York Central freight depot and one in Youngstown to the docks. As the country is very level there were no difficult fillings, only a few wooden box culverts, and one trestle 18 ft. long and 9 ft. high to construct. The entire length of the road is 10 miles. The construction of the line commenced in the spring of 1896, the contract for the roadbed, overhead work and fencing being \$63,500 and was completed in August of the same year. All the fences and poles are painted olive green. In the two towns the track is laid with girder rails, 67 and 87-lb. and in the country 56-lb. T-rails are in use. The power



SCENES ON THE LEWISTON &amp; YOUNGSTOWN FRONTIER RAILROAD.

comes from the Niagara Falls Hydraulic Power & Manufacturing Company whose station is  $7\frac{1}{4}$  miles from Lewiston which gives a maximum distance of transmission 16 miles. The current is conducted over a 500,000-c. m. stranded copper wire strung on the poles of the "Gorge Road" and connected to the feeders and trolley wire at Lewiston. The current from one of the 1,000-h. p. generators is raised to 750 volts by means of a booster for the long transmission. The equipment is for freight and light baggage as well as passenger service. There are four open cars and two closed combination baggage and passenger cars made by the J. G. Brill Company and these are equipped with G. E. 1,000 motors. During the past summer a large freight traffic has been handled, consisting chiefly of peaches, grapes, apples and other fruit, in refrigerator cars; formerly this has all been

Falls, via Tonawanda and North Tonawanda; the greater portion of the right of way is along the highways—the old military roads. The line was an expensive one to build because the company accepted onerous conditions as to the paving in Tonawanda and North Tonawanda, and constructed several steel highway bridges, and a viaduct over the New York Central and Erie railroads to avoid a dangerous grade crossing near North Tonawanda. This viaduct has three spans, one of 42, one of 78 and another of 182 ft., with approaches 500 and 600 feet long respectively; the clear space above the steam tracks is 35 ft.

While as stated the company has but 14.5 miles of double track, it has traffic agreements with the Buffalo Railway Company and the Niagara Falls & Suspension Bridge Railway Company, by which it is enabled to run its cars from the center of one city to the center of the other, making a route of 23 miles. Under these agreements the company also issues transfers good over the local lines. The Buffalo agreement is for 50 years, and that at Niagara Falls for 35 years.

The track work is of the best; 73-lb., 7-in. girder rails of a special section rolled by the Cambria Iron Works, in 60 ft. lengths, are laid on oak ties 6 x 9 in. x 8 ft., spaced 2 ft. between centers, and the line is ballasted with crushed stone, top dressed with gravel rolled hard. The rails are bonded with Chicago bonds. The overhead work is carried on octagonal Norway pine poles. The line is divided into three sections, two of 4 miles and one of 8, and there are some 52 miles of No. 0000 feeders, and 14 miles of 500,000-c. m. wire, which was furnished by Washburn & Moen and John A. Roebbling's Sons Company.

The road is operated by power furnished by the Niagara Falls Power Company, and the company has also a power station of its own, at North Tonawanda, which was built when the road was first constructed—before the transmission line was built. This is used at present when heavy traffic demands it, particularly in the summer. The company expects to place transformers in the power house at North Tonawanda, in the near future, and discontinue the use of the steam plant.

The company owns 35 motor cars, which are 28 ft. inside, and 30 ft. over all, on double trucks having 33 in. wheels. Both cars and trucks were furnished by the J. G. Brill Company. The car-barn is located near the center of the line and is an exceptionally fine building of its class;



FORT NIAGARA.

teamed to Lewiston. On account of the rich country through which it runs and the power facilities this road is a very prosperous one. The officers are: L. D. Runsey, president; H. C. Howard, vice-president; K. Evans, secretary; G. R. Teller, treasurer and R. B. Goodman, superintendent and engineer.

#### Buffalo & Niagara Falls Electric Railway.

The Buffalo & Niagara Falls Electric Railway corporation was formed in 1892, and the right of way secured, but because of the panic in the following year work was not begun until the spring of 1895. The contract was awarded to the White-Crosby Company in May of that year, and the work was completed in the following September.

The road comprises 14.5 miles of double track, extending from the city limits of Buffalo to the city limits of Niagara





W. CARL ELY.



BURT VAN HORN.



C. K. MARSHALL.

the dimensions are 78 x 390 ft., including office and repair shops. The fare from Niagara Falls to Buffalo and return is 50 cents, one way 35 cents. During the day the regular cars run every 15 minutes, and oftener when the traffic demands it; during the week of the Grand Army encampment there was a continuous service at 5-minute intervals from Buffalo to Niagara Falls, during the entire week.

The service afforded is appreciated by the citizens of Buffalo and tourists, as the number of passengers carried indicates. From the opening of the road, (September 22, 1895),

to July 1, 1896, the number of passengers carried was 662,435; from July 1, 1896 to July 1, 1897, there were 1,125,351 passengers carried over the line.

The officers of the company are Hon. W. Caryl Ely, president; H. H. Littell, vice-president; Burt Van Horn, secretary, treasurer and general manager, and C. K. Marshall, superintendent.

The directors are, W. Caryl Ely, H. H. Littell, H. M. Watson, Henry J. Pierce, John J. McWilliams, George H. Dunbar, Robert L. Fryer, Burt Van Horn and Joseph T. Jones.



BUFFALO & NIAGARA FALLS ELECTRIC RAILWAY.

## Buffalo Railway Company.

The intimate connection existing between Buffalo and Niagara Falls, since the completion of the electric railway and the power transmission line, would make an article on the street railways of Niagara Falls incomplete unless mention were made of the street railway system of Buffalo, and

much more so since these interests owe so much to the officials of the Buffalo Railway Company.

Buffalo is particularly well located for the development of a street railway system; it is the trans-shipping point for the greater part of the lake commerce, and this fact has concentrated the business interests in a small area on the lake front, from which the city spreads out fanwise to the north and east, with an area of 40 square miles. The manu-

facturing interests are large and will continue to grow as more use is made of the cheap power from Niagara.

The Buffalo Railway Company operates 150 miles of track, of which it owns 77 miles, all of which is within the city limits. This company was organized in 1890 and chartered for 999 years, and it is particularly fortunate in having franchises for the same term, of which but 30 years have elapsed. The capital stock of the company is \$6,000,000, of which some 10 per cent is carried in the treasury, and its funded debt is \$5,170,000, the greater part of which being the bonds of the constituent companies, and the bond issue of the Crosstown road.

All lines are operated by electricity; the change from horse to electric traction began six years ago, about the time the present management took charge of the road, and the last car was run November 10, 1894, at which time the company operated about 140 miles of track. Since that time but slight extensions have been made to the line; the increase in the number of cars however in these three years was from 345 to 500 at the present time. The importance of the system and the value of the property is shown by the traffic returns: in 1896 the gross receipts of the company were

\$1,867,000, being exceeded by but 12 other companies in the United States.

There are in the territory contiguous to Buffalo seven interurban lines, having in the aggregate 79 miles of track, which are valuable as feeders for the Buffalo system. All these lines terminate at the city limits.

The officers of the Buffalo Railway Company are Henry M. Watson, president; H. H. Littell, vice-president and general manager; Joseph S. Baecher, secretary and treasurer; Peter C. Deming, superintendent.

Mr. Watson is well known to street railway men, having been president of the American Association in 1890-91. He was at that time president of two of the street railways of Buffalo. It was through his efforts that the roads of that city were brought into a single system.

Mr. Littell was the first president of the American Association, being at that time general manager of the Louisville City Railway Company, thus giving to the Buffalo Railway Company the honor of having two past-presidents among its officers. Mr. Littell became vice-president and general manager of the company just as the lines were being changed to electricity, and to his experience and executive ability the efficient operation of the company is largely due. To him also is due much of the credit for the construction of the power transmission line to Buffalo, the Buffalo Railway Company being the first to contract for power, and urging upon the Power Company the necessity for rapid work until the line was completed.

Few delegates to the convention will be satisfied to return home before they have inspected the Buffalo lines, which will be found splendid examples of the best practice in modern street railroading.

## "The Canadian Route."

The Niagara Falls, Park & River Railway, or as it is more quickly termed, "The Canadian Route," is an extremely interesting road. When Father Hennepin made



H. M. WATSON.



H. H. LITTELL.



POWER HOUSE OF THE NIAGARA FALLS, PARK &amp; RIVER RAILWAY.



his famous journey in 1678 he followed identically the same route from Queenston to Chippewa which is now traversed by this road, and could he return to earth it is probable he would be no less astonished at this modern system

tion cars are used, with three tiers of longitudinal seats, so arranged that each passenger secures an uninterrupted view. The special scenes of interest include the historic Queenston, Brock's Monument, the battleground of Queenston

SOME  
VIEWS  
ALONG



American Fall, summer

THE  
CANADIAN  
ROUTE



N. F. & P. R. R. Terminus.



Overlooking Lewiston



Overlooking Queenston



Whirlpool and Lower River

of travel than he was when his eyes gazed for the first time on one of Nature's greatest pictures.

The road is 13½ miles long, double tracked on rock ballast, and affords the finest views to be had from the Canadian side; in fact, to properly appreciate the American Fall one must view it from the Queen's dominion. In the construction of the road no expense was spared to secure a perfect roadway. The bridges are of steel, resting on pedestals of finest masonry; the curves are protected with guard rails and rail braces, permitting a high rate of speed where desired. Specially designed observa-



American Fall, winter.

Heights, the ruins of two forts, after which the road skirts the gorge until the Whirlpool is reached. The Whirlpool Ravine is crossed on a splendid steel structure 500 ft. long and 135 ft. high. Here, also, the company has an incline railway, operated by gravity, water being used for counterbalance, and which takes the tourist down 200 ft. to the water's edge. Resuming the journey, the road passes through the city of Niagara Falls, Canada, and crosses the Dufferin islands, which afford splendid views of the Rapids and Falls. A steel bridge 100 ft. long carries the road from the islands to the mainland,





GRAND TRUNK SUSPENSION BRIDGE REPLACED BY STEEL ARCH BRIDGE IN 1897.

where the line skirts the river for a mile and a half to Chippewa, where connection is made with steamers for Buffalo.

The company built its own power house, a substantial structure of stone, in which are installed three American turbines of 45 in. diameter, working under a head of 62 ft. and delivering 1,000 h. p. each.

The water is taken from the rapids just above the Falls by a flume 200 ft. long to the gates; here it plunges a depth of 62 ft. on the turbines below, and is then carried away by a tunnel 600 ft. long, discharging underneath the Falls. The power is conveyed by the proper shafting and belting to the dynamos, in such a manner that any required number of these machines may be used as necessity demands.

The generators are General Electric multipolar 200-k. w. Forty-one cars are in operation, equipped with G. E., W. P. 50 motors. There are seven feeders ranging in size from No. 0 to No. 000,000. Another incline at the Maid of the Mist landing is owned by the company, this incline being worked by electricity.

The "Canadian Route" commenced operation the year of the World's Fair and during the short season available, carried 420,000 passengers.

In addition to the popularity of the route with loyal Canadians, thousands of Americans come over to make the trip.

The officers are E. B. Osler, Toronto, president; Wm. Hendrie, Hamilton, vice-president; R. A. Smith, Toronto, secretary; W. Phillips, manager; J. C. Rothery, superintendent, and J. E. Stephenson, general passenger and ticket agent, Niagara Falls.

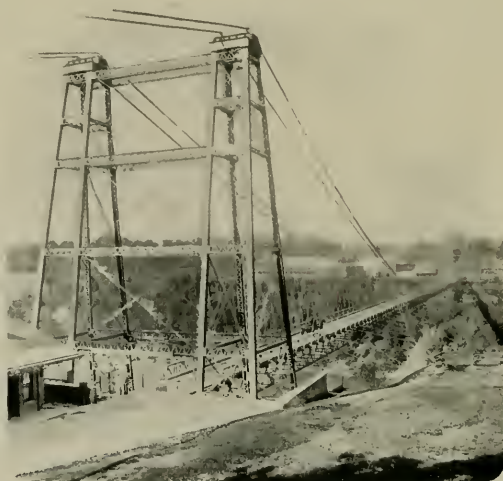
## BRIDGES ACROSS THE NIAGARA.

Members of the American Street Railway Association who attend the Niagara convention will witness the early stages of a work that is destined to result in the erection of a second great steel arch across the gorge and the passing away of the last of the famous suspension bridges between the Falls and Whirlpool Rapids. In the construction of these new arches connecting the Dominion of Canada with the United States, it is interesting to note the provision made for the passage of electric cars over them, thus defining quite clearly the recognition the trolley is receiving in New Niagara. The demands of the locality about the Falls are such that, in order to accommodate the pleasure travel, it is easy to be seen that electricity has played an important part in the innovation in bridge building to be found there.

The old railway suspension bridge is but a memory now, it having been removed during the past summer. As originally built this structure

was of wood with stone towers. The first train crossed it March 8, 1855. The first connection between the cliffs was made by a kite string as described elsewhere. In 1880 the suspended structure of this bridge was renewed in steel, and in 1886 the stone towers were replaced by steel ones. The suspension bridge was a single track structure on its upper deck, and the demands of the time were for better facilities for crossing the gorge, and so the new arch was built with double tracks on its upper deck, and a trolley track on the lower floor.

The second steel arch now building will replace the upper suspension bridge, and it will be the fourth



BRIDGE TO BE REMOVED TO LEWISTON.

bridge erected on this site. The first bridge here was in 1868, connection between the cliffs having been made by carrying a cord across on an ice bridge, and previous to that time the method of crossing was by a ferry. The bridge was opened on January 2, 1869. It was a wooden structure, which in 1887-8, gave way to a bridge of steel. During a violent wind storm on the night of January 10, 1889, this structure was torn from the suspenders and dropped into the gorge, a large portion of it still being hidden beneath the waters of the river. The bridge was at once rebuilt, and it is this structure, less than 10 years old, that is to be replaced by the second arch. It will have a double trolley track, carriageways and walks.

When taken down the suspension bridge will be rebuilt on the site of the old Lewiston bridge, seven miles below the Falls, which was destroyed by wind April 16, 1864, and never rebuilt. In the spring of 1864 a big ice jam piled up

about the guys of the old bridge at Lewiston, and in order that the ice should do them no damage, they were loosened. During the pleasant weather that followed the bridge attendants overlooked the loose guys,

and when the high wind came up, the bridge fell an easy prey to its force, and it has ever since stood a wreck marking man's forgetfulness. It is understood a trolley track will also be laid on the bridge to be built at Lewiston, and, if so, it will result in several trolley loops about the gorge, for crossing by trolley will then be possible at three points.

The opening of the new steel bridge was made the occasion of a three days carnival in the latter part of September. The bridge had been open for traffic for some weeks but a

popular entertainment was designed to attract visitors to the Falls. A feature of the three days celebration was that the lower deck of the bridge was thrown open and no tolls charged.



SKETCH OF PROPOSED BRIDGE.



GRAND TRUNK DOUBLE DECKED STEEL-ARCH BRIDGE DURING CONSTRUCTION, 1897.

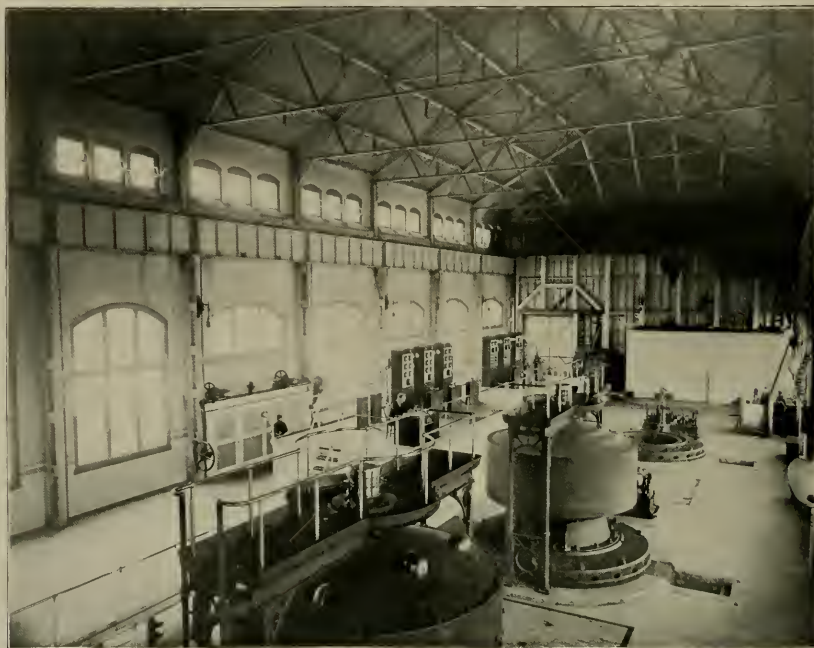
## THE FALLS HARNESSSED.

Niagara Falls now has the right to lay claim to being the "Power City" of America. That this idea was in the minds of those who settled the district about the Falls is shown in the name given to the first village, Manchester. Ever since the first saw-mill, built in 1725 and operated by water power from the Falls, men had been endeavoring to perfect plans whereby at least a portion of the great power there might be diverted to industrial purposes. While the probable future of the Falls was indicated, before the practical difficulties could be overcome, such improvements had been made in the steam engine and the cost of steam power so

There are now two power companies at the Falls, the Niagara Falls Power Company and the Niagara Falls Hydraulic Power & Manufacturing Company.

## The Niagara Falls Power Company.

In 1885 Thomas Evershed, division engineer of the New York State Canals, was called upon to devise a plan for the more extensive utilization of the power of Niagara, and the idea as developed by him was to do so in such a manner as to preserve the natural beauty of the Falls. During a long



INTERIOR OF STATION—NIAGARA FALLS POWER COMPANY.

reduced, that water powers were not sought out and developed as before. At Niagara a few small plants were built but nothing of magnitude was done.

In the early 40's Augustus Porter, who was one of the large proprietors at Niagara, proposed an extension to the system of canals and races then in use and in connection with others arrangements were made for the building of a canal. Many delays, however, ensued, and it was not until 1861 that the plan was carried out. In that year Horace H. Day, the successor to the original company, completed a canal 35 ft. wide, 8 ft. deep and 4,400 ft. long through which water was brought from the river above the Falls to a basin on the bluff of the lower river. Various mills were established on the margin of this basin; the wheels installed drew water from the basin and discharged it through short tunnels terminating in the face of the bluff. This afterward was acquired by the Niagara Falls Hydraulic Power & Manufacturing Company.

carcer as an engineer Mr. Evershed had been engaged upon work in the Niagara River district and he was at this time laying out the New York State Reservation.

Charles B. Gaskell, who was the oldest user of water power at Niagara, after consultation with Mr. Evershed associated himself with seven other gentlemen of Niagara Falls and obtained a charter from the state of New York March 31, 1886, which was afterward amended and enlarged by several successive acts. Mr. Evershed issued his plan and estimate July 1, 1886, and it was at once demonstrated, as was the case when ocean-going steamers were first proposed, that the scheme was impossible, and further, that if it were possible, no one would make use of the power. It required three years for the promoters to convince capitalists that the undertaking would be a commercial success.

The Cataract Construction Company was organized in 1889. Those interested in this company were William B.

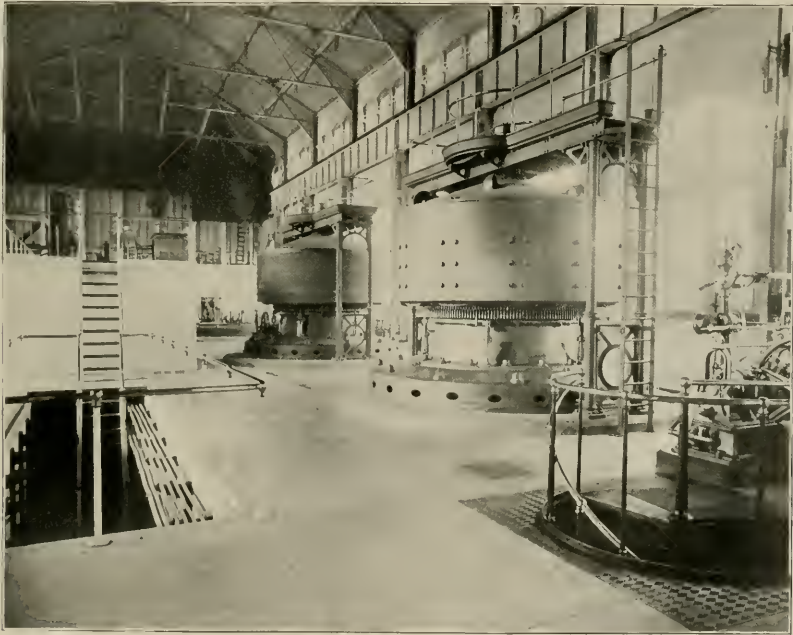


Rankine, Francis Lynde Stetson, J. Pierpont Morgan, Hamilton McK. Twombly, Edward A. Wickes, Morris K. Jesup, D. O. Mills, Charles F. Clark, Edward D. Adams, Charles Lanier, A. J. Forbes-Leith, Walter Howe, John Crosby Brown, F. W. Whitridge, W. K. Vanderbilt, George S. Bowdoin, Joseph Larocque, Charles A. Sweet of Buffalo, and John Jacob Astor. Mr. Adams was chosen president of the company; Dr. Coleman Sellers, of Philadelphia, was retained as general consulting engineer, and Clemens Herschel, formerly of Holyoke, as hydraulic engineer.

Mr. Evershed's plan was adopted with some modifications, and after thus fixing upon the general arrangement,

Taking up first the general plan of the installation. Water is drawn from the river at a point a mile and a quarter above the Falls, and conducted to the power house through a canal which extends inwardly 1,700 ft. This canal is 250 ft. wide at its mouth, which is 600 ft. from the shore line. The walls are of solid masonry, 17 ft. high, 3 ft. thick at the top and 8 ft. thick at the base, laid up in American cement mortar. The power house is along the side of the canal, and the walls of the latter are pierced by 10 inlets, guarded by gates which permit the delivery of water to the wheel pit in the power house.

The wheel pit is an elongated shaft, 140 ft. long, 18 ft. wide and 178 ft. deep. This pit is lined on the bottom with



INTERIOR OF STATION—NIAGARA FALLS POWER COMPANY.

attention was given to two important features, the turbines and the methods of transmission. For the purpose of securing the latest data from engineers and manufacturers, Mr. Adams while abroad established the International Niagara Commission in London, in June, 1890. This commission consisted of Sir William Thomson (Lord Kelvin), chairman, Dr. Sellers, Lt.-Col. Theodore Turretini, of Geneva, Switzerland, Prof. E. Mascart, of the College of France, and Prof. W. C. Unwin. The commission examined into the methods of power development and transmission, and received competitive plans from some 20 different engineers and manufacturers, and awarded \$22,000 in prizes. The selection of Faesch & Piccard to design the turbines of 5,000 h. p. capacity and the adoption of electricity for transmission in preference to ropes, hydraulic pipes, or compressed air are well known.

16 in. of brick, the top course being of the best quality paving brick, and on the sides, to the height of 30 ft. above the top of the invert, with from 2 to 2½ ft. of brick masonry. The walls are capped with a single course of limestone 30 in. thick, and on this are the girders carrying the weight of the penstocks and turbines.

The wheel pit is connected by a lateral tunnel with the main tunnel serving the purpose of a tail-race, and carrying the water from the turbines to the point of discharge just below the suspension bridge. The length of the main tunnel is 7,000 ft.; in addition there are the tunnel connection to the wheel pit and a short tunnel circular in shape and 10 ft. in diameter which was provided with a view to the possible development of lands owned by the company on the north side of the tunnel.

The average slope of the main tunnel is 6 ft. in 1,000; it

was deemed best to lower the portal so that a considerable portion of the discharge might be under water, and 90 ft. from the portal the grade is changed to an ogee, dropping 11 ft. in that distance. The slope gives a velocity of  $26\frac{1}{2}$  ft. per second or about 20 miles per hour when running at full capacity. The maximum height of the tunnel is 21 ft. and the maximum width 18 ft. 10 in.; the net section is 386 sq. ft. It is lined throughout with at least four rings of the best hard-burned brick, making the wall 16 in. in thickness. At points where from the nature of the surrounding material it was thought best to increase the thickness of the wall there are six and eight rings of brick.



EXTENSION TO WHEEL PIT.

Work on the tunnel was prosecuted from three points, two shafts and the portal, and over 1,000 men were engaged continuously for more than three years. Some 300,000 tons of rock were removed and 16,000,000 bricks used for the lining. The shafts were started late in September, 1890, and 6,700 ft. of the tunnel completed in January, 1893; but the whole was not finished till 1894. The rock excavated was used for filling in the lands under water which were owned by the company, and at the present time the greater portion of the plant of the Niagara Falls Paper Mill is on land so filled in.

Aside from the business of generating power in its own plants the company rents the privilege of discharging into its

tunnel as a tail-race, the Niagara Falls Paper Company having such a lease and discharging into the main tunnel by a branch tail-race 7 ft. in diameter. This installation is unique in that it is the capacity of the tail-race and not the supply of water that is limited.

The penstocks are built up of steel and are 7 ft. 6 in. in diameter, tapering down from an elliptical section having the major axis about half again as long.

The three turbines first installed were built by the I. P. Morris Company of Philadelphia, after the designs of Faesch & Piccard of Geneva, Switzerland. They each consist of two Fourneyron turbines, one being inverted and set over the other so as to neutralize the weight on the bearing. Each of the twin wheels is made three stories high and the speed gate is a cylinder which moves up and down on the outside of the turbines. The water from the penstock is allowed to pass through the disk of the upper guide-wheels and to act vertically upward upon the disk of the upper turbine; the disk of the lower guide wheel is solid and the pressure of the water upon it is carried by rods extending through the wheel casing.

The turbine wheels are made of bronze, the rim and buckets in a single casting. The guide wheel has 36 and the turbine wheel 32 buckets. The wheels discharge 430 cu. ft. per second and under the available head, 136 ft. from the surface of the water down to the center of the pair of wheels, will make 250 r. p. m.; at 75 per cent efficiency the output is 5,000 h. p. The shaft is of steel and hollow, 38 in. outside diameter, and  $\frac{3}{4}$  in. thick, except at the journals where it is 11 in. in diameter and solid. A thrust bearing is placed near the upper end of the shaft. It should be mentioned that the upward pressure of the water on the shaft is slightly in excess of weight of the shaft and dynamo fields. The speed-gate is operated by the governor and the speed regulated by its movements. For shutting down entirely the head-gates leading to the penstock are used.

The dynamos are perhaps the most interesting machines of their class that have yet been installed, and were built by the Westinghouse Electric & Manufacturing Company after the designs of Prof. George Forbes. They are of the umbrella type, the field revolving and the armature being stationary. The field ring serves as a fly-wheel for the turbine.

Each generator is 11 ft. 6 in. high from the bottom of the bedplate to the floor of the bridge, which extends over them, for the purpose of giving access to the brushes bearing upon the collecting rings at the top of the shafts. The diameter of the revolving field ring is 11 ft.  $7\frac{1}{8}$  in.; these rings are of nickel steel, forged in a single piece by the Bethlehem Iron Company. Each generator delivers 5,000 electrical horsepower and requires about 5,150 h. p. to be delivered through the turbine shaft, when at full load. The total weight is 170,000 lbs., about 79,000 lbs. being revolving weight. There are six pairs of poles and the generators deliver a two phase alternating current at 2,200 volts.

The governors are after the design of Faesch & Piccard. An interesting feature of the governing is that only one is effective. The alternators are run in multiple so that they must run in synchronism and the speed be that of the fastest governor. In practice it is impossible to set all the governors for the same speed and only the one set for the highest speed does the work.

The power station which houses the generators and covers the wheel pit is a handsome building of Queenston

limestone in the Moorish style of architecture and is along the side of the canal. A bridge connects it with the transformer house. The machinery hall is a plain pitch-roof structure that can readily be extended to cover the new

renting power. In this connection should be mentioned the facilities for switching which are afforded by the Niagara Junction Railway Company (an allied company) whereby any occupant of a mill-site may receive cars from and



wheel pit without marring its symmetry. Three of the 10 units contemplated were first installed and during the last summer work has been progressing on the new wheel pit which when completed will provide for the other seven units.

The Niagara Power Company owns 1,072 acres of land about its station, and leases it to manufacturing concerns

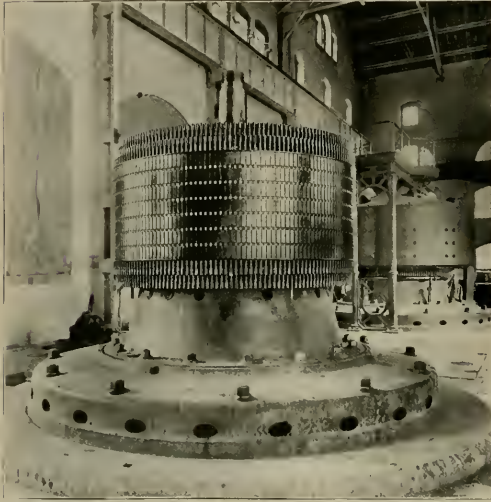
deliver them directly to any of the railroads entering the Buffalo-Niagara Falls district.

The first to use power from this plant was the Pittsburg Reduction Company which has a contract for 3,500 h. p. The current is by means of static and rotary transformers converted to a direct current at 160 volts. This conversion is in two parts; first in static transformers to a two-phase



alternating current at 115 volts; second, in rotary converters to a direct current at 160 volts. This company is engaged in the manufacture of pure aluminum from an oxide of the metal by smelting it in retorts, the mass being melted and the aluminum reduced by means of an electric current.

The Carborundum Company takes 1,000 h. p. from the



WESTINGHOUSE ARMATURE.

Niagara Power Company and this is received in a single static transformer built by the General Electric Company which reduces the voltage from 2,200 to 250; a reactive coil is employed to control this from the maximum down to as low a voltage as 90.

Carborundum is a silicate of carbon made by subjecting the constituents to an intense heat in an electric furnace. The furnace is filled about half full of salt, sawdust and glass sand and on this is laid a core of coke about 21 in. in

diameter and 14 ft. long; contact is made at the ends by packing the coke tightly about bunches of carbon rods which constitute the electric terminals. The furnace is then filled with salt, sawdust and sand. The current heats the core to incandescence and after 24 hours the process is complete, the carborundum being removed in crystals. This is broken up, sorted to size and moulded with a binding material, into wheels, etc., for grinding and polishing.

The Acetylene Light, Heat & Power Company was using 1,000 h. p., the current being transformed to 100 volts, but because of the increase in the demand for calcium carbide has recently increased its plant and now takes 5,000 h. p. In order to display the illuminating power of acetylene the company has placed search lights along the river and at the Falls; they give a beautiful effect and are greatly appreciated by visitors, as heretofore the Falls have been in darkness at night.

The Niagara Electro-Chemical Company has a capacity of about 1,000 h. p., but until recently was using only 400 h. p. It receives current at 2,200 volts and reduces the voltage to 115 in static transformers; this is then changed to direct current at 160 volts by rotary converters, of which the company has three of 250 k. w. each. In this plant the current is used almost exclusively for the manufacture of sodium, decomposing the caustic soda of commerce.

The Central Power & Conduit Company uses some 1,000 h. p. which is transformed to a pressure of 11,000 volts and transmitted to Buffalo. At the Falls end there are two transformers located in the transformer house across the canal from the power house. Each has a capacity of 935 k. w. They are 94 in. high on a base 56x64 in., and weigh 25,000 lbs. each; they are cooled by a blast of air driven up through the core and cells. At the Buffalo end there are three transformers which step down the current from 10,700 volts (the line loss being 300) to 370 volts. This current is carried to two 500-h. p. rotary converters which feed the railway bus bars at 500 volts. This equipment was furnished by the General Electric Company.

The transmission line to Buffalo was built by the Niagara Falls Power Company at great expense. The line is 26 miles long, and for 18 miles a strip of land 30 ft. wide was purchased outright; for five miles the line is along the Erie Canal. The line was constructed by the White-Crosby Company of Baltimore.



SAMPLES OF LINE CONSTRUCTION—NIAGARA FALLS-BUFFALO TRANSMISSION.

Cedar poles, 18 in. at the butt, 8 in. at the top and from 35 to 65 ft. long were planted 75 ft. apart. These poles carry three cables, each of 19 strands, having a total cross-section of 350,000 c. m. For the last 1,200 ft. the cables are laid in vitrified tile ducts. One of the greatest difficulties in the construction of the line was in securing insulators which would stand a high voltage test. By co-operation with the manufacturers great improvements were made in the insulators. That adopted was a double petticoated one of porcelain, made by the Imperial Porcelain Works of Trenton, N. J. All of the feeder cables for this line—two order for 75 miles each, 150 miles of 350,000-c.m. cable—were furnished by the American Electrical Works of Providence, R. I.

Recent tests have shown the insulation resistance of the line to be 300,000 ohms on wet days and 1,000,000 on dry days. The actual working efficiency of the line is very

Hygeia Ice Company, using 50 h. p. For this service General Electric and Westinghouse rotary converters are used, being located in the power house of the Niagara Falls Power Company.

In addition the Niagara Falls & Suspension Bridge and the Buffalo & Niagara Falls Electric Railway each take 250 h. p. for their lines.

Prospective users of power are the Mathiesen Alkali Works, 2,000 h. p.; the Chemical Construction Company, 500 h. p.; and the Albright Wilson Company, 200 h. p.; and about 500 h. p. is to be used in the grain elevators of Buffalo.

#### The Niagara Falls Hydraulic Power & Manufacturing Company.

This company is a powerful rival of the Niagara Power Company and though comparatively little has been written in description, it is well worthy of attention, because of the contrast between the two. In the case of the Niagara



POWER HOUSE AND TRANSFORMER HOUSE, NIAGARA FALLS POWER COMPANY

high, being 79.6 per cent between the generators and the railway circuit, including the losses of the step-up transformers, line, step-down transformers and rotary converters. This high efficiency indicates that it is practical and economical to transmit current 25 miles at 11,000 volts. The transformers, the insulation and the line are all designed for a potential of 22,000 volts. This will bring the losses lower and make the efficiency still higher. At Buffalo, rotary converters change the alternating to a direct current at 500 volts. Connections are then made to the feeders and trolley lines of the Buffalo Railway Company, requiring no alterations in that system. Since last November there have been but two interruptions, and these of very short duration, so that it is demonstrated beyond peradventure that the transmission is thoroughly reliable. Transmission is now only a question of higher voltage for more distant points. Many sanguine predictions are made about the distances this power can be transmitted, but the problem is gradually but surely being worked out from experience.

Other companies taking power from this plant are the Buffalo & Niagara Falls Electric Light & Power Company, using 500 h. p. of alternating current and 150 h. p. of direct current for lighting Niagara Falls; the Niagara Falls Waterworks Company, using 15 h. p. at 500 volts, and the

Power Company the power house is on top of the bluff the wheels located in pits 178 ft. deep, excavated in the rock, and the tail-race a tunnel 7,000 ft. long, constructed at great expense. The Hydraulic Company conducts the water to the top of the bluff below the Falls in an open canal, thence down to the bottom in penstocks along the face of the cliff and generates power at the bottom, utilizing the same fall (with smaller units, however,) with an amount of capital invested that is almost insignificant in comparison with the other; and it might be added that the turbines are of American design in this plant.

The enterprise was the outgrowth of the first scheme to make use of any considerable part of the power of Niagara. Jacob F. Schoellkopf and Abram Chesbrough, organized the company of the present name in 1879, and infused new life into the hydraulic canal. As already mentioned this canal was some 1,400 ft. long, terminating in a basin near the edge of the cliff. The company was unable to make use of the entire fall because it did not own the slope at the water's edge, having merely the right to discharge the water over it. In 1886 the company acquired these sloping lands and the full head of 215 ft. became available.

The capacity of the old canal was about 13,000 h. p. had

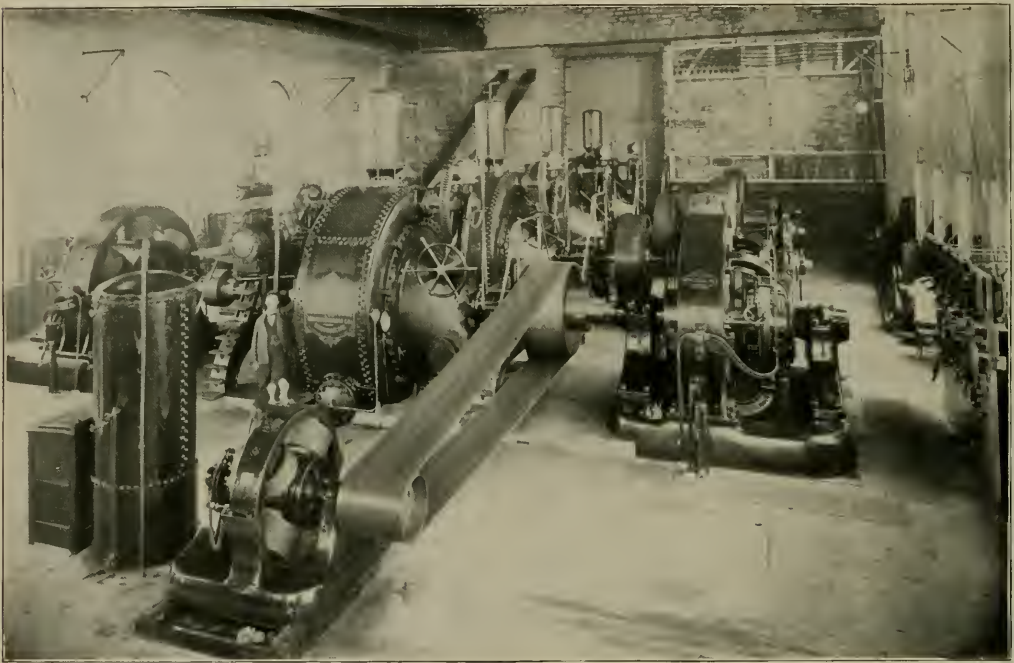
the fall of 215 ft. been used, and was fully taxed by the 6,000 h. p. of wheels installed at the time the sloping lands were bought.

The Cliff Paper Company in 1892 erected its plant at the foot of the bluff, carrying water down through an inclined tunnel in the upper part of the bank, and a penstock along the surface of the slope, and was the first to make use of the full fall.

In the same year the Hydraulic Power & Manufacturing Company began work, increasing the capacity of its canal, widening and deepening it to the present dimensions, and completed it in 1894.

The installation of the power plant at the bottom of the gorge soon followed, being completed in 1896. It is rec-

of the right of way is 100 ft., the canal proper is but about 70 ft. its average depth being 11 ft. At its lower end, running parallel with the high bank there is a basin 400 ft. long and 70 ft. wide. For this installation a canal 275 ft. long, 16 ft. wide and 20 ft. deep, in which the water runs at a depth of 16 ft., leads to a forebay 180 ft. long, 30 ft. wide and 22 ft. deep. This forebay is located between the canal basin and the edge of the high bank, the south end being closed with a wooden dam the idea being to extend the forebay at some future time, when another connection will be made with the canal basin. It is over this forebay that the gatehouse is built which covers the gates by which the water is let into the penstocks, previously passing through racks for screening out all floating substances likely to endanger the wheels



NIAGARA FALLS HYDRAULIC POWER & MANUFACTURING COMPANY—INTERIOR OF POWER HOUSE.

ognized as one of the recent great works in the city, so rich in power facilities and development. The method of development is plain and simple, and the installation is winning much praise from engineers for its efficiency. To all interested in power for trolley lines the plan has several features which will attract attention, especially as a portion of the power operates a trolley road 15 miles distant from the power station. The erection of the plant was under the immediate supervision of Wallace C. Johnson, who is chief engineer of the company.

The hydraulic canal takes water from the upper Niagara river at about the lowest practical point, there being a descent of about 50 ft. from the entrance to the canal to the Falls. The canal is about 4,400 ft. long, and while the width

in the power house below. Under the gate house there is also a gate by which the canal can be cleaned at any time desired. This waste gate consists of two gates, each 20 ft. deep and 8 ft. wide. It is in the apparatus for handling these gates that Mr. Johnson takes especial pride, for it is constructed after his designs, and works most efficiently. In front of each pair of gates stand two cast iron cylinders, each about 8 ft. high, and containing a piston. The tops and bottoms of these cylinders are connected to a pump, run by an electric motor, by which oil can be forced into the top or bottom of the cylinders as desired. The piston rods of the two cylinders are connected at the top by an iron beam carrying four heavy iron hoops, which take hold on pins in the gates, and by simply running the pump and adjusting the



valves the gates may be raised or closed at pleasure, one or both gates being handled at a time. By means of this apparatus a pressure of 100,000 lbs. can be exerted on the gates if necessary. The gate house itself is an iron framed structure covered with corrugated iron 180 x 16 ft. The penstock that takes water from the forchbay to the wheels is 8 ft. in diameter, and for 25 ft. it proceeds in a horizontal direction to clear the edge of the high bank, when it descends in a vertical direction 135 ft. to a solid foundation on the lower stratum of Niagara limestone. From this point it extends, on an angle of 45°, to the power house building, under the floor of which it runs about 70 ft., being 10 ft. in diameter for this distance. The penstock is made of the best quality

of lifting 26 tons. The crane was built by the Buffalo Structural Steel Works. Immediately on entering the power house one is impressed by the beauty and simplicity of the installation. Every part of the machines is before the attendant's eye. If an accident occurs, the cause can be instantly determined. The four water wheels of the plant was made by James Leffel & Co. of Springfield, Ohio. They rest on the floor and take their water supply from the penstock through five-foot openings, each wheel having an individual supply. The inlet pipes to the wheels can be closed by valves operated by hydraulic pressure. The valves are 60-in. and made after Mr. Johnson's plans by R. D. Wood & Co., of Philadelphia.



NIAGARA FALLS HYDRAULIC POWER & MANUFACTURING COMPANY.

of steel plate, each piece of which was rolled to special order and tested and inspected before going into the work. It is  $\frac{3}{8}$  in. thick at the top and  $\frac{1}{4}$  at the bottom. Ritter & Conley of Pittsburg did the work on it. At the lower end this penstock has 100 lbs. pressure to the sq. in. Beneath the power house floor there is a tail-race formed by two masonry walls 17 ft. 6 in. apart and extending from a point 6 ft. below the water in the river back to a point 20 ft. above, or to the floor of the power house. In this tail-race the entire lower portion of the penstock with its enormous weight hangs suspended on iron supports.

The power house is built of stone quarried on the site. The completed section is 100 ft. wide and 60 ft. long, to be extended until it is 180 ft. long, the work now being in progress. It is a one story building, 30 ft. from the floor to the eaves. The roof is supported by iron trusses, leaving the floor free from posts. All parts of the interior are reached by a traveling crane, operated by hand and capable

The details of the wheels were designed by James Leffel & Co.'s engineer, A. F. Sparks, and the entire weight of each one is about 50 tons. They stand on very strong, heavy, double steel beams, placed upon solid foundations of stone, the whole being of a most substantial character. These steel beams span the tail-race, and from the same frame work the horizontal portion of the penstock is supported by means of 48 iron rods, each  $1\frac{1}{2}$  in. square. The wheels are known as James Leffel & Co.'s Niagara type, which is their double discharge turbine in form, and detail especially adapted to the requirements of the Niagara development. This type of wheel consists of a large, flattened, vertical, circular casing containing the guide case of the wheel proper. It is into this exterior casing that the water is admitted from the supply pipes underneath, flowing upwards and surrounding the guide case, being admitted to the runner through a series of oscillating guides, which constitute also the gates. From the sides of this casing project the discharge pipes,

laterally and then downward by a gradual curve, to which draft tubes 20 ft. in length are attached, thus utilizing in part the atmospheric pressure. The heads of the large casing are of curved form to secure strength. They are made of cast iron  $3\frac{1}{2}$  in. thick, and a circular band of steel plates  $\frac{3}{4}$  in. thick, double riveted to the cast heads, constitutes the straight or cylindrical portion of the case. It is within this casing and the guide casing that the runner or wheel proper is located upon a horizontal shaft, supported by adjustable ball and socket oil bearings, upon heavy arched iron bridge-trees exterior to the outer casing. The runners of the wheels are 74 in. in diameter, and made of bronze and iron, very substantially built. The shell comprising the buckets proper, which receive the water by a sharp dividing diaphragm or ridge, is made of bronze, the central portion, upon which the shell is rigidly fastened, being of iron. The wheels discharge the water laterally into the receiving or discharge pipes, and owing to the peculiarity of the design, there is no uncompensated pressure upon any part of the wheel, and therefore no end thrust or pressure endwise on the shaft, but the whole is perfectly balanced wherever it comes in contact with the water. The gates are of the James Leffel pattern, made of the best of steel, and are operated by the double ring arrangement which is easily within the control of a hand wheel operated by one person. To the hand wheel shaft the automatic mechanical governor is readily attached, and in this plant the Lombard governor, made by the Lombard Water Wheel Governor Company of Boston, is in use. The head of water is about 210 ft.

The greater part of the power from this new plant is transmitted on aluminum cables, two in number, each containing 250 wires, to the top of the high bank to the new aluminum factory of the Pittsburg Reduction Company which has two plants at the Falls; the other one has been mentioned. To supply this power the Westinghouse Electric & Manufacturing Company built and installed six 560-k. w. electrolytic generators. These machines were installed under the personal supervision of W. K. Dunlap, the representative of the Westinghouse company at the Falls and are directly connected by flexible couplings to the shafts of the turbines. Each of the turbines nearest the high bank operates two of these generators, and each machine generates 2,000 amperes at 280 volts operating at 250 r. p. m.

The six of these machines are all exactly alike; the field of each consists of eight laminated steel pole pieces, which are cast into a circular yoke or frame. The armature core is composed of punched steel disks, carefully annealed, while the core is built upon an iron spider, which also carries the commutator. The periphery of the armature is slotted to receive the winding, which is composed of copper bars held in slots by means of retaining wedges of hard fibre. These wedges are driven into the notches near the top of the slot, longitudinal with the armature. Should it become necessary to remove any armature coils, they can be pressed out at will. Ventilating spaces through the spider and armature core are so arranged to allow constant circulation of air through the commutator and windings when the machine is running. The commutators are constructed from the very best hard rolled copper obtainable, the segments being spaced by prepared mica of such corresponding hardness that an extremely even wearing surface is presented to the brushes. The brush holders are supported by a casting which is secured to the bearing. Carbon brushes are used.

The fourth turbine is used to operate two generators

built by the General Electric Company. These generators are of 750 h. p. each, their capacity being 1,000 amperes at 550 volts. They are rigidly connected to the water wheel, and are run at a speed of 300 r. p. m. They are compound wound for railway service, and are to be run in multiple. Since the completion of this installation, the Niagara Falls Hydraulic Power & Manufacturing Company has supplied the Niagara Falls & Lewiston Railroad, better known as the Gorge road, with electric power for operating its cars, and also the Lewiston & Youngstown trolley line. For this latter service a second generator, made by the General Electric Company, is used as a "booster." It stands on the power house floor directly in front of the first two generators and their connected water wheel. The service it gives is very good, and the voltage at Lewistown is about 580, and that at Youngstown, about 15 miles distant, is about 507. The current for the operation of the Gorge road comes from the same generators in the power house, but it is taken from a different panel of the switchboard so that it does not pass through the "booster" before being used. The booster was tried at the start, but the current was found too strong for the Gorge road. That portion of the installation furnished by the General Electric Company was installed under the supervision of I. R. Edmonds, the Niagara Falls representative of the company.

It should not be overlooked that any one turbine in this new power house can be operated separately. The superintendent of the Niagara Falls Hydraulic Power & Manufacturing Company's plant, as well as that of the Buffalo-Niagara Falls Electric Light & Power Company, is F. G. Lott, who is an electrician of wide experience. Mr. Lott is highly pleased with the efficiency of the "booster" for trolley line work, and takes pleasure in explaining its workings to visitors.

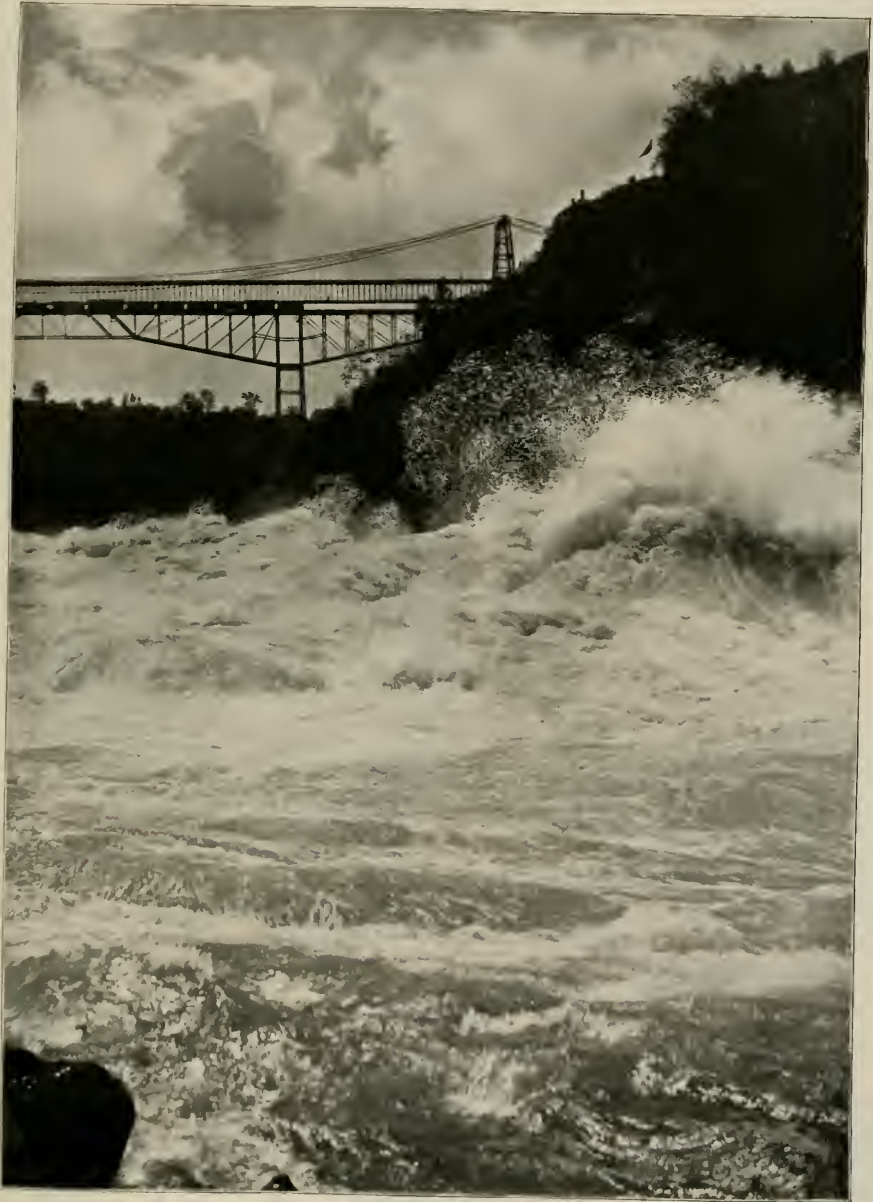
The business head of the Niagara Falls Hydraulic Power & Manufacturing Company is Arthur Schoellkopf, ex-mayor of Niagara Falls. Mr. Schoellkopf is a man not unknown in street railway circles, as he was for years president of the Niagara Falls & Suspension Bridge Street Railway Company. He is a man of extended means, and one who has done much in developing the power resources of Niagara.

Work is progressing on the extension of this power house, and five more turbines, of 2,000 h. p. each, will soon be in operation.

In conclusion attention may be called to the success of Niagara as a power center, as evidenced by the fact that the two great supply companies are both engaged at the present time in increasing their plants.

## THE PAN-AMERICAN CONGRESS.

The Pan-American Congress has already begun to dawn on the horizon of events, and the location of this promising exposition has been chosen. It is midway between Buffalo and Niagara Falls, directly on the line of the Niagara Falls & Buffalo Electric Railway, and well served by steam roads. Some of the most prominent men in the state of New York are on the board of managers and the grounds are in every way desirable and well suited to the purpose. It would be difficult to select a better site, for while the object of the Congress is to make the delegates familiar with the material resources and products of the Americas, no visitor from abroad is satisfied without a glimpse of Niagara.



WHIRLPOOL RAPIDS.





C. S. SERGEANT.



D. B. DYER.



C. F. HOLMES.



H. P. BRADFORD.



ROBERT MCCULLOCH,  
President A. S. R. A.



H. M. LITTELL.



HARRY SCULLEN.



G. B. HIPPEE.



C. H. SMITH.

**OFFICERS OF THE AMERICAN STREET RAILWAY ASSOCIATION.**

The convention of 1897 will be the sixteenth in the history of the association; a history full of interest, and recording an evolution as wonderful as it has been beneficial to the people. The importance of the organization which represents so stupendous an industry can not be overestimated, and it is a matter of pride that its history is a pleasant one to recall and that its proceedings have yet to record dissension, bitterness or strife. The A. S. R. A. was never as strong as it is today; it never had a greater field of usefulness than now; its future was never brighter or so full of promise.

As in the case of the smallest member company, the secret of success lies in good management. The selections for officers and managing board have always been well made, and the official roster this year has never been excelled. Every member is a worker; each enjoys a long experience



THOMAS C. PENINGTON, SECRETARY A. S. R. A.

in railway work; and their management of the affairs of the association has been conscientious and praiseworthy.

The officers this year are: President, Capt. Robert McCulloch, St. Louis; first vice-president, C. S. Sergeant, Boston; second vice-president, Col. D. B. Dyer, Augusta, Ga.; third vice-president, C. F. Holmes, Kansas City; secretary-treasurer, T. C. Penington, Chicago.

The executive committee includes the above and H. M. Littell, New York; H. P. Bradford, Cincinnati; C. H. Smith, Troy; H. Scullin, St. Louis; G. B. Hippee, Des Moines.

The list of meeting places, with president for the year, is as follows:

| Place.         | President.        | Year. |
|----------------|-------------------|-------|
| Niagara Falls. | Robert McCulloch. | 1897  |
| St. Louis.     | H. M. Littell.    | 1896  |
| Montreal.      | Joel Hurt.        | 1895  |
| Atlanta.       | Henry C. Payne.   | 1894  |
| Milwaukee.     | D. F. Longstreet. | 1893  |
| Cleveland.     | John G. Holmes.   | 1892  |
| Pittsburg.     | Henry M. Watson.  | 1891  |
| Buffalo.       | Thomas Lowry.     | 1890  |
| Minneapolis.   | George B. Kerper. | 1889  |
| Washington.    | Chas. B. Holmes.  | 1888  |

|                                                                       |                      |      |
|-----------------------------------------------------------------------|----------------------|------|
| Philadelphia.                                                         | *Thomas W. Ackley.   | 1887 |
| Cincinnati.                                                           | Julius S. Walsh.     | 1886 |
| St. Louis.                                                            | *Calvin S. Richards. | 1885 |
| New York.                                                             | William H. Hazzard.  | 1884 |
| Chicago.                                                              | H. H. Littell.       | 1883 |
| Boston, organization meeting, Moody Merrill, chairman, Dec. 12, 1882. |                      |      |
| *Deceased.                                                            |                      |      |

**THESE WANT THE NEXT CONVENTION.**

One of the most interesting questions at each convention is "Where will the next meeting be held?" and this year the association will not be embarrassed for want of invitations. There will not only be requests in abundance, but they are coming from desirable cities, any one of which would be good, and each will urge its own special advantages and attractions with vigor.

Detroit was first in the field, having put in its request last year and has been following it up energetically ever since. In addition to the street railway companies' invitation, the Detroit Convention League, an association which secured over 80 meetings for that city this year, has taken an active hand. The Association has never been to Detroit, and that city certainly would make a very desirable place in every way.

Cincinnati thinks it about time the street railway men came there again, now they have been to St. Louis a second time. They emphasize their exposition building as an ideal place to show exhibits, and are making an active canvass among delegates in advance of the Niagara meeting. Like Detroit, it is centrally located, with abundant railroad connections and good hotels.

Omaha has been constantly in the papers of late on account of the Trans-Missouri Exposition which will be held in that city in 1898. The exposition buildings are already under way and will be pushed to rapid completion. Our Omaha friends promise that the show will surpass both Atlanta's Cotton Exposition and the Nashville Centennial. The Government has made a generous appropriation and many states as well, and everything points to a magnificent affair.

Louisville has a citizens' committee at work raising funds and making plans to secure the convention, and will come prepared to paint in glowing colors the desirability of meeting there and the interesting southern features which were so pleasing at Atlanta. There are one or two other cities which will in all probability put in their invitations; so among them all the nominating committee will have no easy task to select one from so many, and all desirable.

Still another strong candidate for convention honors is the city of Richmond, Va. Many of the delegates to the Washington meeting in 1888 made the trip to Richmond and had a most enjoyable time. The electric road there at that time was in its infancy and working out its own salvation, being one of the earliest in the country.

**REVIEW HEADQUARTERS.**

The STREET RAILWAY REVIEW will have two offices during the convention; space No. 1 at convention hall will be found immediately to the left of the entrance to the session room; the other at the International hotel is on the office floor directly opposite the clerk's desk. We shall be pleased to have our friends make themselves at home in both places.

# STREET RAILWAY ACCOUNTANTS ASSOCIATION OF AMERICA

The Street Railway Accountants' Association of America was organized "to bring together those engaged in the accounting department of the street and interurban railway companies, for the interchange of ideas, to promote the adoption of a uniform system of accounts, and to improve the work of the accounting department." This association has undertaken a work far reaching and no less essential than the matters which call for an exchange of the best ideas and widest experiences of the brightest men engaged in the operating departments of the same companies. The need of such an organization has been the natural outgrowth of the marvelous expansion in the street railway business, which has inevitably carried its many increased ramifications into the accounts. This effort on the part of the street railway accountants to improve methods and introduce economies, has already commended itself to the Executive Committee of the American Street Railway Association, and a large number of presidents and directors, and deserves and should receive the hearty encouragement and support of every street railway company in America.

The association was organized in Cleveland, on March 24, 1897, at the close of a two-days meeting at which some most excellent papers were read and discussed. Nearly 50 representatives of street railways were present, coming from points near and remote in the United States and Canada.

Their work occasioned the warmest commendation for the thorough and systematic manner in which it was conducted and above all for the earnestness and dispatch with which the very large amount of business was transacted. The good results of this meeting have been heard from on every side. M. W. Hall, secretary of the Camden & Suburban Railway, Camden, N. J., was the presiding officer at the organization meeting, and permanent officers were elected as follows:

President, Henry L. Wilson; Auditor, West End Street Railway, Boston.

First Vice-President, C. M. Duffy; Secretary, Citizens Street Railway, St. Louis.

Second Vice-President, J. F. Calderwood; Auditor, Twin City Rapid Transit Co., Minneapolis-St. Paul.

Third Vice-President, C. B. Reavis; Secretary, Augusta Railway Co., Augusta, Ga.

Secretary and Treasurer, W. B. Brockway; Auditor, Toledo, Bowling Green & Fremont Ry., Toledo, O.

Executive Committee, the above and

Dana Stevens; Accountant, Belt Railway Co., Washington, D. C.  
W. S. Dinmock; General Manager, Omaha & Council Bluffs Railway & Bridge Co., Council Bluffs, Ia.

W. G. Ross; Comptroller, Montreal Street Railway, Montreal.

E. R. L. Tighe; Accountant, Brooklyn Rapid Transit Co., Brooklyn.

The very practical and suggestive character of the papers read at the Cleveland meeting will be seen from the subjects presented, which were: "From Horse to Electric Accounts", H. L. Wilson, Boston; "Suggestions for a Standard System of Accounts", C. N. Duffy, St. Louis; "Transfers," Frank R. Greene, Chicago; "Monthly Closing of Accounts," Dana Stevens, Washington; "The Relation of Accountants to Managers and Employees," P. V. Burlington, Columbus; "A Simple System of Interurban Accounting," W. B. Brockway, Toledo; "Naming and Standardizing Apparatus," J. P. E. Clark, Binghamton; "Depreciation," H. C. McJilton, Baltimore. The papers were all excellent, showing careful preparation and much study, and constituted the largest and best contribution to the literature of this department ever made. The discussions were thorough and afforded fully as much information and data as the papers. The exhibits in connection with the papers

and discussions were a very valuable addition to the work of the association, and the blanks and forms were found to be so important and numerous that a committee was appointed early in the convention to arrange and classify the forms so that they could be more satisfactorily studied. For this purpose a special room with long tables was provided, and when delegates were not in session these exhibits were constantly thronged. The opportunity for gaining

new ideas, and learning of economies in conducting the accounting department was highly appreciated. It may be mentioned here that these forms were all in blank and not for the purpose of showing actual figures.

A committee was appointed to gather forms and blanks, and arrange same at the meeting at Niagara, and companies are urged to respond promptly if they have not already done so, in order that this feature of the meeting may be as valuable and complete as possible.

The program for the coming meeting will commend itself to every accountant as treating of subjects of vital interest to him in his work, and with the discussions, which are always as valuable and interesting as the papers, will constitute a veritable post-graduate course in accounting. There is scarcely a road in the country that can afford to miss the benefits of this meeting by not sending some delegate from its accounting department, for the information gained will be carried home and put into actual use in improving the character of the work, and what is equally desirable, doing it in a more economical manner. In a single instance of which we have personal knowledge, one delegate to the Cleveland meeting effected a saving to his company of \$25 per month, as the direct result of one new idea gained.



H. L. WILSON,  
President.



W. B. BROCKWAY,  
Secretary.





C. N. DUFFY,



J. F. CALDERWOOD.



C. B. REAVIS.



F. E. SMITH.

President Robert McCulloch, of the American Street Railway Association, has accepted an invitation to appear at one of the meetings of the Accountants' Association; and President Wilson has been invited to address a few remarks to the larger association.

New members recently added are:

- St. Louis & Suburban Railway, St. Louis.
- The Peoples Railway, St. Louis.
- Lowell, Lawrence & Haverhill Railway, Lawrence, Mass.
- New Orleans Traction Company, New Orleans.
- Richmond Traction Company, Richmond, Va.
- Campania de Tranvias de Merida, Yucatan.
- Elmira & Horseheads Railroad, Elmira, N. Y.
- Worcester Consolidated Street Railway, Worcester, Mass.
- Birmingham Railway & Electric Company, Birmingham, Ala.

Acceptances have been received from nearly 100 roads, stating their intention to send delegates to this meeting, and a large attendance is thus assured.

Following is the program:

**Monday, October 18.**

7:30 p. m. Meeting of the Executive Committee at the International Hotel.

**Tuesday, October 19.**

10 a. m. President's annual address.  
Report of executive committee, routine business and appointment of convention committees.

Paper.—"The Care and Handling of Fares from Passenger to Bank." C. L. Wight, Auditor The Toledo Traction Company, Toledo, Ohio.

**Wednesday, October 20.**

9 a. m. Paper. "The Handling and Checking of Transfers from Printer to Furnace." J. F. Calderwood, Auditor Twin City Rapid Transit Co., Minneapolis, Minn.

Paper.—"Pay Rolls—Time Keeping and Methods of Paying."

Frank R. Henry, Secretary Missouri Railroad Company, St. Louis, Missouri.

Paper.—"Materials and Supplies Accounts from Purchase to Use." W. G. Ross, Comptroller Montreal Street Railway Co., Montreal.

**Thursday, October 21.**

9 a. m. Report of a committee appointed at Cleveland, Ohio, March 21, 1897, 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." Chairmen, C. N. Duffy, Secretary Citizens Railway Co., St. Louis; J. F. Calderwood, Auditor Twin City Rapid Transit Co., Minneapolis; W. F. Ham, Secretary Nassau Electric Railway Co., Brooklyn.

2:30 p. m. Report continued.

**Friday, October 22.**

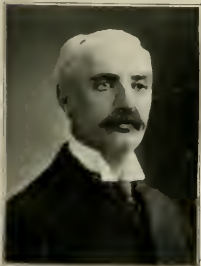
9 a. m. Paper. "Car Mileage—How Arrived at and Its Use." [Street Railway.] H. J. Davies, Assistant Secretary Cleveland Electric Railway Co., Cleveland.

Paper.—"Statistics—Their Use and Abuse." E. D. Hibbs, Auditor Consolidated Traction Co., Jersey City.

- Election of officers.
- Appointment of committees.
- Adjournment.

All papers will be followed by an open discussion upon the subject in question.

A rate of one and a third fares on railroads has been secured. Pay full fare going, taking a "certificate receipt" on presentation of which to proper officer at Niagara an order to purchase return ticket at one-third will be issued. The members of this association are included in all the entertainments arranged for the American Street Railway Association, and are invited to attend its annual dinner which occurs at the International, Thursday evening, October 21, at 7:30 p. m.; the tickets are \$7—the actual cost to the association.



W. S. DIMMOCK.



W. G. ROSS.



DANA STEVENS.



E. R. L. TIGHE.

## HEADQUARTERS AT THE INTERNATIONAL.

There is a certain interest which always centers in the headquarters hotel, and which is different from that to be found among the exhibits or in the session room. It is at headquarters that the social life of the convention is found, and by no means the least valuable part of the gathering is that derived from the quiet, confidential talks, where little groups of acquaintances gather after meals or in the evening, and exchange confidences and experiences. It is here the officers sojourn; here receptions are held, and here the annual banquet is spread. In selecting the International for all these, the executive committee found its task an easy one, and no one will question the wisdom of the choice.

The management is in splendid hands, S. A. Greenwood being one of the best hotel men in the country; and one who has had a long experience in handling conventions and knows just what to do and how to do it. The International is not only the leading hotel at the Falls, but is the largest, is situated on the principal business street, and looks out over the State Park Reservation to a commanding view of the Falls and river. And it may be observed that on the site of International was the first hotel at the Falls; it was the Eagle Tavern, built about 1804 and destroyed by the Indians and British in the War of 1812.



THE INTERNATIONAL.

In fact, from the windows on three sides of the building may be seen the river, rapids and islands. The hotel has, also, a park of its own into which the dining room extends. The building is of brick and Niagara limestone, with the kitchen and laundry in separate buildings.

The International with its accommodations for 600 guests' is filled all through the summer season, which extends from the first of May to October, and attracts the best class of visitors. The convention comes at a date when the house is in better condition than at any other time in the year to take care of it. A rate of \$3.50 to \$4.50 per day has been made for delegates. Our illustrations give several glimpses of the hotel.



THE LOGGIA—INTERNATIONAL.

The Albany Railway Company was sued by the administratrix of John Piehl, who was killed by being struck by a piece of the fly-wheel which burst at the company's power house a year or so ago, and a verdict for the plaintiff was secured in the lower court. On appeal the case was reversed, it not having appeared that the engineer of the plant was negligent so as to charge the company.

The Riverview Street Railway is now under construction at Beaver Falls, Pa., and will be two miles long. The contracts so far involve \$30,000. John M. Hughes is the moving spirit in the company.



ENTRANCE TO DINING ROOM—INTERNATIONAL.



WINDSOR & KENFIELD PUBLISHING COMPANY,  
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TELEPHONE, HARRISON 754.

Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

*Address all Communications and Remittances to Windsor & Kenfield Publishing Company, Old Colony Building, Chicago.*

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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. OCTOBER 15, 1897. NO. 10

A PECULIAR case has been made the subject of litigation at Oakland, Cal., several passengers bringing claims for damages for \$200.05 each on account of having to walk where they expected to ride. It seems the company made a change in the leaving time of its last car on one of its transfer lines in the suburbs, without, as plaintiffs claim, having given public notice of the fact, hence when they transferred it was to foot power instead of electricity. The state statute contains a section which requires street railways to give notice in advance of contemplated changes in schedule.

In selecting the place for next year's convention, no decision should be reached until it is definitely settled what amount of suitable exhibit space can be provided for the display of appliances. The demand, and absolute necessity, for floor space has increased each year until now it requires a building of large proportions. At least 25,000 square feet should be insisted upon as a minimum and twice that amount would not be too much. This year, not only have many exhibitors had their applications cut down nearly one-half, thus preventing the exhibition of much which they would have been glad to bring, but the Association is thereby deprived of just so much revenue it would otherwise have earned. With restricted space, too, it forces exhibitors to condense and crowd what they do bring until it neither shows nor can be approached with advantage. Twice the space available this year could have been sold, with the

result that accepted exhibitors could have done better, and some who applied too late to get any space, would have been taken care of.

The convention has grown to large proportions and its requirements both for hotels and exposition purposes are now correspondingly large.

EVERYTHING points to a large attendance at the Niagara convention. The West certainly will send a big representation, and the location of the meeting place being so convenient to those in the East, it is fair to anticipate an unusually large number from that territory. The program is a most excellent one, and the committees appointed well selected. Many questions have come up during the year which managers will wish to discuss, and the natural attractions at the Falls certainly leave nothing to be desired in that respect. The exhibit space was all taken early in the season, and that feature alone is well worth the time and expense of making the trip. The time has been extended to four days, which will permit of taking things a little more comfortably than in previous years, when it has necessarily been one continuous rush from arrival to time of departure. There is not a company but can profitably send one or more delegates to this convention. The attendance of ladies will be larger than ever, and special provision for their entertainment is promised.

DELEGATES to the convention should plan to spend as much time as possible in the exhibit hall. The temptation always is to devote so much time to the excursions and local features of interest that many leave the display to the last and then find they must hurry away. The exposition of railway appliances is alike a credit to the supply men, who spend thousands of dollars to make a creditable display, as it is to the Association which calls it into existence. We feel that the exhibitors are justly entitled to a reasonable portion of the time of those in attendance, and the inspection should be considered quite as much one of the things to receive attention as the reading of a paper or the election of officers. Aside from the courtesy due exhibitors the display is really a grand opportunity to study the various supplies, and is the one occasion in the whole year on which the manager may actually compare one with another. The benefit in the line of a thorough understanding of the machinery, from inspection and explanation is invaluable, not only in itself but for the suggestions and new ideas to be obtained. Very few of the appliances to be shown at Niagara can in the nature of things be brought to the manager's office to show him there, and it is only the large attendance which makes possible the expense incurred to bring from all directions the vast collection which is to be seen at these meetings. We do not know of another association at the convention of which there is anything like, in value, number or size, the exhibits to be seen at the conventions of the American Street Railway Association, and the delegate who fails to spend a good many hours in the exhibit hall loses more than he may realize.

THE Association has been repeatedly put to no small inconvenience by the arbitrary restriction in its constitution as to the date upon which its regular annual meeting shall be held. The REVIEW has long urged the necessary change which will enable the executive committee to exercise that discretion which it most assuredly should have conferred



upon it. If the meetings were always held in one city there would be less reason for it, but moving about this great country it frequently happens that the middle of October is accompanied by cold and unpleasant weather, especially in the northern tier of states. At Montreal we had snow; a month earlier the weather was ideal. By all means the executive committee should have the power to fix the date, as it now has to change the place if emergency should require.

The matter will come up for action at this meeting, as Mr. Kelly, of Columbus, presented to the committee at its meeting in February, a petition with the required number of signatures, and the committee will present it with favorable recommendation in the annual report. If accepted by the Association it must lie on the table one year, and can be called up for final vote in 1898.

Change the date to a month earlier, or better, give the executive committee authority to set the date, and if it ever takes the convention to the Arctic regions in December, the members can make it hot for the committee.

### WE HAVE BEEN HERE BEFORE.

While this is the first time the Association has met at the Falls, it has visited Niagara in a body before. It was in 1890 when the convention met in Buffalo, and after Henry M. Watson, president of the Buffalo lines, had royally entertained his guests with the good things of that city, he chartered a special train and we all took a day off and visited the Falls. The special left Buffalo at 11 o'clock and ran to Niagara, where it crossed on the suspension bridge. After viewing the sights on the Canadian side the party recrossed on foot and were met with carriages for a drive about the islands and to other points. After lunch another special of observation cars was taken for the trip down the river along the Gorge to Lewiston. Mr. Ely, now president of the Buffalo & Niagara Falls road, was then treasurer of one of the incline lines on the American side and tendered its courtesies to the delegates.

There will be not a few present this year who will recall with pleasure that delightful excursion. The great changes which the few intervening years have wrought are emphasized in the fact that where the 100 miles of excursion then was furnished by steam cars, now the same trip will be made under vastly better conditions for seeing the sights in electric cars exclusively.

### THE BUFFALO CONVENTION OF 1890.

The convention of 1890 was the ninth annual meeting, and like so many others was one of the best ever held; it certainly was a most pleasant and successful one.

Thomas Lowry, of Minnesota (then only of Minneapolis), was president that year, and at the outset of the meeting horrified a good many of the old timers by declaring in his official address that, "I believe that this is the last convention that will ever seriously consider horses for the operation of street railways," and his prediction was true, for while the program that year included "A Perfect Street Railway Horse," the horse has never been to a convention since.

It was that year the mechanical system battled for supremacy. There were representatives of eight systems

of electric roads, including storage battery and underground and each was given 10 minutes, and used 20, to tell how the method he represented was the best.

It was at that meeting Albion E. Lang, of Toledo, extended an invitation for all to visit his city, where experimental tests were to be made in 60 days with compressed air motors. The cable men were still strong at this convention, and many a manager went home more undecided than ever as to which he wanted, storage, overhead, underground, compressed air or cable; and sensibly at that time, concluded to stick to his horses one more year.

Another program feature was B. F. Owen's paper on created travel and park resorts under the title of "Novel Schemes for the Development of Street Railways;" and Hon. G. Milton Scribner's second installment of his splendid contributions, which have never been equaled in convention papers, "Public and State Treatment of Corporations.

It was at this meeting that electricity really was accepted by any considerable number of delegates as the coming motive power and as much time was given the subject as all the other topics combined.

The banquet was given at the Iriquois hotel with the genial C. Densmore Wyman as toastmaster.

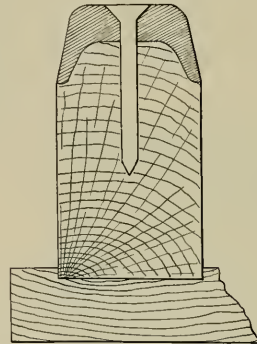
### AN INTERESTING RELIC.

On the desk of the editor of the REVIEW, doing duty as a paper weight, is a section of rail, which has an interesting history, and which dates back to the early 60's. The accompanying sketch will serve to illustrate this form of wrought iron rail, which was rolled and laid at Providence, R. I., in 1864.

Chief Engineer Bronsdon has looked up the matter and kindly hands us the following information:

Between 25 and 30 miles of track were laid on 3 x 5-in.

chestnut stringers and ties. The stringers were cut to fit the under side of the rail, as shown in the illustration. The spikes with countersunk heads were placed in the center of the rail and directly in the path of the wheel tread. The rails were of varying lengths, 22 ft., 25 ft., and 29 ft., and no splice bar was used at the joint, excepting a short piece of cast iron about 6 in. in length formed to fit the under side of the rail.



This casting served to carry the ends of the rails and prevent them from sinking into the stringer. The rail weighed about 22 lbs. to the yard.

In speaking of this rail, General Manager Potter, who was then starting on his railway career, and was connected with this same company, states that this rail has done as good, if not better work in its day, than our present girder and heavy T-rails are now doing under electric service. Of course the cars were small and light and speed was not then desired.

After the stringers had rotted away and it was found necessary to make repairs, it was customary to simply lay a

10-ft. piece of the chestnut stringer at the joints and drive spikes along the rail into the dirt or decayed stringer, which ever was left, under the rest of the rail. When this rail was considered worn out, it was snapped up by dealers in second hand rail and again sold and relaid to do good service. In fact it has been laid and relaid, exchanging to different roads several times.

Some of this iron is still in use for transferring coal at a coal pocket in the Providence power house; is doing good work today and to all appearances will wear another generation.

It is one of the first forms of wrought iron rail which was rolled to take the place of cast iron rails for street railway purposes.

### TRANSPORTATION ON THE SOMO.

Ten years ago a primeval forest of stately pines occupied what is now the site of the interesting city of Tomahawk, Wis., which with its excellent water works, electric lights, broad regularly laid out streets, and one of the finest hotels

boats are patterned after street car bodies on scows, drawing about 18 in. of water.

The motive power is a small tug to which the boat cars are coupled up like any other train, and so closely that a person may step from one to the next without difficulty.

The trip up the Somo river is one never to be forgotten, the train winding around sharp bends with the tug and last cars moving in opposite directions, and taking "curves" of seemingly impossible radius.

The train is run every Sunday for the entertainment of the owner's friends, and where desired for long trips of two or three weeks, a nominal charge is then made for the pay of the crew and for stocking the boat.

The scenery is entertaining, and the route covers a trip which may justly claim the title of being a strictly pleasure resort line.

Some of our readers who have old and useless horse car bodies, might do well to consider offering them for this purpose, or where they have suitable water at their own resorts, to transform some into house boats. In fact this has already been done at Kansas City, where an old car of the Broad-



TRANSPORTATION ON THE SOMO.

in the country, is a revelation to the dusty traveler in the wilderness.

The town and pretty nearly all its belongings, are the property of a millionaire lumberman, of Milwaukee, W. H. Bradley, and he has provided with a liberal hand, churches, school houses and modern improvements of all kinds.

While Tomahawk has not yet aspired to the dignity of a street car line, Mr. Bradley has done the next best thing, and taking advantage of the miles of water travel made possible by the three rivers, the Tomahawk, the Wisconsin and the Somo, has inaugurated a system of transportation at once as enjoyable as it is unique. By no means the least attractive feature of this monopoly lies in the fact that it is conducted without money and without price so far as the passengers are concerned, and Mr. Bradley, in this as in several other directions, receives his return in the thanks of appreciative guests.

The train of house boats illustrated consists of seven in all, one being fitted as a kitchen and another as dining room, for use on long trips into the interior. Two more are fitted with berths with good beds, and the rest are parlors. The

way line was launched on the hulk of a flatboat. A carpenter quickly made it secure and it floated away quite a trim and attractive craft.

### THE INDIANAPOLIS 3-CENT FARE CASE.

The city of Indianapolis has determined to take the initiative in the controversy that is expected to arise with the Citizens' Street Railroad Company over the surrender of the streets under the law declaring all street railway franchises void after 1901, the object of the city being to have all question as to the validity of the act settled before that date.

Regarding the present status of the 3-cent fare case, on the call of the case before the United States Circuit Court of Appeals the announcement was made that the railway company would move to dismiss on the ground of want of jurisdiction, the company contending that the appeal should have been to the Supreme Court of the United States. It would appear that the city was ill advised when the appeal now pending was taken.

## THREE TRUE TALES.

The editor was recently being shown over one of the best managed roads on the Atlantic seaboard, and coming out of the power house his attention was attracted by the handsome stack which constitutes one of the landmarks of the city. After expressing his admiration for its beauty from an architectural standpoint, he ventured to guess its height, and suggested 175 feet as about right.

The manager smiled as he gazed thoughtfully at the stack and replied:

"No, it is exactly 225 feet to the capstone, but there was one day when I thought it was a mile high."

"How was that?" we inquired, anxious for a solution of the puzzle.

"Well, it is not a very long story, but I wouldn't repeat the experience for the power house and the whole road thrown in. The day the boys were setting the cap, the president of the road and myself happened out, and stood some little distance away watching the men working at the finishing touches. There was no scaffold except the little staking of a floor at the top.

"Ever been up there?" inquired the president.

"Well, no," I replied, "been pretty busy you know and there really was no occasion for me to go up."

"View up there must be fine," said he, "you won't have a chance after to-day," and I could not but feel that he was rather pleased at the idea that I had not been attracted to this method of transportation. So I bluffed back with the remark that I had only been waiting for the right kind of company when I made the ascent, something like a president or director. That threw the burden of proof back on to him, and not to be outdone he said he wouldn't mind a little thing like that, and would just as soon go up as not; rather thought it would be a nice trip up in the air. At that I plucked up and assured him I was more than anxious to go, and would be both pleased and honored at his company. Matters had now reached a pass



where neither one of us could gracefully retreat, so the president tried to look indifferent and said he positively must make the ascent. At the same time as his eyes slowly followed up the long line of masonry he didn't look re-enthusiastic, in spite of his words.

"Well, come on," said I, starting for the stack; and not to be behind the procession he forged ahead of me and reached the base first.

The rigging consisted of an ordinary single wheel wooden block pulley, which hung about three feet out from the top from a piece of 6x8-in. timber, and a hemp rope, one end of which was attached to the winding drum of the donkey engine on the ground, and the other to the bucket in which the brick and mortar had been raised. Now, this bucket was nothing more than half an oil barrel which had been sawed in two and suspended by a rope handle like a letter A. The bucket came down empty just as we reached the place. We got in, the president sitting on one side with his feet in the tub and his hands grasping the main rope. I occupied the side opposite and did the same. I sat facing the engineer, and the smile on his face which I caught as the word was given to start was anything but reassuring. As

the rope began to tighten and the bucket left the ground the president called out, "Let her go up slow." We began to rise, and as we did so the rope commenced to untwist and the bucket to spin slowly round and round. To add to our distress, the president is a man weighing 200 while I am satisfied with 120 pounds, and he so overbalanced the tub that his side was away down while mine was away up. And so we were going up, whirling round and round, and the rope squeaking through the wheel far above us. I took one upward glance and that was enough. Then I looked down about 80 or 90 feet, and it seemed as if we were set on a flagpole. Then I looked at my companion and the sweat was running down his face in streams, and he was hanging to that rope as a drowning man would. The ridiculousness of the fool trip struck me and I began to brace up. I urged him to look toward the east where the view stretched out for miles, and to the south, where the church spires, in another state, were visible. "Shut up and hang on," was the response, and, in fact, I found my time pretty well occupied with my part of the rope. The slightest move changed the balance of the bucket as it spun round and threatened to pitch us out. Meanwhile we were steadily but gradually, oh so gradually, rising. My hands and wrists were already numb with the tension of the grasp on the rope. I began to wonder if we ever should reach the top, and to commend myself as a consummate idiot for ever having started. Then I began to estimate the factor of safety in that rope, and for the first time realized how small it was and the responsibility that was vested in that little piece of hemp. Come to examine it, it didn't look much bigger than a clothes line, and the longer I looked the smaller it seemed. And what if there was a weak spot. It had been in use for many days hauling hundreds of tons to build that stack, and altogether I was in any but a cheerful state of mind; and suppose the engine should fail to stop hoisting in time—

"Must be 'most there," puffed the president, breaking the silence; and so we were, almost to the top. You can well imagine the look of surprise on the faces of the boys when they discovered the nature of the load, and they hastened to swing the bucket in to the platform.

We got out and tried to stand erect, but the strain of the ride and the cramped position combined to make us feel as though we had ridden all night in a day-coach.

But once in a place of safety the president recovered his spirits and chaffed me about looking pale around the gills, and that I was no sort of company for a man going up in a balloon. He told me next time he should not bring me along, and I mumbled a sincere 'amen'; and swore I would lead a better life, at least until I again reached the ground. The president expatiated on the grandeur of the landscape, which was indeed an inspiring sight, and not content with naming the several points of interest, began narrating the history of each one after another. In this way we spent fully half an hour. Finally I suggested we had better put on our things and go home. The president looked at me with a grieved sort of expression on his face, stepped cautiously to the edge, took one look over into space, and pointing to the south remarked confidently:

"I should say Cuba lies in about that direction; and think the Klondike must be just beyond that clump of trees." Then he resumed his account of the Indian war which happened ages ago.

But all things have an end, and finally all the Indians had been slain, and the whites had been nicely settled, and the



several towns had grown into cities, and history was exhausted.

The bucket came up empty and I started toward it.

"Hold on there," said he, "I get in first;" so I waited for him to embark on the aerial craft. The bucket was on a level with the platform, and when he jumped in with his 200 pounds the slack in the rope let it suddenly drop five or six feet before the rope became taut. My heart was in my mouth, for I thought he had gone straight to the bottom. But he didn't, and when I slid down the rope into the bucket he was hanging in space with the tub standing on edge in mid-air. We made a quicker trip down than we had coming up, and soon were safely on solid earth once more. The president mumbled something about a parcel of fools, and without any regrets at leaving, we drove home.

But the most remarkable thing of all was when, the next day, the men had taken down the rigging, and I picked up the pulley through which the rope had run which raised us. The shaft was worn down to less than a quarter of an inch in diameter, by actual measurement. Next time when I go up stacks I shall first examine the pulley and then stay on the ground.

\* \* \*

"I will tell you a gong story," said a manager the other day, "and it was one on me. We have a down town loop, where the street is very narrow, and we have a close squeeze to get through even with a single track. We were having so many collisions with wagons I put up a bulletin calling special attention to having the gongs sounded, everywhere and at pretty much all times. Still the boys kept forgetting to ring the bell. Then I stuck up another notice a good deal more stringent, but still they didn't seem to rise to the emergency, and finally I had to make an example of two of them. Then the gongs woke up with a vengeance. I was delighted, but a day or two later I managed to sprain my ankle, and had to stay in the house four days.

"The main line, which also carries several branch lines, is directly in front of my house. The first morning I thought the cars must be in one continuous blockade by the way the gongs sounded, but after crawling to the window two or three times only to find the street deserted, I abandoned the painful operation of looking out. And they kept it up. They all seemed to know I was where I couldn't get away and they serenaded me. All day and until after midnight; and the next day, and the next. They evidently intended the old man should get enough. By the fourth day I was satisfied, and a new bulletin went on the board."

Motor-men will sound gongs only at street crossings and when approaching vehicles or pedestrians; and will use discretion and not sound gongs unnecessarily.

\* \* \*

"Speaking of gongs reminds me of a story," said a superintendent who was standing in the group. "One of our lines passes a lodge room, used by several organizations, so there is something nearly every night. It is down in the business district, and the cars and teams are thick and naturally the gongs are going most of the time. The line in question was a loop extension opened after cold weather set in, so the societies did not notice it until spring. Then it grew warm, and when they opened their windows the noise

from the bells came in. One of the leading citizens, and an officer of the lodge, came to me with the request that the men be instructed to draw the gongs as mildly as possible on lodge nights, as it was very annoying to have the clatter right in the middle of the most impressive portion of a charge. I told him I would look into it, and thanked the gentleman for calling my attention to the matter. Then I went off and forgot all about it. The next week he stopped his carriage in the middle of the street, got out, and came to where I was standing on the curb. I thought I was in for it sure, and was about to offer an apology for the neglect when he said:

"I want to thank you personally, and on behalf of our members, for having abated that gong nuisance. You don't know what a difference it has made, and we are all very grateful. It is such things that the public appreciate, and which go to make a road popular."

"Very pleased to do it, I assure you," I replied; "always glad to have my attention called to these things"; but a notice went up within 15 minutes about ringing gongs in front of the Masonic building on lodge nights."

#### ATTEMPTED STRIKE ON THE CHICAGO CITY RAILWAY A FIZZLE.

A few discharged employes of the Chicago City Railway took advantage of the spare time thus provided to try to work up a strike. W. D. Mahon, the professional agitator scented the battle from Detroit, and hastened here to direct matters. Meeting after meeting was held in the hours between midnight and dawn, and the company was notified through the daily papers that the men were to be taken back, and the union recognized or there would be a strike. General Manager Bowen came out most emphatically from the very first and stated there would be no union men in his employ, even if it should be necessary to discharge the entire force. Repeated efforts to secure any further statement from him proved ineffectual, and when the mayor tried to get his hand in to "arbitrate" he was told there was nothing to arbitrate and that the company would continue to conduct its own business at the old stand. The directors absolutely refused to be drawn into the matter, and announced the whole thing was in the hands of the manager so far as the company was concerned and that he would backed up in whatever course he saw fit to take. After 10 days of agitation the whole thing has quieted down and not a car missed a single trip. Mr. Bowen is certainly to be commended for the positive and fearless stand he took and the company is better for it today. The question of wages, which are the highest in the country, was not involved; it was simply a question of turning over the discharge of employes to the whims of a union. This adds one more to the list of failures of Agitator Mahon, who fell down quite as lamentably at Boston, Philadelphia and Milwaukee.

Charles H. McCann brought suit against the Consolidated Traction Company at Newark, N. J., for \$10,000 for injuries alleged to have been sustained when thrown from his horse which shied at one of the company's sprinklers. It was stated that his injuries prevented him from wearing a stiff hat, but the company's counsel called attention to the fact that Mr. McCann wore a flat topped derby into the court room. The verdict was in favor of the railway company.

### GRANVILLE C. CUNNINGHAM.

Granville C. Cunningham and J. Ross of the Montreal Street Railway Company made a trip to England recently to complete the negotiations by which the Birmingham street railways passed into the hands of Canadian capitalists, and now the announcement is made that Mr. Cunningham

has been appointed manager of the Birmingham system. Mr. Cunningham was a member of the executive committee of the American Street Railway Association and has long been prominent in its councils. After receiving an education in civil engineering in Edinburgh he went to Honduras, Central America, and was engaged on a railroad project there. In 1872 he went

to Canada, and for the next 17 years was connected with various railroad interests. Previous to the introduction of the electric system in Toronto Mr. Cunningham visited the principal cities in the United States; his report and recommendations were accepted by the Toronto city council. In 1892 he was appointed chief engineer of the Montreal Street Railway Company, and its equipment for electric traction was carried out under his direction. He is a member of the Institute of Civil Engineers of London and the Canadian Society of Civil Engineers. In appreciation of his many good qualities his employes presented him with a fine silver tea and coffee set. Mr. Cunningham's successor is F. L. Wanklyn, general manager of the Toronto Railway Company.

### FINE RECORD OF THE FALK COMPANY FOR 1897.

The Falk Manufacturing Company, which is the owner of patents covering the cast-welded rail joint, and is also builder of special work, reports a large business during the past year. Early in the spring cast-welding was introduced on the Pacific coast by the welding of the Pasadena & Pacific Railway Company's tracks at Los Angeles, Cal., and has been continued at Oakland and San Francisco. In the latter city the welding of the unique "Z" bar track rail of the Market Street Railway line has been eminently successful. Some other large contracts have been with the Cleveland Electric Railway and the Cleveland City Railway Company, of Cleveland, Ohio; the Toledo Traction Company, of Toledo, Ohio; the Mahoning Valley Railway Company, Youngstown, Ohio; the Milwaukee Electric Railway & Light Company, the Nassau Electric Railroad Company, the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., and the Elgin City Railway Company, Elgin, Ill., etc.

The company has during the year completed and put into operation several valuable improvements, which have brought the joint to the highest standard of perfection. The joint has also attracted increased attention abroad, being now in use in some of the largest roads of France, and contracts have recently been closed for its adoption in Germany and England. The additional test of the past winter and the wide range of its success justify the prediction that the cast-

welded joint would prove an invention of the greatest importance in track construction, made by the REVIEW when it was first brought out.

The special work department, which was established last year, has been crowded with orders to its utmost capacity, and has been working overtime almost continuously. Shipments have been as far east as Brooklyn and south to New Orleans. The company is also taking contracts for the complete equipment of roads as to track and overhead, furnishing all materials.

### MONTREAL INTERURBAN.

The Montreal & Southern Counties Railway is projected to afford transportation facilities for a large section of country about Montreal. One branch will run to St. Johns through Chambly and the water power at the latter place will be utilized. From St. Johns it is proposed to extend the line through Ste. Alexandre, Notre Dame de Stanbridge, Mystic, Bedford, East Stanbridge, Dunham, Cowansville, Sweetburg and Knowlton. From the latter town the road will pass through Bolton Pass to Bolton Springs and Bolton Centre, thence to Eastman, Magog, over the Hatley Mountains to North Hatley and Sherbrooke by way of Capelton and Lennoxville.

A. J. Corriveau has recently made a tour over the proposed route and was very favorably impressed by the opportunities for large traffic and the lack of engineering difficulties in constructing the road. He anticipates that building will commence early next spring.

### WINTER PROGRAM OF THE CHICAGO ELECTRICAL ASSOCIATION.

The fall and winter program of the Chicago Electrical Association is as follows: "Economy in Electric Car Control," by J. R. Cravath; "Evolution of the Isolated Electric Plant," by Harold Almert; "The Safe Current Capacity of Electric Conductors," by C. H. Sewall; "Daily Mathematical Conveniences," by S. G. McMeen; "Heavy Electric Traction," by Cloyd Marshall; "Electricity in Ship Building," by C. C. Mattison; "Electrical Shop Transmission," by H. G. Dimmick; "The Art of Constructing Telephone Apparatus," by H. P. Clausen. The meetings are held the first and third Fridays of each month at 1737 Monadnock building.

### NEW CONDUIT TESTED AT HAMBURG.

At Hamburg, Germany, a piece of track 525 ft. long has been built to test a new form of electric railway conduit. It is an inverted U-shaped metal trough made in sections of convenient length and shielding the conductor which is mounted on suitable insulators. The purpose of this form of conduit is to prevent the conductor being submerged in water and it acts on the principal of the diving bell. The imprisoned air in the U conduit holds the water away from the conductor. In one of the recent tests the leakage of current, with the tracks and conduit flooded, was between .2 and .3 ampere. It is stated that the conduit is not expensive in its construction.

## CABLE LINE OPERATED BY ELECTRIC MOTOR.

BY CHARLES GROVER.

That it may be economical to operate a cable railway with an electric motor power has been fully demonstrated by the Metropolitan Street Railway Company, Kansas City, Mo.

The cable machinery in the power house at 9th and Washington streets, which has been driven by a 24 x 28-in. Wright engine for the past eight years, is now operated by a 300-k. w., 4-pole electric motor. The Summit street cable line, which has 2.17 miles of double track with grades as heavy as 10 per cent is operated by this motor. During the 19 hours daily run an average of 208 trips made over this line by six cable trains of a grip car and trailer each.

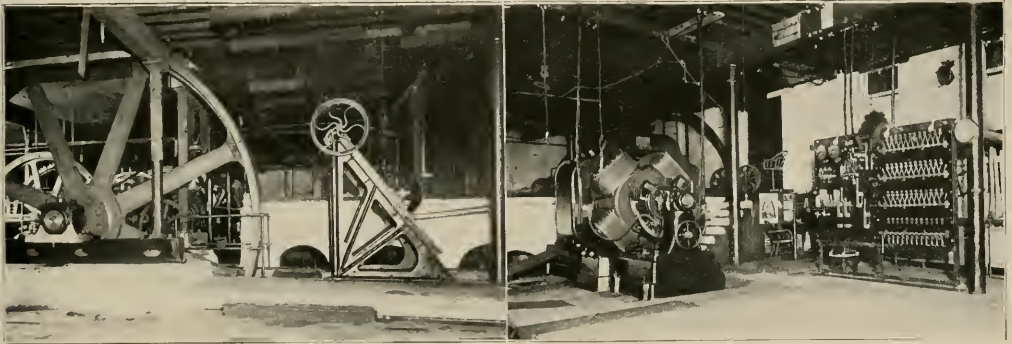
Extra trains are run morning and evening during the periods of heavy travel. On July 5, the motor pulled 20 grip cars with 25 trailers for a few hours during the day. It has been observed by the passengers as well as by the officials of the road, that the speed of cable is more uniform

shaft on the winding gear of the cable machinery was lengthened out 13 ft. and a belt wheel 24 ft. in diameter with 37-in. face was mounted on this shaft.

The motor is mounted on a concrete foundation with a wood platform for insulating the motor frame from the foundation. A double leather belt 36 in. wide is used for transmitting the power from the motor to the cable machinery. This belt passes over a 34-in. pulley on the motor shaft to the 24-ft. pulley on the cable machinery with a distance of 36 ft. between centers of the shafts carrying the pulleys. The stretch of the belt is taken up by an adjustable pulley mounted on an iron frame.

The motor runs at a speed of 380 r. p. m. when up to speed, and with the use of the specially arranged starting rheostat described below, the motor can be operated at any desired speed from 10 revolutions to 380 revolutions. The demand for the wide variation in speed is at such times as it is necessary to repair the cable or put in a new one.

The switchboard is made of slate 2 in. thick, has a front surface of 48 sq. ft., and is supported on a frame made of angle and T-iron. It was designed and built in the com-



MOTOR DRIVEN CABLE PLANT—KANSAS CITY, MO.

and that there is less jerk to the cars than when operated by the engine. The current for operating the motor is obtained from a 1,300-k. w. generator at the Central avenue power house, which also supplies current for the electric lines in the western portion of the city. The current is carried for a distance of 8,855 ft. over a triple braided weatherproof insulated copper cable of 1,000,000 c. m. area for the positive conductor. The return conductor consists of 1,670 ft. of both insulated and bare copper cable of 1,000,000 c. m. area, and is tapped to the iron structure of the Kansas City Elevated Railway, which forms the remaining 7,185 ft. of the negative conductor. The iron structure was heavily bonded at all its joints with No. 0000 flexible copper bonds.

The motor was originally a General Electric Company's standard 300-k. w., 4-pole generator with a speed 480 r. p. m. and 500 to 625 volts when run as a generator. It was used four years ago as one of the generators which operated the Kansas City Elevated Railway, but since that time it has been idle, until it was taken into the Metropolitan Street Railway Company's shops, and remodeled for a motor.

The arrangement for attaching the motor to the cable machinery is shown in the photographs. The intermediate

pany's shops, and is mounted with a Form K automatic circuit breaker, of 1,000 amperes capacity, manufactured by the General Electric Company, a voltmeter of 600 volts capacity, a Weston ammeter of 1,000 amperes capacity, a positive and negative switch, a double pole double throw reversing switch and 48 small switches for the rheostat.

A small electro magnet is mounted to one side of the circuit breaker, with its coils connected as a shunt to the motor circuit and provided with mechanism to open the circuit breaker, when the potential on the line falls below 100 volts. With this arrangement the automatic circuit breaker will automatically open the circuit from an excessive amount of current or from the failure in the supply on the lines.

The starting rheostat consists of 12 separate boxes made of white pine, each box contains 680 ft. of No. 9 galvanized iron wire, wound in spirals 2 in. in diameter, and placed in a zigzag shape with glass partitions between them. Water is piped to each box and a continuous stream is passed through and around the coils to keep the iron wire cool during the time the rheostat is used in operating the motor at very low speed. The glass partitions between the coils prevent the electrolytic action from destroying the iron



wire. Each box has four points of resistance in series which are connected to quick break switches on the switch-board, and the twelve boxes are connected in parallel. The arrangement of the resistance coils gives from 50 to 1,080 amperes at 500 volts for any desired length of time. The rheostat is connected in on the negative side of the motor to prevent a leakage of current through water connections.

The operation of a cable line, especially one which contains numerous long and heavy grades, is one of the most severe tasks that can be put on a motor. The change of load to which the motor is subjected on this cable line ranges from 20 h. p. acting as a generator to over 650 h. p. as a motor. The average horse-power required to operate the road estimated from the total during the month of July was 146 h. p.; that required to drive the cable including the friction of the machinery and motor without the cars is 117 h. p. The wide variation of load does not take place at all times during the day, but usually during the morning and evening when the cars are heavily loaded and the extra trains are out. The trains, at times, become blocked from various reasons, and if this occurs at or near the foot of a heavy grade the motor has from six to eight heavily loaded trains to pull up the grade. After they pass over the top of the hill, and are descending they pull the cable above speed and cause the motor to generate a current which is delivered back to the Central avenue power house, and from there to the electric lines. The extreme maximum and minimum loads do not continue long, therefore the heating effect on the motor from the excessive current which reaches 900 amperes at times, does not alter its temperature perceptibly. The sparking at the brushes and the armature reaction due to the extreme overloads were the principal difficulties to overcome. If a larger motor had been used so the peak of the load would be approximately the rated power of the motor, if a properly designed shunt motor, it would run sparkless. Such a motor would, however, not only run with poor efficiency, due to the small average load required, but would greatly increase the investment over what is really necessary. The interest on the larger investment together with poor efficiency would increase the cost of operating.

The most interesting feature to the financial man, is the cost of operating as compared with the steam plant. The items of operating expense given below, are those which have been affected by the change of power from steam to electricity. Under the head of steam plant the items are taken as an average per month during the year 1896; those under the head of electric motor are taken for the month of July, 1897:

#### OPERATING WITH STEAM PLANT.

|                                      |            |
|--------------------------------------|------------|
| Engineers, firemen and oilers.....   | \$ 205 00  |
| Repairs on engine and machinery..... | 58 00      |
| Oil and waste.....                   | 21 45      |
| Coal.....                            | 604 55     |
| Water.....                           | 46 52      |
| Total.....                           | \$1,025 52 |

#### OPERATING WITH ELECTRIC MOTOR.

|                                                                                                     |           |
|-----------------------------------------------------------------------------------------------------|-----------|
| 64,458 kilowatt-hours consumed during the month of July, 1897, at \$0.048647 per kilowatt-hour..... | \$ 313 57 |
| Motorman.....                                                                                       | 50 00     |
| Oil and waste.....                                                                                  | 2 00      |
| Water for rheostat and workroom.....                                                                | 2 50      |
| Total.....                                                                                          | \$ 368 07 |

The foregoing figures show that \$657.45 was saved during the month of July, 1897, as compared with the average cost per month of operating the steam plant during the year of 1896.

The men that repair and splice the cable attend the motor also, and one-half of their salary has been charged above as motorman.

The cost of producing a kilowatt per hour as given above was taken from the actual cost of operating the Central avenue power house during the month of July, but does not include the interest on the investment, or the allowance made for depreciation in the value of the machinery and building.

### A FINE TRIBUTE.

One of the happiest testimonials we have ever seen, was posted on the boards of the New Orleans Traction Company, on September 20, and is evidence of that spirit which most firmly binds the employe to the manager in the mutual interests both serve. The bulletin reads as follows:

#### NOTICE.

To Employes:—

It is with the greatest regret that the management announce the resignations of Messrs. B. Willard, general superintendent, W. Nelson Smith, chief electrician, and Ben Johnson, assistant superintendent and claim adjuster. These gentlemen, finding it to their advantage to accept positions elsewhere, were perforce of necessity obliged to relinquish their duties with our company, and we were obliged with reluctance and regret to bid them good-bye. They have all distinguished themselves in their respective departments of construction and operation, and to their skill, energy and loyalty, the company is largely indebted for its present status of excellence. They will be greatly missed in our councils and our work, and I am sure that all the employes will join with those of us who were immediately associated with them in an official capacity, in regret at their leaving, and will follow them with us, with the heartiest of good wishes for their further success in the new fields to which they go.

Obligated thus to do without the help of such faithful and intelligent workers, it is ours, both officers and employes, to exhibit in larger measure, our devotion to the interests of the company, and especially at this time, and under present discouragements, to fail in nothing that shall tend to improve the service and general operation of the road. We may have the utmost faith in the splendid future awaiting our great system, and we may anticipate this by bringing to bear forethought, care, accuracy and courage in the performance of every duty falling to our respective positions.

C. D. WYMAN.

General Manager.

### FREIGHT LINE AT BALLSTON SPA.

Considerable interest is being manifested in the completion of the Ballston Terminal Railroad, at Ballston Spa, N. Y. This road has been contemplated for some time, and within the last three months, under the energetic management of J. C. Stanton, gives evidence of early completion.

The power house, which is a commodious and substantial structure, of modern ideas, is now completed. The selection of Hamilton-Corliss engines, Westinghouse electrical apparatus, Brill cars, and Mayer & Englund overhead material, indicates the excellence of the work, which will be completed this month.

The road is largely a freight line, which will be handled by electrical locomotives designed especially for the Ballston Terminal Railroad, and are now being erected at the works of the J. G. Brill Company, in Philadelphia. The passenger service will be taken care of by the ordinary passenger cars.



# CROSSINGS OF STEAM RAILROADS AND STREET RAILWAYS.

The decision of the supreme court of Pennsylvania, rendered in May last, whereby the Scranton & Pittston Traction Company (acting as contractor for the Lackawanna Street Railway Company) was permanently enjoined from crossing at grade a steam railroad operated by the Delaware & Hudson Canal Company suggested the desirability of collecting data upon the subject of crossings and the examination of the regulations prescribed by statute and by municipalities.

Street railways are those which are constructed in streets, whether on, below or above the surface is immaterial, along and over which cars are propelled as common carriers for the accommodation of the people living on and near the highways, and to facilitate the transportation of passengers. They may be constructed within or without the limits of municipalities and when laid for the purpose of facilitating the use of the street by the public are street railways, independent of the motive power that may be used. When some of the first steam roads were chartered the idea prevailed that the tracks laid by them would be admirable for wagon traffic, but it was soon abandoned, and at present it is the purpose of "facilitating the use of the highway by the public" that serves in a great measure to distinguish the street railway from its elder brother. While this distinction is as sharp as ever, the street railways have in many instances proved to be successful competitors of railroads. Most electric interurbans carry express and light freight as well as passengers, and this competition is perhaps one reason why the steam roads have made such strenuous efforts to prevent electric lines crossing their tracks at grade. To prevent grade crossings means in a majority of cases such increased cost as to prohibit the construction of the electric road.

Railroads were essentially interurban roads in their conception and have remained so except in the large cities, where there is a suburban business. In the beginning street railways were distinctly urban; the street car was evolved from the omnibus and for convenience provided with a track to run upon; next the cars were provided with trucks; then came cars with mechanical motive power, which made increased size possible and led to double truck cars. All these vehicles were for urban traffic and entitled to the use of the streets and also to cross steam railroad tracks without being subject to more restrictions than would a carriage or omnibus. Extensions of street railways to run between different towns could not be predicted, but bearing in mind that they are for the same purpose, it is not apparent why the interurban car should not have the same privilege of crossing railroad tracks as did the stage coach.

The status of street railways and of railroads and their rights in the streets is very clearly set forth in the decision of the supreme court of Indiana in the case of the Chicago & Calumet Terminal Railway Company against the Whiting, Hammond & East Chicago Street Railway Company, decided in 1891. The law regarding crossings as there

stated is that which obtains in most of the states in the absence of special statutes providing for the interlocking of grade crossings or placing the subject in the hands of the railroad commissioners. (Indiana has such a statute passed in 1897, which will be referred to later).

In this case the street railway company had secured franchises and licenses from the cities of Hammond and East Chicago and from the county commissioners, permitting the building and operation of an electric railway which would cross the tracks of the railroad company at grade at five different points, at all of which the railroad was crossed by streets or highways. The street railway had completed its lines with the exception of the crossings, and was ready to construct "jump crossings" at its own expense. The railroad company refused to permit the construction of any crossings except upon the conditions that the street railway would agree to certain requirements, covering the expense of maintaining gates and flagmen at these points and the future construction at its own expense of interlocking switches as may be demanded. The street railway applied for an injunction to prevent the railroad from interfering with it in constructing the crossings, which was granted; the railroad appealed to the supreme court, which sustained the injunction.

The court said in part:

"It is the settled law of this state that the public takes only an easement in the streets of a city or town, and if a steam railway company lays its tracks upon such streets, the abutting owner of the fee whose title extends to the center of the street is entitled to recover damages. (T. H. & I. R. Co. v. Scott, et al., 71 Ind., 29; Eichels v. Evansville St. Ry. Co., 78 Ind., 261; Cox v. Louisville, etc., R. R. Co., 18 Ind., 178; Sharpe v. St. Louis, etc., Ry. Co., 19 Ind., 296; Ross v. Faust, 51 Ind., 171; Nelson v. Fleming, 56 Ind., 310; Anderson, etc., R. R. Co. v. Kernodle, 54 Ind., 310; Roelker v. St. Louis, etc., Ry. Co., 50 Ind., 127).

"The basis upon which this rule rests is that the appropriation of the soil over which a street passes for the construction, operation and maintenance of a steam railway is a new or additional appropriation to that of the easement granted to the public, which entitles the abutting owner to such damage as he may sustain thereby. (Cox v. R. R. Co., supra).

"It follows from this that the steam railway which obtains a right of way over a street and constructs its railway thereon obtains something more than an easement; it obtains property rights in such right of way subject only to the right of the public to travel over the streets. And the question here presented by challenging the sufficiency of the complaint is whether the same rule applies to street railways; that is, whether the appropriation of a street to the use of a street railway is a new and additional appropriation, a new and additional burden to that of the easement of the public generally. It is conceded by the appellant (the rail-

road company) that a street railway is not an additional burden upon the fee in the street, although appellant claims that strong reasons exist against the doctrine. It is conceded, however, that the courts have quite generally held such use of a street is not an additional burden; that it is simply an extended use of the right which the public acquired in the first instance. This concession we think admits that appellant has no cause to complain of the action of the circuit court. The writer of this opinion (Judge McCabe) seriously doubts the soundness of the rule thus conceded by the appellant. It is true that street railway corporations have a right to the use of the public streets of a city or town for the purpose of ordinary travel over them in the same way that any other portion of the general public may enjoy that right. But when they obtain a right of way over such streets to lay down their tracks on such streets, they obtain and secure a right and an interest in the street that the general public does not and cannot have and enjoy. They obtain to all intents and purposes as much a property right in their right of way in the streets attached to the soil as does the steam railroad laid in such streets. This is so because such companies are authorized to mortgage their corporate property and franchises to secure the payment of loans of money to the corporation. Such power necessarily carries with it power to sell such property and franchises at sheriff's sale to make the money. (2 Burns' R. S., 1894, Sec. 5, 473; New Orleans, etc., R. R. Co. v. Delaware, et al., 114 U. S., 501.)

"How such a right can constitute nothing more than the easement has in the street it is difficult to understand. If the location and operation of a street railway on a public street is no new nor additional burden on the soil, but rests on the easement the public has in the street, then it would seem to the writer the company need not obtain any license, permit or franchise from the municipal authorities to construct its tracks in the public streets of a city. And yet it is the settled law in this and other states that a street railway cannot be laid upon the streets of a town or city without a grant of a license or franchise therefor either by the municipality or the legislature. (Indianapolis Cable St. Ry. Co. v. Citizens' St. Ry. Co., 127 Ind., 369; 23 Am. & Eng. Ency. Law, 946-947, and authorities there cited.)

"No other part of the public is required to obtain a license or franchise to use or enjoy the easement of the street. The very fact that a franchise is required to authorize and justify a street railway company to lay down its tracks on a public street seems to the writer a sufficient reason for saying that such was not one of the uses in contemplation when the street was opened and dedicated. Besides, it is settled law that the street railway company, when once its track is constructed on a street, has rights over that part of the street where its track is located superior to those of the public who enjoy only the easement in the street. For instance, the public must turn off of the street railway track when met by the street railway cars. (23 Am. & Eng. Enc. Law, 990-991, and authorities there cited.)

"But the overwhelming weight of authority seems to settle the law both in this state and elsewhere that a street railway is not an additional burden to that of the general easement in the street and that the owners of the fee are not entitled to damages on account of the construction thereof on a public street. (Eichels, et al. v. Evansville, etc., Co. et al., supra; Indianapolis Cable Co. v. Citizens' Co., supra; Elliott v. Fair Haven, etc., R. R. Co., 32 Conn., 575; Hinch-

mann v. Paterson Horse R. R. Co., 17 N. J. Eq., 75; Jersey City, etc., R. R. Co. v. Jersey City, etc., Horse R. R. Co., 20 N. J. Eq.; Cincinnati, etc., St. Ry. Co. v. Cumminsville, 14 Ohio St., 523; Hobart v. Milwaukee City R. R. Co., 27 Wis., 194; Attorney General v. Metropolitan R. R. Co., 125 Mass., 515; Brown v. Duplesses, 14 La. Ann., 842; Savannah & Thunderbolt R. R. Co. v. Mayor, etc., 45 Ga., 602; Pedicord v. Baltimore, etc., Ry. Co., 34 Md., 463; 23 Am. & Eng. Enc. Law, 954, 955, 956 and 957, and authorities there cited.)

"These authorities and others that might be cited so firmly settle the rule that it could not now be departed from without serious disturbances of vested property rights. The use of the street by the appellant (the railroad company) is subject to the easement in the public and the burden of keeping the street crossing over its tracks in such a condition as not to impede or obstruct the public easement and use of the street by the public generally is a burden already resting on the appellant. This burden is in no way to be added to or increased by the crossings appellee (the street railway company) proposes to construct. So long, therefore, as it is the settled law of this state that a street railway is not an additional burden to that of the easement the general public has in the street, and that the street railway company's right to use the street is founded on that easement, that long it must be held that the right of such street railway to cross over the tracks of a steam railway laid on such street is subject to no conditions other than those to which the general public is subject in traveling over such streets. When the steam railway company obtains its right of way over and along a public street, it does so subject to the right of the general public to use that street and the street crossings over its tracks, and it is generally incumbent on such steam railway companies to make such crossings as passable for the general public as they were before the construction of their tracks thereon. The duty therefore is incumbent on the steam railway company only to make the crossing as passable as it was before the construction of its tracks thereon for the public generally, or as nearly so as practicable. That does not impose the burden of providing cross rails and tracks for the street railway to make the crossing. But the street railway is proposing to furnish all that itself and to be to all the expense of making the crossing and connection. Appellant contends that this will be a burden and a hindrance to the free and unobstructed use of the appellant's steam railway which it is claimed is a taking of private property without just compensation in violation of the Constitution. True, it is a hindrance and an obstruction to the use of appellant's steam railway. But having obtained its right of way subject to the burden of the easement in the public generally, and the street railway being entitled to the use of that easement, all the rights appellant obtained in the street for its steam railway were subject to the right of the street railway to use the street. In short, the appellant's rights obtained in the use of the streets for its steam railway were subject to the burden of the appellee's use thereof in the ordinary and proper manner for its street railway. The complaint shows that appellee was only proposing to use the streets at the crossings in the ordinary and in a proper manner for the construction of street railway crossings, and that it had been hindered and obstructed therein by the appellant in the use of force. It would therefore not be a tak-



ing of private property without just compensation, because it does not propose to take from appellant anything it ever owned. It never owned its right of way over and across the streets named free from the burden of the public easement, a part of which belongs to the appellee, the street railway. The conclusion we reach is not in conflict with the case of the Indianapolis, etc., Gravel Road Co. v. Belt Railway Co., 110 Ind., 5, cited and relied on by the appellant. In that case the gravel road company was a private corporation and the owner of the gravel road before the construction of the Belt Railway. The property of the gravel road company was not acquired subject to any easement in the public or anyone else to construct a railroad across its gravel road. It was there held very properly that while the statute confers upon railroad companies the power to cross highways and to do so without the payment of compensation so far as the public is concerned, yet that a gravel road owning its road owns it as anybody else owns his property, and that private property cannot be taken by anyone without just compensation, nor, except in case of the state, without

for its street railway. (2 R. S., 1894, Secs. 5165 to 5168; R. S. 1881, Secs. 4155 to 4158.)

"The right to pass over a highway by a steam railway is subject to the easement of the public, a part of which is owned and enjoyed by the street railway."

### ELECTRICITY FOR MERIDA, YUCATAN.

The excellent system of horse, or rather mule railway, at Merida, Yucatan, will be converted to electric. The work of changing several of the principal routes is already under way, and it is hoped soon to bring the entire system up to date. This road is one of the most progressive of the Central American properties, and the energetic young manager, N. Escalante y Peon, some time since laid out a fine pleasure resort which has proved a great success.

Our illustrations show street scenes in Merida, the view at the left being that of the Plaza de la Independencia, and the one at the right a street scene on 60th street, Merida.



PLAZA DE LA INDEPENDENCIA—MERIDA, YUCATAN—SIXTIETH STREET.

such compensation first assessed and tendered. (Art. 1, Sec. 21, Constitution of Indiana.)

"And it was there further held that the building of a railroad across such gravel road would be a taking of private property within the meaning of the section of constitution referred to, on the ground that it was an incumbrance on the property. Manifestly that case has no application here because the gravel road company acquired its property in the gravel road, not subject to, but free from any easement or incumbrance of any kind whatever. Not so with the appellant, the steam railroad company, in the case now before us. As we have already seen, it acquired its rights subject to the easement and incumbrance against which it admits by its assignment of error it has made forcible resistance.

"The same principle applies to the crossing over appellant's tracks where they cross Indiana Boulevard, a public highway of the county. The statute provides that the county board may grant the right of privilege to a street railway company to use any public highway of the county

### CONSOLIDATION AT BIRMINGHAM, ALA.

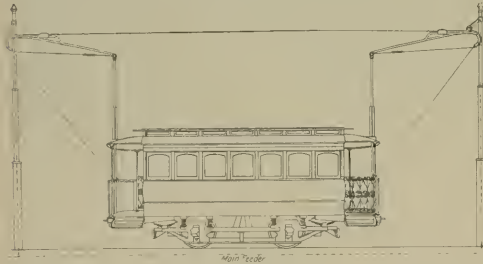
The Birmingham, Powderly & Bessemer Railway Company, operating 13 miles of steam dummy road, has been absorbed by the Birmingham Railway & Electric Company. The property transferred includes the 13 miles of track, three locomotives, 14 passenger and freight cars, all tools and 350 acres of land between Cleveland and Bessemer. This line will soon be equipped for electric traction and will complete a circuit of trolley roads taking in Bessemer and the whole Birmingham mineral district that far. General Manager McClary contemplates using a voltage of 750 on this line.

The Birmingham (Ala.) Railway & Electric Company has provided a special car for conveying the pupils of the Athenaeum at East Lake to and from the city. Each morning the car leaves the Morris Hotel in charge of one of the teachers and returns in the evening. Only the school children are accepted as passengers.

## AN OVERHEAD ELECTRIC SYSTEM WITHOUT THE TROLLEY.

In a paper read before the British Association for the Advancement of Science at its meeting in Toronto, J. G. W. Aldridge reviewed at some length the present conditions of electric traction in England. He stated that there are 103.5 miles of tramway line operated by the trolley, 15.75 miles by the third rail, 6 miles by storage batteries and 4 miles by the conduit system. The relative costs for construction and equipment per mile of single track are £5,500 for the trolley, £10,000 for the open conduit system and £7,000 for the closed conduit. After mentioning that for economy and sound financial success the trolley system has proved itself to be the best all around device for tramway operation he said that there are and will be instances where overhead wires will be absolutely prohibited in certain cities.

The open conduit system is so expensive in its construction as to be out of the question for most localities and no closed conduit system has shown sufficient merit to justify its serious consideration. The author then introduces a new system of his own design which is intended to do away with the overhead contact wires. The general plan is to have two supports at the extreme ends of the car and a wire stretched between them as shown in the cut. Poles of the ordinary pattern are planted at intervals of 50 ft. or within the length of the span of wire on top the car. From the pole there extends a horizontal arm over the track and to this is pivoted a support for a rod, ribbon or roller, which is connected to the feeder line. When the wire on top the car strikes this contact the springs of the pivoted arm permit it to lift and swing slightly in the direction in which the



car is going yet hold it with sufficient rigidity to give good contact. Before the collecting wire passes from under it another contact is reached so that at all times the electrical apparatus in the car is in circuit.

If at any place it is impractical to set the poles at the required distance, a surface contact plate can be put in the track midway between the poles, and can be regulated by electro-magnets just as a closed conduit system is to avoid keeping the contact always alive. A contact shoe is fixed under the car in this case.

The advantages claimed for this system are: Fixed overhead wires are avoided; the poles are considerably shorter than generally used for such purposes; the stay wires and anchor poles at curves are absent; the poles are at regular intervals and can be used for lighting. The cost of such a system would be about 25 per cent more than the trolley but much less than the conduit systems.

## ACCELERATION TESTS AT SCHENECTADY.

Among the many events connected with the visit of Lord Kelvin to the works of the General Electric Company at Schenectady, N. Y., none possessed more interest to the electrical railway engineer than the acceleration test made upon the experimental track which runs along the heel path of the Erie canal for a distance of nearly two miles.

The car used was one of the familiar American elevated railway type provided with four 50-h. p., 500-volt 90-ampere motors, known as the G. E. 57, mounted two on each of the trucks. On each armature shaft was a 33 tooth pinion meshing into a 52 tooth gear fixed to the axle. The total weight of the loaded car was 25 tons, including trucks, motors and passengers.

At present, owing to the long distance which must be covered by elevated railways and the frequent stops and starts resulting from the nearness of stations, the question of quick starting and stopping has become a serious matter. Quick stopping, is, however, well taken care of by both air and electric brakes leaving rapid acceleration as the point needing attention. Realizing this the General Electric Company has been experimenting for the past several months, with the idea of determining at what rate of acceleration the passengers would be annoyed.

As a starting requirement, W. B. Potter, chief engineer of the railway department, assumed that an increase in speed of three miles per hour each second would not be unpleasant and the car was equipped as already explained to prove or disprove the assumption. The only departure from ordinary practice was to reduce the gear ratio and use a controller which would admit sufficient current to give the required starting torque. In some of the previous runs the car had attained a speed of 28 miles per hour at the end of 10 seconds, while on the test under consideration the car was moving at the rate of 30 miles per hour, at the end of 10 seconds. On this particular run, 5 seconds after the controller handle was moved the car had attained a speed of 19 miles per hour; at the end of 10 seconds, 30 miles per hour; 15 seconds, 35 miles; 20 seconds 38 miles; and in 25 seconds a speed of 40.5 miles had been attained.

These figures convey no real idea of the rapidity of the start. However, a comparison with acceleration on steam roads may serve to bring out this point. An ordinary train seldom exceeds a speed of 10 miles per hour at the end of 10 seconds; just  $1\frac{1}{3}$  the speed attained in the same time by the test car. In a similar test of a regular elevated train at the end of 20 seconds the speed was only 13.5 miles per hour during which time 196 ft. had been covered as against 38 miles and 356 ft. in the case of the electric car.

The sensation due to the rapid starts was not unpleasant, and as the starting was perfectly smooth those standing were inconvenienced no more than is now the case with the elevated trains drawn by the slower steam locomotives.

The Brooklyn Rapid Transit Company has distributed some handsomely illustrated pamphlets advertising the special car service for theater, Sunday school and social parties. One circular explains the advantages of Brooklyn as a residence district, and with this was sent a pass for a complimentary trip over the routes of the company. H. Milton Kennedy is the general passenger agent and attends to all the special traffic.

## NEW WATER POWER STATION AT TAMPA.

Florida is usually considered a low, flat country and the statement that a water power of considerable magnitude has been developed will occasion surprise to many engineers. The Consumers' Electric Light & Street Railway Company, of Tampa, has built a dam across the Hillsborough river and a fine power station at a cost of \$200,000. The city of Tampa has increased very rapidly in population in recent years; it is now claimed that there are 25,000 inhabitants. The Consumers' Company has built up a railway system which is well suited to serve the present and future needs of the city. There are about 30 miles of track upon which 27 motor and three trail cars operate. Until the first of this year the electricity was generated at a steam plant which was the largest in the state.

Realizing the advantages of cheap power, water rights were secured and a dam and station, shown in Fig. 1, built on the Hillsborough river six miles from Tampa. The dam and flume are constructed of concrete masonry composed of the best Portland cement and flint rock taken from the bed of the river on the shoals at the dam, over 6,000 cu. yds. being used. The flumes occupy a space 110 ft. long by 24 ft. wide and 30 ft. high from the base, and to these flumes is joined the weir which is 132 ft. long and 19 ft. 6 in. high. At the end of this, is a waste gate 14 ft. wide, making the total length including retaining walls, 162 ft. At either end of this masonry are wings composed of dirt.

Parallel with the flumes and dam is located the power house, 150x50 ft. under which the water discharges upon leaving the wheels. In the masonry flumes are installed, four pairs of 36-in. McCormick horizontal water wheels arranged to operate separately or together. The machinery in the station is used not only for street railway service but also lighting and power. These departments are run separately, two pairs of wheels driving each, being belted to jack shafts located in the power house and 35 ft. from the turbine shafting. These jack shafts are driven by four 33-in. belts. At either end the jack shafts are coupled to the generators by clutch pulleys; the one to two 300-k.w. alternators for

the lighting, and the other to two 200-k.w. General Electric railway generators. The shafting and standards are mounted on heavy I-beams which rest on the masonry. The bearings throughout are of the ring self-oiling type.

On the opposite side of the station, 30 ft. from the main



FIG. 1.—DAM AND POWER HOUSE.

shaft, as shown in Fig. 2, is a 500-h. p. engine, belted to the jack shaft to which the water wheels are connected. The engine is installed as an auxiliary to be run in unison with the water wheels in case of low water. Under the boiler house, which is located opposite the station, is a large cistern where all the water for the boilers is filtered and treated when using steam. The steam machinery was that in service before the water power was developed.

At high water the river has a maximum power of 4,000 h. p. and the minimum is 800 h. p.; the four pairs of wheels now installed develop 1,500 h. p. One of the lines runs from the city to the station which is eight miles from the center of distribution. This road is laid with 56-lb. T-rails; the bonds, consisting of lead and scrap copper, are of Superintendent Munsing's design.



FIG. 2. INTERIOR OF POWER HOUSE, TAMPA, FLA.



## THE OLDEST STREET RAILWAY AIR-BRAKE COMPANY.



NCE more the Standard Air-Brake Company, of New York, exhibits at the convention of the American Street Railway Association, and as in years past its display will not be only interesting and instructive, but will illustrate the progress of the year in this work. Our pages have steadily chronicled the achievements of this enterprising concern until

in the brake it offers today one would not recognize the original. These changes have been made at the expense of great outlay and untiring study, until the perfected brake now offered and in service, would seem to leave no further improvement to be desired.

As is well known, it is the pioneer in street railway air braking and is to be commended for the determination shown in making the business the success it has become. Starting as it did in 1891, the company has seen the remarkable changes which have occurred in street railway practice. E. J. Wessels, the managing director, has shown very keen foresight in preparing to meet problems which he felt were certain to arise as street railroading became more and more an exact science. With commendable prudence several years ago he began the development of a motor compressor, by means of which it would be possible to equip any electric car or train without requiring any part of the car axle on which to mount such apparatus. The company has not been satisfied with apparatus that merely met requirements. Its ambition has always been to make its apparatus exactly what its corporate title implies, "standard." In order that this end might be secured, the company has spent a large amount of money and years of patient labor in solving the problem. Difficulties which would have daunted ordinary individuals have apparently not terrified it. Many varieties of apparatus have been tested and the wheat sifted out from the chaff. It is generally known that the company has been doing a very large business and that most of its apparatus at present in use has been in constant operation on the different roads for from two to three years. Mr. Wessels reports that the company's business thus far in 1897 has been a record breaker. Sales have exceeded those of any previous period. Collections have been very satisfactory. Since last convention the motor compressor has been installed in a large way on special roads. Various sizes are now furnished, ranging from 1 h. p. to 5 h. p. One of its best points is the ease with which the armature can be withdrawn by removing the front head of the motor. The motor is securely protected against dust and moisture by being iron clad. It is of the slow speed series, multipolar type. The frame being of steel, gives lightness with maximum capacity. The insulation is such as to guard against possible grounding or breaking down. There are some interesting devices for preventing the the ingress of oil from the bearings and compressor. The motor compressor runs at 600 r. p. m. and does not require to be in operation much of the time, as it very quickly replaces air which has been drawn from the storage reservoir comprised in the Standard air-brake system, when making stops.

The Standard Air-Brake Company's axle driven compressors have been making a phenomenal record and have given great satisfaction wherever installed. Since last convention

the company has sold hundreds of these outfits, and "repeat" orders have come, not only from the Continent of Europe but from Australia, where a large number of different types of Standard outfits are in service. The single acting compressor Type A furnishes sufficient air to supply enough pressure for heavy cars, even though they are operated at slow speed. The Duplex double acting compressor, which was installed a number of years ago, is still in service, notably on the Buffalo railway, where 30 outfits are completing their third year of hard service. Although the air-braking apparatus has had to contend with slush, ice, dirt and changes in temperature, there has been little difficulty experienced in its operation. The interlocking controlling handle with which all Standard outfits have been supplied since last convention, has proved a great success and in no instance has there been a failure to accomplish the end sought, that is, the prevention of tampering with the apparatus on the part of careless or malicious parties. The company furnishes its own type of brake rigging and is prepared to equip a car with everything in the brake line down to the brake shoes. In fact, it prefers to do this, so that all parts of the brake rigging may be properly adapted for use with the Standard system. Within the past few months the company has greatly increased its capital stock and it is well known that all its purchases are made on a spot cash basis. By reason of its financial ability the company has always been able to buy to advantage and can therefore supply air-brakes at reasonable prices. Associated with Managing Director Wessels are some of the most noted international bankers in the world, making a strong combination, which gives railway managers a sure guarantee that whatever the company undertakes will be faithfully performed. E. H. Dewson, Jr., the company's chief engineer, is well known to the fraternity by reason of his experience east and west. H. P. Merriam, one of the company's engineers, is at present in Europe supervising the installation of a large number of air-brake equipments for which General Manager Wessels secured contracts. The company has been most fortunate in its selection of foreign representatives. They stand in the very front rank and include such names as Dick, Kerr & Co., Limited, London; Bergische Stahl-Industrie, of Berlin, Germany, and Noyes Brothers, Sydney and Melbourne, Australia.

## FUEL OIL ON THIRD AVENUE ELEVATED.

Experiments were recently made with crude oil as fuel for a train on the Third Avenue elevated, New York. The oil was carried in barrels in the coal bunk and sprayed on the fire with pumps. The result was far from satisfactory, the steam pressure falling to 45 lbs., and clouds of offensive smoke poured into the cars.

In many respects oil would seem to be an ideal fuel, but in spite of frequent trials on many steam roads it has failed to secure a footing. Recently a very thorough test was made on one of the suburban trains of a leading steam road in this city, but the expense was found to be nearly twice that of coal fuel, and after a continued effort to make a success of the experiment it was abandoned.

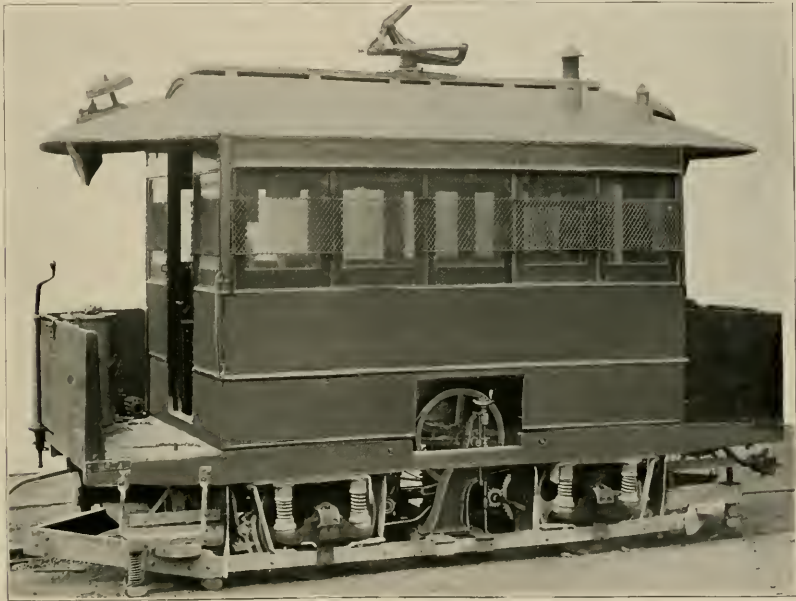
The Camden & Suburban Railway Company, on September 21, provided a street car collision as an attraction at Knight Park. Two cars were set on fire and started towards each other at a high speed, resulting in a realistic smash-up.

### NEW ELECTRICAL FEATURES ON THE LINDELL RAILWAY, ST. LOUIS.

Various temporary arrangements for testing the electrical conductivity of track joints have been devised and put in use from time to time, but it is doubtful whether there is anywhere in use a more completely equipped car for testing and maintaining bonding than that in use on the Lindell Railway of St. Louis, designed by Samuel Barnes, the electrical engineer.

It is an old horse car propelled by two old double reduction motors. Under each corner of the car is a shoe, making two contacts with the rail for testing the drop of potential across the rail joints, as shown in the engraving of the

nections of the testing circuits. It will be noticed that in addition to the voltmeter wires leading from each pair of shoes there is another set connected to a few battery cells and an electric bell circuit. This is for purposes of testing, to be sure that the shoes make contact, for if they do not make contact there can be no voltmeter deflection, and if one of the shoes should be raised or the circuit broken, considerable testing might be done with the operator under the impression that everything was all right because he got no deflections, when really the truth would be that the circuit was open. By using a few cells of dry battery and an electric bell it can be found in an instant whether the circuit is all right. The voltmeters used have the zero point in the middle of the scale and deflect to



TEST AND DRILL CAR OF THE LINDELL RAILWAY, ST. LOUIS.

car herewith. From the two contacts on each shoe, wires lead up to the low reading voltmeter terminals, and also to a test circuit explained later. Two voltmeters are used, one for each side of the track. The object in having contact shoes on each end of the car is to make it always possible to take the readings on joints between the car and the power station. The car is usually sent out during the night, when nothing but owl cars are running. Consequently the current taken by the test car plays an important part in the drop of potential at any one joint. Therefore, when the car is approaching the power station, or a negative feeder running to it, the shoes on the front end of the car are used, and when the car is going away from such a feeder those on the rear end are used. The voltmeters employed read to twelve-thousandths of a volt. Whenever a deflection of five-hundredths of a volt is obtained the joint is marked as bad and is rebonded. The accompanying diagram shows the con-

right or left according to the direction of the current. Thus there is no trouble with reversing the voltmeter terminals and no danger of mistaking a reversal for a zero deflection. The testing is done very rapidly and 90 miles of track have been tested in 27 hours. The crew consists of a motorman, a trolley boy and two men to read voltmeters. The car is not only used for locating faults but for remedying them. Under the center of the car on each side is a track drill for use in rebonding defective joints. These drills are driven by one of the motors. A belt is run from the commutator end of one motor as shown, to the horizontal shaft which operates both drills. When drilling is to be done the pinion is taken off of the motor so that it is free to drive the drill. The drill belt is kept tight with an idler pulley. It is not necessary to disconnect the drill machinery when the car is running as there is no harm in letting it revolve. The other motor propels the car when

the drill motor is disconnected for use with the drill. In order to get the car exactly in the position desired for drilling, the armature journal on the motor which propels the car is extended out each way, so that a man sitting in front of a

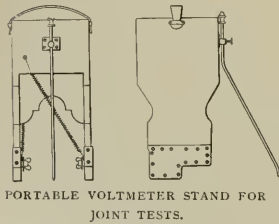


INTERIOR BOND TESTING CAR OF LINDELL RAILWAY.

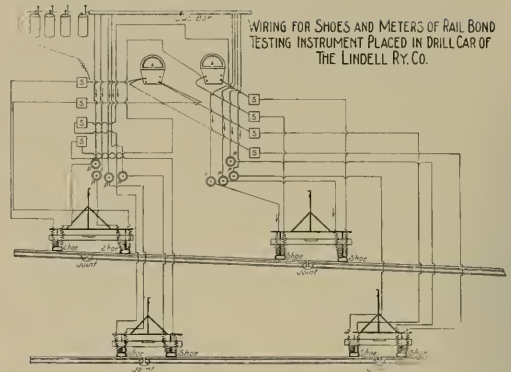
drill between the wheels can attach a hand crank and move the car a little one way or the other. This makes a very convenient arrangement.

The main object of this kind of testing is, of course, to give the comparative condition of the bonds, so that repairs can be made on the joints that need attention without tearing up the pavement and rebonding all the track. There is no way to tell, unless it be by the melting of the snow around a joint in winter, whether one bond is in any worse condition than any others along the line, except by going over the whole track with a voltmeter and this test car affords a means of doing this rapidly. In the car, small double pole switches are used to manipulate the testing circuits.

As a substitute for the car, to test joints during hours of heavy traffic on the road, the company has a voltmeter case or stand, in which the low reading voltmeter is placed and the legs of the stand are arranged to make contact with the rail on each side of the joint. The legs fit the shape of the rail head and two sharp steel points on the legs insure a good contact on the head of the rail. A third leg or pointer shown in the drawing keeps it from tipping over. All that is necessary to do to take a reading is to set the device down on the rail with one



PORTABLE VOLTMETER STAND FOR JOINT TESTS.



leg on one side of a joint and the other leg on the other, — the voltmeter terminals being connected to the metallic contacts on the legs. It can be carried around in one hand and is very convenient, as a glance at the engraving will show.

The test car is also used for testing the insulation of the strain insulators in the span wires along the overhead lines. To do this one terminal of a voltmeter is connected to the trolley pole and the other terminal to a wire which is run up beside the trolley pole and which makes contact with each span wire a few inches from the trolley hanger. The deflection noted will then be due to whatever current flows to ground through the voltmeter and strain insulators on that span wire and the insulation resistance of the strain insulators can be determined by the usual formula

$$X = \frac{E R}{V} \text{ -- R}$$

where R = resistance of voltmeter,

E = full voltage between the trolley and the ground,

V = voltage as indicated by the testing voltmeter,

X = insulation resistance of insulators.

By connecting one terminal of the voltmeter to the ground and the other to the test wire which makes contact with the trolley the insulation resistance of the trolley wire hanger is measured. Thus the complete overhead and track electrical work can be tested with this car with a minimum of labor. The car is made of scrap materials and cost little save the expense of putting it together.

#### MACKENBEUREN-TETTANG RAILWAY.

The electric railway between Mackenbeuren and Tettang, Wurtemberg, was built for passenger and freight service. It is a single track line, nearly three miles in length, with 15 turnouts. The track is standard gage and laid with 44-lb. rails. Current is generated at a water power station on the Schussen river where there is a fall of 8½ ft.; there are two turbines of 45 and 75 h. p. capacity, respectively. There is also a reserve steam plant with a 60-h. p. engine and boiler. The larger generator is of the four pole type and gives a voltage of 700 for the trolley line, while the other machine is a 2,100-volt alternator for lighting and power purposes. The trolley line is supplemented by a feeder and the two are joined together at intervals of 220 yds. Two motor cars are in service, each equipped with two 25-h. p. motors and have compartments for mail and small baggage. The motors are connected in series with rheostatic control.



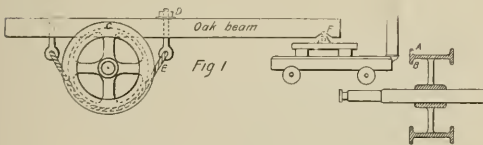
**SOME METHODS OF MAKING EFFICIENCY TESTS OF STREET RAILWAY MOTORS.**

FRANK B. PORTER.

It becomes many times advisable, even necessary, in street railway practice to make an efficiency test of the car motor, as, for instance, on the equipment of a newly constructed system or upon the proposed purchase of new motors for a system in operation. Probably each manufacturer upon application will readily supply a prospective purchaser with data and plotted curves of speed, torque, horse-power and efficiency for various amperes used, but it is a business proposition that the buyer should examine somewhat for himself and make comparative tests under like conditions of the different motors before a contract is closed. Again, when it becomes desirable to make a change in the winding of armature or field coils of the motor, which is sometimes done in street railway practice to meet some special condition of service, it is well to make an efficiency test after rewinding, as a check on the accuracy of the calculations made previously.

It is the object of this article to describe with some detail a simple method of efficiency test in use in many electrical manufacturing shops which will give good results when applied to the street railway motor in the repair shop. With care, these results should be quite accurate, and data from comparative tests under like conditions of various types of railway motors would prove most instructive.

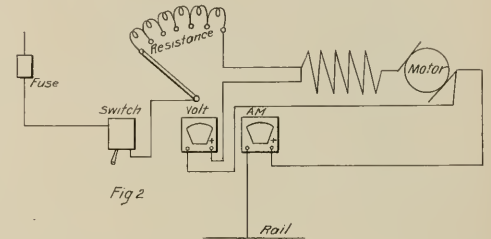
Take an axle shaft and fit to it a pulley, having deep double flanges, both external and internal, as shown at



A and B in the cross section. Also fix to this axle a gear such as is used in service to engage with the armature pinion, and a collar to take up end play; there should be no end play, the motor fitting exactly between axle gear and collar, but not wedged so as to produce excessive friction. Place the axle shaft when equipped as above, into the motor axle bearings as though it were the car axle with the motor in place. Construct a hard-wood beam of cross section sufficient to fit easily in between the two flanges of the pulley, say of about 1 in. in width. Cut out a portion of the beam so as to fit the periphery of the pulley for an arc of a few inches, or about 75° as at C, Fig. 1.

Bore the beam on each side equidistant from the center of the surface of contact with the pulley, and in these holes place the eye bolts D with nuts on top to enable them to be tightened at will; have several strands of 3/4 in. cotton rope spliced into each eye bolt around the under side of the pulley as at E, so that by screwing down the nuts the amount of friction can be regulated and the motor load consequently varied. Notch the end of the wooden beam at F, as a bearing for the edge G. Move up an ordinary platform scale, such as is used in the shop for weighing material, and place upon it four car spring rubbers; on these rubbers rest

a block having a triangular section, so as to offer an edge to the beam, and allow an exact measurement of distance between the center of the pulley and this knife edge, to be made. Place a cut-out, a fuse, a variable resistance and an ammeter in series with the motor with a volt meter in shunt as in Fig. 2.



After turning on the current and starting the motor, any desired load can be obtained by tightening the nuts of the eye bolts, that is, by increasing the friction between beam and pulley. If the horizontal distance from the center of the pulley to the bearing point of the beam on the scale platform were equal to the radius of the car wheel the pounds indicated upon the scale would be the pull at the periphery of the car wheel for the current passing; if this distance were equal to four times the radius of the car wheel, the scale reading should be multiplied by four to obtain the pull at the car wheel. By placing a tachometer against the end of the axle, a speed reading, usually in revolutions per minute, at any load may also be obtained. To calculate the horse-power developed by the motor for any given amount of current passed, proceed as follows: Multiply the horizontal distance, in feet and decimal parts, from the centre of the pulley to the bearing, on the scale by two, and this result by  $\pi$  (3.1416), this gives the circumference of the sweep of the beam, were it free to move; multiply this result by the revolutions per minute, as read from the tachometer, and the result is the speed in feet and decimal parts per minute. As the voltage is not apt to be constant, and it is necessary to assume a constant standard of voltage in comparing speeds in different tests, or in taking many different readings as data from which to plot curves, it will be well to assume a constant of 500 volts as a standard, and correct each speed reading to conform to this. To do so, divide 500 by the reading of the voltmeter, taken at each speed reading, and multiply the observed speed by the result. Multiplying this calculated speed by the pressure on the scale in pounds and dividing the result by 33,000 gives the horse-power that would be exerted by the motor at 500 volts and the amount of current used as noted when readings were taken.

Multiplying the voltage (500) by the indicated amperes and dividing this result by 716 gives the horse-power supplied to the motor were the voltage 500, and dividing the horse-power exerted by the horse-power supplied gives the efficiency of the motor. Expressing the above process in algebraic formula, as perhaps presenting the operation more clearly to those familiar with their use:

- D Distance from horizontal center of axle to bearing on scale in feet and decimal parts,
- $\pi$  3.1416,
- R Revolutions per minute as recorded by tachometer,
- E Indicated voltage as read from the voltmeter,
- I Amperes,

$$T = \text{Force applied to scale measured in pounds,}$$

$$\frac{2 \pi D R T}{33,000} = \text{Brake horse-power actually exerted.}$$

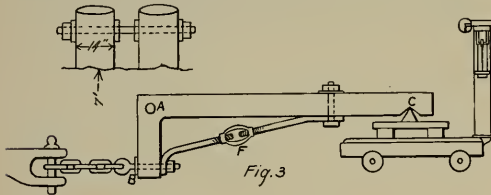
$$\frac{(2 \pi D R \times \frac{500}{E}) T}{33,000} = \text{Brake horse-power exerted by motor if voltage had been 500,}$$

$$\frac{E I}{746} = \text{Actual horse-power supplied to motor,}$$

$$\frac{500 I}{746} = \text{Horse-power supplied to motor at 500 volts,}$$

$$\frac{2 \pi D R T}{\frac{33,000}{E I}} \text{ or } \frac{(2 \pi D R \times \frac{500}{E}) T}{\frac{33,000}{500 \times I}} = \text{Efficiency of motor.}$$

When the motor is started in making a test, water should be poured into the pulley between the flanges of the inner circumference to prevent overheating, also the face of the pulley should be lubricated to insure an even friction, and a constant pressure on the scale, without which no accurate reading can be taken; more important is this in regard to the speed reading. Many experimenters think it advisable to use a separate means of load when taking this reading, and rigidly couple the armature shaft of the motor being tested to another, which it drives as a dynamo, delivering current back to the line, and use a variable field shunt as a means of regulating the load. If this latter method is followed in taking speed readings they should be used in connection with the scale readings taken when the motor was passing the same amount of current (amperes).



If the beam be constructed so that the horizontal distance from the center of the pulley to the bearing on the scale equal the radius of a circle 33 ft. in circumference, it will simplify the calculations considerably, and, besides, a beam of this length should be of about the right design for an ordinary platform scale; the use of a shorter one perhaps causing an overload when the heavier currents are passing. The scale should of course be balanced with the weight of the beam, block, rubbers, etc., when in position, before the motor is started and the test commenced.

By placing the pulley and beam first on the armature shaft and obtaining the horse-power exerted for a given amount of current used, and then changing to the axle and making a test at the same load, the horse-power lost in the friction of the gears and axle bearings can be determined.

If the motors are already under the car, and it is wished to make a test without removing them, place a screw jack under each side of an end of the car and raise it until there is a very slight amount of friction between the wheel and the rail. A bell crank lever may be designed, as in Fig. 3, and securely fastened to a pivot at A, so that when the drawbar is coupled to it at B, and the current turned on, (the motor at the other end of the car being cut out) the pull exerted at B will be transmitted to C and may be measured on a scale as

before. The load can be varied, and consequently the amount of amperes passed, by lowering gradually on the jacks, increasing the friction between wheel and rail. The speed at any load may be obtained by taking off a journal box cover and applying the tachometer to the end of the shaft and a calculation made of the horse-power exerted at the drawbar for any given amount of current used. To do this multiply the the indication on the scale by the quotient obtained from dividing the long arm of the lever by the short one. Multiply this result by the speed in feet per minute, and divide the product by 33,000. The algebraic formula in this case is:

$$D = \text{Diameter of car wheel in feet and decimal parts,}$$

$$\pi = 3.1416,$$

$$T = \text{Scale reading in pounds,}$$

$$L = \text{Length of long arm of lever,}$$

$$L' = \text{Length of short arm of lever.}$$

$$S = \text{Speed in revolutions per minute,}$$

$$h. p. = \text{Horse-power.}$$

$$\frac{T \frac{L}{L'} D \pi S}{33,000} = h. p.$$

In making this test, care must be taken to see that the lever is securely pivoted at A; for if not, as the friction increases between the wheel and the rail, with starting resistance cut out at the controller, a runaway car may result and a general mix up of the lever, jacks, etc., take place. Again, whatever this pivot is fastened to should be securely anchored. It would not be good practice to use any part of the car house construction, as a beam or sill, for this purpose, for unless it were especially strong we might have a nineteenth century illustration of Sampson and the Philistines. By taking two posts, as shown in Fig. 3, about 14 in. in diameter, with the pivot between them, and sinking them some 7 ft. in the ground, a safe and suitable structure can be easily prepared. The friction of the lever upon this pivot should be made as small as possible, having a smooth bearing with lubricant applied.

It must also be observed that there are no depressions in the rail where the car wheels revolve or a loss in energy would result in the form of a blocked wheel and not appear as pull at the drawbar. Some lubrication of the rail under the wheel may be necessary, a little powdered soapstone will probably be found sufficient; also clean wheels and a clean and smooth rail under the wheel. The lever should be provided with a brace rod and turn buckle, as shown at F in Fig. 3, in order that it may keep its shape under stress and be adjustable should the angle vary somewhat by shrinkage.

The horse-power of both motors acting together in either series or multiple may be found for any given amount of current used by noting the pull at the drawbar, using the same lever as in the preceding test and obtaining the speed in an actual run by means of a Boyer speed recorder or a tachometer, belted to the axle, the motor using the same amount of current in each case. In this last method, however, the horse-power developed in overcoming the friction in the gears and axle bearings would not be included in the result, as the drawbar pull would be made with the car resting on the rail, and the wheels consequently not revolving unless they should slip as the starting resistance is cut out at the controller and large amounts of currents passed.

In conclusion it should be reiterated that care must be exercised in the preparations for a test, and absolutely like conditions must prevail in comparative tests in order to make the results valuable.

## RECORDING WATTMETERS FOR STREET CARS.

The advantage of exact measurement of station output has long been recognized, and the requisite meters provided, but to record the ever varying energy used on a car traveling over all conditions of road, involves difficulties almost unsurmountable. The new meter which has been placed upon the market after a number of years of experimental work, is intended for installation in the car, like a cash register. It records the actual energy used by the car. A few trials determine the proper energy consumption per car per trip under various conditions of track and traffic. Subsequent readings of the meter determine at once if energy is carelessly wasted, and thus serve as an effectual check on the motorman and condition of the motors.

Well authenticated data prove that meters on lighting circuits increase the lighting capacity of the station by nearly 30 per cent. Many railway managers agree that the average waste due to carelessness of the motorman, amounts to not less than 20 per cent of all the energy generated. The economy, therefore, which will be induced by the use of street car meters will mean a saving of half of the average waste or 10 per cent of the total energy generated. The profit from such economy is two fold: It saves, first, the cost of coal and water necessary to generate one-tenth of the total energy output of the station; and second it increases the receipts by increasing the car capacity without enlarging the station, or in other words enables the station manager to operate 10 per cent more cars without increase in the station equipment.

Car meters used in connection with station meters supply a beautiful system by which the detailed and combined efficiencies of a station are directly obtained and an account given of the energy developed by every pound of coal con-



FIG. 1.—METER IN CASE.

sumed in the station. The adoption of such a system will, by necessity, increase the efficiency of any station under intelligent management, since it reveals and locates with unflinching accuracy any causes of wasted energy.

The simple motor construction of the car meter, as shown in the accompanying illustration, is similar to that of the other forms of Thomson recording wattmeter, but new

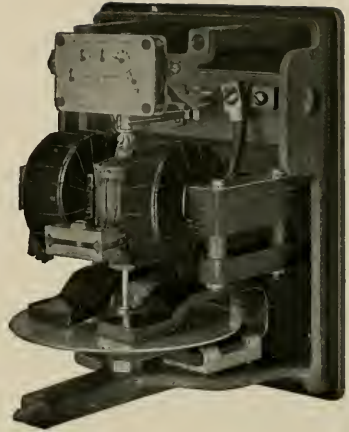


FIG. 2.—THOMSON RECORDING STREET CAR METER.

conditions imposed by the rough service have been met by the careful design of the rotating parts. The unavoidable vibration, due to rough tracks, demands a low drop in the armature in order that contacts may not be injured by sparking. High torque is also a requirement so that heavy brush pressure insuring perfect contact can be used. The sudden and wide variation of current requires a meter that will start quickly and slow down as soon as the current diminishes. The General Electric Company, claims high accuracy for its new car meter and also that it has the ability to withstand severe and continued use on the roughest tracks. The meter is now made for 500-volt circuits in sizes for 25 or 50 amperes with a liberal provision for overloading.

## THE ELECTRICAL EXPOSITION FOR 1898.

Ever since the electrical show held in New York City during May 1896 there has been a feeling in the trade that it should not be the last. Its splendid success in the way of bringing trade to exhibitors has led to a very general demand that it be repeated.

A company has been formed and incorporated with \$20,000 capital, and a live up-to-date board of directors to conduct such an exhibition in 1898. The officers and directors are Cyrus O. Baker, Jr., president; Ferd. W. Roebing, vice-president, and George F. Porter, secretary and treasurer. These officers, with Leonard F. Requa, Chas. A. Lieb, J. W. Godfrey, and H. H. Harrison, constitute the board of directors. Executive committee, C. O. Baker, Jr., Leonard F. Requa, and H. H. Harrison. Marcus Nathan has been selected as general manager.

This insures a first-class exhibition. The new electrical inventions and improvements developed since the last show will be an important factor. The interest and coöperation of many manufacturers already assured will count for much towards making this a more complete demonstration of all the applications of electricity and its branches than was possible in the first exhibition in 1896.

E. T. Birdsall of New York has been engaged as consulting electrical engineer for the proposed Springfield & Southwestern Street Railway, Springfield, Mass.



## TROLLEY CARS AT DOVER.

Dover is the first city in England where the street railway system has been designed and constructed for electric traction. The work has been completed and the lines were recently opened for traffic. The equipment is largely of American manufacture and is of the best and most substantial design.

The Electrical Engineer of London has this to say: "The rails are of the girder type, weighing 87 lbs. to the yard, 30 ft. long, and laid on a continuous block of Portland cement concrete, 12 in. wide and 8 in. deep. Two motors on each car are of the G. E. Soo type, each capable of a nominal output of 25 h. p., and mounted on a Peckham truck. The motors are regulated by one or the other of two K2 series-parallel

## EXCESSIVE DAMAGES NOT ALLOWED.

A year ago the four year old son of Loren Fox was killed by an electric car of the Oakland Consolidated Street Railway Company and a verdict of \$6,000 was given to the father by the superior court. The railway company appealed to the supreme court and the verdict was set aside. The father of the boy is a poor plumber and in reference to the damages sustained by him on account of the loss of his son, Judge Van Fleet said:

"We think it quite manifest upon its face that the verdict was actuated by something other than a consideration of the evidence. When we regard the probable number of years to be taken in his schooling comparatively little valuable time would be left to be devoted to the service of the parent. And



CORNER FOURTH AND ADAMS STREETS, MARION, IND.

controllers, placed one at each end of the car. Eight of these motor cars have already been equipped and four trailers. The Peckham trucks appear to carry all before them in this country, as every electric tramway now running is using them. The car bodies, which are supplied by the Brush Electrical Engineering Company, are very comfortably fitted. They hold 20 passengers inside and 24 outside. Another feature of the car equipment is the placing of a meter on each car to measure the energy taken by the motors. In this way a check on the driver will be kept, so that any undue waste by careless use of the controllers may be prevented. The power plant consists of two McIntosh & Seymour engines, direct coupled to two 100-k. w. dynamos of the General Electric type. The switchboard is built up of two standard G. E. panels with additional panels for meters."

The Metropolitan road of Kansas City hauled 135,000 passengers Sunday, August 15. This is the best record for 1897, the average Sunday traffic being 110,000

while in no sense conclusive, we have the right, and it is most reasonable in judging of the probable character of occupation the deceased would have pursued, to regard, with the other circumstances surrounding him, the calling of his father, since experience teaches that children do frequently pursue the same general class of business as that of their parents."

## THE MARION CITY RAILWAY.

The street railway system of Marion, Ind., dates back to 1889 and unlike many roads built at that time was not built to sell. The original promoter of the enterprise was W. C. McWhinney, who associated himself with three other gentlemen and organized the Marion Street Railway Company. After operating a short time as a horse road the lines were rebuilt and equipped for electricity, the electric road being opened July 4, 1891. One of the stockholders withdrew and the company was reorganized in 1892 as the Marion City Railway Company. The officers are Eli Halderman,

president; C. W. Halderman, vice-president, and W. C. McWhinney, superintendent and general manager.

The road comprises 25.5 miles measured as single track, there being six miles of double track. There are four routes: The main line extends from City Park, 2½ miles north of the public square to Jonesboro, 7½ miles to the south; the double track is on this route from the square to the Soldiers' Home, 3 miles. There is a branch a mile long to the Normal College and also one from Jonesboro to Gas City, a mile distant. Route No. 2 is two miles long extending to the cemetery southeast of Marion. Nos. 3 and 4 are the lines to West Marion and York, respectively. The franchises for these lines were obtained at different times and are for from 30 to 50 years.



W. C. McWHINNEY.

The track is now laid with 60-lb. T-rails in 30-ft. lengths, on white oak ties 5 x 7 in. x 7 ft., spaced 2 ft. between centers. Wheeler rail joints are used, and the track is bonded with No. 0 wire. The sharpest curve is of 50 ft. radius and the steepest grade 5.75 per cent; there are but three grades. The lines cross the tracks of three steam railroads, one of them in two places, at grade. The special work at these points is of 87-lb. T-rails and was all furnished by the Paige Iron Works, Chicago. No. 0 trolley wire is used; it is strung on cedar poles 30 ft. long and 7 in. in diameter at the top, spaced 100 ft. apart; the cars, hangers, insulators, etc., were furnished by the Ohio Brass Company. There are four feeders, one 2 miles, one 3 miles and two 5 miles long; they are of No. 00 wire.

The power house which is one of the most modern and finest looking plants in the country, is located at Home avenue and 30th street. It is constructed entirely of stone, brick, iron and slate, excepting the floor which is of wood, and is completely fireproof. The front part of the building containing the engine and dynamo room is 52 x 87 ft., and the boiler room which adjoins it at the rear is 45 x 56 ft. In the building and foundations there are some 600,000 bricks. The roof is of fireproof tile covered with slate. In the boiler room the floor is brick; in the engine room it is of

mill construction, supported on 10 x 12-in. sills; on these is laid 3 ½-in. pine flooring and on top of that 1 ¼-in. white maple, oiled and polished. There is a large ornamental fire place in the side wall which is not shown in the illustration.

The engine equipment consists of two Buckeye compound

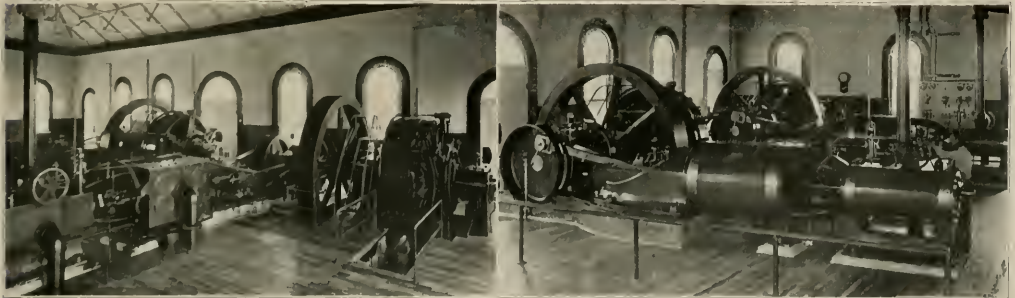


POWER HOUSE—MARION CITY RAILWAY.

engines with cylinders 17½ and 33 x 33½ in. Each is direct connected to a 350-k. w. Siemens & Halske generator, run at 118 r. p. m. and wound for 500 to 550 volts. A 12-ton fly-wheel, 12 ft. in diameter with 16-in. face, is mounted on each shaft. The engines are operated non-condensing.

The switchboard is of white marble, 2 in. thick, and divided into four panels, one of which is used for the lighting circuits. Weston instruments are mounted on the board.

In the boiler room are two water tube boilers rated at 750 h. p. each. In each are 131 1-in. tubes 18 ft. long, and on top three drums 38 in. in diameter and 18 ft. long. The pressure carried is 125 lbs. at the present time which will soon be increased to 150 lbs. Natural gas is used for fuel being burned with Claybourne burners. Crude oil is fed into the boilers to prevent the formation of hard scale and an automatic feeder supplies it at the rate of one quart per day. The Crane Company of Chicago furnished the valves and piping. Stratton separators are used on the steam lines and all the exhaust returns to a heater which raises the feed to about 200°F. City water is used.



INTERIOR OF ENGINE ROOM—MARION CITY RAILWAY.

The stack is of brick, 75 ft. high, and 13 ft. square at the base. The flue inside is 7 ft. The connection from the boilers to the stack consists of three underground conduits arched over.

The road employs 50 men and operates 32 cars, eight of which are open. The closed cars are of 16 and 18 ft. body and the open cars have a seating capacity of 45. The cars and trucks were manufactured by the J. G. Brill Company and the Barney & Smith Company, and are equipped with G. E. 800 and S. R. G. motors. The company has two car barns, one with three tracks 150 ft. long and one with two tracks 200 ft. long. At one of the barns is also located the repair shop.

Cars are run at speeds varying from 9 miles per hour in the center of the city to 25 miles; the headway is 10 minutes on the route No. 1 and 20 minutes on all other lines. Marion has a population of 22,000, Jonesboro has 2,500 and Gas City 5,000 and in addition there are some 3,000 at the Soldiers' Home, giving a total population served by the



BOILER ROOM—MARION CITY EAILWAY.

company of nearly 35,000. The Union Traction Company which will build a road from Anderson to Marion has already completed 9 miles of track to Alexandria, and in the near future will open a line from Jonesboro to Fairmount, leaving only 10 miles to be built in the spring. This line will connect with the Marion City Railway at Jonesboro and cannot fail to prove a benefit to the latter.

The general manager, Mr. McWhinney, is another example of a railway man who entered that field after a successful career in other lines. Mr. McWhinney was born in Preble county, Ohio, in 1848, and after engaging in various mercantile enterprises removed to Marion in 1889 and soon organized the street railway which has been in every way a success.

### THE GENERAL ELECTRIC 57 MOTOR.

The new G. E. 57 street railway motor has been introduced by the company in response to the demand for a motor of greater capacity. It is similar in design to the G. E. 1,000; while still as compact, it has an output of 50 h. p. at 500 volts. The frame is dust and waterproof and is of steel, cast in two bowl-shaped pieces with a hand hole in the lower half for cleaning. There are four laminated poles, each having a separate coil which is wound on a cast spool, thoroughly insulated with asbestos. There is a cover-

ing of heavy duck drawn over the spool to protect the winding from injury.

The armature is similar to that of the G. E. 52 and is 14 in. in diameter with a spread of 12 in. It is iron clad, the core being built up of annealed laminated disks, and in assembling these, three sets of spacing blocks are used, pro-

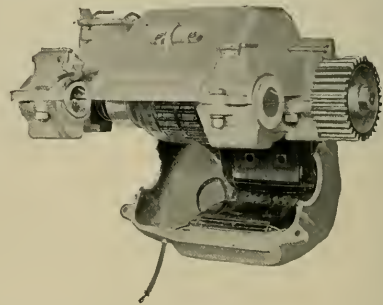


GENERAL ELECTRIC 57 RAILWAY MOTOR.

viding three ventilating ducts. There are 33 triple coils, each composed of three separate coils, and these are wound with either two or three turns per coil. The three-turn winding is the standard for ordinary service. This method of winding insures few repairs and admits of thorough insulation. The armature is as light as possible.

The commutator has 99 segments of hard drawn copper 2 in. deep, giving a wearing depth of 1 in. The brush-holders are staggered to prevent the wearing of ridges on the commutator, and each holder contains two radial brushes, 2 1/4 in. long, 1 3/4 in. wide and 5/8 in. thick.

The bearings are of ample size, the pinion end being



WITH FRAME DROPPED.

3 1/4 x 8 3/4 in.; the commutator end 2 7/8 x 6 3/8 in. There is a combination thrust collar and oil guard which the lower half of the case does not cover, thus allowing the lubricant free egress and preventing it from working into the motor frame. Either oil or grease may be used. The lower oil wells are provided with felt wicks which wipe the shaft through holes cut in the linings. The motor is adapted for either nose or yoke suspension, and with a slight modification of the frame can be fitted for side bar suspension.

For inspection or repairs the lower half of the motor can be swung down into the pit without disturbing the upper half. When mounted on 33-in. wheels the clearance between the bottom of the motor and the rail is 3 1/4 in. With the 67-tooth gear and case the weight complete is 2,972 lbs.



A BIG FIRE AT WASHINGTON.

CHICAGO UNION LOOP IN USE.

Fire entirely destroyed the central power station of the Capital Traction Company of Washington, D. C., the night of Wednesday, September 29, and the loss aggregates \$1,000,000. The building occupied a block bounded by D, E, 13<sup>1</sup>/<sub>2</sub> and 14th streets, and was six stories in height; the ground floor and a part of the second were occupied by the company for the cable plant and offices, and the rest of the building was let for offices and manufacturing purposes.

It was of "mill" or "slow burning" construction and was completed for occupancy June, 1893. In spite of its construction the building burned with remarkable rapidity. The engines driving the cables continued running until a large piece of iron fell from the floor above into the wheels. The engines were of the E. P. Allis make with 36 x 72-in. cylinders and rated at 750 h. p. The boilers consisted of a battery of eight 184-h. p. water tubular boilers.

After a long season of parlay all the leases for the use of the Union Loop have been signed, Leslie Carter, president of the South Side Elevated Railroad, being the last to agree to the terms of the lease. All the differences were settled in a conference held October 2 and on the following morning the trains of the Lake Street Elevated Railroad ran around the loop without any previous announcement. The Metropolitan West Side Elevated began operation around the loop October 11. The South Side Elevated Railroad Company has yet to complete the connection on Harrison street, a half square between its structure and the

Loop. All the supplies are at hand and the work is progressing rapidly and will be finished by October 25. The Alley L trains will be drawn around the loop by the locomotives now in use until its cars are equipped for electric traction. Some progress is being made in this work



WRECKING WALLS WITH DYNAMITE.

THE FIRE, 11:45 P. M.

RUINS NEXT MORNING.

The entire plant was designed and furnished by Robert Poole & Son Company, Baltimore. The cars of the company are stored in the sheds at either end of the line. Horses were procured at once and 50 cars, the cable trailers, were put in service on the lines. The Metropolitan Railroad Company tendered the use of 25 horse cars. Plans were made at once for erecting a temporary structure and installing machinery to drive the cables. The station of the Washington, Alexandria & Mt. Vernon Electric Railroad on 13<sup>1</sup>/<sub>2</sub> street was also seriously damaged.

The photograph of the fire from which our illustration was reproduced was taken at 11:45 p. m., 30 minutes after the fire started; it was taken by E. R. Myers, and is quite a rarity in the art. The other two views show the ruins, one of them being taken as a charge of dynamite was exploded under the front wall the following day.

Since the above was put in type the directors have decided to adopt the underground electric system, and will build electric stations instead of restoring the cable plant. The present cable conduits will be used.

Mrs. S. G. Milliken, of Augusta, Me., has been chosen a member of the board of directors of the Bangor, Oronto & Oldtown Railway Company. She is the first woman to be elected to such office in the state.

as the new motors and trucks are being placed under the cars and the vestibules built by the Wells & French Co., of Chicago. Frank J. Spague is in Chicago supervising the work preparatory to installing his system.

It requires from 17 to 18 minutes for the trains to make the circuit, on which there are 12 stations in the two miles.

TERRE HAUTE HAS AN OBJECT LESSON.

A spasm of legislating struck the Terre Haute city council, and for want of something better to do an ordinance was introduced cutting the speed of electric cars down to about one-third the previous rate; requiring stops to receive and discharge passengers to be made at the near crossing; and cars to come nearly to a standstill before crossing any street, regardless of whether any passengers wished to get off or on.

President Harrison was equal to the emergency and instead of camping at the city hall, published a notice that if that was the kind of service the people wanted they need not wait for an ordinance to get it, and put the entire system on the proposed schedule for three days. Before the three days were over the whole town was in arms, and raised such a cry that the council was glad to retreat by deferring action on the ordinance. It will probably not come to life again.

## MODERN COMPRESSORS FOR AIR-BRAKING.

BY E. J. WESSELS.

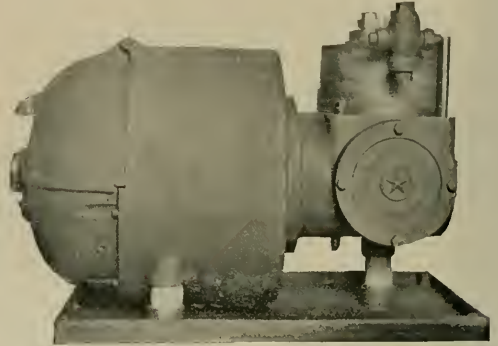
Although compressed air was known in Aristotle's day and has long been used for a variety of work, its application in the field of electric traction remained in an undeveloped state until recent years. So long as horse cars were the order of the day, no necessity existed for its use in braking surface cars. Shortly after the first electric car was put into service, the company of which I have the honor to be managing director, met the need which arose by furnishing an air-braking system, operated by a single or double acting compressor, for controlling electric and cable cars.

As electric traction developed, increased demands were made upon us for apparatus of higher efficiency than had sufficed in the dawn of street railroading. As a result not only had existing conditions to be confronted and met but what was fully as important, a system had to be evolved which would successfully meet the radical changes which became necessary. The air-brake system really had to be ready before the need for it had become fully apparent. No time was granted for experimenting, after the high efficiency car motors were in place.

With these special needs in view, an electric compressor embodying radical changes had to be designed. Many experiments were made with the initial outfits and large outlays were necessarily incurred, without always being followed by satisfactory results. It may be admitted with perfect frankness that the first apparatus left much to be desired. We had to rely upon the reports and friendly criticisms of railway managers in order that defects might be cured and that each installation might be an improvement upon its predecessor. Some of our friends realized that their interests and ours were very closely allied and through them we obtained important help.

The problem of braking by air, high speed, heavy cars running in trains, is not as simple as might appear at first blush to the uninitiated. It becomes more complicated when the factors of heavy grades, frequent stops and numerous

crossings are involved. A motor compressor which answered in 1895 falls short of the requirements of 1897. With a full appreciation of this fact our company's aim has been ever to keep in the van. The illustrations accompanying this article are not "manufactured" but taken from real life, and represent the interior and exterior of our latest ma-



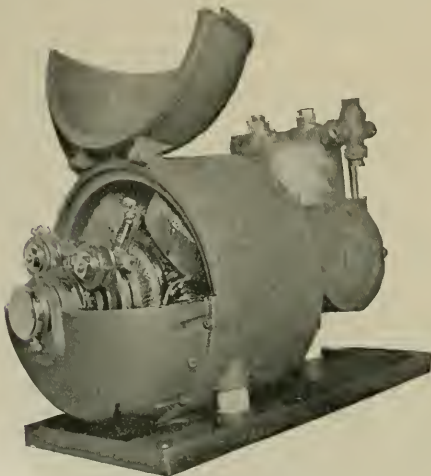
THE STANDARD MOTOR COMPRESSOR.

chine as actually photographed. Reference to some of its features may be timely and it will be seen wherein this type of air compressor differs from all others. The  $1\frac{1}{2}$  h. p. type is illustrated. The motor compressor is very compact, being but  $26\frac{1}{2}$  in. long by 15 in. wide by  $18\frac{1}{2}$  in. high. The complete weight is 400 lbs. The motor is of the iron clad, multipolar, slow speed, series type. It was found after repeated experiments that the use of gears necessitated a much bulkier machine and that the noise arising from a geared machine was very much greater than from the other type. This noise was intensified after the gears showed wear. For this and other reasons the geared type was abandoned.

While our motor is absolutely rain and dust proof, nevertheless the construction is such as to make the brushes readily accessible. It will be noticed that the commutator is of very generous proportions, as are also the brushes. Special brush holders are provided, which are exceedingly convenient. Their long springs insure even tension of the brushes and require only infrequent adjustment. The wide insulating surfaces prevent leakage through "creeping." In this motor extraordinary precautions have been observed throughout for obtaining the strongest and most durable insulation.

While the armature is of the slotted drum type (such as is used in the best sort of street railway motors) the winding is special, being of the well known Hochhausen type. It should be stated that ours is the only company which is authorized to use the Hochhausen patents in air-compressor work. Damaged sections can be renewed (in case of injury) as is common in car motor armatures. The machine is thoroughly protected against ingress of oil from bearings and compressor.

The compressor is of the single acting type, with double cylinders which are placed vertically, with trunk piston connecting directly to eccentrics in crank case. The pistons are carefully balanced to insure a minimum of noise and freedom from vibration. The eccentrics are effectively lubricated by revolving in a closed chamber partly filled with oil,



THE STANDARD MOTOR COMPRESSOR.

which is kept at such height as always to be in contact with the sliding surfaces. The compressor is bolted to the end of the motor and the shaft is a prolongation of the armature shaft, although it does not form a part of it. The compressor has a capacity of 11 cu. ft. of free air per minute when working under a gage pressure of 60 lbs. per sq. in. It is capable of operating with great economy even at 100 lbs. pressure, although in straight air work the maximum pressure required by the Standard system is 60 lbs. The remarkably high efficiency of the compressor is largely due to the design of the valves. These combine ease of access with a minimum loss arising from clearance. Being made of steel, they are very light and are practically indestructible. The air supply is drawn from a chamber which, although dust proof, has so large a filtering surface that the work of drawing the air through the same is inappreciable.

This modern motor compressor has been in operation for a number of months, and has been mounted on a number of cars with very satisfactory results. The operation is completely governed by the automatic current controller, which relieves the motorman of responsibility by starting the motor compressor when necessary to replenish the air supply, and by cutting out as soon as the needed supply has been obtained.

In view of the recent advent of the third rail and Sprague systems, he indeed would be a bold prophet who would undertake to predict what the next five years may have in store for the traveling public, but it is safe to assert that, no matter what form of electric construction may become the recognized standard of the future, the modern air compressor will be found doing its work of maintaining a sufficient air supply (in connection with an air-brake system) to curb the speed of what would often otherwise prove "wild" trains or cars. For such work it is singularly well adapted and its place is not likely to be usurped by any other forms of braking apparatus, with their pronounced weaknesses and limitations.

### SERVICE TEST OF ALLEN-MORRISON BRAKE SHOE.

When describing the Allen-Morrison composition brake shoe in the REVIEW for September, page 604, mention was made of the mileage run by car No. 24 on the South Side Elevated of Chicago, which was equipped with these shoes for the purpose of testing them. At that time the shoes had run 16,666 miles.

On September 9 the mileage was 21,011 miles, and four of the eight shoes were removed; the average loss in weight of these four was between 11 and 11½ lbs. each. On September 23 the other four were removed, after making 23,373 miles; the loss in weight for the second four was 12½ lbs. each. The reduction in thickness of the shoes was 1¾ in. and the reduction of the diameter of the wheel (steel tire) 1/16 in. The thickness of the composition in one of these shoes which we have examined is less than 1/16 in., but shows not the slightest evidence of any tendency to break loose from the iron shell.

In the same service chilled iron shoes run 16,000 miles and soft cast iron shoes between 1,000 and 5,000 miles.

Wages of trainmen on the Denver City Cable Railway have been increased from 18 to 20 cents per hour.

### THE RED MAN AND THE WHITE.

(With apologies to Lord Kelvin, who, while visiting the Falls, a few weeks ago, said:—"No, I do not hope that our children's children will ever see the Niagara cataract.")

In the early days when the world was new,  
And woods, and sky and prairie were unsoiled with use;  
A dusky warrior wearied with the chase  
Came to a river's brink and paused to rest.  
He quaffed the waters pure and sweet,  
Drawn from the depths of the great inland seas;  
And resting in the shade beside the stream  
The queen of slumber closed his eyes with sleep.  
When he awoke the sun was in the west,  
And from the distance came a mighty roar,  
Like constant thunder rumbling o'er the hills;  
And to the voice thus calling he arose,  
And hastened on to find the cause unknown.  
Nearer and nearer came the awful roar,—  
As if the Titans battled for their life,—  
Until he saw the cloud of conflict rise  
Above the struggle of the waters wild.  
Upon the earth he prostrate flung himself,  
Nor dared to stand in presence so austere,  
But gaining courage knelt and slowly crept  
Until his eyes looked down into abysmal depths.  
No human face had ever turned its glance  
Into that chasm wild and fierce;  
No human hand had e'er been raised  
In homage to the god of endless storm;  
No human lips had ever kissed  
The sweet faced Maiden of the Mist.  
Then in his ear a whispered word,  
"Return unto your tribe" it said;  
"Nor ever dare again to tread  
"The borders of this sacred land."  
In fear and trembling he retraced  
The pathless track which he had come,  
And to the chief he told the tale  
Of all which he had seen and heard.  
The wise men sat in council grave,  
And when at last the pipes went out,  
The brave was taken hence and slain.

\* \* \*

Years passed. One day the white man came,  
And marveled much at what he saw,  
Then went away to come again,  
With harness for the waterfall.  
He dug a ditch, the water turned  
From out the path it long had known;  
He forced it through a turbine wheel,  
Direct connection was the song.  
No longer free this water god,  
Now he must work by night and day,  
His arms are bound, free-willed no more;  
Where once he bounded o'er the rocks at play,  
Now he must draw great cars, on tracks;  
The sparks he scattered in a million drops  
Are now collected in an arc;  
His breath that filled a cave with wind,  
Is fastened with a copper band,  
And ere its freedom it may take  
Must even turn an electric fan.

### FINE RECORD AT GIRARDVILLE.

E. W. Ash, general manager of the Schuylkill Traction Company, Girardville, Pa., reports an excellent record for his road. During the year ending July 1897, over 2,000,000 passengers were carried on the 22 miles of track and the personal injury account amounted to only \$10. One of the main lines has a grade one mile long, a considerable portion of which is 8½ per cent, and in running this mile cars made an average of 10 stops each trip.



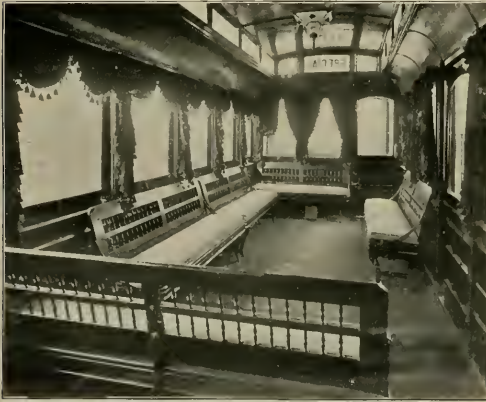
## DETROIT FUNERAL CAR.

The accompanying illustrations show exterior and interior views of the special car which the Detroit Citizens' Street Railway Company has provided for the use of funeral parties. The interior of the car is handsomely upholstered



DETROIT FUNERAL CAR.

and carpeted and draped in black. In the front is a space for placing the casket, with seats at the sides; the rear portion of the car is provided with cross seats, making places for about 30 persons in the car. The charge made by the company for the use of this car is \$15. The advantages of



INTERIOR OF CAR.

such a service in a city, and particularly one so well provided with street railways as Detroit, will be readily appreciated, and it is rather surprising that funeral cars are not more common in our large cities.

The Southern California Electric Light & Power Company of Redlands, has contracted to supply the Los Angeles Street Railway Company with power for the period of 20 years. The minimum payment is fixed at \$50,000 per annum,

## FENDERS FOR CHICAGO.

On September 27 the Chicago city council passed an ordinance which provides that within 60 days all the street railways shall equip their motor and grip cars with fenders, and shall equip all open cars with wire or other suitable guards on the side towards the inner rail, and also place such a device on the side of the cars to protect passengers from falling under the wheels. The fenders "not to be more than 4 in. above the top of the rails, and shall be of such design as to effectually form a guard for the wheels of the cars, subject to the approval of the mayor and the commissioner of public works." The mayor signed the ordinance October 2.

## FORSYTHE'S CAR CURTAIN FIXTURES.

During the fall of 1895 Forsythe Brothers & Co. introduced to the trade their patent roller tip curtain fixtures. This curtain was entirely new both in principle of operation and in form of construction, and was the first fixture to show a working or tilting head having friction surfaces of divers holding power whereby the shade is made self-righting. It had the ordinary tube with spring actuated rods, these latter at their outer end tips being provided with anti-friction rollers. This construction makes the fixture right itself and remain level and within the grooves. It can be operated either by grasping the finger pieces or the curtain anywhere along the bottom. The fixtures are exceedingly simple and very durable. While remaining in the grooves when in use they can still be readily removed therefrom, for cleaning, repairing or washing of the curtain or window. These curtains met with immediate favor and have been adopted and extensively used by nearly all the leading railroads and many street car companies. Although this concern has but recently sought after the traction company trade, they are able to report to us that this department has grown rapidly and they are forced to work at night to fill orders. They have lately filled orders for the Metropolitan Traction Company of Washington, their second order, the third order from the Fort Pitt Traction Company of Pittsburg, the Detroit Citizens Street Railway Company, the new cars for the Chicago City Railway Company.

W. H. Patterson, president of the Bloomington (Ill.) Street Railway Company and Senator J. J. Patterson have succeeded in making satisfactory arrangements with creditors and the company will continue operations under the present management; there is now no probability of the appointment of a receiver being asked, as was for some time expected.

About 225 Italians at work on the Oxford (Me.) Central Railroad, struck on account of not receiving their pay on time. They captured the contractors, Albert Davis and L. B. Wilson, and held them as hostages. Their position was precarious and Albert P. Bassett, a state detective, went to the rescue. The prisoners made a dash for liberty and reached the wagons which had been provided for them. The Italians then turned furiously upon Bassett, who made a most courageous fight. He was severely beaten about the head and received a bullet wound but made his escape after shooting six of the strikers.

## COST OF POWER FOR ELECTRIC RAILWAYS.

| STATION.                           | MONTH. | Output Measured by | 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. Coal per k.w.h. |        |
|------------------------------------|--------|--------------------|---------------------------------|----------------------------------------------------|--------|----------------------------|--------|-----------|----------------------------------------|-------------------------------------------|--------------------------|----------------------|--------|
|                                    |        |                    |                                 | Fuel.                                              | Labor. | Supplies, Oil, Waste, etc. | Water. | Re-pairs. |                                        |                                           |                          |                      | Total. |
| 1.....                             | July.  | Wattmeter.         | 1,005,360                       | .284                                               | .239   | .035                       | .027   | .020      | .605                                   | 3.3                                       | 1.                       | 10.                  | 2.9    |
| 2.....                             | July.  | Wattmeter.         | 158,376                         | .560                                               | .360   | .090                       | .000   | .080      | 1.090                                  | 5.81                                      | 6.82                     | 5.78                 | 4.27   |
| 3.....                             | July.  | Wattmeter.         | 166,144                         | .482                                               | .347   | .081                       | .....  | .055      | .965                                   | 6.2                                       | 9.33                     | .....                | 4.53   |
| 4.....                             | July.  | Wattmeter.         | 238,120                         | .419                                               | .268   | .049                       | .003   | .008      | .747                                   | 3.9                                       | 7.6                      | .....                | 3.95   |
| 5. Metropolitan Elevated, Chicago. | July.  | Wattmeter.         | 995,173                         | .299                                               | .200   | .022                       | .013   | .114      | .648                                   | 5.2                                       | 2.0                      | 5.84                 | 3.22   |
| 7.....                             | July.  | Ammeter.           | 764,460                         | .520                                               | .240   | .080                       | .020   | .....     | .860                                   | 1.9                                       | 1.4                      | 5.                   | 6.8    |
| 8.....                             | July.  | Wattmeter.         | 994,110                         | .451                                               | .224   | .090                       | .....  | .044      | .809                                   | .....                                     | .....                    | .....                | .....  |
| 9.....                             | July.  | Wattmeter.         | 144,176                         | .658                                               | .596   | .006                       | .....  | .017      | 1.277                                  | .....                                     | .....                    | .....                | .....  |

### LATEST CONVERTIBLE CAR.

### THE SMALLEST ROAD.

Many managers are still looking for a convertible car which shall be equally adapted to summer and winter use, and which can be changed from one to the other without going into the shop. In fact, on some roads doing a big summer traffic, where sudden storms bring extreme changes of temperature in a few minutes, such a car is really a necessity.

The car we illustrate is called the "Duplex," and was built at the Jackson &

We have repeatedly printed descriptions of big roads, with thousands of cars, carrying millions of passengers, and earning enormous sums of money. Here is what might well be termed the "minimum road," and the owner writes us of it as below. The road is in California, and in response to our mild suggestion that all well regulated lines found it profitable to subscribe for and read the REVIEW, he relates the story of his woes. Under the circumstances we hardly have the audacity to expect an entire day's earnings for one year's sub-



THE DUPLEX CONVERTIBLE CAR.

Sharp works, Wilmington, Del., and is one of an order for several which were built for the Duplex Car Company this summer and sold to the Bergen County Traction Company. One of these cars will be exhibited at the Niagara convention, and will be found on the special track directly in front of the convention hall. The inventor of the car is John A. Lovell, a Boston capitalist.

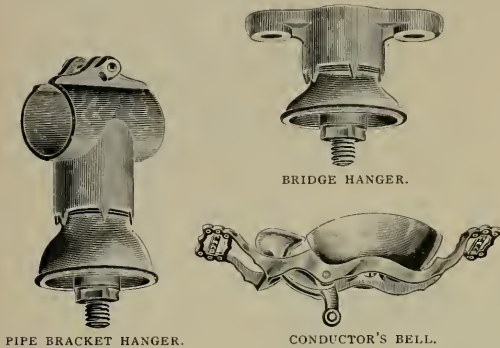
The passenger receipts of the Brooklyn Rapid Transit Company for the month of September were \$30,921 more than for the same month last year.

scription. He says: "Our road is literally a one-horse concern, not averaging \$2 a day receipts; so I hardly deem it advisable to subscribe for your paper. Being 71 years of age, and with bicycles, competition from livery stables, etc., and business rather falling off, there is little prospect of my ever seeing an electric line here."

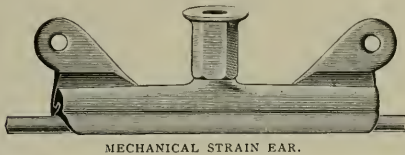
It is stated that the Westinghouse Electric & Manufacturing Company has purchased the Gibley's Electric Company of Milwaukee and the plant will be closed as soon as the important contracts on hand have been completed.

## CENTRAL ELECTRIC NEW OVERHEAD SPECIALTIES.

The Central Electric Company, Chicago, is constantly adding to its line of railway specialties, and we illustrate some of the most recent. The bracket hanger is arranged to fit many types of bracket arms, as well as the special angle brackets. The bridge, or barn hanger, is made especially for places where the ceiling or roof is very close to the ground and is made short so that the wire is held close to the ceiling. These hangers, where specified, are furnished with special clincher bolts which will hold in rock, making



it unnecessary to fasten timbers. The company claims the distinction of originating another useful feature which can be applied to all its overhead materials of the West End type. It is a very small device which fits the stud just above the ear and absolutely prevents the ear from working loose from the stud. Various other methods have been employed to overcome this difficulty, one of which the Central Electric has employed in all of its West End hangers for some time, viz., the self-locking features of the cap;



but this method of locking the stud to the ear is something radically new, and has never before been used in railway overhead materials.

The conductor signal bells are nicely finished and furnished complete with 6-in. gongs. In addition to the various hood gongs a full line of foot gongs is carried.

The mechanical strain ear is desirable on account of its strength and quick application. It is impossible to move it on the wire after it is placed in position. These ears are made for No. 0, No. 00, or figure 8 wire. The company has made a careful study of overhead parts, and reports that where samples of these goods are sent, orders almost invariably follow.

## PERSONAL.

L. M. Erb has resigned as general manager of the Leavenworth Electric, and will go into construction work.

G. A. Cooke, assistant to the general manager of the Toledo Traction Company, was a caller on the REVIEW, September 18.

Col. C.F. Morse, president of the Metropolitan Street Railway Company has returned to Kansas City after a two months' vacation.

F. H. Chamberlain leaves the United States Electric Company, of Washington, to become electrician for the Metropolitan Railroad of that city, succeeding W. A. Heindle.

Fred Mundes has received the appointment of general road master of the lines of the Houston Electric Railway Company. Mr. Mundes has been in the service of the company for many years and is a capable and experienced railway man.

C. W. Smith, president of the Pasadena & Los Angeles Electric Railway Company, was severely injured by being thrown from a mule while descending the Mt. Wilson trail. Although cut and bruised about the face the injuries will not result seriously.

W. C. Gotshall, who resigned his position with the Union Depot Railroad Company, of St. Louis, to take charge of the underground construction work on the lines of the Metropolitan Traction Company, New York, was married to the Countess Von Rathgen, of Hamburg, Germany, at the home of Dr. Heidenfeld in the Catskills.

Ben Willard, who has been engaged the past three years in charge of the installation and construction on the New Orleans Traction Company, having completed the work has resigned to become assistant engineer for the General Electric, and will make headquarters at Schenectady. Mr. Willard's work is of a high order and his friends will continue to watch his future with interest.

S. L. Nelson, secretary and general manager of the Springfield, (O.) Railway Company, attended, on Wednesday, September 22, the 55th wedding anniversary of his father and mother. There were seven children in attendance, of which Mr. Nelson was one, he being the baby of the family. There were 10 grandchildren and one great-grandchild. There has not been a death in the family for 50 years. His father and mother are both very hale and hearty, his father being 79 years old and his mother 70.

## OBITUARY.

Thomas W. Fowler, well known to street railway men as for many years superintendent of the Lewis & Fowler Car Company, died in Brooklyn, on September 30. Mr. Fowler was 77 years of age.

Allen D. Norman, receiver for the Citizens' Traction Company of San Diego, Cal., died after suffering several weeks from nervous prostration. Mr. Norman was a native of Illinois and during his residence of 10 years in San Diego had become prominent in business and social circles.

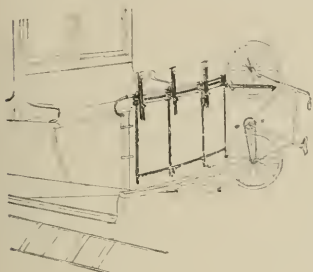
Charles A. White, president of the Bibber-White Company of Boston, died at his home in Malden, Mass., September 16. He was prominent in manufacturing and electrical interests and was largely instrumental in building up a large business in feed and insulated wires of all kinds. At the time of his death he was president of the Malden Council.

Albert L. Ide, the well known maker of high speed engines which bear his name, died at Chetek, Wis., where he had gone in search of health. He went to Springfield, Ill., in 1855 and has made that city his home ever since. He was two years in the army, and at the close of the war built and became president of one of the street railway lines in Springfield. He began manufacturing in 1870 and built up a large works. He was also president of the National Electric Company, at Eau Claire, Wis.



**BICYCLE HANGER FOR STREET CARS.**

Street cars will carry bicycles, or at least the progressive roads will do so, and every manager who desires to increase his receipts will have to make some kind of provision for this service. Contrary to first impressions it is found that it is not on hilly lines alone that cyclists are glad to avail

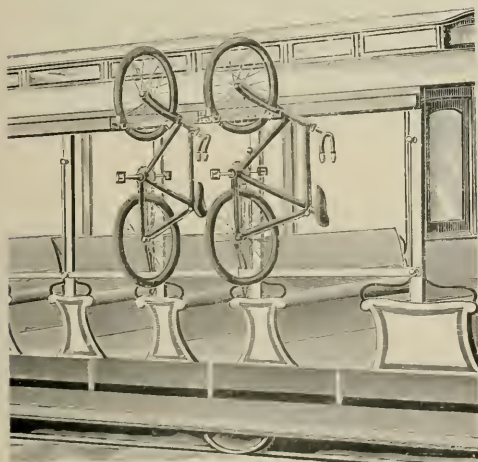


APPLIED TO DASH.

themselves of a "lift," but that when tired, or accompanied by ladies, it is very acceptable to use the cars, especially against a strong wind.

The hanger illustrated is made by the Champion Bicycle Hanger Company. The hangers may be attached to both dashes and the closed side of open, and both sides of closed cars. On open cars the pedal does not protrude beyond the width of the foot board, and wheels are hung high enough so as not to interfere with pedestrians.

The dash holders are riveted to a portable wrought iron frame in a series of three, four or more as may be desired, and are placed about 18 in. apart, allowing ample room for the handle bars; from the back of each holder are books made solid with the frame and shaped to fit the rail of the dash-board, and made to be put on, or taken off with ease. Where the rear wheel comes in contact with the car, are iron prongs that engage the tire and keep the wheel from

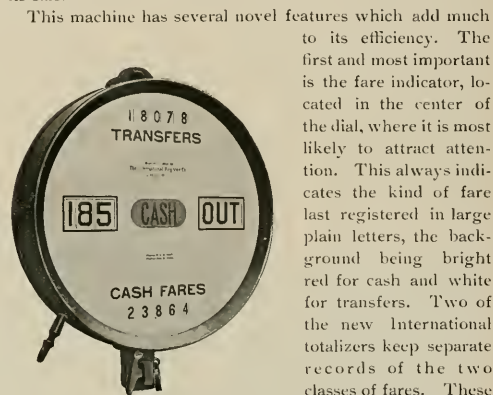


CHAMPION BICYCLE HOLDER.

swinging when turning curves. The wheel when in the holder is from 12 to 15 in. from the ground. There is positively no danger of scratching the enamel or straining the wheel. A special device is supplied where folding fenders are used.

**THE INTERNATIONAL DOUBLE REGISTER.**

The increasing necessity for better methods of registering fares where a large proportion of transfers are used has resulted in the adoption of double registers on many of the largest systems. The register here illustrated is, with the exception of trifling improvements, the same as shown by the International Register Company at the St. Louis convention. This machine has not been advertised during the year as the company had orders for quite a number, and preferred to demonstrate in actual hard service that the register had passed the experimental stage, before pushing its sale.



This machine has several novel features which add much to its efficiency. The first and most important is the fare indicator, located in the center of the dial, where it is most likely to attract attention. This always indicates the kind of fare last registered in large plain letters, the background being bright red for cash and white for transfers. Two of the new International totalizers keep separate records of the two classes of fares. These totalizers show the readings in much larger figures than heretofore used in a double register, and the manufacturer lays stress on the claim that these are the only register totalizers that are tamper-proof in themselves. In addition to this all the registers of this company are protected by a glass signature seal. A solid drawn case fits closely over an iron rim on the bed plate and is secured by a spring lock covered by the seal. The mechanism cannot be reached in any way by wires while the glass dial and seal remain unbroken.

The totalizers of some registers are accessible to any one who can handle a screwdriver and the facility with which they can be opened and set back is hardly appreciated by most street railway managers, but those who have given the subject their attention will not fail to commend the double protection offered in this as well as the other machines made by this company.

**CITY REGULATION OF SPEED.**

A judgment rendered in favor of the Nassau Electric Railroad Company of Brooklyn in an action brought by the city for the violation of an ordinance limiting the speed to six and eight miles an hour has been reversed. The company claimed that the consent of the city to the building of a road to be operated at a rate of speed not exceeding to miles per hour constituted a contract, but the court held that the regulation of the speed of street cars is to be exercised under the police power of the state, and when the power is delegated to a municipality it can not be alienated by the latter, as would have been the case had the consent been held to be a contract.

## DOUBLE TRUCKS FOR ELECTRIC RAILWAYS.

BY T. L. HARRIS.

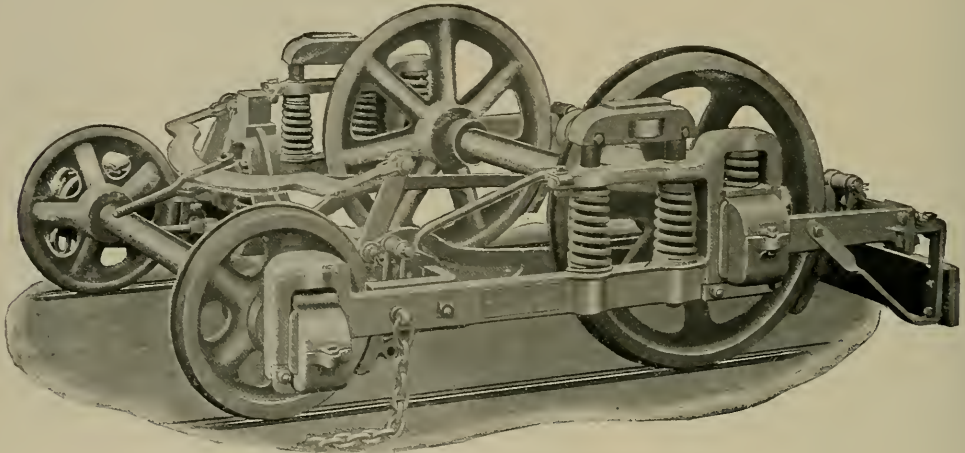
The thoughtful engineer or manager who has given some consideration to the modern practice in track building for steam and electric roads and to the conditions that obtain in the two classes of service has not failed to observe certain facts which when examined seem quite remarkable.

The modern street railway is laid with deep and heavy rails (the writer has in mind two pieces of track recently built in which rails weighing 103 and 106 lbs. to the yard, respectively, were used); few steam roads use rails that are heavier than those considered standard for street railways. The weights, per wheel, however, are quite different on the two roads; on street railways the normal weight per wheel is from 4,000 to 5,000 lbs., while on steam roads the weight per wheel is as high as 20,000 lbs. for locomotives, and as high as 12,000 lbs. for coaches; in addition

a long wheel base was considered necessary to make room for the motors between the bolster transoms and the axles, and then there was trouble because on curves the trucks would strike the sills of the closed cars or the steps of the open ones. When the wheel base was shortened the motors came under the bolster and the latter had to be raised, raising the car body and requiring two steps.

The Brill Company has placed three pivotal trucks on the market in which these objections have been overcome. They are intended for the three branches of street railway work which are: Heavy city traffic with its many stops and moderate speeds; a low car body and great adhesion for the truck are desirable. Mixed city and suburban service with frequent stops in the city and high speed in the country; for this the cars must be low and the trucks interchangeable between closed and open cars. Suburban and interurban service, where the highest practicable speeds must be reached on the main lines, and yet the cars must come into the heart of the city over tram roads.

The Eureka maximum traction truck is filling the require-



EUREKA MAXIMUM TRACTION TRUCK.

there are the increased rail pressures due to the presence of the counterbalances in the driving wheels, which at high speeds bring the maximum pressure on the rail to up fully 75 per cent above the normal. The speed on the steam road is 50 miles per hour; on other than interurban electric roads it is nearer 15.

Now, what are the results so far as the track is concerned? The mechanical engineers of the steam roads are on record as saying that their tracks are never injured by well-designed locomotives run at the speeds for which they were intended. On the other hand the street railway managers complain that the track is torn to pieces by the electric cars. There is only one reason for this, and that is the rolling and plunging cars mounted on four-wheeled trucks pound the track, loosen the joints and shake the car to pieces; the car pitches forwards and backwards so that often the entire weight is on a single pair of wheels and racks both truck and body.

Until recently there seemed to be no adequate remedy because the use of two pivotal trucks of the ordinary pattern was open to several objections. On the early pivotal trucks

of the first service; with this truck the bottom of the car sill is but 27 in. above the head of the rail, and only one step is required to reach the ground. The truck keeps the rail perfectly by aid of the spring compressor device at the trail end of the truck. This device is made in the shape of a double inclined plane, the center of which is on a straight line with the track, and when the car takes a curve it rides on one of the inclines and thereby puts more weight on the small wheels. Eighty per cent of the total weight is made available for traction on straight track. The side bars are solid and are spring-supported over the journal boxes; the whole of the center of the truck is open for the motor.

For the second class of service the newer "universal" truck which was illustrated and described in the REVIEW for September, 1897, page 624, appears to be perfectly adapted.

The "perfect" or No. 27 truck was designed for the peculiar service on interurban roads running into cities at the termini. Within the city limits wheels must be used which will not be destroyed by the pavements and which will not injure the tram rails. In the country where T-rails are used

the type of wheel suitable for the speeds common in the city becomes dangerous except at low speeds, and even then it readily leaves the track. In practice it is found that the motormen are tempted to exceed a safe speed, and many accidents have resulted in this service. For T-rail construction the wheels should have wide treads and comparatively deep flanges; but such wheels can not be used where the street paving is laid close against the rails because it will chip into the treads. Also, the deep flanges cut out the grooves of the tram rails and the rails as well as the wheels are quickly worn out.

A pair of trucks of the "perfect" type were placed under a car on the Buffalo & Niagara Falls electric road in the latter part of 1895 and their action fully demonstrated that the conditions of the service had been appreciated and met in the design. The car took the curves, whether long or short, with ease and at speeds that had theretofore been impossible. The trucks did not leave the rails at any speed though severely tested, and during the two years that these trucks have been in service on this road there has not been a single case of derailment reported.

The reasons for this will be apparent when their construc-

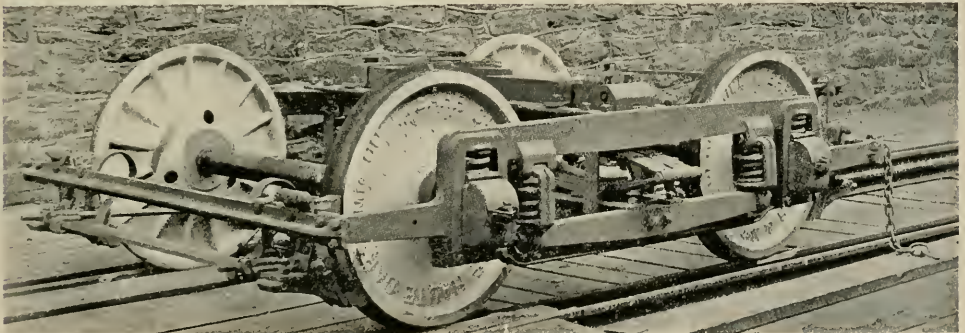
tion with safety, and at 10 miles curves are scarcely perceptible. It is evident that the soft side motion must also reduce the cutting of the rails and guard rails at the entrance to curves.

By giving the swing links a wide spread the transverse stability is greatly increased over that of the ordinary truck, and by spreading them longitudinally great stability is given in that direction also. The hangers are 60 in. apart longitudinally and placed but 12 in. from the centers of the journals; this, of course, diminishes the stresses on the truck sides.

Whether the vertical pull of the brakes has much or little influence on the truck frame has a great deal to do with the comfort of the passenger; in this truck the brakes may be applied very quickly and yet there is no canting of the frame.

### FRANCHISE TAX WINS IN KENTUCKY.

Kentucky and the City of Louisville have been trying to enforce a franchise tax, and the Louisville Railway Company has resisted in the courts. The state won its case, and the road will have \$27,000 to pay; but the city will in



BRILL NO. 27—THE "PERFECT" PASSENGER TRUCK.

tion is examined. The radical departures from the former practice consisted in suspending the equalizers from spring links, and in making the equalizers a part of the swing motion by securing them to the spring plank. The load comes upon the equalizer at its center with springs at the ends, thus distributing the load in a more perfect manner than in the standard M. C. B. truck. As will be seen in the illustration there are three sets of springs; elliptic springs to transmit the weight of the car body to the equalizers, coils to transmit it from the equalizers to the truck sides, and, finally, coil springs placed between the truck sides and the journal boxes. The springs in the swing links soften the side motion, whether on tangents or curves, and this is why the trucks stick to the rails; the trucks, of course, must change the direction of their motion more or less suddenly, but the car body follows slowly and is cushioned, so that no shock can be brought upon the wheels such as would cause them to jump the track. And this also is the reason why the motion of the car is easy; no shocks are transmitted to the body, whatever may be motion of the truck. The cars so equipped have made 60 miles per hour

all probability lose as the contract between it and the company provides for the payment of 2½ per cent of gross receipts in lieu of all city taxes. The latter case, however, will yet have to be finally settled by the court. The state franchise tax applies to all the street railways in the state.

### NEW CARS AT BIRMINGHAM.

Under the direction of G. H. Harris, electrician of the Birmingham (Ala.) Railway & Electric Company, 10 new cars have been wired and equipped for the Ensley line, which commenced operation September 1, with electricity for motive power. Five of the cars have been in service for a short time, but the others are entirely new and unequipped by any now on the system. General Manager McClary states that a 20-minute service will be given on the Ensley line, each train consisting of a motor car and trailer.

T. H. Conderman, president of the Wheeling (W. Va.) Railway Company has returned from an extended European trip.



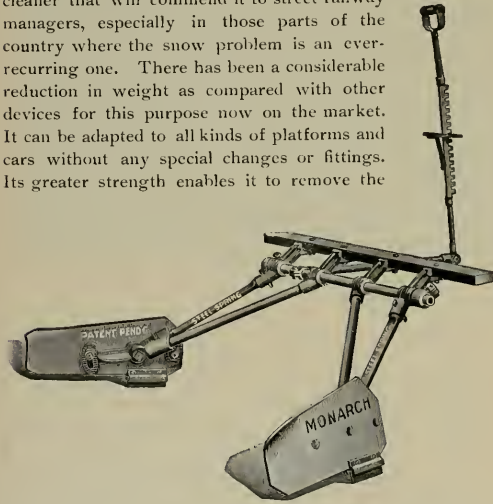
### AMERICAN MUTUAL INDEMNITY COMPANY.

Newton Jackson, who has been very successful in insurance work, and who has made a specialty of street railway risks of various kinds, both fire and personal damage, has become general superintendent of agencies of the above named company, whose headquarters are located in Scranton, Pa., the directors being wealthy capitalists of that city. The company writes liability insurance only, such as employer's liability, boiler insurance, elevator insurance, etc.

A street railway department gives attention to handling the claim department of street railways, for which special facilities have been provided. The company has been very successful in settling such claims out of court, and always prefers to do so where possible. Roads which wish to be relieved of the annoyance and expense of this department, and desire to limit the expense for this item to a definite sum per year, find many advantages in this insurance, which covers all losses from this source.

### THE MONARCH TRACK CLEANER.

The illustration herewith shows the Monarch track cleaner which is manufactured by the Monarch Stove & Manufacturing Company of Mansfield, O. There are a number of points of superiority about this cleaner that will commend it to street railway managers, especially in those parts of the country where the snow problem is an ever-recurring one. There has been a considerable reduction in weight as compared with other devices for this purpose now on the market. It can be adapted to all kinds of platforms and cars without any special changes or fittings. Its greater strength enables it to remove the



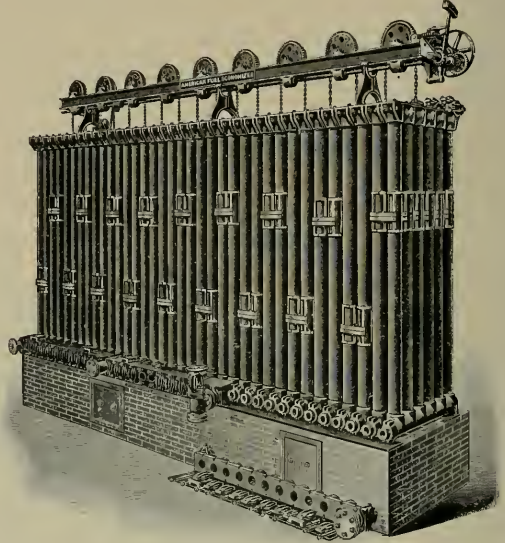
heaviest snows without straining or breaking. A steel shoe is attached to the bottom of the blade and scrapes the track without wearing the blade, and as the shoe can be renewed at trifling expense this feature can not fail to prove a valuable one. To these points must be added the fact of high-class workmanship and finish in every part of the mechanism.

The cleaner will be on exhibition at the Niagara Falls convention, and its inventor, Mr. Hurst, will be present to show up its good points. Mr. Hurst is a practical man who has been engaged in this class of work for a number of years.

### AMERICAN FUEL ECONOMIZER.

The value of a fuel economizer in utilizing the heat of flue gases that would otherwise be lost, in purifying the water, and reducing the boiler repairs, is so well known that it is unnecessary to dwell upon these points in connection with the economizer here illustrated.

The American differs materially in detail from the older types: All the joints are taper joints, metal to metal, and the use of either steel or wrought iron has been avoided in the construction because of the rapid deterioration of those metals when in contact with water at varying temperatures.



AMERICAN FUEL ECONOMIZER.

All pipes, headers, wall boxes and parts subjected to water pressure, are manufactured from a special mixture of fine-grained strong irons, producing a metal of high tensile strength. The pipes are cast on end in dry sand moulds, and are of even thickness, smooth and free from blow holes. Sections and pipes are tested by hydraulic pressure to 300 lbs. per sq. in. in the shops.

The tubes may be easily removed and replaced, it being only necessary to take off the cap, when the tube may be drawn out vertically. For keeping the exterior of the tubes free from soot, scrapers are arranged as shown in the illustration.

The American is manufactured under patents by Broomell Schmidt & Co., Ltd., York, Pa.

### CORPORATIONS CANNOT COMMIT HOMICIDE.

It has been discovered that the penal code of New York defines homicide as the "killing of one human being by the act, procurement or omission of another," and does not appear that there is any provision to make corporations liable for this crime. Two New York City roads have had indictments for manslaughter returned against them, but the cases have never come to trial.

### MOTORMAN'S PROTECTOR.

The devices which have been evolved for front platform vestibules have been many, and some have proved excellent, but until now no one seems to have stopped short of an entire front to the car. This involves no small expense to construct, and costs quite a little to put on and remove when the seasons change. Many managers have very good reasons for objecting to the front vestibule.

The problem seems now to have been satisfactorily solved by some of the street railway men of Bridgeport, Conn., and a company has been formed and the manufacture commenced of this device, by the Motorman's Protector Company, of that city. Our illustration readily conveys a very good idea of the plan and device which is brought out to meet the demand and requirements of a vestibule without the expense and loss of room which a vestibule necessitates.

The protector is constructed of a waterproof strip, provided with a sheet of glass, a self-winding roller upon which the strip may be wound, and a frame in which the roller is



THE MOTORMAN'S PROTECTOR.

journalled and means for attaching the frame to a car. This frame consists of side plates connected by cross rods and provided with hook-shaped arms, adapted to engage the hood of a car, and set screws by which the protector is clamped in place.

But one protector is required for each car, as it is adjustable and can be changed to either end at terminals as may be necessary, without delay.

The officers of the Bridgeport Traction Company highly recommend the device.

### SUED FOR DAMAGES AFTER SIGNING RELEASE.

At the September term of court held at Ovid, Seneca County, N. Y., Judge Nash presiding, in the case of Jeanette D. Kist vs. the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company, a non-suit was granted under circumstances that render the case of peculiar interest to railway men.

On February 25, 1897, an accident occurred to one of the defendant company's cars, in which the plaintiff was more or less seriously injured. The Electric Mutual Casualty Asso-

ciation of Philadelphia, insurer of the Traction Company, was immediately notified of the accident, and sent its adjuster, Dr. H. B. Rockwell, to make an investigation. He arrived at the scene about 12 hours after the accident occurred, and succeeded in effecting a settlement with Mrs. Kist, one of the injured parties, and plaintiff in this action, to whom he paid \$100 and secured her release, together with that of her husband. Three or four days after the releases were signed, Mrs. Kist was visited by a "runner" from a law firm in Rochester, and was so influenced by visions of heavy damages, that she was persuaded to institute a suit against the traction company for \$10,000. The "runner" then inveigled her into paying him the \$100 consideration that had been paid her in the previous settlement, and the money was tendered to the general manager of the Traction Company, W. C. Gray, who, of course, refused to receive it. It was then deposited in a bank of Waterloo, New York, to the credit of the Traction Company.

The suit was brought to set aside the release on the ground that it had been obtained by coercion, and that the woman was incompetent as a result of her injuries to sign such a paper. The company was ably defended by Hawley, Nicholas & Hoskins of Geneva, who proved that the woman was not only entirely competent to give a release, but that she was perfectly satisfied with the settlement, until she had been approached by the enterprising law firm from Rochester. Mr. Hawley in his opening address to the jury, alluded in a very pointed manner to a certain class of "ambulance attorneys," that were becoming quite numerous, and who made it their business to prey upon corporations and follow in the wake of the ambulance, ready to pounce upon any victim who may be so unfortunate as to fall into their clutches.

Judge Nash, after hearing the testimony in the case, rendered a non-suit, giving as his reason for so doing, that the only evidence presented by the prosecution that would tend in any way to impair the validity of the release, was given by the plaintiff herself, she having testified that she was in a "dazed condition" and only "dimly remembered signing the papers." The judge further stated that "it is a very remarkable and significant circumstance that both the husband and the mother of the plaintiff should have been present at the signing of the document, and yet neither have been summoned to the witness stand."

It afterward developed that the husband, after hearing his wife swear to what he believed to be falsehoods, whispered to his counsel that he had better not call him to the stand to testify as to his wife's mental condition at the time of signing the release, for he had made up his mind to "tell the truth."

The vigorous manner in which Judge Nash disposed of this case cannot fail to have its influence in cases of similar import.

A rather amusing sequel to this case is that the Casualty Company has both the release and the \$100 paid in consideration of the same, while the plaintiff is compelled to pay the costs of action.

The Eckington & Soldiers Home Railway of Washington is still pursuing its search for a suitable air motor for traction purposes. Engineer McFarland went to New York to examine the experimental air motors on the street railways there.

### ONE HUNDRED DOLLARS DAMAGES FOR IMPROPERLY ISSUED TRANSFER.

Damages to the amount of \$100 were awarded in a suit against the Cortland & Homer (N. Y.) Traction Company. Suit was first brought one year ago, and final decision reached two months ago.

Briefly, the circumstances were as follows: The line running from Cortland to Homer is, within the corporate limits of the former place, divided for transfer purposes, that part of the line north of a certain point being called North Main, and on the opposite side South Main. The issuing of a transfer from North to South Main or vice versa which would, in effect, serve as a stop over ticket is, for obvious reasons, prohibited. The plaintiffs, one Ray and wife, boarded the car in Homer, paying their fare through to Cortland and wishing to stop off at a point somewhat more than midway between the two villages to transact some business, as they alleged, asked the conductor to issue them transfers, which would allow them to do this. The conductor, a comparatively new man, although he knew he was violating a rule of the company, issued the transfers as requested. The couple boarded the following car and presented the transfers to the conductor, who refused to accept them. The man then requested that the car be stopped, stating that he would make a test case of it. They then left the car about a mile from their residence and immediately placed the case with a local firm of lawyers. Shortly afterward an action in the supreme court was brought in the woman's name for \$500 damages. The case was tried the September following, motion for nonsuit being denied, and was sent to the jury, which returned a verdict of \$100 for the plaintiff. The company then carried the case to the appellate division, which affirmed the verdict of the lower court.

The company regards the verdict as excessive, inasmuch as no claim was made of damage to the health or business of the plaintiffs, nor of assault on the part of conductor or other employe, and the payment of 10 cents would have secured passage to destination.

### EMERGENCY TROLLEY WIRE SPLICER.

The Ohio Brass Company of Mansfield, O., has designed a trolley wire splicer for emergency cases. The splicer is made of seamless brass tubing in two duplicate parts, joined at the center by a hollow threaded coupling piece. In this is a coiled spring which forces two steel caps holding the



ends of the wire against the tapered sides of the tubing. In making a splice the ends of the trolley wire are first rounded off slightly with a file and are forced into the splicer with enough force to seat the caps on them their full length. By means of this device a strong compact joint is made with good electrical connection.

A workman in the station of the San Antonio, Texas road, who was raking cinders in the car house touched the overhead wire with his hoe which was solid iron, and falling struck his head on a rail and was killed.

### THE AMERICAN ELECTRICAL WORKS.

It is always interesting to note the growth of a great business concern, and few have had a more successful career than the American Electrical Works, of Providence, R. I. whose president, Eugene F. Phillips, started in business in 1870. Under his management steady progress has been made, until at the present time this company is the largest concern engaged in the making of wire exclusively for electrical purposes. The factories are located at Phillipsdale, R. I., the grounds and buildings comprising about 35 acres, adjacent to the Seekonk river, which is a part of Narragansett bay. The Canadian branch of the American Electrical Works is known as the Eugene F. Phillip's Electrical Works, Ltd., and is located at Montreal. This factory has been also very successful in every way, and now does nearly, if not quite, all of the wire business of Canada.

The American Electrical Works makes a specialty of drawing bare copper wire from the ingot, and its product includes bare copper, weatherproof wire and feeder cables, annunciator and magnet wires, office wire, Americanite rubber wire, and, in fact, every kind of wire that is used in the electrical industry. It is an interesting fact that rubber wire has been manufactured by this company since 1872.

This company has executed many of the largest orders for electric railroads in the United States and Canada, and has recently secured two orders, each for 75 miles of 350,000-c. m. bare stranded copper cable for the Buffalo-Niagara Falls transmission line. It might also be stated that the greater part of the bare wire and weatherproof cables supplied the Yerkes interests in Chicago came from this company, besides other large contracts.

It would be quite extraordinary, while speaking of the American Electrical Works, if the annual "clam bake," tendered by Mr. Phillips to the electrical fraternity, were not mentioned. This "clam bake" has become an institution of the electrical business, and has been given by Mr. Phillips for 19 consecutive years, guests coming from all parts of the United States to testify to the generous hospitality of the donor. From a small beginning, this event has constantly grown in size until it is one of the largest electrical gatherings held in the country.

### THE LAKE SHORE & MICHIGAN SOUTHERN TO THE CONVENTION.

The reputation of this well-known and justly popular route between Chicago and the East is such that no comment is necessary here. Those who have traveled over the Lake Shore to previous meetings know that no attention is wanting to make the trip as pleasant and comfortable as possible.

To take care of delegates, special cars for their exclusive use will be attached to the Lake Shore Limited, and delegates given the benefit of the special rate without extra charge for going on this famous train. The leaving time from Chicago is very convenient, leaving from the Lake Shore Depot at 5:30 p. m. and going through without change to the Falls, reaching there next morning for breakfast. Delegates from the west and south coming to Chicago to take this train can have all arrangements made in advance by writing or wiring C. K. Wilber, A. G. P. A., Chicago, or by calling at the city ticket office, corner Clark and Monroe streets.



## THE VAN DORN COUPLER ABROAD.

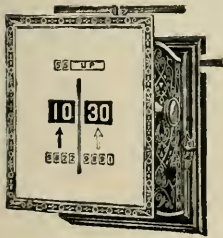
The Waterloo & City underground, of London, is another English road that appreciates American devices, and wishing to equip its cars with a perfect automatic coupler placed the order with the W. T. Van Dorn Company, of Chicago. Both the motor and the trail cars have been provided with



these couplers. Our illustration shows the coupler applied to the trailers; it differs from those for the motor cars in that the spring buffer is not attached directly to the car but is bolted to a bar of iron which swivels on the king pin of the truck.

## NEW HAVEN NEW DOUBLE REGISTER.

We illustrate the new double register which the New Haven Car Register Company is to exhibit for the first time at the coming Niagara Falls convention. This register is intended for use on cars operated by two different roads and is so arranged that only one set of rod or cord fixtures is necessary for operating both sides of register.



Each side of the register is complete and is provided with a special lock so that the conductor upon leaving the car locks his side of the register thereby preventing any fares being rung up against him during his absence. The completeness and great convenience of this machine and the superiority of this system of operation over the use of two different registers in a car will be appreciated by

all railway managers. The full operation of the machine will be explained by the company's representatives at the exhibit in Space 47 at the convention.

The New Haven fare registers have a world wide reputation and the production of this new machine will undoubtedly be hailed with much satisfaction by the managers of the large class of roads for which it is intended. The features of these registers are fully protected by patents.

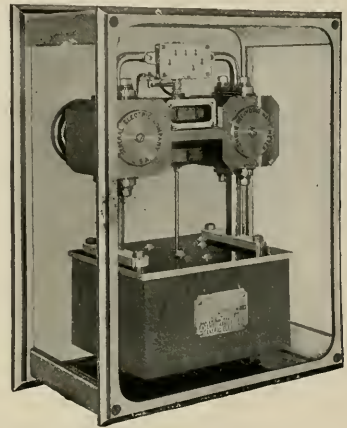
## START TO NIAGARA ON THE BIG FOUR.

The Big Four with its splendid equipment and popular service does not have its own tracks into Niagara but it will run through sleepers from St. Louis and Cincinnati without change, attaching them at Cleveland to the Lake Shore train hauling the special cars from Chicago. Delegates from the territory served by the Big Four are generally selecting this route.

An early reorganization of the Bass Foundry & Machine Works, Fort Wayne, Ind., is in prospect.

## G-2 ASTATIC RECORDING WATTMETER.

During the last three years the demand for recording wattmeters has undergone a great change, and meters which at that time would have been regarded as of enormous capacity are now considered small. Meters of 10,000 amperes are now commonly called for while inquiries have been made for sizes registering as high as 16,000 amperes. Measurements of these heavy currents precluded the use of any form of wound meter field, and the Thomson recording wattmeter had necessarily to be modified. Furthermore, the rapidly growing tendency to set the bus bars closer together and bring the switchboard into the least possible space has rendered it advisable that large meters of this character, where intended for boards of modern construction, should be astatic. While on the majority of switchboards an astatic wattmeter is not necessary, there exist cases in which the best metering results could not be obtained without one; and that total station output meters might be applicable alike to all switchboards, whether within heavy



G-2 ASTATIC RECORDING WATTMETER.

projected fields or not, the G-2 meter has been designed and is manufactured by the General Electric Company in an absolutely astatic form.

In the G-2 meter the field is a single straight bar of forged copper, above and below which are placed two armatures, arranged astatically and having a common commutator. The damping device is also double and astatic, the polarities of the upper and lower group of damping magnets being opposite. The damping mechanism being enclosed within an iron shielding box, any stray leakage lines of an unbalancing character are prevented from entering. The G-2 meter is so independent of local or stray influences that it may be installed directly in front of the very heaviest bus bars without the introduction of any inaccuracy.

The entire meter is held in position upon the switchboard by two studs which form at once the electrical connections and the mechanical support of the instrument. These pass through the board and are bolted to the bus bars by binding nuts with large contact surface.

The cover is of beveled glass set in a polished brass frame fastened to the board.



Sargent & Lundy, Chicago, are interested in a very large amount of work, being either contractors or consulting engineers for construction aggregating \$3,500,000.

The Atmospheric Motor Company has been incorporated at Baltimore, Md., with \$200,000 capital stock, by Sidney S. Frank, H. M. Reinhart and others, of Baltimore.

The Edison-Brown plastic bond is making steady progress not only at home, but across the water. Among the most recent foreign orders are the roads at Blackpool and Dublin.

Breden & Sullivan, of New York, have received the contract to construct the electric road between Nassau and Rensselaer, N. Y., for the Greenbush & Nassau Railway & Power Company.

The Wells & French Company of Chicago is building two 18-ft. closed cars for the Elgin (Ill.) City Railway. These cars are equipped with the Price momentum brake and the standard truck used by the company.

The Southern Street Railway Advertising Company has been incorporated at Baltimore, Md. The capital stock is \$45,000 and the incorporators are Issac E. Emerson, William S. Belding, Charles L. Birmingham, W. Burns Trundle and Parker Cook.

The Electric Third Rail & Signal Company has been incorporated at St. Louis to introduce the invention of B. C. Seaton. The capital stock is \$250,000, and the incorporators are B. C. Seaton, H. H. McElhiney, Benjamin Eiseman and A. M. Sullivan.

The Union Traction Company of Anderson, Ind., has let contracts for 10 double truck motor cars to the Barney & Smith Company, Dayton, O.; for 30 miles of trolley wire to the Western Electric Company, and for rail bonds to J. M. Atkinson & Co., Chicago.

The Safety Third Rail Electric Company has been incorporated at Jersey City, N. J. The capital stock is \$10,000, and the incorporators are William M. Keepers, Newark, N. J.; David F. Halsted, Brooklyn, N. Y., and J. McLeod Murphy, Torrington, Conn.

After a thorough trial of the instrument by the electrical department of the road, the Lindell Railway Company of St. Louis has given an order to the Cravath Manufacturing Company, 825 Monadnock building, Chicago, for Cravath excessive current recorders to equip its Vandeventer avenue line.

The Sargent Company, 675 Old Colony building, Chicago, has issued a pamphlet descriptive of its new "Diamond S" brake shoe. This shoe consists of a number of sheets of expanded steel laid together, into the meshes of which soft cast iron is poured and thus combines the desirable qualities of both metals with great strength added.

The West Chicago Street Railroad has been dissatisfied for some time with its method of lighting cable cars, and recently decided to adopt some good system. After investigation, a contract for equipping 80 cars on the West Madison Street line with the Pintsch system, has been given to the Safety Car Heating & Lighting Company, of New York.

A. L. Ide, of Springfield, Ill., died September 30. As the patentee and manufacturer of the Ide and Ideal engines he gained both fame and fortune. These engines enjoy a deserved popularity for the driving of moderate size electric dynamos and other high-speed machinery, so much so that two shops are maintained to supply the demand, at Springfield and at Harrisburg, Pa.

Mayor & Englund of Philadelphia have secured the contract for all of the overhead material required for the 12.5 miles of the Bucks County Railway, running from Doylestown to Willow Grove, Pa. The contract includes all of the weather proof copper and hard drawn trolley wire, together with the overhead fixtures, flexible horseshoe rail bonds and International fare registers.

The forgings in the engine of the torpedo boat "Rogers" built by the Columbian Iron Works & Dry Dock Company, Baltimore, which broke last week, causing considerable damage to the machinery, are being replaced by forgings from the well known works of the Bethlehem Iron Company at South Bethlehem, Pa. It might be well to remark that the forgings which broke were not made by this concern.

The American District Steam Company, of Lockport, N. Y., has received a contract to install the Holly system of steam heating at Muscatine, Ia., for the Muscatine Electric Railway Company. To utilize the exhaust steam there will be laid 20,000 ft. of 10-in. wrought iron mains, insulated with asbestos paper and incased in a tar-coated wooden log, with variators every 100 ft. to take up expansion and contraction.

The Wells & French Company, Chicago, has issued a small pamphlet describing and illustrating the Price momentum street car brake, which is manufactured by it. This brake was designed by W. G. Price, of the Chicago City Railway. A full description was given at the time of its adoption by this road and will be found in the REVIEW, October, 1896, page 610. The brake is proving very efficient and is earning fine testimonials.

J. Holt Gates & Co., Marquette building, Chicago, have just received the contract to rebuild the entire street railway system of Wichita, Kan. Mr. Gates will lay 20 miles of track, put up 20 miles of overhead work, and equip the power house with 800 h. p. water tube boilers, two 350-h. p. tandem compound condensing engines, three 125-h. p. arc light machines and one 1,500 light incandescent machine. Fifty miles of wire will be required.

The Jamaica government has granted a franchise for electric railways in Kingston and its suburbs to D. B. Chapman of Montreal, Canada. Associated with him are F. S. Pearson, of New York, W. B. Chapman of Montreal, B. F. Pearson of Halifax, N. S., and others, who have sup-

plied \$1,000,000 with which to build the first 25 miles of road. A large power house will be erected for the railway and commercial lighting. Construction will begin very soon and continue all winter.

The H. Channon Company has lately taken orders for Ajax transmission rope manufactured by it to go in the elevator now building at Peoria, Ill.; the new mill of the Texas Star Flour Mill Company at Galveston, Texas; the new elevator for Louisville & Nashville Elevator Company at Pensacola, Fla.; the new elevator for the Kingston Elevator & Transit Company at Kingston, Ont. The drive for the Louisville & Nashville Railroad Company's elevator is probably the largest in the country.

The Canon City & Cripple Creek Construction Company has been incorporated to build 30 miles of electric railway between Cripple Creek and Canon City, Col. This road is the outcome of the excessive charges of the Florence & Cripple Creek Railway for passenger and freight service. Paul E. Hirsch, of Chicago, has entire charge of the construction of the road, and shipments are being made of rails and electric supplies and equipment. The line will cost about \$800,000 and it is stated will be in operation by February 1, 1898.

R. Graham-Woodward has opened offices in the Havemeyer building, New York, and offers his services as expert street railway accountant. Mr. Woodward was auditor for three years of the Oakland, Cal., road and only left it to take up the more extended phases of public accounting and general auditing. His street railway work in this and other roads, with experience in the details of operating departments, fit him for the special work he engages in. He makes a specialty of expert examination of accounts and the arranging of a more simple and economical method of accounting and auditing, with a view to showing where a saving can be effected in the operating department.

The Phoenix Iron Works Company has received a letter through its agent in Japan, Lamar Lyndon, of Kobe, regarding a 75-h. p. tandem compound condensing engine, 7½ and 13½ x 12 in., furnished by it, which is as follows:

"Yokkaichi, Japan, August 28, 1897.

Phoenix Iron Works Co., Meadville Pa.

Dear Sirs:—

We have pleasure to inform you hereby that in the first part of this month we got through with the setting up of the engine which we bought of you, and same was inspected yesterday by the Government officials, and the result was so satisfactory that we thank you for same, and are glad to give you hereby testimonial for the strength and perfectness of the engine which you are selling.

Yours faithfully,

The Yokkaichi Electric Light Co., Ltd."

The E. P. Allis Company of Milwaukee has been doing a very extensive foreign business in large engines for street railway power stations, the contracts aggregating \$500,000. Orders from the foreign trade call for 21 engines averaging 1,200 h. p. each. The six engines for the Central London Railway, the underground electric road building in London, are each 1,500 h. p. Four engines of the same size go to Sidney, Australia, for the increased power required to operate the railways there. Six 500-h. p. engines will be furnished the Dublin Tramways Company. Three engines

of 1,000-h. p. will be required for the street railway lines of Barcelona, Spain, as soon as they are equipped for electric traction. Two duplicate engines will also be shipped to Madrid for tramway service.

A. E. Jones, constructing engineer for the Morrin "Climax" boiler stopped at Chicago on his return from Omaha, a few days ago, where he closed the contract for all the boilers for the Trans-Missouri Exposition. About 3,500 h. p. will be installed, and the order was secured in the face of the usual active competition that is made for exposition work. The progress made by the Morrin people since they entered the field in 1890 has been one continued advance, and the works have not had occasion to lay off a man all through the hard times. At present the works are running full, night and day. These boilers were also installed in the Nashville exposition, and our readers will recall the large battery at the World's Fair where they attracted great attention and made a famous record. The company reports large foreign orders. Among western orders four large units are being installed at Salt Lake City.

George H. Barrus, consulting engineer, of Boston, has recently made an evaporative test on a 200-h. p. Cahall boiler at the Narragansett Mills, Fall River, Mass., from which we quote some of the results and the conclusion of the report as follows:

### HEAT BALANCE.

| Total heat of combustion per lb. of combustible by oxygen calorimeter,                                       | 15,457 B. T. U. |           |
|--------------------------------------------------------------------------------------------------------------|-----------------|-----------|
|                                                                                                              | B. T. U.        | Per cent. |
| Heat observed in useful evaporation, 12,507 × .666 =                                                         | 12,168          | 78.7      |
| Loss by hot gas, 14.4 × 520 × .24 =                                                                          | 1,825           | 11.8      |
| Loss by evaporation of moisture in coal and moisture formed by burning of hydrogen (.043 × 9 + .035 × 128) = | 541             | 3.5       |
| Loss by unconsumed CO <sub>2</sub> , .04 × 10,150 =                                                          | 406             | 2.6       |
| Radiation, carbon in smoke, hydrocarbons, and unaccounted for,                                               | 517             | 3.4       |
|                                                                                                              | 15,457          | 100.0     |

The power developed on the test was 223.4 h. p., or about 10 per cent above the rated capacity of 200 h. p. This was obtained with an average draft of .14 in. water pressure, which is far below the maximum available draft.

The evaporative result was 11,841 pounds of water from and at 212° per pound of dry coal. This exceeds the guarantee of the boilers (10.5 pounds of water from and at 212° per pound of dry coal) 12.8 per cent.

The heat utilized by the boiler was 78.7 per cent of the total heat of combustion of the coal. Of the remaining 21.3 per cent, the gas analyses accounted for 11.8 per cent due to the loss from the waste heat, and 2.6 per cent due to the unconsumed carbonic oxide, all of which is detailed in the table of the "heat balance." The evaporative result is unusually high for a boiler in which the flue gases escaped at the high temperature which was found in this case, but this is not inconsistent, considering the fact that the quantity of gas is unusually small, good combustion having been obtained with a very small amount of excess air.

The boiler steamed freely during the entire run without undue exertion on the part of the fireman, and there was an entire absence of fluctuation in the water line as revealed in the gauge glass. The steam was slightly superheated at a point in the pipe a considerable distance from the boiler.

The British Thomson-Houston Company of London through its representative A. K. Baylor, has just closed an important electric railway contract with the companies op-



rating the tramway system of Dublin, Ireland, and Barcelona and Madrid, Spain. The contract for Dublin includes all steam, as well as the electric generating and motor equipment, and comprises six Allis horizontal engines of 500 h. p. each, six 500-k.w. General Electric generators for direct connection to the engines and complete switchboard and station equipment. The car equipment will consist of 150 complete motor and series parallel controller equipments, the motors to be mounted on Peckham trucks. This contract follows closely that made for the equipment of the Clontarf line, of the Dublin tramway system, which will be opened within the next week or two. The apparatus for this was also supplied by the British Thomson-Houston Company. The contract signed for the Barcelona and Madrid roads covers five 400-k.w. General Electric generators and three of 75 k.w. each, all to be directly connected, while the three latter will be lighting generators, they will also be wound for 500 volts. This contract also includes full station equipment.

Hayes & Arthur, Cuyahoga building, Cleveland, have taken the agency for A. O. Schoonmaker, New York, and will carry in stock a full line of both India and amber mica, and will be able to fill all orders promptly.

The catalog of the Fuel Economizer Company of Matteawan, N. Y., gives some data from tests of Green economizers which show a great saving from their use. There are also numerous diagrams which show the different methods of installation in numerous plants where these economizers are now in service.

The American Air Power Company has been incorporated with a capital stock of \$7,000,000 and will manufacture machinery and apparatus for supplying light, heat and power for railways. It is stated that the Metropolitan Traction Company, of New York, is one of several companies behind this new organization.

The W. T. Van Dorn Company reports orders for its automatic car couplers as follows: Brownell Car Company, 40 couplers; St. Louis Car Company, 40 couplers; Laclede Car Company, 100 couplers. Among recent foreign orders were one for 23 sets for the Waterloo & City underground of London and one for the Glasgow road.

The Albert & J. M. Anderson Manufacturing Company of Boston, has recently issued a new catalog of the electrical and street railway appliances manufactured by it. This company had its electric railway, light and power specialties at the Brussels Exposition, all its goods being placed "hors concours," which is to be translated as "above competition."

This month the Western Electric Company of New York and Chicago sends to the trade the third of its series of handsome engravings. It is a box of strawberries in colors entitled "Full measure and good quality" like electric supplies furnished by the company. On the opposite side of the card is illustrated the Western Electric enclosed arc lamp.

Pantasote, that product of the Pantasote Leather Company which is so extensively used for car curtains, is the material which the Franklin Institute reported, after an

investigation of two years, to be "the best substitute for leather on the market." It is strong, is not injured by heat, is non-inflammable, and does not shrink, stretch, harden, peel or crack.

One of the most enterprising and active concerns in the gear and pinion business is the Catskill Foundry & Machine Works, located at Catskill, N. Y. This company entered the field about four years ago, setting aside a part of the works for the manufacture of gears and pinions exclusively; foundry facilities are superior, and the works equipped in the best manner possible, having entirely new machines of the latest and most improved designs for both steel and cast iron.

The West Shore, Hudson River, and Boston & Albany railroads as well as the Hudson river boats, afford excellent shipping facilities to all points, and saving freight charges to nearby customers. By prompt deliveries and strict attention to all orders they have built up a considerable business, which is constantly growing. The New York office is at 126 Liberty street, managed by J. C. Dolph & Co.

The Ohio Brass Company of Mansfield, Ohio, believes from present indications that this season's sales of the adjustable track brush holders will far exceed all previous ones. During the past month several large foreign shipments of holders and brooms were made, one consignment alone being for 45 sets, and in addition numerous orders have been received from roads operating in the country for both initial and additional equipments of these. Several important changes have been made in the detailed way of manufacturing the holders since they were first placed on the market two years ago, but their operation remains the same.

The Mica Insulator Company of New York, Chicago and London, and Eugene Munsell & Company, miners and importers of "mica" of New York and Chicago, will have a joint exhibit at the Niagara Falls Convention. This exhibit will include the flexible "micanite" plate and the "M. I. C." insulating compound, two new insulating materials which have been introduced during the past year, also the India and amber "mica" in sheet as it comes from the mines, "mica" segments, "micanite" plates for commutator segments, "micanite" and "empire" cloths and papers, several sets of commutator rings and segments for railway generators and motors. Franklin Brooks, vice-president of the Mica-Insulator Company and Chas. E. Coleman, manager of the Chicago branch will be in attendance.

## GRAND TRUNK TO THE FALLS.

The Grand Trunk road has been known as the old time route to Niagara Falls, so long, and by so many thousands, that our readers are already well informed as to its features. The road has been greatly improved and popularized. The Suspension Bridge has been replaced during the present year with a fine steel arch which is one of the best specimens of bridge work in the world. A solid vestibuled Pullman train leaves Chicago daily at 3:02 p. m., and arrives in Niagara Falls at 7:15 a. m. the following day. Tickets and reservations can be had of L. R. Morrow, city ticket agent, 103 Clark street, Chicago, or any ticket agent in the west.



WINDSOR & KENFIELD PUBLISHING COMPANY,  
 OLD COLONY BUILDING, - - CHICAGO.

TELEPHONE, HARRISON 754.

Published on the 15th of each month.

SUBSCRIPTION, - - - TWO DOLLARS.  
 FOREIGN SUBSCRIPTION, - FOUR DOLLARS AMERICAN MONEY

Address all Communications and Remittances to Windsor & Kenfield Publish  
 ing Company, Old Colony Building, Chicago.

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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. NOVEMBER 15, 1897. NO. 11

OF all the engineering or technical associations, the American Street Railway might be expected to conduct its finances on a sound business basis. It is, therefore, a matter of pride that the treasurer's report this year shows nearly \$5,000 in the treasury or collectable, as against a deficit of nearly that amount two years ago.

ONE of the most satisfactory results of the convention was the change in by-laws, which places the fixing of the date of succeeding meetings in the hands of the executive committee. This is as it should be, and will be appreciated by every person who attends these annual meetings. The REVIEW has long advocated this departure from the rut in which we have traveled so long, and congratulates the Association on this great improvement. Mr. Kelly, of Columbus, was the one who finally drew up the petition and presented it to the committee, and thus placed the matter in shape to be acted on at the past meeting.

THE Association is turning its path over the course already traveled in its earlier years. Boston was the birth-place of the Association, and Boston will be its host next year. But the Association of 1881 is quite as different from what the Association of 1898 will be, as the Boston of the two dates named. The selection, while somewhat distant for western members, pleases all, and the west will be found with a big representation when the time comes. The city, aside from its ever interesting historical features, presents

as an object lesson one of the best constructed, best equipped and best managed properties in the world, and furnishes plenty to study and copy. Our western brethren may possibly have to dust off their grammars and rhetorics somewhat before they go, but we promise all Boston will be found a good place in which to be.

THOSE who have attended these conventions for ten or more years cannot fail to observe, and with regret, the decreasing number each year of the old guard, those who for many years were always found in attendance. They belonged to the old school it is true, and for the most part were then old enough to be the fathers of the greater number of the present attendants. But they were eminently practical and successful, as a rule the chief owners of the properties they represented, and were a splendid body of men, who have now stepped out of the harness to engage in other pursuits, or retired to enjoy the fruits of their hard earned fortunes. When electricity came in, the most of them went out and while there is the utmost harmony and good will among the rising generation of managers, it is doubtful if the sympathies and warm-hearted interest in each other which characterized the old days, will ever be repeated in like degree.

PRESIDENT McCULLOCH proved one of the best presiding officers that ever filled the chair. He insisted on the convention sticking close to the business before the house, and dispatched that business without a moment's unnecessary delay. At the same time he in no instance tried to turn the channel of what the Association desired, and richly deserves the many compliments he received. His ruling on the question of supply men being allowed the privileges of the floor was eminently correct, and meets with the hearty approval of almost every exhibitor. The limited time of the Association ought not to be granted to the advertisement of anybody's wares, for if once the door is open, in all fairness a whole army should be admitted to the same privilege. And this the supply men realize and appreciate. If some highly radical and absolute departure from existing methods should arise, which involved a great change in operating expenses for example, the matter certainly should be considered by the assembly; but even then it should be made the subject of study and report by some competent committee of actual members.

CONSIDERABLE interest was expressed, not only by supply men, but delegates as well, in the proposition to hold an international street railway convention in Paris, in 1900, during the great exposition. It was believed that street railway men from all parts of the world would be glad of the opportunity to meet in general conference, and the display of exhibits would be of special advantage to the managers of foreign roads. While we Americans naturally feel that we are farther advanced in the science of electric railroading, as in fact we certainly are, and ought to be, on the other hand it is maintained that we may well study to advantage the more durable types of street construction which characterize the track work abroad. The idea is well worth considering, and the convention need not take the place of the annual meeting of the American Association, as the date could be such as to avoid any conflict. There ought to be a sufficient number going over to pretty well fill one vessel, and a continuous convention of

the Americans while en voyage, would occupy the time in a pleasant and profitable manner. We should be glad of an expression from our readers as to the desirability and advisability of the project.

THE outcome of the "dispute in the engineering trades," as the conflict between capital and labor now being waged in England is called, cannot fail to be watched with the greatest interest by the employers of labor in this country. Dispute appears to be a good name for the difficulty which is a combination of a lock-out and a strike. The announcement on the part of the unions that in the event an eight-hour day were not conceded the men would be ordered out was met by the employers deciding to discharge the men in batches of 25 per cent of the total employed; this caused the remainder to go out on a strike. The beginning was in the first week in July and early in October the number of men out was stated to be 59,000, of whom 40,000 were engineers and allied workers.

There are two features about this dispute which are novel in the strikes of late years. The employers for the first time have a federation which really amounts to something and the prospect is that it will hold together. The civil authorities are doing their duty in discouraging "picketing;" this is quite unusual.

The demands of the trade unions have been growing so intolerable that the employers were driven to unite in self-defense and give battle for the purpose of managing their own affairs in their own way, and it is this combination which makes a satisfactory result possible, for heretofore the employers have stood alone. Needless to say this combination or trade union of capital is regarded as a great grievance by the other side, the men being inclined to regard the "sacred right of organization" as peculiar to labor. This time the demand is not "a fair days wage for a fair days work" on the part of the men; but it is for "a fair days work for a fair days wage" on the part of the employers. We at home are union-ridden in many lines—a notable instance of the tyranny of the unions recently occurred in Chicago, where all work on the public school buildings was stopped for weeks until the school board agreed to let contracts only to those who employed union labor—and trust that the day is not far distant when contractors here may succeed in forming a federation sufficiently strong to at least hold the unions down to what is fair and right to both sides.

The effectiveness of "picketing," which in fact consists of abusing non-union men and intimidating them by threats and force, has made it a very common and practically the only serious weapon at the disposal of strikers. Contrary to the usual practice the English magistrates have in this dispute taken to imposing terms of imprisonment at hard labor instead of paltry fines, with the result of greatly discouraging the practice and hence also giving the labor agitators a new grievance.

We have had no street railway strikes of moment since that at Milwaukee in the spring of 1896. That resulted in the complete triumph of the company after a fight against great odds. The city of Milwaukee being chosen as the scene of the strike because it was well known that the patrons of the cars there would lend aid to the strikers, as they did. For a time it was thought that the Chicago City Railway would have a similar experience this year, but the

threatened strike was averted by the firm measures adopted by the company.

When a free born, American citizen is prevented from earning his daily bread by honorable labor, except he do so according to the dictates of a union, it is high time for our Fourth of July orators to fold up the eagle's wings and take some other country as an illustration of the vaunted "land of the free."

THE papers read at the convention are published in full in the succeeding pages and will be found well worthy of a careful reading.

Mr. Sullivan has strong convictions on the subject treated by him, "Municipal Ownership," but relies upon a simple statement of facts and the logical conclusions to be drawn from them, and carefully avoids anything approaching the vituperation that is to be found in so many of the articles written nowadays on this subject. The facts in regard to municipal ownership of railways abroad were given; and also the facts regarding municipal maladministration at home, from which the conclusion is that the powers and duties of municipalities should be abridged rather than enlarged.

Mr. Knox pointed out some of the difficulties experienced in operation, and that many of them were due to the lack of a well defined policy on the part of the management. Frequent changes in the force and useless experiments are a fruitful source of loss.

Mr. Hewitt discussed the use of the storage battery, and the various ways in which it has been applied to street railway work, and gave in detail the experience of the Union Traction Company, of Philadelphia. This subject is one in regard to which data were surprisingly scarce, and the facts given by Mr. Hewitt were greatly appreciated and the discussion of them animated.

Mr. Hoopes treated of the distribution of power to railway lines and drew the conclusion that of the methods at present feasible, direct current distribution will give the best results in the majority of cases, that the three wire system does not show the same economy in railway as in lighting work, and that the field for multiphase transmission is at present quite limited.

Mr. Davis in his paper, which was particularly well and logically arranged, gave the details of the system of discipline of employes as developed by him on the Canal & Claiborne road where it has proved to be very successful in attaining the object sought, that of securing the best men and of identifying them with the interests of the company.

Col. Hest as the pioneer in the development of electricity on steam roads treated of its application to the two lines of the New York, New Haven & Hartford and gave the results in the increase of traffic which surely point to the further adoption of electricity for such service.

Mr. Hield prepared the paper which had been assigned to Mr. Goodrich of Minneapolis and gave a systematic though brief discussion of the principles underlying the settlement of damage claims, and also of the prevention of accidents.

The last vestiges of horse car days are passing away on the Metropolitan Street Railway of Kansas City. The "cannon ball" line has ceased operating by animal traction and the mules are sold. The cars, which are narrow gage, are for sale, and will likely be converted into play houses for some of the small children in the city.



## ALBION E. LANG, PRESIDENT-ELECT, A. S. R. A.

We are once more reminded that Ohio is a state resourceful in presidents and great men, and the Association made a wise and acceptable selection when it called Albion E. Lang, of Toledo, to occupy its chief place of honor for 1898.

Mr. Lang was born in Huntington, Lorain county, Ohio, in the year 1849. His street railway history dates from 1881 when he became the owner of the Monroe & Dorr Street Railroad, in Toledo. At that time there five other roads in

Company, and these two companies control all the street railway and electric lighting properties of Toledo, which is a city of 135,000, and growing rapidly.

Mr. Lang has been a constant attendant upon the meetings of the American Street Railway Association since 1888, having missed but two meetings during that time, and his counsel and judgment have always carried much weight in the deliberations of the body. In 1893 Mr. Lang was president of the Ohio State Tramway Association.



ALBION E. LANG, PRESIDENT-ELECT, A. S. R. A.

that city, which were five more than there should have been, and Mr. Lang set out in a quiet and determined way to bring about a consolidation of them all. In 1885 he succeeded in uniting them under the name of the Toledo Consolidated Street Railway, and became successively the secretary, vice-president and general manager, and eventually the president. Later on the Consolidated acquired two other companies which had come into the field, and a second consolidation occurred in 1895 under the name of the Toledo Traction Company, of which Mr. Lang has been president since its organization.

He is also president of the Toledo Consolidated Electric

Company, and these two companies control all the street railway and electric lighting properties of Toledo, which is a city of 135,000, and growing rapidly.

Mr. Lang is progressive, broad gaged, and far sighted; in manner he is genial and warm-hearted, and has the happy faculty of making friends with all he meets.

He will honor the Association, which has honored him.

In his administration Mr. Lang will have the assistance of an able executive committee. Ex-President McCulloch is a member by reason of being retiring president, and the three vice-presidents, Messrs. Ely, Rigg and Connette, and the other members, Messrs. Wyman of New Orleans, Moore of Trenton, Roach of Chicago and Goff of Fall River, are men whose names are synonymous with successful management in their respective cities.

## THE NIAGARA FALLS CONVENTION.

The Sixteenth Annual Gathering of the A. S. R. A. a Great Success—The Sessions Well Attended—  
Papers Excellent—Exhibits Many and Attractive—Delightful Excursions—Accountants Hold  
Their First Regular Meeting with Good Attendance and Fine Results—  
Next Year, Boston.

The gathering of street railway men in convention at Niagara Falls was a great success; all are agreed on that point. The weather was for the most part fine, with the exception of the smoke from forest fires which clouded the sky and prevented the best views of the Falls, and the rain which came at the close. But it was a jolly, good natured crowd, which did not mind the little eccentricities of late October. The attendance was large, being about the same as at St. Louis, which was a record breaker, and this year a larger number of ladies were present than at any previous meeting.

The attendance upon the business sessions was unusually good, and held up strong to the close. The fact that a warm room was provided for the meetings had largely to do with this.

The exhibits, which are described in detail elsewhere, were fully up to those of a year ago, in point of numbers, careful arrangement, and interest; but suffered greatly from lack of room, the demands for space being such that few were able to display their goods to the best advantage, and the larger exhibitors were positively cramped for room, even after leaving at home much which they would have been glad to bring. The supply men, however, were somewhat compensated by the fact that delegates gave more time than ever before to a study of the display, and more orders were hooked than at any previous meeting in years.

The ladies were nicely taken care of by a large committee of Niagara ladies, who were constantly in attendance, and the excursions were among the most interesting and instructive ever provided. The arrangements by the management of the Association were most excellent, and everything moved along with rapidity and method. In fact it was one constant rush, from arrival to departure, and the extra day did not seem to leave any more spare time, than under the three-day order of affairs. This, however, is but an indication of the steadily growing scope and work of the Association, and points to the no distant time when an entire week will be required to properly take care of the convention work.

The Accountants' Association was a highly gratifying success. The representation was good, the papers carefully prepared, and the report of the committee on a Standard System of Accounts, was the most important advance in this work ever attempted. The warm reception and hearty endorsement and encouragement these young men received at the hands of the "big association" was a graceful compliment which was at once deserved and gratifying, and cannot fail to spur the accountants to better work through the whole year.

The Niagara people did everything in their power to make their visitors welcome, comfortable and happy, and will be long remembered as genial hosts.

The excellent work of President McCulloch and Secretary Penington was evident in the completeness of arrangements, and the absence of much confusion which has marred

some previous meetings. The utmost harmony prevailed throughout, and while there was an active contest for the next place of meeting, it was accepted in good part by the defeated contestants, and the convention next year, at Boston, will certainly exceed in attendance and displays anything ever attempted.

## Tuesday Morning.

The arrival of delegates was somewhat earlier than usual, and promptly at 11 o'clock, Tuesday morning President McCulloch called the meeting to order in the assembly room of the armory. A pleasant feature was the seating upon the platform, in addition to the president and secretary, of ex-presidents H. H. Littell, Henry M. Watson, H. M. Littell and George B. Kerper, and members of the executive committee, Charles S. Sergeant, D. B. Dyer, C. F. Holmes, H. P. Bradford, and Charles H. Smith.

According to custom, an address of welcome by the mayor, Hon. A. C. Hastings, preceded the other business, and after a pleasant introduction by the president, Mayor Hastings spoke as follows:

## ADDRESS OF WELCOME.

Mr. President and Gentlemen of the American Street Railway Association: It hardly seems necessary for me, representing the city of Niagara Falls, to extend a welcome to an association of such a wide reputation that all cities are anxious and happy to entertain you. It seems fitting that we should have you within our gates only long enough to show you the power we generate and send out for manufacturing. We have two large companies; one delivers current to our Buffalo neighbors, some 20 miles distant, and the other runs electric cars 14 miles in another direction.

While the last few years have seen great strides in the commercial use of the great cataract, as long ago as 1725 the French sawed lumber here with power from Niagara river to build old Fort Niagara. From that time forward more or less use has been made of this wonderful fall of water.

With some 200,000 h. p. being developed by the two companies we will have enough power to run a great many factories and we expect that you gentlemen in the near future will be knocking at our doors to obtain power to operate your roads for hundreds of miles about us. The roar of Niagara was heard in New York on a telephone; why not the same energy in larger quantities and commercially? We are generous and trust you will call on us for all you want.

I have this week seen a report of the New York State Railroad Commissioners of 1893 and find that our local road, the Niagara Falls & Suspension Bridge Street Railway Company, was chartered October 20, 1882, this being their 15th anniversary, or crystal wedding, as it were. They have a chance to give thanks that they are alive and healthy. From the same report I find the capital invested in '93 was something over \$100,000,000, with some \$20,000,000 gross income in New York State alone, but I also find your business was not very much better as to net profits than a great many others in that year. From the general air of prosperity as shown in your faces, they must have improved and I trust they will keep on improving until you will not find it necessary to have your men mention about there being more room up front. We will not crowd you while in our beautiful city.

A few words of advice as to how to see the Falls may not be amiss, as you are here for a few days only, and most of your time will be taken up by your business. The park is free to all parts and comprises over one hundred acres that are accessible by walks and road-

ways. The electric car service is such that you can ride for miles with only a change of car from one road to another at two or three different points. The carriage hire is very reasonable—all reports to the contrary—only have it understood when you start, what the rate shall be per hour, which is regulated by ordinance. Don't think because you have driven or walked about for an hour or so you have seen it all. Take time and view the Falls and parks from different points.

We appreciate the honor of your visit and want you to leave with such an impression that the memory will always be pleasant. Remember the latchstring is always out for you and we trust you will come again, individually and collectively. We wish you all success in your deliberations. May your association grow and flourish like a green bay tree. The gates of the city are wide open to you and the only restriction made, is that if you find anything bolted down, please leave it.

Personally, it is a pleasure for me to meet and welcome you and I trust to have that pleasure again. (Applause).

The President: Gentlemen, we are obliged to his Honor, the Mayor, for his words of welcome, and we hope that he will preside at the police court if any of us are unfortunate enough to stray out and be captured.

After the roll call an opportunity was given for new members to join, and the following companies were admitted to membership:

Nassau Electric Railroad Company, Brooklyn, N. Y.  
 Binghamton Railroad Company, Binghamton, N. Y.  
 Buffalo Traction Company, Buffalo, N. Y.  
 Roxborough, Chestnut Hill & Norristown Railway Company, Philadelphia.  
 Chester Traction Company, Chester, Pa.  
 Colorado Springs Rapid Transit Company, Colorado Springs, Col.  
 Southwest Missouri Electric Railway Company, Webb City, Mo.  
 Union Traction Company, Anderson, Ind.  
 Atlanta Railway Company, Atlanta, Ga.  
 Wakefield and Stoneham Street Railway Company, Boston, Mass.  
 Mystic Valley Railway Company, Boston, Mass.

On motion of Mr. Kelly, the published minutes of the last meeting were approved as printed. President McCulloch then delivered the annual address.

#### PRESIDENT'S ANNUAL ADDRESS.

Gentlemen of the American Street Railway Association: Our convention assembly for the sixteenth annual period is within the sound of nature's greatest wonder, but the wonders that are wrought in our own immediate application and appropriation of nature's resources are even more startling and awe-inspiring than the great Niagara Cataract. If our ancestors of two centuries ago could sit in judgment on our doings of today we would unquestionably be required to involuntarily undertake the feat of the gallant Captain Webb, and if, perchance, we survived the perils of the raging torrent, the bonfires of our aboriginal predecessors would be rekindled on the cliffs below, and a fat-frying would take the place of our discussions and merry making, as there would be no escape on our part from the charge of witchcraft. These great falls were worshipped by our red brother; the venturesome explorer and historian dipped his pen in consecrated fluid as he wrote reverentially of their grandeur; the poet and the maiden everywhere have sung of them in enchanting praise; reverence and poetry and romance have characterized the stories which tell us of them; but the matter-of-fact Yankee of today, casting reverence and poetry and romance to the winds, has harnessed them like an old plow-horse, and compelled them, just as subversively, to do his bidding; they make heat and light and power for all purposes; they revolutionize the processes of the manufacturer and the chemist, and ere we meet here again they will, without doubt, have been saddled with the menial duties of cooking and washing and tilling the soil of all the country around. The enabling element for the utilization of this wasted energy of the past is electricity, in the development and search for uses of which the scientist and manufacturer sleep not, neither do they rest. They furnish us with their best and latest devices and appliances today, and tomorrow these devices and appliances are obsolete. To keep our place in the procession we must join in the cry of "The king is dead, long live the king." We must discard the old and adopt the new, or else be ground

under the wheels of this juggernaut of progress. Unfortunately, if we endeavor to "shun Scylla, we are in danger of being wrecked on Charybdis;" hence we assemble here to counsel together as to how we may best shape our course. To learn more of this revolutionary factor in our business, to discuss this and other kindred subjects, to compare our experiences, to meet and greet each other, to renew old friendships and acquaintance, and to form new ties, to be forced, if need be, to recognize that "there are other pebbles," to find that the American Street Railway Association is filled with men to know whom is both an honor and a pleasure—these, my friends, are some of the things which have brought us together, and it is hoped that a full measure of pleasure and profit will reward all who honor us with their presence.

Our local brethren, with a hospitality as abounding and exhaustless as the never-ceasing flow of their great river, have provided for our physical comfort and entertainment. We beseech them not to seduce us from a proper contemplation of the business before us.

Our noble ally, our helper in all the good work we accomplish, our always alert, jovial and genial friend, the supply man, has contributed, as usual, his share to our entertainment and enlightenment. He is here to show us the best of everything he has. He is not, in one sense, a member of our association; he does not participate in our deliberations; but he stands at our threshold, and the vigilance which he exercises, that none may escape, is worthy of our emulation in the conduct of our business. Let us show our appreciation of his efforts by inspecting his wares, by loading him with orders and by fraternizing with him, that his enjoyment of the occasion may be equal with ours.

We have still another and a new element in our gathering for this year. Whilst we are here engaged in the discussion of questions pertaining to the construction, equipment and operation of the roads and interests in our keeping, there is assembled near by, and also in deliberative convention, an earnest, intelligent, enthusiastic body of mostly younger men than ourselves. They have in view the same objects which bring us together—a betterment in the performance of street railway work. Their duties, whilst distinct and apart from ours, are just as essential, and the requirement is for the same degree of intelligence, industry and integrity. Their organization is young, and they are just starting out in their efforts to enlighten each other by a mutual interchange of information as to methods and ways. I allude to the Street Railway Accountants' Association. Let us not extend to them the right hand, but both hands, and help and encourage them to persevere in their good work. Their interest and efficiency in the performance of their duties is susceptible of the same betterment by convention as ours. If they find it desirable and convenient to meet at the same time with ourselves, and thus extend the acquaintance and good-fellowship between the operating and accounting departments which must result from contact, let that arrangement continue; but if it be considered wiser to have two separate meeting times and places, that may be the plan, but they should have our encouragement and indorsement, and even financial support, if necessary.

Our meetings are always attended by quite a number of persons engaged in the same business as ourselves, but whose companies are not members of the association, and we receive requests for information from the same source, which information is always cheerfully given. We would not like to close our doors against these non-members, but we would be glad to enter their names in our official lists, and their annual dues, which is only a small amount, would fill an aching void in our treasury.

There is still another class who, although members of our association, seldom or never grace our meetings with their presence. Whether this may be from a lack of time, a feeling of exclusiveness or a consciousness of a possession of all the knowledge attainable concerning our business, I know not. But if the first, an effort and sacrifice might be made experimentally; if the second is the cause of their absence, a surprise and discovery is in store for them if they will only develop it. And if the last reason keeps them away, a feeling of charity and good-will for their fellow laborers should impel them to come amongst us and show us how to surmount our perplexing obstacle.



The questions to be discussed in our convention have been selected with reference to newer developments and applications. The gentlemen honored by selection (and the honor should be much coveted) to prepare papers have all been urged to be present and personally present their efforts, thus giving them a force that can only be imparted by the enthusiasm of the author. Time will be given for the presentation and discussion of each paper, and it is hoped the discussions will be free and exhaustive.

I wish that my successor in office may have a secretary and executive committee who so thoroughly realize and faithfully perform their duties as have the secretary and executive committee who have assisted me in the performance of my very pleasant work.

And now, my friends and brethren, thanking you with more earnestness than my language can express for the unexpected honor with which you crowned me a year ago, and promising an impartial ruling on all questions presented, we will proceed with the business of the convention.

The report of the Executive Committee was then read, including the minutes of its meetings held during the year. Deaths during the year were as follows:

W. H. Sinclair, ex-president Galveston City Railroad Co., Galveston, Tex., Jan. 11, 1897.

A. M. Billings, president Memphis Street Railway Co., Memphis, Tenn., Feb. 7, 1897.

John Radall, vice-president Brunswick Traction Co., New Brunswick, N. J., May 9, 1897.

R. Dudley Frazer, ex-president Memphis Street Railway Co., Memphis, Tenn., July 10, 1897.

In the matter of banquet tickets the following action was taken: "That there shall be issued two banquet tickets to each member company of the association, where there are two or more official representatives, and when there is only one such representative only one ticket shall be issued, and where a company is not represented, no banquet ticket shall be issued on account of such company."

The report of Secretary-Treasurer Penington showed a membership of on October 12, 1897, of 163 companies; 15 companies having joined and 12 withdrawn during the year. The receipts during the year were:

|                            |            |
|----------------------------|------------|
| Cash on hand Oct. 15, 1896 | \$1,640.94 |
| Annual dues, 1897          | 3,789.58   |
| Membership fees            | 375.00     |
| Space, exhibit hall, 1896  | 2,146.30   |
| Space, exhibit hall, 1897  | 180.00     |
|                            | \$8,131.82 |

Expenses to October 12, 1897

Leaving cash on hand

The cash on hand with \$1,500 due for exhibit space at Niagara,

and 350 members' dues makes the total assets at date \$4,781.48.

The secretary read letters of regret at their inability to attend the meeting from Thomas Lowry, of Minneapolis, and C. Denmore Wyman, of New Orleans.

H. H. Littell, of Buffalo, then offered the following resolution which was unanimously adopted:

Whereas, The American Street Railway Association, through the report of its president, has been officially informed of the organization of the Street Railway Accountants' Association of America, and

Whereas, The aims and objects of that association are to bring together those engaged in the accounting department of street railways for the interchange of ideas, to promote the adoption of a simple, concise and uniform system of accounts, and to improve the work of the accounting department, and

Whereas, that association is now in convention assembled in this building,

Therefore, be it resolved: That the American Street Railway Association, believing that the attainment of the aims and objects of the Accountants' Association will be of permanent benefit to the street railways of America, heartily endorses and approves of the organization of that Association and pledges to it its cordial encouragement and support.

The President: If there is no further business in connection with the opening exercises of the meeting we will now proceed to the reading of the papers. The first paper is that on "Municipal Ownership

of Street Railways," by P. F. Sullivan, general manager of the Lowell & Suburban Railway Company, Lowell, Mass. This is a subject to which Mr. Sullivan has given considerable personal attention, and he has gone to great trouble and expense to procure information on this subject, and his paper will be very interesting.

#### MUNICIPAL OWNERSHIP AND OPERATION OF STREET RAILWAYS.

By P. F. Sullivan, General Manager, Lowell & Suburban Street Railway Company, Lowell, Mass.

The subject of this paper is one which cannot be treated properly or in other than a limited manner within the time and space permitted. What I shall write, therefore, is intended more to suggest lines along which others may follow, rather than to attempt to treat it exhaustively.

The subject will be considered under the two following heads:

Municipal administration in American cities is so extravagant and unbusiness-like that in the interest of the public, the powers and duties of municipalities should be reduced rather than be enlarged;

Municipal ownership and operation abroad are the exception rather than the rule; and were the reverse true, and such ownership and operation successful from a financial point of view, it does not follow that American cities could or should follow such examples or that if they did so, success would result.

As to whether we should experiment with socialism, particularly under our forms of municipal government while still going through the experimental stage, and as to whether popular government should compete with private enterprises, I leave for other and separate discussion.

#### Municipal Maladministration.

Thoughtful men view with alarm the growth of American cities, and the maladministration of their affairs; some go so far as to believe that both conditions seriously threaten the future of the republic. So alarming have these become that patriotic and thoughtful men, and women, too, have organized in nearly every city in the country with a view of arousing public opinion, of devising ways and means to purify local politics, and to obtain a fair return for money expended.

In nearly every large city in every state in the Union from Maine to California and from Oregon to Florida such organizations exist under one name or another, and in some cities they go so far as to employ counsel and to instruct city governments in their duties. This is true of Boston, Providence, New York, Baltimore, New Orleans, Chicago, San Francisco and other cities. At the present time there are over 60 of such organizations in existence.

Not only are there local organizations, but such organizations also send delegates to national conferences to adopt methods of arousing public opinion, and purifying local politics in every city in the Union. Conferences for good city government were held at Philadelphia in 1894, at Minneapolis and Cleveland in 1895; at Baltimore in 1896; and at Louisville in 1897. To show how general and widespread are municipal maladministration and corruption throughout the country, I quote below extracts from the remarks of a few of the delegates:

#### PHILADELPHIA CONFERENCE, 1894.

"On the other hand, a Chicagoan would have to be in full training, and at his very best, to attempt to do any boasting about his city politics. Indeed, he knows very well that when compared with the government of any but American cities, the government of his city, like that of so many other cities of his country, is simply a deep disgrace to republican institutions and to the great democratic idea."

Franklin McVeagh, Chicago.

"It is no exaggeration of language to say that saloons and gambling houses and brothels are here nurseries for 'statesmen,' that the active hostility of their keepers is, if not fatal, at least, a grave impediment to success in public life; and that men and women who gain their living by habitually breaking the laws have a potent voice in selecting the public servants, who make, interpret and execute those laws!"

Charles J. Bonaparte, Baltimore.

"It must be admitted, however, that there are public servants who are not burning with desire to discharge their whole duty to their employers, and who have no wish to keep the channels of communication open between themselves and the respectable classes. Their tastes and ambitious will lead them in other directions. They have great faith in the power of the corrupt and disorderly elements of the population, and their closest alliances are with those who represent these elements. Under management of officials of this class conditions have been established in many of our municipal governments, which are far from satisfactory. Unbusiness-like methods of administration, have crept in; illicit relations with contractors and plunderers of all sorts have been formed; a thousand subterranean openings into the treasury have been discovered; the guardians of the peace are seen to be on the best terms with several classes of prosperous law-breakers; many officials are using the patronage of their offices with small regard for the interests of the city, but with a constant reference to their own political fortunes. There are honest men in the government, but they find it difficult to resist the rapacious and anarchical tendencies. When any such state of things exists, it is difficult for individuals to bring any effective saving influence to bear upon the city government. The task is one that requires the united and sustained efforts of many good men."

Rev. Washington Gladden, D. D., Columbus, O.

"There is no province where the American people need education more today than in the province of municipal government.

"But the governments of our great cities for the last thirty years have been our despair—Republican Philadelphia as bad as Democratic New York, Baltimore as bad as Chicago. The character of the men at the head of our city governments, our mayors and aldermen and common councils, has startlingly deteriorated. The proudest of American cities must blush when it thinks who the men are in its common council, controlling its high interests, disbursing its millions of money, and representing its corporate life, when compared with the class of citizens who sit in the town councils of Birmingham and Glasgow and the great cities of France and Germany. In almost everything that touches municipal administration we are today behind Europe. We have everything to learn and almost nothing to teach. It is, I say, disgraceful and humiliating."

Edwin D. Mead, Boston.

"First.—That we must keep more constantly before the people the perils to which we are exposed, and the menace to the safety of our free institutions, because of the corrupt governments of most of our large cities. In the light of the present day, was not Wendell Phillips right when he prophesied that the correct solution of the problem of our great cities would test our free institutions more severely than our struggle with human slavery?"

"We all know that the cities are growing out of all proportion to the country districts. It is one of the phenomena of this century the world over. At the present rate of increase the cities will control this nation in 1920. Do we want these great cities as at present governed to hold this power?"

Samuel B. Capen, Boston.

"The officials of our great cities are not elected, nor their affairs managed for the benefit of the members of the corporation, but to reward men for, and to encourage them in, holding or gaining the local votes to swell the majority of one or the other of the great national parties, which have no more interest in or concern with the good government of a city than a mob with the good management of a bank which it loots and plunders for purposes of its own."

John A. Butler, Milwaukee.

CLEVELAND CONFERENCE, 1895.

"The city of Indianapolis has had its share in emphasizing the failure of American municipal government. What with hoodle aldermen, hoodle councilmen and a loose financial system, with police and fire departments worth in votes to the party in control many times the number of employes, with a street department honeycombed with private and party snaps, boss-ridden, party-ridden, and nearly wrecked by its servants, the city had all

the decorations which entitled it to a place in the front rank of civic failures."

Lucius B. Swift, Indianapolis.

"We have our machine; our political bosses; some unworthy men in office; the self-seeking contractor; the dishonest officer of election; the spoil seekers in legion.

"The spoil system is the one great octopus which is strangling virtue, truth and honesty in public life. The weapon of destruction that must be used is the search-light of public opinion, blinding and destroying the evils which follow the creed that to the victor belongs the spoils; that dishonesty is legitimate in politics; that the political party a man belongs to must be his infallible guide in municipal politics; that a public trust is no trust; that the political boss is the boss and that his mandate is the law, the right to the contrary notwithstanding."

Frank N. Hartwell, Louisville, Ky.

"All municipal offices are held by ward bosses or their followers, and their success so intoxicated them that hardly were they well seated before they commenced their carnival of plunder and corruption. The men composing this administration were mainly of small means, and some of the councilmen were dependent upon their daily toil for their support, but notwithstanding their salaries were meagre, or nothing at all, it was not long before they took on an air of general prosperity, ceased to labor at their usual vocations, and waxed mightily in the goods of this world.

"In the department of public works, for instance, at the present time the inspectors and ward foremen almost equal in number the laborers they superintend. To recite the progress of the present administration is but to recount the sacrifice of the city's best interest, and the complete prostitution for personal and political ends by its officers of their official powers. No private individual could obtain the most paltry privilege without being subjected to corrupt demands, and unless he complied his request was promptly refused. The lesson taught the people by this administration has proved a most profitable one, and will, it is hoped, help to bring about the end of boss rule in this city."

Walter B. Spencer, New Orleans.

"The investigations of the Committee of 100 have conclusively demonstrated that the first evil tendency of personal greed as opposed to the public welfare, instead of being sternly checked in this city of Portland, has been actually encouraged by its political managers. If a contractor voted his men aright work was given him liberally and the pay was prompt and excessive. Honest performance of the work itself was, however, a matter of little consequence. Miles upon miles of defective sewers and streets bear eloquent witness to the evil effect of political control in business matters. The contractor and the city officer felt their first duty was to each other's selfish interests, and contractors and officers cannot well serve two masters.

"From the far West we send your greetings. Our city is no worse, is perhaps better, than some of yours, but our cause is a common one, and until our municipalities are honestly and economically managed upon business principles, the war both in the East and in the West should neither falter nor fall."

Thomas N. Strong, Portland.

"The board of public works consists of three members. Under the original charter this was simply a supervisory board, the various branches of the city work being under the charge of separate superintendents. As usual in large cities, this department was for a time the chief center of jobbery and intrigue in the city's affairs; appointments on the board were sought and used for political ends, and its patronage was used to promote the political fortunes of its own members or their political backers."

Edward O. Graves, Seattle.

"It is therefore exceedingly unfortunate that a very large proportion of our office-seekers are unfit or unworthy to fill the places they contend for.

"Men of character and ability are repelled by the conditions imposed on the services expected by those who control the nominations. Men who lead or belong to the vicious or predatory classes are eager and persistent in their efforts to secure the positions which enable them to increase their power, or to de-



fraud or oppress the people by such methods as those which have been so thoroughly exposed by the Lexow Committee in New York."

Charles Richardson, Philadelphia.

BALTIMORE CONFERENCE, 1896.

"In the first place we had everywhere enormous taxation, a taxation which produced a revenue sufficient, if it were honestly and wisely applied, to furnish every city in the land with every possible comfort and convenience, and even to adorn them with the triumphs of architecture and art. But all this was, in great part, misapplied and the consequence was we had very little return for it. Our streets were miserably paved and everywhere in a filthy condition. The schools were poor; the police were corrupt from top to bottom, and in collusion with evil-doers. All departments of government were affected by the demoralization, and the official force, from the mayor down, in our principal cities, was of a character which we could not exhibit in the face of the world without a feeling of disgrace. These were the consequences which flowed from this demoralization."

James C. Carter, New York City.

"I cannot here attempt to describe at any length the rise and rule of the despotic oligarchy which for 20 years dominated political life in this city and state, ground down our people, endeavored to crush out independence, cheated us of our suffrage and ate up our substance."

Charles Morris Howard, Baltimore.

"Our municipal condition however, is far from satisfactory. Our administration is neither judicious nor economical. Questions of appropriation do not receive mature deliberation, results in nearly all departments are not the best of their kind, and the disposition of the council has been, and now is, to exceed annually the current revenues of the city."

Virginus Newton, Richmond, Va.

"The interests of the people must be conducted by those who are entrusted to manage them, with the same wise, careful and conservative judgment that a competent business man should use in the transaction of his own affairs."

A. V. S. Lindsey, Nashville, Tenn.

"The abuses of administration were retrenched by law; the heads of departments had just been re-elected for four years, the ring organization was perfect in every detail; its members were held together by the cohesive force of public plunder, and its managers had ample sources on which to draw for all the money which might be needed for any purpose, and had the influence which flows from the absolute power to distribute the public patronage, franchises and improvements; and it was supported by thousands of voters who were dependent on city work and knew that active, willing and efficient service was the price they must pay for the opportunity to earn a living for themselves and family."

George W. Guthrie, Pittsburg.

"The development of an active, intelligent, civic spirit, the practical exclusion of the most ignorant and purchasable classes from the lists of voters, and the absence of political influences in the matter of appointments, in foreign cities, are in brilliant contrast with our deficiencies in these respects."

Charles Richardson, Philadelphia.

Under the conditions disclosed by the foregoing extracts—extracts, too, from American citizens, is it not strange that men will be found who will advocate enlarging the opportunities and powers of our city governments? Surely no business man would advocate it. On the contrary, he would have our municipalities conduct the business in hand in the same manner as the same business could be conducted by private enterprise before he would approve enlarging their powers and opportunities.

But the theorist says, enlarge the responsibilities of the government, and you will improve it. Acting upon that theory the doors of every house of correction and penitentiary in the land should be opened and every evil-doer therein sent back to the community whence he came. He should then be restored to his former position in the community, and instead of looking after his conduct and affairs more closely, he should be given carte blanche to do as he may wish.

Ownership and Operation Abroad.

According to the returns of street and road tramways to Parliament July, 1896, there were 153 distinct street railway undertakings in Great Britain and Ireland, subdivided as follows:

|                                                                                                         |     |
|---------------------------------------------------------------------------------------------------------|-----|
| Number of companies owned and operated by private capital.                                              | 116 |
| Number of undertakings where tracks are constructed by the municipalities and leased to private parties | 31  |
| Number of undertakings owned and operated by the municipalities                                         | 6   |

153

The six cities are as follows:

|                     | Popula-<br>tion. | Miles of<br>Track. |
|---------------------|------------------|--------------------|
| Glasgow and suburbs | 840,000          | 73                 |
| Leeds               | 400,000          | 27                 |
| Sheffield           | 380,000          | 19                 |
| Huddersfield        | 100,000          | 21                 |
| Plymouth            | 90,000           | 5                  |
| Blackpool           | 35,000           | 5                  |

GLASGOW.

Of the above cities Glasgow is the only one wherein the undertaking may fairly be called successful. And with reasonable economy it could not well be otherwise than financially successful. For a population of over 800,000 Glasgow has only 73 miles of tracks, whereas St. Louis, with a population of less than 700,000 has over 335 miles of tracks. It does not follow therefore, that if the government of St. Louis were conducted equally as well as the government of Glasgow, that it could also operate the street railway system of that city successfully financially.

It is well to remember, however, that Glasgow boasts of a "continuity of existence of over nine centuries." We may therefore safely place it within the limits of possibility that when our American cities survive a "continuity of over nine centuries," that they may be so far advanced in methods and morals that they, too, may be intrusted with additional power and responsibilities.

LEEDS.

The city of Leeds had operated its street car system for nearly three years. The first year showed net earnings of approximately \$15,000, less than 1 per cent upon the capital invested, whereas private capital earned and paid 7 per cent the previous year. The second year showed net profit of \$35,000, not quite the interest upon the sinking fund. And such results, too, with a population of nearly 15,000 per mile of track.

SHEFFIELD.

Previous to the acquisition of the street railway by the municipality, July, 1896, private capital received from 5 to 8 per cent dividends from the operation of the property. Under municipal management there was a loss the first year, not even earning the interest upon the capital invested. And such results in a city which has over 17,000 persons per mile of track!

HUDDERSFIELD.

This is the first city in England to attempt the operation of its street railway, and for the 14 years which it has operated the property there is a loss of \$311,000, varying from \$3,300 to \$83,000 in a single year.

This loss has been met by drawing \$105,000 from depreciation account and the balance by taxation, varying from 1-9 of a penny to 5 pence per pound. It may seem strange that the municipality should thus continue to operate under such conditions. The fact is that Huddersfield is a manufacturing city and the non-property-owning and small tax-paying voters are in a majority.

PLYMOUTH.

In the last fiscal year there was a loss of \$5,430. This city did not acquire the property voluntarily. On the contrary, the operating company intentionally forfeited its charter and abandoned the operation of cars.

BLACKPOOL.

This operation shows a net profit for four years of \$992 after paying interest and charging off to depreciation.

And yet in Plymouth, Huddersfield, Sheffield and other cities in England, boys of from 14 to 16 years of age, receiving \$2.50 per week are employed as conductors. Notwithstanding such conditions some of those cities have not earned the interest upon



the capital invested. Does anyone suppose that American cities if operating street railways could employ such conductors at such rate of wages?

In Germany there are only three cities which own and operate their street railway systems, and two which own the tracks and lease them to operating companies. In France, none.

The facts as they are before us are, that there are few cities abroad which own and operate their street railway systems with more or less indifferent results, and only one of which, viz.: Glasgow, which can properly be called a financial success; and yet there are those who would have American cities regardless of differences of conditions and institutions, plunge blindly into the acquisition and operation of 15,000 miles of street railway tracks because Glasgow operates 73 miles successfully.

It seems to me that those who honestly advocate the acquisition and operation of street railways by municipalities do not look below the surface. The find that an occasional city abroad does such things and they immediately jump to the conclusion that we should do likewise. They do not study the conditions with respect to accommodations furnished abroad as compared with those in this country; the methods of administration there compared with these here, and the civil service abroad compared with ours.

### DIFFERENCE IN CONDITIONS.

In a previous paragraph, I showed the difference between St. Louis and Glasgow. Below will be found a comparison of other

### COMPARISON OF ADMINISTRATION.

(City Government in the U. S., by Alfred R. Conkling.)

"The Right Honorable Joseph Chamberlain, in an article on 'Municipal Institutions in America and England,' in the Forum for November, 1892, makes an interesting comparison between Birmingham (his residence) and Boston. He says the total annual municipal expenditure (excepting the appropriation for schools and almshouses) of Birmingham is but \$1,665,000, while that of Boston is \$10,194,000, or more than six times greater than the expenditures of Birmingham. The two cities have much in common. They have about the same population and are both large manufacturing towns.

"The public works of American cities are perhaps the field of more swindling than any other department of the municipality. Brooklyn furnished us with an object lesson. For example, the commissioner of city works finds nearly 50 sinecures in his department, and he has begun by abolishing these offices, at a saving of \$50,000 a year to the city. The result is that he has that additional sum to expend upon actual work for the welfare of the public. Fifty other idlers in his department are marked for early discharge and the commissioner of public parks has also dismissed 75 men whose only occupation was drawing a salary!

"The comparative cost of municipal government in Europe and America is easy to understand. Any person who inspects the annual budget of the chief cities of the old and the new world will

### FINANCIAL STATEMENTS OF REPRESENTATIVE CITIES.

|                  | Population..... | Fiscal Year..... | Not Indebted-<br>ness..... | Capita<br>Indebtedness... | Annual Interest<br>Payment..... | Annual<br>Expenditure..... | Per<br>Capita Cost<br>Of Education..... | Per<br>Capita Annual<br>Expenditure..... |
|------------------|-----------------|------------------|----------------------------|---------------------------|---------------------------------|----------------------------|-----------------------------------------|------------------------------------------|
| London .....     | 4,221,452       | '90-'91          | \$225,000,000              | \$53.29                   | \$10,801,675                    | \$54,601,965               | 1.58                                    | \$12.93                                  |
| Glasgow .....    | 752,728         | '95-'94          | 39,620,770                 | 50.61                     | 1,321,890                       | 9,046,000                  | 1.62                                    | 11.54                                    |
| Birmingham ..... | 429,906         | '92-'93          | 38,146,440                 | 88.73                     | 1,335,125                       | 7,033,025                  | 1.45                                    | 16.36                                    |
| Berlin .....     | 1,579,241       | '92-'93          | 68,275,000                 | 43.23                     | 2,450,000                       | 2,991,595                  | 2.16                                    | 18.31                                    |
| New York .....   | 1,515,301       | '94              | 101,428,481                | 66.92                     | 4,889,383                       | 37,322,065                 | 3.04                                    | 21.65                                    |
| Chicago .....    | 1,438,010       | '94              | 17,722,950                 | 12.32                     | 851,421                         | 32,020,184                 | 4.24                                    | 22.26                                    |
| Boston .....     | 494,205         | '95              | 37,131,423                 | 75.13                     | 2,443,716                       | 22,099,543                 | 5.09                                    | 44.71                                    |

cities of nearly the same population, taken from the Yale Review for May, 1897:

|                   | Population..... | Area In<br>Square Miles..... | Street Railway<br>Mileage..... | Mileage Per 1,000<br>of Population..... | Mileage Per Square<br>Mile of Area..... |
|-------------------|-----------------|------------------------------|--------------------------------|-----------------------------------------|-----------------------------------------|
| Birmingham .....  | 497,000         | 20                           | 33                             | .066                                    | 1.63                                    |
| Boston .....      | 494,000         | 37                           | 295                            | .597                                    | 8.06                                    |
| Edinburgh .....   | 289,000         | 14                           | 21                             | .072                                    | 1.50                                    |
| Detroit .....     | 300,000         | 23                           | 202                            | .673                                    | 7.21                                    |
| Leeds .....       | 400,000         | 34                           | 27                             | .067                                    | 0.79                                    |
| Cleveland .....   | 350,000         | 32                           | 205                            | .585                                    | 6.40                                    |
| Liverpool .....   | 641,000         | 21                           | 66                             | .103                                    | 3.14                                    |
| St. Louis .....   | 644,000         | 62                           | 216                            | .320                                    | 3.50                                    |
| Manchester .....  | 530,000         | 20                           | 54                             | .102                                    | 2.70                                    |
| Baltimore .....   | 512,000         | 34                           | 262                            | .511                                    | 7.70                                    |
| Bradford .....    | 228,000         | 17                           | 21                             | .091                                    | 1.33                                    |
| New Orleans ..... | 250,000         | 40                           | 169                            | .676                                    | 4.22                                    |
| London .....      | 4,400,000       | 105                          | 230                            | .052                                    | 2.19                                    |
| New York .....    | 1,851,000       | 59                           | 357                            | .203                                    | 6.05                                    |

Compare any one of the above foreign cities with an American city of the same population and you will find that the area of the latter is greater and the street railway accommodations greater in proportion than the former. The English cities average over 15,000 persons, and the American cities, over 2,000 per mile of track. And yet there are those who would state that because Leeds could operate 27 miles of track successfully that Cleveland with nearly the same population and area could also operate 205 miles of track, nearly 9 times as many miles of track, also successfully. If, therefore, the methods of civil service and administration were the same in both cities, Leeds could be eminently successful and Cleveland a monumental failure.

he started at the economy of the one and the extravagance of the other.

The average per capita expenditure of the foreign cities above mentioned was \$14.79; of the American cities, \$30.54.

"The new Mayor of Chicago (1894) has said that the greatest danger of cities is that of being robbed by their own officials, in the sense of being burdened with expensive and superfluous office holders. In one month he directed the city treasurer to reduce his salary 10 per cent and transfer it to the general fund.

"A law was passed in 1883 to build a new aqueduct from the Croton river watershed to the city of New York. This stupendous public work became a harvest for politicians; large sums of money have been squandered upon it, and much of the work had to be done over. The defective work, was, in part, owing to corrupt inspectors and engineers, who approved work that was not only contrary to specifications, but done in a most scandalous manner.

"The public works of American cities are, perhaps, the field of more swindling than any other department of the municipality. Mr. White in his suggestive article in the Forum for December, 1890, says 'The city halls ... are the acknowledged centers of the vilest corruption.' In that connection this remark applied chiefly to the aldermen, and, occasionally, to the mayor. But the public works that are controlled by the officials in the city halls of the larger towns are generally as badly and corruptly done as the proceedings of the city legislature. I could give many examples, but I shall simply remind the reader of the "Tweed" courthouse in the city of New York, which cost untold millions, and the new city hall of Philadelphia. The visitor to the Quaker City is at once struck with the prominence of this public building. The gigantic tower is a monument to the extravagance and corruption that formerly existed in the city government.

"Unfortunately, the inspectors of public works in large cities are often political appointees 'out of a job.' They must be taken

care of by the ring, and are put upon the pay-rolls to the detriment of the citizens. Their salaries are so low, and their 'assessments' or contributions to the ring so large, that they are often forced to approve of defective public work, or blackmail the contractors of private dwellings in order to support themselves and their families. These inspectors learn from their superiors lessons in the practice of blackmail. Their political employer or overseer has probably extorted money from the contractors on public and private buildings, so that he is not surprised when his clerks and underlings in turn pursue the same practice. These inspectors show discretion in levying tribute on citizens.

"In the cities of Europe millions have been spent on the quays and docks. Take, for example, the magnificent Victoria Embankment on the Thames at London, the quays of the Seine at Paris and the embankment on the Neva at St. Petersburg. Few American cities have been willing to improve the water-fronts properly. If our water-fronts were improved, economically and carefully, it would meet with the general approval of the intelligent citizen, but so many large cities are cursed with ring rule that the suggestion of a general system of stone embankments and docks (either on bays or rivers) arouses universal objection and indignation.

"Several years ago a dishonest contractor was constructing a sewer near Central Park in New York. He was in great haste to obtain his money, and, instead of using pipes, he laid barrels in the ground, for which he received the contract price.

"As I write, municipal officers of all grades in many of the large cities are now under indictment, and many more would be added to the list if it were not for corrupt police magistrates, packed grand juries and negligent attorneys."

(Municipal Reform in the United States, by Thomas C. Devlin.)

"The science of municipal government in this country is crude. Our methods are expensive and our governments inefficient. The burden has become oppressive and nearly every city in the land is making some efforts for reform, and there are no cities where the same are not necessary.

"That there are able and well-meaning men in all those reform movements no one will question, but there are also 'sore-head' politicians who nourish the rancor of defeat, and hotheaded theorists who have never had one practical thought in matters of personal interest.

"In summing up the short-comings of American cities, it has been very easy to make comparisons with European cities and to suggest the adoption of the same principles of government and methods of administration under which those cities have been made models for efficiency and economy. It is, however, the opinion of those who have studied most carefully the municipal problem in the United States that no material aid can be had from the adoption of European methods in matters of city government.

"The matter of franchise is one of the most distinguishing features between American and European city governments, and which in a measure renders the adoption of European methods impractical. All the powers of government in Europe are in the hands of the property-owning class. In Germany, the three-class system of voting, while affording the masses a pretense of power, gives to the wealthier classes absolute control of municipal affairs.

"A study of the franchise in American cities shows that the non-taxpaying voters are a large majority. Taking Boston for instance, the registered vote of Boston in 1892 was 73,000. There were 32,407 taxpayers, of whom 3,200 were women having no vote, and about 700 aliens or non-residents. Deducting the taxpayers who are non-voters leaves 28,507 as the number of property-holding voters out of a registered vote of 73,000. If every tax-paying voter voted this shows the non-property vote at 46,693 against a property vote of 28,507.

"It is said that the cities are business concerns in which every taxpayer holds an interest, and there is a persistent demand that its affairs shall be conducted on business principles. Then it seems not unfair that representation in the city should be limited, as in a business corporation, to the stockholders, if the same results are desired. If this hypothesis is correct, we must admit that no business would succeed under management similar to the cities.

"It is also true that the ignorant, vagrant and purchasable

element comes almost wholly from the non-taxpaying class, and their only interest in an election, is the price they may receive for their votes. They are an element of especial solicitude to the ward politician, and are often, the decisive power in partisan contests. Indeed, it may be further said, that integrity, honor and ability will never prevail, in city councils particularly, until the candidates may safely disregard the demands of the worst elements of society and know that their election depends upon citizens who hold those virtues to be their chief qualifications.

"Every large city is practically in control of the non-taxpaying element, and from this class the intemperate, vicious and purchasable vote is mostly composed, and it is through his influence with them, and his ability to handle them, that the ward politician secures his own election, and achieves success for, and standing with, his party. He is often one of this party, which he controls, and, if not, affiliates with them, which amounts to the same thing.

"He extends to them so far as he can, the same patronage which he and his colleagues in other wards have received from higher authority. He promises the creation of new offices, clerkships in others, and jobs in parks and streets without number, and thus crowds every department of the public service with incompetency and unworthiness, which would never be tolerated in any private enterprise. Through all the avenues of patronage he looks forward to paying campaign obligations and of maintaining his prestige with the party. Surely the alliance of the business of cities with national politics, and its control by the party machine, is a serious evil. It opens the way for every form of dishonesty and mismanagement which avarice and ambition can suggest.

"The power of the legislature to meddle in city affairs is corrupting both to the legislature and the city. The city 'professionals' will be in attendance at each session of the legislature and when the city charter is acted upon, or special acts concerning the city is passed, they will be marked by their cunning and avarice. The Hon. Seth Low tells us that in every year of his term of office he was compelled to oppose at Albany, the seat of the state legislature, legislation seeking an increase in the pay of policemen and firemen, without any reference to the financial ability of the city or the other demands upon the city for the expenditure of money. . . . New and useless offices were sought to be created and the mayor found that not the least important of his duties, as mayor, was to protect the city from unwise and adverse legislation on the part of the state.

"Edward W. Bemis, writing in Public Opinion, says: 'A recent chief of the Chicago sanitary department assured the writer, that there were not six of his 100 subordinates whom he could trust. It was useless to dismiss any one, for the chief must take in his place whomsoever some alderman may desire.' Not infrequently new offices with chiefs and many deputies are created for no real purpose other than the positions they offer. The pay is often out of all reason for the service rendered, but it is expecting too much of human nature to hope for any change while the system which makes it possible prevails. To cut off the salaries or positions of one's friends who labored during the long siege of an election campaign, requires a degree of courage and ingratitude not attainable by the average councilman.

"Francis G. Peabody, in comparing municipal service in the United States with service in the cities of Germany, says: 'With us municipal offices are the spoils of successful politicians; in Germany they are the prize of experts. It seems to a German as incredible to hear of a city governed by men who are just pausing on their way to some higher place, as it would to hear of a railroad or of a cotton-mill thus superintended. Good city administration with us is an accident.'"

The advocates of municipal ownership point with pride to the postal service of the United States, and would have us infer that in all things the national and municipal governments could do likewise. In this they speak as partisans, yet we should not deny them such comfort as they may get. They do not refer to the annual pension appropriation now \$150,000,000 per annum, nor to the fact that the late General Grant and the late General Garfield, both good authorities, stated that \$40,000,000 would be amply sufficient. They do not refer to the river and harbor appropriations, of which the late President Arthur wrote in one of his veto messages, "as the measure (River and Harbor Bill)

became more objectionable it would secure more support." They do not refer to the National Government's experience in the Union Pacific or to the experience of the state of New York in the Erie Canal.

#### State Ownership of Railroads.

The experience of France and Brazil with government ownership of railroads is not encouraging to the advocates of the idea that railroads should belong to the people at large, and should be operated by officers appointed by the government. The South American republic has determined to abandon state ownership of railroads, after a thorough test of the theory, and is now negotiating with European capitalists for a lease of the entire system, comprising 14,000 miles of track. When Brazil took charge of the Central Railroad, that corporation had paid as high as 9 per cent dividends, but under government control it has not only failed to earn its expenses but has cost the people \$2,000,000 or \$3,000,000 a year above its receipts.

The experiment of state ownership of railroads has been tried longer in France than in Brazil, and under more favorable conditions. The model road there runs through well-populated districts, with large cities as terminals, but the results in France are discouraging. Eighteen years ago a railroad system was constructed, which was to furnish cheap rates for passengers, cheap freight for shippers, and abundant profit for the state. It has done none of these things. At first the advocates of the enterprise insisted that only time was required to prove the wisdom of the project. Eighteen years have passed and the results may be briefly summarized: Theoretic methods have been abandoned, and the railroad is now managed substantially as are those in the hands of private capitalists except its tariff of rates is a little higher, and its cost of operation is considerably larger. The last report shows that the net return on the whole capital expended is 1.35 per cent, and even the state cannot borrow money for less than 3 per cent. The government has every year a considerable deficiency to settle, and the people who use the line pay somewhat more than they would have done if the enterprise had been left to private capital.

Canada has had an experience of state ownership also, but upon a more limited extent. There the government owns about 10 per cent of the whole, upon which it loses about \$500,000 annually.

The railroads and their equipments and fares of France and Germany operated by the government, cannot be compared with those of England, operated by private capital; and the manufacture of tobacco and cigars by the government of France has produced such vile stuff as to be an object lesson to enthusiasts of government monopoly.

#### Public Ownership and Private Operation.

Some of the advocates of changing the present state of things stop short at the operation of street railways by the municipalities and advocate that the municipalities own the tracks and lease them to private capital. They are aware of the present condition of our administrations, and dare not go to the logical length of the position. If our municipalities are so unbusiness-like and corrupt in their methods as to be incapable of operating a street railway property, then they are also unfit to manage the construction of the property and to make contracts for its use. You cannot stop half way.

The motive for public ownership abroad is twofold. The first has reference to the conditions of the streets and street surface. They have, as a rule, finely constructed and maintained streets, and in their very proper regard for keeping them so, they desire to control all construction and maintenance of tracks. The second has reference to controlling and regulating the methods of operation. That has proved a failure, and can be accomplished better when granting a franchise. In nearly every case in England where the municipality acquires the operation of the property it did so involuntarily.

The city of Toronto, Canada, is the only instance on this continent of public ownership and private operation. The conditions and contract there please the theorists and the street railway company, and all are happy. While I am neither a prophet, nor the son of one, I will state that in my opinion before the con-

tract period shall have expired, Toronto will have cause to regret that it adopted some English methods under almost American conditions. The municipality constructs the concrete bed for the tracks, supplies and does all paving, and removes all plowed snow. The compensation which it receives per mile of track is much less than that paid in some states by one company for running over the tracks of another company. Percentage of receipts, rates of fare, etc., should be looked upon as nothing more nor less than a premium for which the operating company receives a monopoly. Competition and the fear of it are completely shut out. Single fare and transfer carry a passenger only to the suburbs. Those going to and from the suburbs pay extra fares, and as the city grows in population, it will become as congested as foreign cities, or the people will be compelled to pay extra fares to get to and from suburban homes. Such conditions exist nowhere in the United States.

The conditions with respect to Toronto and its suburbs suggest a practical problem in the United States should municipalities desire to acquire street railway properties. Usually broad street railway systems are operated within the limits of the municipality as at Toronto. Should the systems be extended farther additional fares are charged. In the United States, on the contrary, in nearly every instance the street railway system extends beyond the city or town limits and usually only a single fare is charged. Should a city obtain the street railway system within its own jurisdiction an interesting problem is opened with respect to the owner of the balance of the property; and in case the balance of the property should be acquired by the other towns through which the system may be operated, as to divisions of "spoils," profits and losses. It may result as it did in Birmingham, England, in the price of gas. That city provides its own gas and charges suburban towns 50 per cent more than it charges its city consumers.

W. W. Bean, of St. Joseph: I move that a vote of thanks be extended to Mr. Sullivan for his very able paper, and that the same be spread upon the minutes. Carried.

The President: We will now proceed to the next paper "Some of the Difficulties Existing in the Construction and Operation of Electric Street Railways," by G. W. Knox, electrical engineer, Chicago City Railway Company.

Mr. Knox read the paper as follows:

#### SOME OF THE DIFFICULTIES EXISTING IN THE CONSTRUCTION AND OPERATION OF ELECTRIC STREET RAILWAYS.

By G. W. Knox, Electrical Engineer, Chicago City Railway.

With the smaller street railways during the panic period, from which it is to be hoped we are about emerging, it has been a struggle for existence, and a road that has pulled through these times without running behind, may be considered fortunate.

The railway management has often during these times been called upon to make a good showing in dividends, having at the same time a decrease in earnings to contend with; how to do this has been a most perplexing problem for many a street railway manager, and by his not being equal to the emergency, has resulted in there now being a long list of roads in the hands of receivers.

I do not charge up to the stock manipulators or the hard times, all the crime of the necessity for receiverships of these railways. Many an electric road now in the hands of a receiver could be making neat incomes for the investors had a closer study and practice of the economic principles governing the details of construction and operation been made and thereby done away with the many wasteful measures which are sapping the very life out of what might have been paying investments.

The keynote of doing this does not lie altogether in the ability to make any one or two large reductions or savings, but rather in lopping off here and there the many unnecessary extravagances existing in the various departments of the system.

The first and most important step in working out economies is in selecting a corps of operators from the head foreman down to the man sweeping out the depot. If they are interested, and are working for the good of the company, scarcely an hour of the time in



G. W. Knox has been at the head of the electrical department of the Chicago City Railway Company for the past five years. Mr. Knox was graduated from the Northern Illinois College at Fulton, Ill., in 1885, and at once engaged in railroad work, superintending the construction of depots along the lines of the Burlington & Northern Railroad. Two years later he

was connected with a car building concern, and the following year the Thomson-Houston Company sent him with several of the first electrical equipments that were installed west of the Mississippi river. In 1889 he entered the service of the Sprague Electric Railway & Motor Company and was given charge of street railway work in Milwaukee, Minneapolis and St. Paul. When the Edison General Electric Company, Mr. Knox was retained in the railway department and was sent to install equipments in Cincinnati, Springfield, Ill., Columbus, Newark, St. Joseph, Mo., Kansas City, Lincoln, Ill., and other cities. When the Chicago City Railway decided to equip its horse lines for electric traction, Mr. Knox was employed January, 1893. To prepare for the World's Fair traffic it was necessary to work day and night stringing the wires and completing the equipment, but the design and construction were of such high

order that no serious accident or breakdown occurred during that period of arduous service. Mr. Knox planned the feeder system and line apparatus on the City Railway.



G. W. KNOX.

which they are engaged can go by without their effecting little savings which in time swell the item of economies to mammoth proportions.

The examples of how this is done are very numerous. For instance, had a certain motorman been the man for the position and exercised more care in operating his car, he could perhaps, have averted an expensive accident case for his company. In a minor matter an armature winder by being interested and more painstaking in his work, could by insulating an armature coil with perhaps a thirty secondth of an inch more insulation, have saved a burn out and an expense of \$25 or \$30. These are only examples of the many instances where a reduction in expenses is made possible.

In considering the question of our engines and electrical machinery we have reached a state of comparatively high efficiency and economy, and there is not the chance of making the saving on these lines, in either the designing or operation, that there has been in the past.

There is also but little chance, in a broad sense, for argument upon questions,—as to feeder requirements, the necessity of ample and absolute return, cars, motors, etc.,—a general idea of what is required is so well understood that these problems narrow down to a study of how to accommodate the conditions as found, which the man in charge should be fully able to meet.

In the management of railway work, the greatest opportunities for economy will be found in the details of construction and operation.

It is totally out of the question for any one to lay down a code of rules to be followed, owing to the varying conditions. The success attained in both construction and operation depends wholly upon the practicability of the man in charge of the work. What is greatly needed by those directly in charge of the equipment and operation of electric railways, is a better opportunity for meeting each other to discuss matters of detail in construction and operation.

One of the mistakes into which we are most liable to fall is the rut of self satisfaction with our own style of work. Then it is that the manifestations of decay and inefficiency begin. Those who are most satisfied with their own work are often the ones making the poorest showing. It is imperative in order to eliminate the difficulties with which we meet, that we brush up against the other fellow and get his ideas. To be better able to do this, the plan now adopted by the electric railway companies of several states of having state meetings for the discussion of plans for better methods of carrying on the work, should be made general. There are a few of these state organizations for the purposes mentioned, but there are not enough of them. The American Street Railway Association, has, I believe, too much of a national character to afford the time to take up and discuss details, of which the work is principally composed.

To these state meetings, the companies should send the men at the head of the different departments, for which all concerned would be well repaid by the benefits derived therefrom. By keeping a man

isolated, back in some dingy old shop or barn, he cannot be expected to be bristling with the bright ideas that bring forth the efficient service which characterizes the others fellow's road, and makes it a good dividend payer.

Following up the idea—that it is the first wrong step that counts—our whole aim must necessarily be to make as few mistakes in the construction as possible, for it is an easily demonstrated fact that the cost of operation depends largely upon the method of construction.

It is an absolute necessity that we look ahead and plan against all kinds of speculative disaster, ignoring if you please, in this case, the teaching that "we should not cross the bridge until we come to it." A little foresight which results in preventing an accident, will probably mean the saving of the profits for many days' operation. One of the examples being—with ordinary conditions in the installation of overhead work—is the use of but one insulation between positive and negative. For the first year or so, this will be found sufficient, but a little later on the insulation begins to deteriorate and there follow frequent short circuits and burn outs, which stop traffic and entail an expense many times the cost of two additional insulations, which would insure to a reasonable extent against such leakages and burn outs.

It is not fair to the owners of the majority of the electric railway properties to say that they have worked on the retrenchment idea as regards expense in putting in the system; as universally they have been liberal with their money, but where they are to be censured is in the fact that they have not familiarized themselves more fully concerning the methods of installation. They have been inclined to leave the question entirely to the honesty of the contractor or supervising engineer, who was not necessarily dishonest, but a man who knew a good thing when he ran across it, and perhaps slighted the work accordingly.

Among the most important matters to study for economy connected with construction and operation is the supply department. There is an immense sum of money needlessly squandered in supplies and repairs for an electric road in a year. One of the causes of this waste lies in the fact that the roads have not yet arrived at a standard in the design of the apparatus which they use, to which too much importance cannot be attached. Every road should be its own designer of all articles used, for why should the manufacturer be better able to determine than you what is required. You are on your own grounds, you know exactly the conditions to be met and are in constant touch with the difficulties as they arise, and are far better able to devise the remedies than is the manufacturer miles away, who perhaps has only his own experiments and a confusion of theoretical speculations to rely upon.

I mean in no wise to decry the assiduous and most excellent work of the manufacturers of electrical apparatus. It was and is a field of necessary inventive development, and the manufacturers are sparing no effort or expense in their endeavors to supply the trade with the improvements in demand, but the unwary railway man has had an immense amount of experimental claptrap machinery inflicted upon him, all of which has cost dearly, and which is still maintained at a sacrifice. It is a lamentable fact that we have not done more than we have towards correcting this evil.

Along this line another evil for which the railway man in his efforts to save money is in part accountable, is in the shaving of prices on material to the extent that it has resulted in competition being so sharp among the manufacturers of electrical supplies that they have adopted the piece work plan in order that cheapness may be secured, thus turning out upon the market apparatus that was not gotten out for efficiency, but to fill orders. Of course these articles may have been built according to specifications, and stood the shop test, but there is demonstrated an entirely different proposition when this apparatus is put into actual use; it is then that we see the bad effects of the hurried and slighted work of the pieceworkers.

To free ourselves of these troubles we must be more careful in getting out the specifications and checking up the material received. The most carefully prepared specifications in detail should go out for every piece of apparatus used. You will then find that your supplies are coming to you made up in the proper manner, your supply man knowing that should he send out a mixed up and defective lot of material it will be promptly returned to him with charges "Collect."

To be able to get out the specifications needed it requires a certain amount of experimental work, and how far to go with this experimenting is a problem requiring the keenest discretion. Experimental

work should only be encouraged and allowed by a company to the extent of having in view the elimination of an existing money-wasting evil. The testing, making of new designs and patterns, with perhaps the subsequent throwing in the scrap heap of the article gotten out to conform to some pet theory, when kept track of is found to be a tremendous waste of money.

Experimental work should, however, be encouraged as far as it is profitable in the way of stimulating sagaciousness and promoting adaptability on the part of the men handling the work, but all experiments should be allowed only as passed upon by the management of the road, who should be fully competent to determine the probable practicability of the theory proposed.

In making up and buying supply parts, one of the factors of economy lies in the bulk to be used. Of course, the greater the amount purchased, the greater the saving. I would, though, strongly advocate not getting too great a quantity of stock of any kind of material on hand, as the defects developing often require the complete changing of designs, with consequent scrapping of all material in stock.

Another serious difficulty to be considered in connection with operation is the inefficiency of the motormen. I concur with a railway manager who once said: "Motormen, like poets, are born, not made." There are motormen who will operate a car day after day, year in and year out, without the slightest accident or complaint while others are constantly having wrecks and their cars are always being run in the depot out of order.

In the calling of a good motorman, we have a position with more responsibility attached perhaps, than the position of an engineer of a steam railroad. A motorman, of course, has not in trust property that has the value of a steam railway train, but his field of operation lies where there is greater menace to life and property, (for which his employer is responsible in case of injuries) than with a steam railway engineer. A trustworthy motorman should be required to pass a physical examination, possess a cool, collective temperament, judgment in cause and effect of ideas in general, and have a fair amount of mechanical ability. He should be obliged to undergo the most strict examination as to his fitness in these requirements and in addition be thoroughly conversant with the correct methods and rules of how to handle the equipment.

The board of examiners for the fitness of employes on street railways will be able to make a better showing in efficient operation than most other departments, by giving more attention to the examination and instruction of operators, and that there is needed improvement in this particular, is evinced by the magnitude of the accident account which is due mostly to the operators not being properly schooled in the work they are handling.

I do not believe in attempting to educate motormen to any extent in electrical knowledge, as it has been proved that it is a waste of time, and nothing is accomplished by it. Giving them an insight into, and encouraging them in determining the cause and remedy of some electrical trouble with which they may meet on their cars while on the road, you have men with all kinds of theories, wasting the company's time in tearing apart and dissecting the equipment and perhaps not then locating the trouble; at the same time, they are undoubtedly blocking the line, where, had they, after failing with the simpler methods of locating the trouble, called for an emergency crew, or been pushed into the depot, they would have been doing much better service. There are, of course, some cases where it is excusable for men to attempt to locate trouble on their cars, but, as a rule, it is found to be the wrong practice. If they understand the brake mechanism, the proper manner of applying the power into their motors, how to cut out a disabled motor, and the rules as given in the rule books, they will have about all they are able to master.

A good, bright interested motorman, or other operator on the system, upon noticing anything wrong with the equipment should be educated in, and made to feel that it is his first duty to report everything coming under his observation that is working to the detriment of his company, and he should have this so impressed upon him that he will feel uneasy about his position until he does so.

It may be asked, what is to be done with employes in cases of carelessness and consequent losses through their actions. Of course, it is out of the question to always avert accidents or mishaps, and specific rules cannot be laid down defining what is to be done in handling every case, other than by saying, it depends mostly upon the ability to get the right kind of men and to instruct and impress upon them that the burden of preventing such losses rests entirely with them. It

is well to remember in disciplining men for offences or carelessness in their work, that if they have clean records in the way of good intentions, they should be given another chance, as they will in all probability improve as a result of their experience and make valuable employes for the company.

In placing a man in charge of work or a department, he should be given the full responsibility of his position; then he will take an interest in what he is doing, have a little company of his own, so to speak, wherein he tries to save the dollars to the extent that he would were it his own. That is the way he should feel and act, and if he does not, his placed cannot be filled too quickly. A company should, however, be governed with all cautiousness in making changes with heads of departments, also operators in general. A man assuming a new position usually comes loaded down with fertile ideas. They may have fitted perfectly the conditions existing at his former location, and believing that is a poor rule which does not always work, he immediately proceeds to put into effect his ideas. Some of them may be good, but as a whole, by the time he has tried all of them, the company is, in the long run, unless heretofore there existed a deplorable state of affairs, liable to lose money by his practices.

I know of an excellent piece of railway property which should be paying good dividends. The company was born at a time when the experimental stage in electrical apparatus was well under way, thus enabling the selection of a fairly first-class equipment. It spent plenty of money on the installation, but as soon as the road was equipped the practice of changing management every three or six months was adopted. This resulted finally in it having about every style of apparatus. One of the managers came to the conclusion that he could make money by scrapping a style of motor he found on the road, so back in the corner they went. When his six months had expired, and the other fellow came on, he said he would make those motors go all right by changing their windings and otherwise fixing them up, and they were dug out of the scrap pile, the rust scraped off, new windings of field and armature substituted, and the motors are now in operation.

*This practice costs money.* There is nothing at all strange that this road should be struggling along for existence in the hands of a receiver, and I will not believe that overstocking or the hard times had all to do with its being in this position.

As a rule, the general condition of affairs out on the line and in the depots and stations of street railways is in a much shabbier state than exists in other lines of business. This is partially on account of the apparatus used being out in the middle of the street or back, may be, in an old, dark barn, where no one really expects to see good order and cleanliness prevail; but is a most serious mistake to allow this state of affairs to exist. Besides being directly wasteful of itself, it has the effect on every man connected with the company of making him generally careless and neglectful in his work. Out on the line it breeds contempt for the whole system in the public eye, and will act as a barrier to getting further concessions for lines. I can call to mind a repair depot, where the floor of the shop part is as clean as the floor of a Dutch kitchen, the walls and ceilings are neatly white-washed, and there is an individual place for every repair part used, from the cotter pin of the trolley wheel to the truck wheels of the car. Any repair man could be blindfolded in this depot and yet he would be able to go straight to and get any article of repair needed. There is no time lost in pulling out and hauling over material to find what is wanted. The results obtained by reason of those practices are highly profitable and wonderfully gratifying to the management. In point of neatness of cars, a minimum in the number of car trouble reports and amount of material used in repairs, while the car expense per day is no greater, and in most cases less, than that of other depots working under like conditions.

Much valuable time is lost and money thrown away by roads which are keeping so many records on matters pertaining to operation. Where a few records may be gotten out with a view of demonstrating that a leak is going on in some line of the work, or for the purpose of comparison in spurring some of the departments up when they are inclined to be negligent, there is of course money in it, and in fact it is necessary in order that the work may be handled intelligently, but where you have your men spending their time in keeping track of how long a certain armature ran, the length of time it takes to make repairs of a certain part of the motor, etc., which records are rarely referred to, and should one want to use them, it would be necessary to spend as much time as it originally took to get them out in looking them up for use; it is all a waste of time and money.



The man in charge of a department should be able, when called upon, to show exactly what it is costing to perform any part of the work under his charge, but he should be able to have this knowledge without the constant keeping of a lot of records.

One of the most commendable practices employed in the maintenance of a street railway is the regular calling together of the heads of the different departments for consultation on matters pertaining to their respective departments. The details and new complications constantly coming up concerning the work are so varied and numerous, and the men actually handling the work have such an excellent opportunity of observing and dealing successfully with the difficulties arising, that their reports at once place the situation of affairs panoramically before the management for action. Some serious trouble with the equipment or operation may be going on; some one man, perhaps, has a way of remedying the difficulty, which the others had not thought of, and again, practices that are extravagant may come to light during these meetings; so that those who have not tried this plan will find it a most valuable adjunct in methods of operation.

The subjects mentioned are, I know, being constantly thought about and worked upon by all street railway men, and are well understood by them, but there is no denying the fact that there exists with us in our work at times an unjustifiable and inexcusable amount of carelessness which results in the property depreciating as a money earner, to the extent that the holders of street railway securities become disgusted, withdraw their holdings, the receiver is appointed and the road is branded as a failure.

The way of preventing the most of these cases rests with the men who are actually handling the equipment, in assisting the management in keeping down expenses; how far this is accomplished resolves itself into the extent to which we go in getting the most practical men who will be able to adapt themselves to and handle efficiently the conditions existing in their respective lines of work; and there must be constant vigilance on the part of heads of departments in taking advantage of the advancements being made, and in thoroughly and constantly checking every man and his work.

H. H. Littell, of Buffalo: I move that the paper be received, spread upon the minutes, and a vote of thanks returned to Mr. Knox. Carried.

The President: I think Mr. Knox also deserves thanks for being present and presenting his paper. It is my opinion that the selection of a man to present a paper before this Association gives him an opportunity (especially if he is a young man and is not known except in his own city and amongst his own people with whom he is thrown in contact), to become known all over the country and to men who come from every section, and he ought to appreciate it so much that he would take the pains and trouble, recognizing the compliment of the selection, to prepare a paper and come here and read it, and Mr. Knox deserves credit for having taken that trouble and I am glad that he has done so.

H. H. Littell, of Buffalo: I think that the paper just read commends itself to every street railway man, whether he be president, general manager or superintendent of a company, and especially if he is the electrician. The paper should be read carefully and studied carefully as it is very important, and especially in reference to buying the supplies, and not buying in too large quantities; and also the point about calling the heads of departments and employes together. I have been practicing that for a good many years, and we have a school every Monday. We not only talk over matters, but we discuss them, and the practice is attended with a great deal of good. It is certainly a great benefit to our company, and consequently to the public, and I think that this paper should be given a great deal of careful consideration.

On motion, the meeting adjourned until Wednesday morning at 9:30.

#### Wednesday's Session.

President McCulloch called the meeting to order at 10:30 a. m.

The Saginaw Street Railway Company, of Saginaw, Mich., acquired membership in the Association.

The President: The first business this morning will be the report of the auditing committee.

Mr. Sergeant: Mr. President and gentlemen: I beg to say that we have examined the accounts, and we have affixed to the report of

the treasurer the following certificate: "We have examined the cash account of T. C. Pennington, treasurer, and find the same supported by proper vouchers, and find the same correct.

Niagara Falls, October 20, 1897.

C. S. SERGEANT,  
D. B. DYER,  
Auditing Committee."

Mr. Bear: I move that the report be received and spread upon the minutes. Carried.

The President: The first paper this morning will be that on "Application of Storage Battery to Electric Traction," by Charles Hewitt, electrical engineer, Union Traction Company, Philadelphia, Pa.

Mr. Hewitt read the paper, as follows:

#### APPLICATION OF THE STORAGE BATTERY TO ELECTRIC TRACTION.

By Charles Hewitt, Electrical Engineer, Union Traction Company, Philadelphia.

To give a history of the application of the storage battery to electric traction would only be turning over dry bones. The long series of remarkable failures is no doubt familiar to you all. To say that the storage battery has no place in electric traction is an error, and on the other hand to say that it will supplant all other means of applying power to the cars, I believe, only the dream of the enthusiast. We are sufficiently acquainted with the possibilities and limitations of the storage battery of today to be able to make installations whose success will be certain; improvements in manufacture have certainly been made during the past few years, but the cause of past failures has been due quite as much to errors in installing and in manipulation as in manufacture.

In preparing this paper I have made an effort to obtain accurate information from parties in Germany, France and England, but all such attempts have been of no avail. As far, therefore, as the state of the art in Europe is concerned, we must rely upon what we have been able to gather from current literature.

The most important applications of the storage battery to electric traction are:

1. The application of the battery direct to the car or locomotive.
2. The application of the battery at points on the line distant from the generating station.
3. The application of the battery in the power house.

#### The Application of the Battery Direct to Car or Locomotive.

We are led to consider this form of application first, not on account of its successes but rather on account of its conspicuous failures. From our investigation we can see nothing in this form of installation to commend, except for certain local conditions, which are peculiar to the large cities on the continent of Europe.

The first cost is greater than our present overhead form of construction, and the expense of operation is considerably greater; in fact it is doubtful whether the expense of operation can be brought below that of horses. It is less reliable, and more objectionable to passengers on account of the gas given off. But very little reliable data are obtainable from all the various experiments which have been made. Most all such experiments, in this country at least, have been made by the battery manufacturers and the results obtained have been most carefully guarded. Mr. Dawson, in an article, published in Engineering, October 16, 1896, says: "Two principal causes have so far prevented the successful use of the accumulator cars, their great weight and rapid deterioration of plant; owing to these causes, the manufacturers of storage batteries only have seriously taken up accumulator traction, and although they have been working on the problem since 1880, little reliable information has ever reached the public."

In a paper read by the writer before the Engineers' Club of Philadelphia, December 5, 1896, I gave in detail results of a test made by me of a certain battery car. The main results agreed quite closely with data which have come to us through European publications and I





CHARLES HEWITT.

Charles Hewitt was born in Trenton, N. J., January 28, 1861, and his early education was obtained in the state school in that city. In 1879 he entered Princeton University and was graduated by the John C. Green School of Science four years later. In 1887 Mr. Hewitt was instrumental in organizing the Edison Electric Illuminating Company and became general manager. Two years later he entered the employ of the Sprague Electric Railway & Motor Company, and for five years remained with that concern and its successors, the Edison General Electric and the General Electric Company, designing and installing some of the most important roads that were built during that period. In 1894 Mr. Hewitt was employed by the Electric

Traction Company of Philadelphia, and became electrical engineer for the Union Traction Company when the latter absorbed the former.

feel confident in stating that the battery car requires considerably more power to operate than an ordinary trolley car of the same size and under the same conditions, and further, the battery car will require a larger investment in generating machinery. The unreliability of the battery car, and the disadvantages due to the necessity of constantly changing the batteries are familiar to you all, and we have no facts which would warrant us in holding out any hope of improvement in this line. In fact, unless some form of battery be discovered with entirely different characteristics from the lead battery, I should advise leaving such experiments to those who enjoy spending money on this kind of a hobby.

When the action of the battery is thoroughly understood it is not difficult to understand the cause of failure. Every battery has what may be termed a critical rate of discharge. From zero up to the critical rate the working e. m. f. remains practically constant. Above the critical rate the e. m. f. decreases as the rate of discharge increases. On the other hand, the e. m. f. increases with the rate of charge and the length of charge. For any particular battery there is a rate of charge which cannot be exceeded without useless waste of energy. In Fig. 1, I have shown typical curves for charge and discharge at normal or critical rates and the portion between the curves represents lost energy. In Fig. 2 I have shown the discharge curve taken from a traction battery test. With a fairly constant discharge at the average rate used by the car, with rests of one minute every 15 minutes, the fall of e. m. f. is very marked. You will appreciate therefore the remarks of Sir David Salomon, "that it takes power to get current through the battery, and it also takes power to get the current out." These critical rates of charge and discharge seem to be partly due to the time required for the chemical reactions in the battery to take place. The physical limitations of a car require the battery to have a large output for its weight and bulk. To obtain this it is necessary to increase the surface of active material as much as possible and to decrease the inactive supporting grid. In consequence the battery plates become mechanically weak. The conditions seem to prevent the making of plates large

enough to prevent exceeding the critical discharge rate, and which are at the same time light enough and small enough to be carried on a car. The inherent characteristics of the lead battery are such that it is very doubtful whether it will ever be successful in propelling cars unaided by other sources of power. Great results are expected from the experiments now being made in Chicago; but great results have been expected before, and I do not look for results in Chicago much different from those that have preceded. It is claimed that the batteries in use in Chicago will show a much longer life than any that have as yet been tried. But even if the life of the plate were all that could be desired, we would not feel warranted in recommending the system.

There is another phase of this method of application which is used somewhat extensively in Europe. In some of the larger cities on the Continent there is a prescribed area within which overhead lines are not allowed to be erected. To overcome this difficulty the cars are supplied with batteries sufficiently large to propel them at a low rate of speed for a distance of three or four miles from the point where the overhead line ends, into the city and return. While the cars are completing the trip the batteries are charged from the overhead wire. I am sure such an arrangement would not commend itself to any practical railroad manager, except as a makeshift in such government ridden cities as exist in Europe. There are only two cities in this country where such an arrangement might reasonably be considered, and in those cities the slotted conduit has (and I believe wisely) been adopted.

The advantages of this method are apparent. Aside from the lack of overhead lines in the crowded city center, which is purely aesthetic, the most marked advantage is the lack of necessity for changing the batteries for charging. But this advantage is offset by the fact that as the charging is done en route the current for charging must be transmitted over the feed wires in addition to the current necessary for propelling the car with its extra weight of battery, thus increasing the loss due to charging. The power transmitted may be divided as follows:

1. For propelling the car without the battery.
2. For propelling the extra weight of the battery.
3. For charging the battery.

I regret that I have been unable to get accurate data showing the relation of these items to each other. But I feel satisfied that the extra cost of feeder cables due to the extra power transmitted and the decrease in efficiency will more than offset any saving in the cost of linework, while the cost of operation must be, and is acknowledged to be in excess of the less complicated system in common use in this

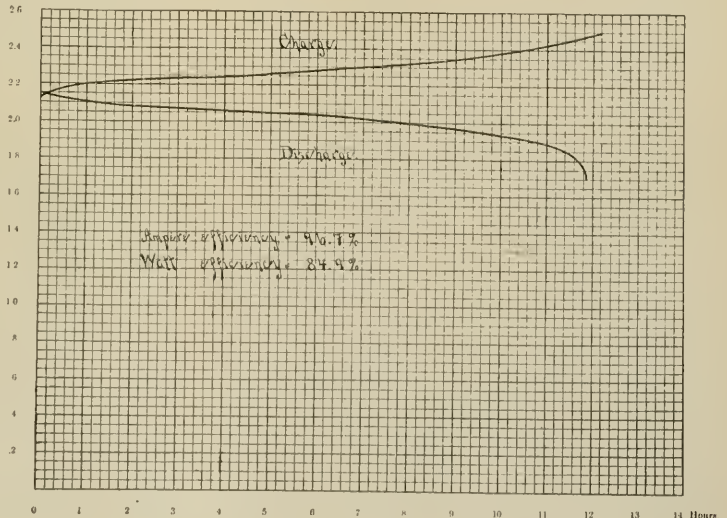


FIG. 1.—CHARGE AND DISCHARGE CURVES.

country. The fact that overhead lines are in use up to the proscribed limit and that the battery is only used where it is compulsory speaks volumes. It is also significant that the commissions appointed by the larger roads in England and Scotland to investigate the various methods of traction in vogue throughout Europe and America have vetoed any form of battery car.

The following data are taken from the writings of Mr. Dawson and others:

| Comparative data of accumulator cars.                                 |               |         |           |
|-----------------------------------------------------------------------|---------------|---------|-----------|
|                                                                       | Paris.        | Berlin. | Vienna.   |
|                                                                       | Lead.         | Lead.   | Cop. Znc. |
| Passengers carried.....                                               | 50            | 31      | 32        |
| Empty car, weight, lbs.....                                           | 18,081        | 19,845  | 16,097    |
| Loaded " " ".....                                                     | 25,739        | 24,630  | 21,036    |
| Weight of cells, lbs.....                                             | 3,749         | 7,270   | 3,969     |
| Number of cells.....                                                  | 56            | 88      | 136       |
| Capacity of cells, ampere-hours.....                                  | 230           | 130     | 330       |
| Power per car-mile required at power house, Board of Trade units..... | 1.130         | 1.072   | 1.380     |
| Data of accumulator cars running in Paris.                            |               |         |           |
| Number of cells.....                                                  | 108           |         |           |
| Number of plates per cell.....                                        | 11            |         |           |
| Size of plates, ins.....                                              | 7 3/4 x 7 1/4 |         |           |
| Thickness of negative plates, ins.....                                | .286          |         |           |
| Thickness of positive plates, ins.....                                | .315          |         |           |
| Weight of plates, lbs.....                                            | 39.69         |         |           |
| Capacity, ampere-hours.....                                           | 250           |         |           |
| Efficiency, per cent.....                                             | 70            |         |           |
| Average discharge rate.....                                           | 35            |         |           |
| Maximum discharge rate.....                                           | 100-120       |         |           |
| Life of negative plate, car-miles.....                                | 96,750        |         |           |
| Life of positive plate, car-miles.....                                | 8,750         |         |           |
| Passengers carried.....                                               | 50            |         |           |
| Weight of loaded car, lbs.....                                        | 30,870        |         |           |
| Weight of cells, lbs.....                                             | 6,615         |         |           |

| Data of accumulator line at the Hague, 1891. Julien accumulators. |                        |
|-------------------------------------------------------------------|------------------------|
| Length of line, miles.....                                        | 3.5                    |
| Maximum grade, per cent.....                                      | 1.50                   |
| Weight of car, loaded, tons.....                                  | 14 to 16               |
| Number of cells.....                                              | 192                    |
| Weight of cells, tons.....                                        | 4                      |
| Maximum speed, miles per hour.....                                | 12.5                   |
| Maximum distance run with one charge, miles.....                  | 44                     |
| Average.....                                                      | 35                     |
| Capacity of cells, ampere-hours per pound of plate.....           | 4.5                    |
| Positive plate can run without renewal.....                       | 9,000 to 11,000 miles. |
| Cost of maintenance of cells, per car-mile, pence.....            | .85                    |
| Cost of handling cells, per car-mile.....                         | .23                    |
| Board of Trade units, consumed per car-mile.....                  | 1.080                  |
| Probable maximum of discharge rate, amperes.....                  | 130                    |

| Cost of running accumulator cars in Birmingham, England, per car-mile in 1893. |             |             |
|--------------------------------------------------------------------------------|-------------|-------------|
| Wages.....                                                                     | 3.37 pence. | 6.74 cents. |
| Fuel.....                                                                      | 1.76 " "    | 3.52 " "    |
| Stores.....                                                                    | .68 " "     | 1.36 " "    |
| Water and gas.....                                                             | .12 " "     | .24 " "     |
| Sundries.....                                                                  | .17 " "     | .34 " "     |
| Repairs and maintenance.....                                                   | 5.49 " "    | 10.98 " "   |
|                                                                                | 11.59 "     | 23.18 "     |
| Car-miles run.....                                                             | 140,093.    |             |

| Working expenses of accumulator traction in Paris in 1893, per car-mile. |             |             |
|--------------------------------------------------------------------------|-------------|-------------|
| General expenses.....                                                    | .304 pence. | .498 cents. |
| Cost of power.....                                                       | 2.828 " "   | 5.656 " "   |
| Maintenance and handling of accumulators.....                            | 2.537 " "   | 5.074 " "   |
| Motorman and assistants.....                                             | 1.210 " "   | 2.420 " "   |
| Maintenance of motors and trucks.....                                    | 1.410 " "   | 2.820 " "   |
| Heating, lighting and various.....                                       | 0.138 " "   | .276 " "    |
|                                                                          | 8.227 " "   | 16.654 " "  |
| Car-miles run.....                                                       | 144,715.    |             |

| Comparative cost of various systems of traction in Paris in cents, per car-mile. |              |
|----------------------------------------------------------------------------------|--------------|
| Horses.....                                                                      | 17.10 cents. |
| Accumulator.....                                                                 | 16.66 " "    |
| Hot-water locomotives.....                                                       | 10.78 " "    |
| Overhead trolley system.....                                                     | 9.24 " "     |

A third phase of the battery car system is the battery locomotive. Aside from special forms such as the Heilmann locomotive, the one most worthy of mention is the experiment on the New York elevated railway, in which the battery is connected in multiple with the motors and charges or discharges according to the demands of the train. When the demand of the motors is sufficient to lower the pressure on the line to or below that of the battery, the battery will then discharge into the motors, thus relieving the feeders. When current is shut off from the motors, the battery will charge. No results of

this experiment have been made public yet, but it is difficult to see how much is to be expected. It has the advantage of maintaining a fairly constant pressure at the motors, but this can be accomplished better in other ways, as I shall show later. It subjects the battery to usage which history has proved to be disastrous to its life and efficiency. In this method the extra weight of the battery has the certain advantage of giving additional adhesion to the rails.

While not wishing to seem pessimistic, I must confess that to me the outlook for the battery car is not bright, and I do not look for much improvement unless some combination of elements be discovered whose characteristics are entirely different from the lead battery

### The Application of Storage Batteries on the Ends of Long Lines.

In such applications the conditions are entirely different. The battery in this case acts essentially as a pressure regulator. The conditions do not restrict the size of the plates, so that the plates can admit of such a size that the current density on discharge can be kept well within the limits of normal discharge; and in consequence of this, the battery is not subject to the great loss of efficiency, due to the fall of e. m. f. on discharge.

Only a few such installations have been made, two of which are on the Isle of Man; one has been installed by the Anaconda Mining Company at Butte, Montana; there is also a small plant at Merrill, Wis. The first installation, however, that has been made for any large city road for its suburban service, I find, is the one installed by the Union Traction Company of Philadelphia, Pa.

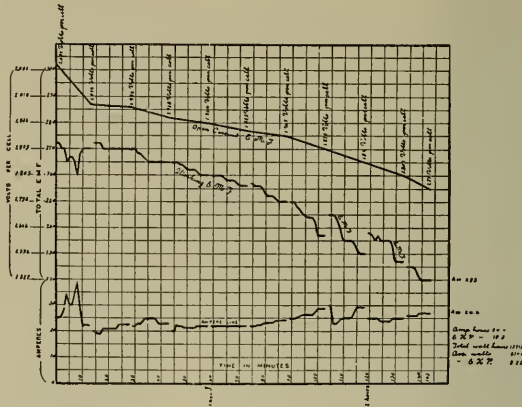


FIG. 2.—BATTERY DISCHARGE THROUGH RHEOSTAT.

The road was originally a horse car line which ran as far as the depot at Pelham, a distance of 7.3 miles from the power house. Conduits and cables were installed for operating a number of cars which were supposed to be amply sufficient. The phenomenal increase in the travel, however, necessitated a large increase in the car service. In addition, the success of the line warranted its extension to Chestnut Hill, 2.3 miles farther. More recently the line has been extended down a long grade to Hillcrest avenue, and from Hillcrest avenue to the Wheel Pump on the Bethlehem Pike 1.6 miles farther, making the line 11.2 miles from the power house, with the first extension of the line to Chestnut Hill, the underground cable was also extended, but the drop in pressure over this long line made it impossible to run the requisite number of cars, as the speed of a trolley car is approximately in the direct ratio to the applied e. m. f. The cables for feeding this section consisted of one cable extending to Chestnut Hill, one to Cheltenham avenue and one to Wayne Junction, about five miles from the station; all these cables were 1,000,000 c. m. in area, copper, rubber covered and leaded, laid in terra cotta ducts. The investment in feeders for this line had reached a point considerably above \$100,000 not including the conduits. To have increased the cable system so as to have supplied this section properly would have required about 336,000 ft. of 1,000,000-c. m. cable. At \$1.05 per ft. laid, this would amount to \$352,800; deducting the value of cables which were already laid, and which is estimated at \$79,000 we find

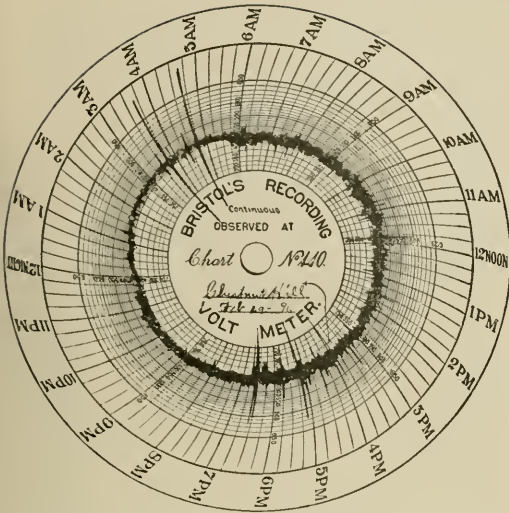


FIG. 3.—VOLT METER CHART TAKEN AT CHESTNUT HILL BEFORE THE BATTERY WAS INSTALLED.

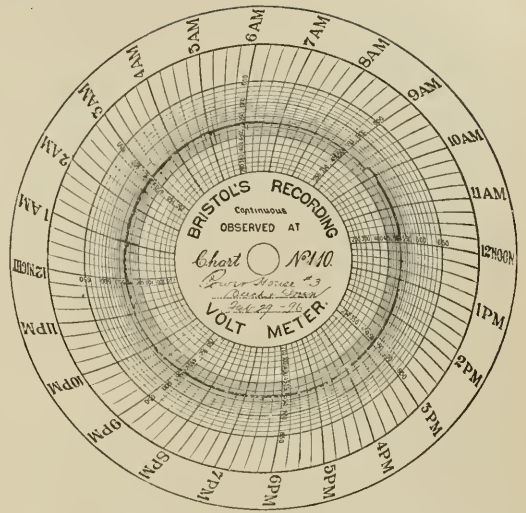


FIG. 4. VOLT METER CHART TAKEN AT BEACH AND GREEN STREET POWER HOUSE.

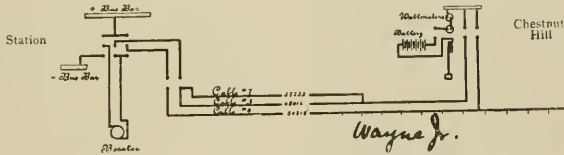


FIG. 5.—DIAGRAM OF CHESTNUT HILL CABLES.

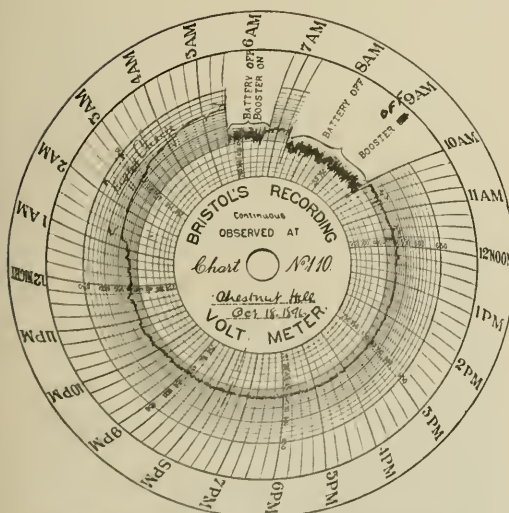


FIG. 6.—VOLT METER CHART FROM BATTERY HOUSE AFTER THE BATTERY WAS INSTALLED.

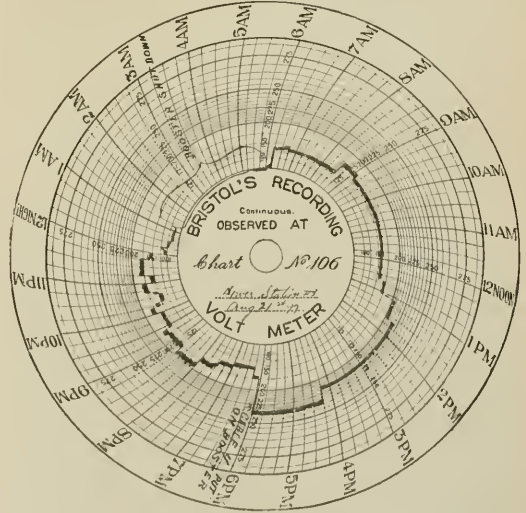


FIG. 7.—BOOSTER VOLT METER CHART.



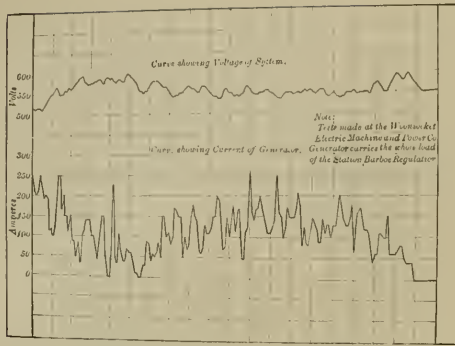


FIG. 8.—CURRENT AND PRESSURE CURVES AT WOONSOCKET BEFORE BATTERY WAS INSTALLED.

that the extra cost for cables without conduits would have been \$273,800; this figure is, of course, prohibitive.

In order that you may appreciate the condition of the line previous to the installation of the battery, I would call your attention to Fig. 3 which shows a recording voltmeter chart taken at Chestnut Hill, and to Fig. 4 which shows the pressure at the station bus bar on the same day; 350 volts was frequently touched; the average was a little over 400 volts with 530 at the bus bar.

It was necessary, therefore, to furnish some means of keeping up the pressure. If a station had been built at that point, it would of necessity have been small and inefficient. From records taken at the main power house, it was found that it would be necessary to provide a station of about 750-k. w. capacity; such a station would have cost about \$85 per h. p., or a total of \$85,000. A battery station on the other hand required but little real estate, and would be inexpensive to operate, its cost would be considerably less than a power station. In the Chestnut Hill plant the entire cost of real estate, battery and building was approximately \$25,000; to this must be added the cost of a booster in the main power house. This required a 200-k. w. generator, which with its engines would cost about \$8,000. The total cost of battery and booster would, therefore, have been \$33,000. In this installation, however, they simply adapted a 300-k. w. generator at their power house to this service, so that they were put to but little extra expense in the power house for adapting it to booster purposes. We find, therefore, that deducting \$33,000 the cost of the battery and booster, from \$85,000, the cost of a station, that the difference in first cost is \$52,000 in favor of the battery. In addition to this, they were put to an expense of a little over \$13,000 for changes in the cable. In the estimates that follow I do not include any cost or interest on the cable, as the investment would have been about the same whether they had built a station or installed a battery. It is very apparent, therefore, from the facts given, that on a score of the first cost, the battery was by far the cheapest installment which they could make. In order that you may better understand the results which I propose to give in reference to the operation of this battery, I beg to describe the plant somewhat more in detail.

You will see by Fig. 5, there are three cables concerned in this work, which are numbered No. 3, No. 4 and No. 7, all of 1,000,000 c. m. in area; the lengths of these cables are shown on the diagram. Cable No. 4 is the only one which supplies the trolley wire direct; or, in other words, all the taps from the underground cable to the trolley wire are tapped on Cable No. 4; this cable runs all the way from the bus bar at the power house to the end of the line on the Reading Pike at Chestnut Hill. It feeds in all about 12 miles of trolley wire. Cable No. 3 runs direct from the power house to the bus bar at the battery house, e, as shown in the diagram. Cable No. 7 simply augments the capacity of cable No. 3.

In ordinary operation the current on cable No. 3 passes through the booster at the power house, by which the initial pressure is raised 150 volts more or less above the ordinary bus bar pressure of 550 volts, Fig. 7. By this means the drop in the cable is overcome, so that the pressure at the battery house can be adjusted to a point where the battery varies but little to either side of the zero point or, in other words, it charges and discharges continually maintaining the

load on cable No. 3 nearly constant, and consequently maintaining a constant e. m. f. where the current passes out from the battery house through cable No. 4, as shown in Fig. 5. This cable (No. 4) is therefore fed from two points, namely, from the power house end at 550 volts and from the Chestnut Hill end at about 515 volts. As a consequence, the distribution along the line from Wayne Junction to the end at Chestnut Hill is comparatively uniform and is now very satisfactory.

At first the battery was allowed to discharge during the day about three times as much as it charged, making up the charge at night between the hours of 1 a. m. to 5 a. m. Later the amount of day discharge was decreased until the charge and discharge were about equal. The first gave a very even voltage of a little over 500. With the present method the voltage is somewhat more irregular, but the average is somewhat higher. By keeping the battery continually up to full charge, the night man has been dispensed with.

Fig. 6 is a copy of an average voltmeter chart after the battery was installed. When the load in the line is low, the current going over the cable No. 3 to the battery house, divides at the bus bar, one part supplying the necessities of the line, the other part charging the battery. When the demand on the line is heavy, the pressure drops a little at the battery house; all the current going over cable No. 3 will pass out over cable No. 4, and in addition, the battery will discharge sufficiently to make up for the extra demand for current. This has the effect, as I have stated above, of keeping an almost constant load on cable No. 3. At times the load on cable No. 3 has become so heavy as to exceed the cable's capacity. At such times by an arrangement of switches at the power house, shown in Fig. 5, cable No. 4 is put on the booster as well as cable No. 3. In doing this, the current through the booster is largely increased, but the pressure can be reduced from about 250 to 125 or 130 volts, (see Fig. 7) and in addition, a better pressure is obtained at the Wayne Junction end of the section.

#### COST OF OPERATING.

For volt and ampere meter readings taken from the power house in October, 1896, we find that 136,576,919 watt-hours were delivered to the line at the battery house. These figures I may explain do not

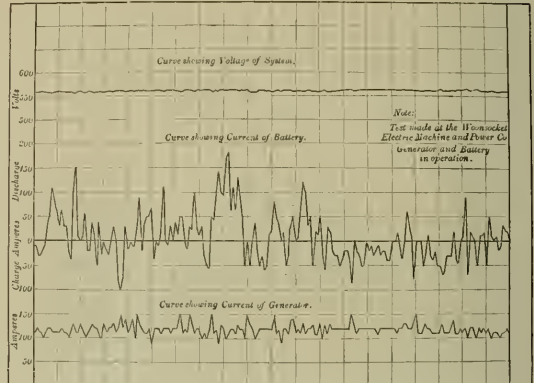


FIG. 9.—CURRENT AND PRESSURE CURVES AFTER BATTERY WAS INSTALLED AT WOONSOCKET.

include the watt-hours generated by the booster, since we have assumed that this entire amount is lost in transmission. As a matter of fact, this is not strictly correct; but if a station were operated at Chestnut Hill, it would be run at a bus bar pressure a little above the battery pressure, and therefore for our present purposes the assumption is correct. From our experience in operating power houses of various capacities we find that a power house operated at Chestnut Hill under conditions which I have described would cost about 1.5 cents per kilowatt-hour. We therefore got the following as the cost of generating the number of k. w. h. required by the Chestnut Hill

branch during the month of October, 1896, if furnished by a station at Chestnut Hill:

|                                                               |            |
|---------------------------------------------------------------|------------|
| 134,848 k. w. h. at 1.5 cents.....                            | \$2,022 73 |
| Interest on \$85,000 at 5 per cent per annum.....             | 354 17     |
| Depreciation on machinery, etc., at 5 per cent per annum..... | 354 17     |
| Insurance, taxes, etc.....                                    | 200 00     |

Total cost of operation for the month by direct methods..... \$2,931 07

Actual cost of operating the battery and booster.

|                                                     |             |
|-----------------------------------------------------|-------------|
| Watt-hours delivered to cable No. 3 by bus bar..... | 136,576,919 |
| Watt-hours generated by booster.....                | 31,234,648  |

Total watt-hours delivered to cable No. 3..... 170,811,567

The cost of operating the power house for the month of October, exclusive of interest and depreciation, was 7 mills per k. w. h.; therefore, we obtain the following:

|                                                      |            |
|------------------------------------------------------|------------|
| 170,811,567 k. w. h. at 0.7 cent.....                | \$1,195 68 |
| Cost of labor and supplies at battery house.....     | 179 73     |
| Total.....                                           | \$1,375 41 |
| Depreciation of battery at 5 per cent per annum..... | 83 33      |
| Interest at 5 per cent per annum on \$39,000.....    | 137 50     |
| Taxes, insurance, etc.....                           | 32 00      |
| Total cost of operation.....                         | \$1,625 24 |

Deducting this from the cost of operating by a station at Chestnut Hill, we find the difference in favor of the battery for the month would be, \$1,302.83.

Since October 1, 1896, the method of operating has been somewhat changed and by installing wattmeters more accurate data have been obtained.

During the month of May, 1897, there was delivered

|                                  |                         |
|----------------------------------|-------------------------|
| To cable No. 3 at 550 volts..... | 101,750,000 watt-hours. |
| To cable by booster.....         | 28,969,280 " "          |

Total at station..... 130,719,280 " "

|                                       |                 |
|---------------------------------------|-----------------|
| Total delivered at battery house..... | 103,673,448 " " |
| Less amount lost in line.....         | 630,000         |

Total output at battery house to line..... 103,043,448 " "

|                                                      |            |
|------------------------------------------------------|------------|
| 103,053,348 watt-hours at 1.5 cents per k. w. h..... | \$1,545 80 |
| Interest on \$85,000 at 5 per cent per annum.....    | 354 17     |
| Depreciation at 5 per cent per annum.....            | 354 17     |
| Insurance, taxes and miscellaneous.....              | 200 00     |

Total cost for May, 1897, by direct method..... \$2,454 14

|                                                    |           |
|----------------------------------------------------|-----------|
| Actual cost of operating battery:                  |           |
| 130,719,280 watt-hours at .6 cent per k. w. h..... | \$ 784 26 |
| Cost of labor and supplies.....                    | 163 67    |

Total..... \$ 947 93

|                                                      |        |
|------------------------------------------------------|--------|
| Depreciation of battery at 5 per cent per annum..... | 83 33  |
| Interest at 5 per cent per annum on \$39,000.....    | 137 50 |
| Taxes, insurance and miscellaneous.....              | 32 00  |

Total cost of operation..... \$1,100 76

NOTE: Cost of operating power house for May, 1897, was 6 mills per k. w. h.; 5 per cent depreciation of battery is the amount guaranteed by the makers.

Deducting \$1,100.76 the actual cost of operating battery for May, 1897, from \$2,454.14, the cost if station had been built at Chestnut Hill, we find a saving of \$1,353.38 in favor of the battery.

We may safely say, therefore, that the saving by using the battery is about \$1,350.00 per month or about \$16,200.00 per year.

### RECAPITULATION.

Saving in cost of installing battery over a new power station for Chestnut Hill..... \$52,000 00

Saving in operation per annum..... 16,200 00

These results speak for themselves, and need no further comment. The following data may also be of interest:

|                                                 | OCTOBER, '96. | MAY, '97.   |
|-------------------------------------------------|---------------|-------------|
|                                                 | Watt hours.   | Watt hours. |
| Highest charge for 24 hours.....                | 456,000       | 300,000     |
| Lowest " " 24 hours.....                        | 312,000       | 150,000     |
| Average " " 24 hours.....                       | 395,161       | 218,380     |
| Highest discharge for 24 hours.....             | 456,000       | 250,000     |
| Lowest " " 24 hours.....                        | 216,000       | 150,000     |
| Average " " 24 hours.....                       | 329,419       | 198,380     |
| Average efficiency for the month, per cent..... | 85.5          | 90.8        |
| Average day charge, amperes.....                | 46            | 45.8        |
| Average night charge.....                       | 155           | 155         |
| Average discharge.....                          | 50            | 48.7        |

Ratio of the night charge to the day charge..... } Highest 4 to 1.  
 } Lowest 1½ to 1.  
 } Average 2.63 to 1

OCTOBER '96.      MAY, '97.

Ratio of day charge to discharge..... } Highest 1 to 4.45      1 to 1.5.  
 } Lowest 1 to 1.86      1 to .78.  
 } Average 1 to 2.95      1 to 1.10.

|                                         |       |
|-----------------------------------------|-------|
| Maximum specific gravity at 6 a. m..... | 1.210 |
| Minimum " " " 6 a. m.....               | 1.2   |
| Average " " " 6 a. m.....               | 1.207 |

The above are the specific gravities at the end of full charge:

|                                         |       |
|-----------------------------------------|-------|
| Maximum specific gravity at 6 p. m..... | 1.201 |
| Minimum " " " 6 p. m.....               | 1.184 |
| Average " " " 6 p. m.....               | 1.192 |
| Maximum " " " 12 p. m.....              | 1.194 |
| Minimum " " " 12 p. m.....              | 1.182 |
| Average " " " 12 p. m.....              | 1.188 |

At a specific gravity of 1.16 the battery would be about empty; so that we find at no time was the battery more than half discharged.

At the end of 15 months of continuous operations, we have only had to repair two leaky tanks at an expense of about \$25. The positive plates look as good as when first installed, and show no depreciation whatever; the negatives on the other hand have contracted somewhat and some of the plugs have cracked, but this in no way impairs their usefulness.

This method of power distribution cannot be considered economical per se, but where the conditions are such as we have described, there is no question as to the economy in favor of the battery.

### Application of Battery to Power House.

This form of installation has not become very generally appreciated in this country, and but few installations have been made. As its advantages become better known, I feel confident the practice will become more general.

The wide fluctuations in load in railway power houses are now well known. The average daily load varies from 50 per cent of the maximum in small stations to 70 per cent of maximum in the largest stations. From a very large number of observations in all parts of the country I find that in the majority of stations the average load is very close to two-thirds of the maximum load. Now it is also a well known fact that the maximum economy of the steam engine exists for a very small range of load, and that on each side of the point of maximum economy the efficiency falls off; rapidly on the overload, somewhat less rapidly on the underload. The result is apparent.

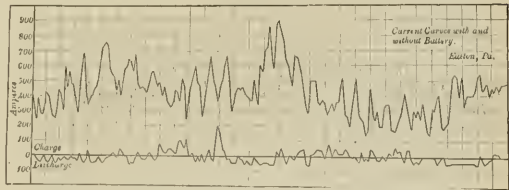


FIG. 10.—HEAVY LINE SHOWS OUTPUT OF FOUR GENERATORS WITHOUT BATTERY. LIGHT LINE SHOWS OUTPUT OF THREE GENERATORS WITH BATTERY. EASTON TRANSIT CO., EASTON, PA.

In most stations the engines at the best have an average load of only two-thirds their most efficient load, and as a consequence consume over 4.5 lbs. of coal per kilowatt-hour.

With badly regulated engines, and especially with water power plants, the changes in load are accompanied by variations in speed and consequently in voltage. These troubles may be entirely corrected by installing a battery.

The battery in this case becomes distinctly a load regulator. Figs. 8 and 9 show results obtained at Woonsocket, which is a water power plant. In Fig. 8 the load is carried entirely by the generators, and as is to be expected, the potential curve is very irregular, varying almost 100 volts, while the current varies from 0 to 250 amperes. The action of the battery is shown in Fig. 9, where the generator load varies about 50 amperes and the potential curve is most regular. Fig. 10 shows the results obtained at Easton, Pa. In this case the battery is quite small and the advantage is not quite so marked as it would be if a larger battery were used. Instead of using four generators, however, they are able now to operate the same number of cars with three engines. No cost figures for these plants are made public, but the increased efficiency is made apparent.

It is necessary that the capacity of the battery should bear a larger ratio to the output of the station than is necessary for potential regulation as described in the previous section of this paper. In potential regulation a comparatively small battery is necessary, since by changing the potential of booster from time to time during the

day the charge and discharge can be kept very low. In the case described a battery rated at 120 amperes has successfully regulated for a total output of 1,400 amperes. For load regulation, however, the battery should have a capacity equal to one-third the maximum output of the station. The average load of the station may then be made the maximum load of the engines, the battery taking care of the fluctuations.

As in the previous case there are no physical limitations to be placed on the size of the plates to be used, and the charge and discharge may be kept well within the normal rates. Under such conditions the efficiency of the battery is high, 85 to 90 per cent, and the deterioration very low. In most cases no additional labor will be required.

The President: Gentlemen, you have heard Mr. Hewitt's paper. We would like to have it fully discussed.

Mr. McCormack, of Brooklyn: Mr. Hewitt, I understood, stated that there were two cities in the United States where a car storage battery would be applicable. I would ask to what cities he refers.

Mr. Hewitt: I have in mind the cities of New York and Washington. There may be other cities which would like to have that system, but these are the only two which are seriously considering the matter.

Mr. McFadden, of Chester: Do you recommend the storage battery in conjunction with the booster in smaller stations, or the booster itself, say with a capacity of 900 amperes?

Mr. Hewitt: From my observation I believe that all small stations would be benefited in a large measure in their economy, if they had a storage battery. Of course, the question of investment must be considered in all these cases; but as a general principle, the operation of the station would be economized, if the battery can be used as an auxiliary.

Mr. MacFadden: What is the difference in cost per k. w. h. between the output of the booster, independent of the battery?

Mr. Hewitt: The only case in which I have had personal experience is the one in Philadelphia. I assume the output of the booster to be the same as the general output of the station. We do not keep separate records of the cost of it, and it would be impossible to do so. The steam furnished for the battery engines is from the same source as the steam furnished for the other engines, and we could not separate them; but I have taken the cost of the station for the months described, and assumed that was the pro rata cost of the k. w. h. generated by the booster.

Mr. Harrington, of Camden: Ask Mr. Hewitt if the manufacturers of the battery installation have guaranteed the depreciation, and if so, what the guarantee is?

Mr. Hewitt: The storage battery people will guarantee the depreciation, and they have guaranteed the depreciation in our case. I believe it is for five or 10 years, and at a certain rate pro rata to the cost of the battery. I do not feel at liberty to say just what the figure is. I do not think, however, that there is any special secret about it. Any man who wants to purchase a battery will get the information from a battery company.

Mr. Patterson, of Salt Lake City: I am very much interested in Mr. Hewitt's paper. It brings out some things that I have been thinking of along this same line. We in Salt Lake City have a steam plant as well as a water power plant, and we are now running our system by water power 18 miles from the city. We have occasionally, not often, been caused to shut down; once from a snow slide, which swept away the channel which we had around the mountain, and once from losing a bucket off the wheel. We still have our steam plant kept in good running order, but it takes from an hour to an hour and a half to steam up when these things occur. I was thinking when listening to the paper, that it might be possible to operate a storage battery in connection with our plants. I would like to ask Mr. Hewitt if, in his opinion, if we can have a storage battery, and if it would be a plausible scheme to turn the current after shutting down (we are at present, on average days, not counting the big days, running from 300 to 500 amperes), and run the plant by a battery; and if so, at which end of the plant would it be best to put the battery? I presume, of course, at the transformer end.

Mr. Hewitt: I think I am right in saying that the transmission referred to us by the gentlemen is an alternating current transmission; and there are difficulties in working a storage battery in conjunction with an alternating current. For that reason, it would be

impracticable to put the battery at the generating end. To put it at the steam plant end, which, I presume, is in the city, is simply a question of dollars and cents. A battery can be bought large enough to run any road in the United States, if you want to pay for it. It takes a pretty large battery to run the road, independent of all other sources, but it is simply a question of dollars and cents entirely. In using the battery, in conjunction with other sources of power, as I have explained in the paper, you take up simply the fluctuations, and let the station do the main work; but to have a battery installation large enough to do the entire work, and make up the fluctuations as well, you would find it necessary to have a pretty large battery for any ordinary road, but it can be done, if you want to buy it.

Mr. MacFadden: Would you consider it economical to have a booster and storage battery combined, as a booster line, where you would only want the power at certain times, during heavy loads and on heavy grades. The reason I ask is that we have a booster and only use it as required, and we have very good results, using it without any storage battery at all. I do not know about the economy. Would it be better to have the battery in conjunction with the booster, for such work, or turn the generator into a booster? We can use it either way, as required. If we do not use it as a booster, we can run it as a generator.

Mr. Hewitt: In the case referred to at Chester, I do not think the battery would add to their economy. The battery, as a potential regulator on the end of a long line, becomes useful when the variations are so great that in case of a sudden stopping of the cars, the potential would go so high as to do damage. For instance, at Chestnut Hill, on our plant there, we at times have the booster as high as 250 volts, above the usual 550 volts, making 800 volts in all. If the cars should be stopped or blocked at any point, the potential would go very high, and become dangerous and blow out the lights in the lamps and cause damage to controllers and other consequences would be sure to follow. The battery prevents the pressure going up in such cases. In the case the gentleman has mentioned, where the potential does not have to be boosted as high as to be dangerous, and is only boosted at times of heavy load, when the potential on the end of the line is within safe limits, I do not think it would be economical to use a battery. The local conditions of every case must be considered in all such installations.

Mr. Mundy, of Louisville: I desire to ask about the application of the battery, particularly in suburban work, such for instance, as race track travel, without the use of the booster. If the battery were mounted in cars, would it be practicable to run these cars out in cases of special loads to the end of the route, when you will have the load, and then, during the race or anything of that sort, the battery would be charged from your line, and at the instant of starting of the cars, pulling off at the same time the battery, and discharging back into the line, to carry you over the heavy peak? What do you think of the application of that? You could use that same battery, in times of long waits of that kind, by having a side-track at the station, and run it in to act as an auxiliary at the stations.

Mr. Hewitt: That is one of the variations of the scheme used abroad, which is perfectly possible. It is a matter, of course, on which an opinion could hardly be given in an off-hand way such as this. It would have to be considered entirely with a view to the local conditions. The cost of the battery would have to be considered against the cost of putting up the necessary line work, and running cars under these conditions and the cost of maintaining the batteries would have to be considered as against the cost of running the cars in the other way. It might in some cases prove valuable, and it might in other cases prove very costly. I could not give an opinion or estimate at the present time.

Mr. Mundy: Which do you consider would be the most economical? The use of the battery or the use of the booster.

Mr. Hewitt: I am hardly prepared to give a judgment in an off-hand way in a case like that.

H. H. Littell, of Buffalo: This is the most important question, as far as dollars and cents are concerned, that has been brought before this meeting—the question of saving money. The gentleman talks of a saving of \$33,000. It has been shown to us that we can save \$75,000 yearly in our operation by the use of the storage battery, and I am almost led to believe that we can do it, but we have not made any contracts yet. I believe we ought to hear from all of the storage battery men. They have not asked me to make this request, and I have not talked with them on the subject. I believe we should give them an opportunity to say what they have to say. I ask that



unanimous consent be given to the various representatives of the storage batteries to state the merits of their respective batteries.

President McCulloch put the question asking unanimous consent to have the representatives of the storage battery companies address the meeting; but as objection was raised by some of the members that the time of the convention could not permit this, the matter was not acted upon affirmatively.

Mr. Mundy: I ask the question if it is practicable to construct these batteries so that you could handle them on cars without drawing the liquid from the cells?

H. H. Littell: That shows the necessity of hearing from the battery men. The battery Mr. Hewitt described does not go on the cars, and is not supposed to be put on the cars. It is an accumulator.

Mr. Mundy: I mean with reference to what I said a few minutes since, using it at the end of the line, if it could be handled in a car of that kind, to stand jolting without spilling the cells?

Mr. Wilson, of Sioux City: During the last few years a number of the smaller plants throughout the country—those which are operating a load from 300 to 1,000 amperes—have installed direct connected units, a great many of them using compound engines. As Mr. Hewitt stated these engines run at their highest efficiency only through a small range of the load. Now, in these smaller plants these engines run at very light load the most of the time. Mr. Hewitt spoke briefly, I thought, of the application of storage batteries to stations for load regulation. I would ask him if he can say anything further on that point and give some idea of what saving could be effected in stations of the size I have mentioned.

Mr. Hewitt: I spoke briefly on that subject, because there has been so little done in that line. If I had gone any further, it would have been in the line of argument only, and I wanted to keep as close to the facts as possible. In the case of Easton, it required four engines to run their cars. At the present time they run with three engines. That of itself shows that these three engines will run more economically than the four in the previous case; the number of cars remaining the same. The difference will be between the economy of an engine running at approximately its maximum economy and an engine running at a lower economy. Just what the difference is at Easton, I do not know, because I was unable to get the exact data; but it would probably be a difference of 25 per cent in the coal. If an engine is running at a low economy, with five or six pounds of coal, at a low average load, and you increase the load to its maximum economy, you can probably reduce the coal per horse-power-hour output 20 or 25 per cent; but, in addition to that, you must deduct the loss in the battery itself, so that the net saving would possibly be 20 per cent or thereabouts. I do not wish to quote that as an authority, because I have not the facts.

Mr. Harrington, of Camden: I would inquire if there is any person present who has had experience in the question which has been raised, as to the matter of percentage of efficiency between running with or without the storage battery. It has been raised in our particular case, and just that one question is the hinge point, I think, more than anything else, to decide the question with us—just what saving would be effected, what the percentage would be. Mr. Hewitt thinks it would be about 20 per cent. If any of the Easton people are here, they would probably know.

The President: Is there any gentleman here who has had experience so that he can answer this question?

Mr. Ely, of Niagara Falls: I agree with Mr. Littell that this is probably the most important question coming before us, as it means, if successful, the saving of thousands of dollars, to say nothing of the cents. We are taking power for the Buffalo & Niagara Falls Railway, and other street railways of Buffalo as well, from these large generating companies, the Niagara Falls Power Company, and the Niagara Falls Hydraulic Power & Manufacturing Company. They generate the power and sell it to the street railway companies at so much per electrical h. p. per annum. You will see at a glance that the street railway company has to pay for that power, whether it is used or not, and for eight hours of the day, on an average, but a small quantity of the power will be used, and for a certain number of hours, on our line particularly, four or five hours, no power whatever is being used; but we are paying all the time the fixed rate for the entire amount of power. If the accumulator could be used to store the current, and we could use it at times when we might not take it from the power companies direct, it would be a saving to our companies of thousands of dollars per annum. In Mr. Littell's case it would be great saving. His company is taking 1,000 h. p. from this

transmission line, and they are going to take more. Mr. Hewitt, in your judgment, as the result of your investigation, has the state of the art advanced to that degree that storage batteries or accumulators may now be safely, practicably and economically installed to meet such cases?

Mr. Hewitt: Yes, sir, I think the batteries can undoubtedly be installed in such cases with economy. It is merely a question of size. If you install a battery powerful enough to do the work, it will do it well and reliably. The trouble in most cases has been an over-rating of the batteries. The batteries are expensive, and in most cases the railroad companies have been afraid to buy a battery large enough to do the work well. If you buy a battery which is too small it will go to pieces. If you pay enough money to get one that will last you for years, it will do the work well, and will be a valuable auxiliary. Whether it will be a saving to any considerable extent in this particular case, I could not say, off-hand. It could be figured out and possibly effect a considerable saving. From what you have said, I can see that if you are paying for a 24-hour day, and you could accumulate a certain amount of power in an accumulator, you might reduce the amount of power which you are paying for; in other words, if you are paying for 1,000 horse-power-hours, you might reduce it at the end of your present contract to a lower amount, and use your power then the whole 24 hours. That is a possibility; whether it would save you money, I would not wish to say. It would have to be considered the expense of the battery, maintenance, and such things would have to be figured out. As far as the physical possibilities go, it is perfectly feasible.

Mr. Dyer, of Augusta: I offer a resolution of thanks to Mr. Hewitt for this very able paper. It is certainly one in which we have all been much interested, and we are under many obligations to Mr. Hewitt. I also move that the paper be received and spread upon the minutes. Carried.

President McCulloch, in putting the motion, said: Mr. Hewitt also deserves great credit for having been present and read his paper, and answered the questions asked of him. One hundred times the force and value is given to the paper, by being present and able to follow it out and answer questions as Mr. Hewitt has done. (Applause.)

The President: The next paper is on "Power, Distribution and Use of Multiphase Current Transmission for Ordinary Street Railways," by Maurice Hoopes, electrical engineer, Lynn & Boston Railway Company, Lynn, Mass. Mr. Sergeant says that Mr. Hoopes intended to be here and read his paper, and answer questions, but has been compelled to abandon his work, and go away for recuperation, and as he is unable to be here the secretary will read the paper.

The secretary read the paper, as follows:

#### POWER DISTRIBUTION AND THE USE OF MULTIPHASE CURRENT TRANSMISSION FOR ORDINARY STREET RAILWAYS.

By Maurice Hoopes, Electrical Engineer, Lynn & Boston Railroad Company, Lynn, Mass.

The subject that has been assigned to me for discussion is one that has received considerable attention of recent years. Aside from the demands of what is usually considered steam railroad service, the business of the ordinary urban and suburban railways has grown lately in a way that requires some means of augmenting the usual method of power distribution. Lines have been extended to greater distances from power stations, and traffic has increased on lines which always have been remote from their points of power supply. These conditions have arisen at places where disadvantages of location or lack of sufficient load would render additional power stations unprofitable. To meet such demands, several methods have been devised. The consideration of the comparative merits of these systems is the principal purpose of this paper. Before undertaking this task, however, the writer desires to discuss some of the conditions met with in the operation of the ordinary 550-volt distribution system, some of the points raised have been frequently made. For these, an apology is offered in advance, the excuse being that they are sufficiently important to bear reiteration.

The usual electric railway distribution system, with its copper network as one, and its iron network as the other half, offers

Maurice Hoopes, electrical engineer of the Lyon & Boston Railroad Company, received his early experience with the Edison Electric Illuminating Company of West Chester, Pa., where he served one year as assistant superintendent and one year as superintendent. He gave up this position to begin the course of electrical engineering at Cornell University. A prolonged illness ended his collegiate training, and upon his recovery he was appointed to the superintendencies of the West Chester Street Railway Company and the Edison Illuminating Company. After two years of service Mr. Hoopes resigned these positions and became the engineer of the Lynn & Boston which was the consolidation of the various railway companies north of Boston. This position which includes both electrical and steam engineering, he has held for the past five years and has been instrumental in solving many important problems which have presented themselves on this system. Some interesting features of his work have been described in these columns and his convention paper is based on the experience with alternating and direct current distribution.

rather more complicated problems than does the ordinary form of all copper circuits. The latter system is symmetrical, whereas the former is likely to have greater resistance in the copper than in the iron portion. A rule that holds good of both systems is that the maximum benefit in reduction of total resistance, due to the addition of a given amount of conductor, results when the addition is made to the parts in which the drop is greatest per unit of length. An observance of this rule is important in adding to distribution systems. This demands a careful analysis of existing conditions. Before adding feed wire to a railway circuit, it is important to know the drops, under usual load, of the parts of the circuit. These may be found by the use of pressure wires, or by short circuiting the trolley wire to the rail, and passing a given current through the circuit, measuring the total drop and deducting the calculated overhead resistance from the total resistance thus found. Private telephone lines serve the purpose of pressure wires to measure track drops, and public lines, connected through the exchange may be used without interference with the service. An exception to the general rule, that the copper should be added to the part of the circuit showing the greatest resistance, is the case of a poorly bonded track that may show less resistance than the overhead. Re-enforcing such track with overhead copper connected to each end of all special work may result in the greater decrease in the total resistance of the circuit. This is really a special application of the general rule, rather than an exception to it, however.

Means for regular and easy measurement of track joint drops should exist. For tracks having frequent high resistance joints, there is no better way than walking over it with a low reading voltmeter connected to prongs on the end of a stick, that it may be bridged across joints. For detecting poor joints in good track, where they are far apart, and for the general inspection of the condition of track wiring, a car is convenient. A box trailer with each wheel insulated from all others, and a voltmeter connected between the two wheels on each side of the car, may be used. A third meter connecting the two opposite wheels will indicate defects in cross bonding. The writer considers that it is unnecessary to complicate the measurements by attempting to measure the resistance of the joint. His experience is that, if a bond is loose enough to have abnormal resistance, it will get worse rapidly and show excessive drop with even small amounts of current. It behaves very much as did Longfellow's little girl, and is either "very, very good," or "horrid."

It is universally recognized that the maximum efficiency is obtained from a distribution system when it is operated as a whole, and not divided into sections. The liability of accident to railway trolley wires makes it necessary to separate them in such a way that trouble at one point will not block the whole road. These sections should be as few as possible, while accomplishing the purpose for which they are designed.

Where one road has two or more power stations, the sections approximately equidistant from each of the two stations should be connected with both. They may then serve to equalize load between stations, the common section being cut loose from the station needing to decrease load. Two feeders to such a section, one from each station, constitute a tie line between stations. If desired, the potential may be raised in one station to a point that will deliver current into the other. Unless the drop in the combined feeders is excessive, it will probably be safe to allow the section attached to take the increased potential. Tie lines between stations which serve none but emergency purposes, are expensive, especially if the stations are distant from each other.

Where the ordinary methods of distribution are not applicable

because of the prohibitive amount of copper necessary, some one of the following systems is commonly used to care for the particular section:

1. A "special generator" run at increased voltage and usually over-compounded as much as possible, handling the section and no other load.

2. A "booster," consisting of a series wound generator, connected in series with the feeder as it leaves the main station bus bar. The field turns of this generator should be such as to make the e. m. f. of the armature as nearly as is possible equal to the drop in the feeder, throughout all ranges of current.

3. The "three wire system." This requires the division of the section into two. One half is then supplied from the regular bus bar, and the other from a special generator, with the polarity reversed, to bring the trolley wire opposite in potential to that of the rest of the system. The trolley wire should be so divided into the two half sections as to leave, as nearly as possible, equal loads on the two at all times. With this arrangement, the current in the track is only that flowing from the cars on one half section to those on the other. If these half sections are located near each other, this path through the track is very short. For this reason, it is usual to make one track of a double track road one half, and the other track the second half section. Unless conditions are such that the cars are likely to be bunched on one track this seems the better way of dividing. In addition to conducting current between cars, the track has to conduct back to the power station the excess in current used on one half section over that used on the other.

4. The "alternating current transmission system." The only form of alternating current system desirable for railroad work consists of high voltage multiphase generators (or low voltage generators with step-up transformers) in the main station, connected with one or more sub-stations containing step-down and rotary transformers. There are some half dozen such systems in use in this country, of which the best known are those from Lowell to Nashua, and from the station of the Niagara Falls Power Company to Buffalo.

With any of the foregoing systems, the storage battery may be applied as an auxiliary. In a railway power station, a battery is useful to the extent that it improves the station capacity and fuel economy by removing the immediate fluctuations. The writer considers that there are few instances where a battery can be installed, with resulting profit, where its function is the storing of power one hour for use the next. Except with very short time peaks, the battery costs as much as the additional generating apparatus. Particularly in small stations, however, there is such a variable load that it is impossible to average the full load from the station for a period of time, because of the inability to handle the very great short time overloads that such an average load demands. In such a station, a battery may result in a considerable increase in station capacity, and, by allowing the engines to operate at practically constant loads reduce the fuel consumption greatly. While a battery may do these things in the station, it may do even more, remote from the station. In the latter location, it will keep the potential near it practically constant, and will also maintain uniform current flow between the station and the particular point, thus adding the advantages of regulation and greatly increased copper efficiency.

One side of the story makes a pretty good case for the storage battery; unfortunately, the other must be told. The first cost of a battery is so very great that reasonable interest and depreciation on the amount invested will more than consume the apparent saving, in many cases. Especially is this so in the case of a battery located on the line, where it has been shown that the gross saving is the greatest. This is true because it requires a very much larger investment in the battery to care for the load variations of a given station if the batteries must be divided up among several sub-stations, the load factor of each of which is necessarily lower than that of the main station. The sum of the maximum variations of the several stations is always greatly in excess of the maximum variations in the main station. If, however, a power station were to be located at a considerable distance from a single center of distribution, through which all feeders from the station passed, it is quite probable that a battery placed at the latter point, would result in a net saving, due to its giving each, the station and copper a uniform load.



When it becomes necessary to select from the foregoing list the most suitable system for a given case, there are many considerations to consider in the decision. Either of the first three, the special generator, the booster, or the three wire system, may be arranged with the apparatus in any railway power station, assuming that it includes a reserve generator of the necessary size. It is better to use standard railway machines for these purposes, and, if possible, to arrange the station so that any one of the regular station machines may be used. It frequently occurs that one or more sections of line fed from a certain station have copper enough leading to them to care for them properly at all times, excepting a few hours on each ordinary day, and for longer periods on heavy days. While the work may be quite variable at times of light load, when the load increases it becomes more nearly uniform. Such sections may be satisfactorily supplied over the copper designed for the lighter load, by raising the voltage on the station end of the feeder during heavy loads. Usually, the margin in the field rheostat will allow the increase of voltage on any one of the generators, to a point considerably above the normal. When this is not so, it is possible that the generator speed may be increased, unless limited by the requirements of safety in the driving engine.

In one or both of these ways, it is often possible to get from 700 to 750 volts from a standard 550-volt machine. This increase enables the heavy load on the section to be handled very satisfactorily. The voltage at the feeder end necessarily varies with the load, and with ordinary fluctuations there may easily be 100 volts difference between the minimum and maximum. A recording voltmeter placed at the feeder end will show a very inky piece of paper, after a run. In practice, on a line which the writer finds it necessary to handle in this way, he gets variations from 450 to 550 volts. The minimum is infrequent, however, and the schedule is made apparently as well as though the potential were absolutely uniform.

Considering the question of abuse of apparatus, the increased voltage is not likely to injure a generator of modern construction. Practically, the only additional care that seems necessary is of the generator fields, noting that the increased current in the shunt windings does not heat them above safe temperature. So long as the potential at the car stays under 600 volts, there is little probability of trouble with equipment. Although the writer has had no such experience, he has known of cases where higher voltages have caused the arcs at the controller contacts, when breaking, to jump to the iron frames. This difficulty has been experienced more particularly on small roads using boosters, where one car might constitute the entire load on the booster. At times of throwing off the power, the booster holds up its potential for a sufficient time to result in a very greatly increased voltage during the time of the controller opening.

The method just described has the advantage of simplicity and economy. Cases arise, however, when the very great fluctuations in load make its use impracticable, with a line which, at certain times, carries very heavy current, as compared with the average, there must be some means of automatically raising and lowering the voltage at the station end of the feeder, to properly compensate for the variable drops. To accomplish this, a booster is used. As has been said, this machine is a series wound generator, connected into the feeder as it leaves the main bus bar, and so proportioned that a given current through it will give sufficient field strength to induce an e. m. f. in the armature equal to the fall of potential which the same current causes in the feeder. In practice, this condition is only approximated. Were the generators to have a perfectly straight characteristic curve, of proper pitch to match that of the feeder drop, the feeder and potential would exactly coincide with that of the power station. The curves of all dynamos drop away towards the horizontal as the magnets approach saturation. This results in the booster failing to compensate wholly for drops of currents above a certain amount. In practice, however, boosters are used which raise a feeder potential to 1,000 volts, and care for variable loads without allowing the light load voltages to rise at the feeder ends, to dangerous amounts. The system has the advantage of caring for extreme overloads on particular feeders, and is useful in cases where, for short periods of time, the feeder load is such as to cause excessive drops, and the time is not great enough to justify increased copper investment. On the other hand it is expensive of operation, due

to the facts that it wastes considerable energy, and that it generates this wasted energy in rather an extravagant way. If the booster is engine driven, the engine has widely fluctuating loads to handle, the load varying as the square of the current in the feeder. These variations necessarily result in a very low economy for the engine. With a motor driven booster, there are the constant losses of the two machines to meet. These are not so great as those of the engine and booster, but the necessity of keeping a particular generator for use as a booster limits the flexibility of the arrangement as compared with one which permits the use of any of the regular station generators, and, moreover, the addition of a motor booster does not increase the capacity of the station, as the power to drive the motor must come from the engines. The compounding of the standard types of railway generators is usually such that, when full load current is passed through them, the series turns alone will raise the fields to a point that will induce nearly normal e. m. f. in the armature. This adapts the machine for use as a booster on almost any line, excepting one requiring more than 100 per cent increase of potential at times of full load. As lines when so overloaded would be much better provided for by the addition of more copper, they need not be considered. In most cases, it is necessary to cut down the e. m. f. of the standard generator in order to secure the proper ratio of e. m. f. to current, for boosting, and this may be done by decreasing either its speed or the number of field turns. The former method has the advantage with an engine driven unit of improving the engine economy by lessening the friction losses and keeping the cut-off at a less wasteful point, when the latter is the simpler way. To accomplish this, the writer uses a long German silver strip of sufficient section to carry the proportion of current that it is desired to shunt out of the fields. This strip is fastened to the generator frame, connected across the terminals of the series field and doubled on itself in such a way that a clamp may be slid back or forth on it, raising or lowering its resistance. Knowing the resistance of the feeder upon which the machine is boosting, the clamp may be shifted to the point where the ratio between the readings of the voltmeter and ammeter is equal to the feeder resistance, and the proper adjustment reached.

For temporary uses, it is possible to make the necessary switch-board connections with flexible cables as the only adjuncts to the apparatus on the regulation board. A cable which may be attached to the positive lead of any of the generators, at the switch-board, and to any feeder, answers the entire purpose. With some boards, it is only necessary to have terminals on the cable that may be inserted into switch jaws. If the generator leads and the feeders happen to terminate in switch blades instead of jaws, the cable must have its ends fitted to clamp quickly to these blades. With this preparation, in order to transfer a particular feeder to a special generator for the purpose of increasing the voltage upon it the cable should be attached to the positive generator terminal, the other end hung (convenient to the feeder switch, the generator built up already for use, the feeder opened and attached to the cable, and finally the circuit breaker and negative generator switch closed.

If it is desired to extend this system to booster working, it is necessary to have a second cable leading from the positive bus bar and capable of connection to the negative terminal of the booster. It is best to include a circuit breaker in this cable to protect the booster, as the regular generator circuit breaker will be cut out.

At best, however, cables are troublesome appliances and allow only comparatively slow transfers. Moreover, it is impracticable to arrange cables so that two generators may be run in parallel on the special high voltage service. Where a new board is being installed, and where the circumstances justify the alterations in an existing board, such a one as is shown in Fig. 1, meets the required conditions. The two equalizing bars make it possible to run two or more machines on each the regular and high voltage at one time. With the arrangement, any two combinations of feeders and generators desired may be had. When running the "special generator," the negative switches are thrown up, and the positive and equalizing switches on the special machines thrown down. The switches on the feeders needing the increased voltage are likewise thrown down. If it is desired to use the auxiliary bus bar for booster purposes, the equalizing switch is left open, and the adjustable field shunt applied, the negative generator



switch is thrown down, after closing the booster circuit breaker, and the feeder is transferred down to the auxiliary bus bar. This puts the booster generator in series with the particular feeder. One very important thing in this connection is to make sure that the shunt field circuit is open on the boosting generator. It might be advisable to interlock the field switch with the negative generator switch in such a way that the latter could not be thrown down except with the former open.

The drawing of the board shows a wattmeter and an ammeter in each bar. By providing a double throw switch connected in such a way as to open the lower wattmeter from the feeder board, and connect it to the upper bus bar on the generator side of the ammeter shunt, the four instruments will be in series between the

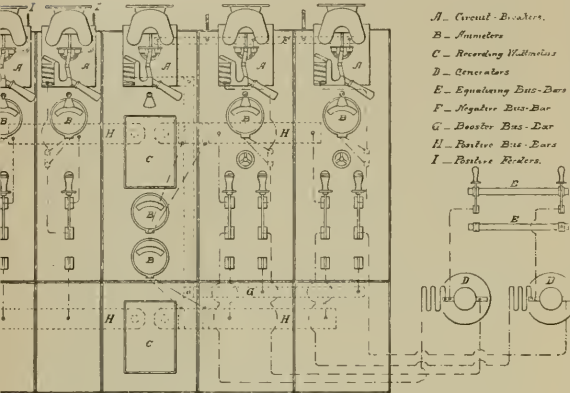


FIG. 1.

generators, all running on the lower bus bar, and the feeders all running on the upper bus bar. This offers convenient means for checking meters, care being taken to see that current passing through the diagonal bar, on the back of the instrument panel, does not introduce an error into the wattmeter indications.

In a modern station of few large units, it is improbable, were the necessity for booster service to exist, that one of the large generators could be spared or would be desirable for the purpose.

In such stations, however, it is usual to install a smaller machine to carry the all-night and other light loads. This machine might be relied upon for the booster work. If the engine driving it have its governor arranged to adjust for a large variety of speeds, both above and below normal, and the unit be designed to run safely at the increased speeds, the combination will be found very convenient for meeting all classes of demand. The speed may be dropped for booster working, and raised when the generator is run at high voltage on a particular feeder. With this arrangement of dependence upon an individual unit for the special service, it is of course unnecessary to equip the whole switchboard with the extra negative bus bar. The double positive bus bar will be found convenient in any station, however.

The "three wire system," although very useful in lighting work, has been of little service in railroad distribution. Its value for the latter purpose has been considerably over-estimated, although there are places where its use has resulted in the maintenance of a satisfactory potential on sections of track, using the same copper, when the usual system could not approach doing it.

The advantage of the three wire system is due to the fact that it enables the use of double the usual potential for distribution, thus in the perfect case requiring but one-fourth the copper to transmit a given current at a given loss.

This law, that the amount of copper varies inversely as the square of the potential, is because doubling the voltage halves the current for a given amount of energy. The same percentage of loss allows a loss of twice the number of volts, and this, with but half the current, admits of the use of copper having four

times the resistance, hence one-fourth the weight. The "perfect case" just cited is one in which no third or "neutral" wire is necessary. Such an one does not exist in practice, and this neutral wire has to be supplied to conduct the excess of the current used on one side of the system over that used on the other, between the generators and the motors. In railroad work, the rail is used as the neutral conductor. It is seldom that a whole road is operated on the system, the common practice being to apply it to only those parts on which the ordinary system is insufficient. Where there are but one or two sections to operate with the reversed potential, the switchboard described may care for them satisfactorily. If one generator is made to build up with reversed polarity, and is coupled into the auxiliary bus bar, it will handle such feeders as may be thrown upon it as the negative side of a three wire system. The generator may have its residual charge reversed in a number of ways, one of which is to have the shunt field wired through a double throw switch on the machine, arranged to disconnect the field coils from the armature and connect them in the reverse direction to a pair of charging wires fed from the switchboard. The machine may have its residual charge brought back to the usual direction by the commonly used means of throwing in the positive and equalizing switches, with the negative open, and allowing the current shunted from the series coils of the other machines to energize its series coil. Where three pole switches are used on the generators, the shunt field double throw switches may be omitted, and the field reversed through the series coil by using an X-shaped pair of contact pieces insulated from each other at the point of intersection. These may be pressed against the switch jaws in such a way as to reverse the current shunted from the other series coils through that of the machine to be reversed. Where the three wire system is the regular system of operation, and the sections are divided equally between the two sides of the system, a regular three wire board is preferable. For a less general use of the system, the method described answers as well. The arrangement then becomes the same as that of the "special generator," with the polarity reversed, and the potential on the machine may be raised above normal, and the advantage of greater allowable drop in the copper added to that of the saving in track drop, due to the reversed current flow.

The writer has said that the value of the three wire system in railroad service has been considerably over-estimated. This statement probably needs explanation. In lighting work, the three wire system saves 62½ per cent of the copper. Each wire has to be but one-fourth as large as with the two wire system, but it is usual to make the neutral of the same size as the other wires, thus requiring three wires, each of one-fourth the size of those of a two wire system, hence the use in the three wire system of three-eighths, or 37½ per cent, of the copper necessary in the two wire system. Because this is true of lighting work, it is often assumed to be true of railway work. It is not, however, and in no case, where the track renders any appreciable service as a conductor, can the saving from the adoption of the three wire system approach the above figures. In general, its use will make a gross saving of the loss in track (assuming that there is no copper paralleling the track that may be used as a positive feeder). The net saving will be this gross loss in track less the track losses due to the passage of current from car to car, and of the excess of current due to lack of balance, back to the power station, and the increase overhead loss due to the greater drops in the divided feeders than in them when

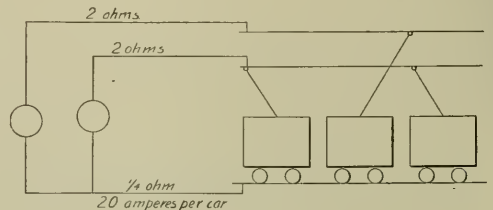


FIG. 2.

## LOSSES IN WATTS.

|          | TWO WIRE SYSTEM                 | THREE WIRE SYSTEM               | SAVING |
|----------|---------------------------------|---------------------------------|--------|
| + Feeder | $60^2 \times 1 = 3600$          | $20^2 \times 2 = 800$           | } -400 |
| - " "    |                                 | $40^2 \times 2 = 3200$          |        |
| Track    | $60^2 \times \frac{1}{4} = 900$ | $20^2 \times \frac{1}{4} = 100$ | } 800  |
| Total    | 4500                            | 4100                            | 400    |

combined. The sketch, Fig. 2, may present this more intelligibly. It illustrates the simple case of an unbalanced three wire system, and shows that its losses aggregate 4,100 watts under the particular load. If this system were changed to a two wire one by throwing the two feeders in parallel, it would save 400 watts in the feeders, and lose 800 more in the track, leaving a net loss of 400 watts, or about 10 per cent of the total loss. Such a difference as is shown by this hypothetical case would not justify the complication introduced by the system. The only conditions where the method seems to be applicable, are those of excessive track losses with fair opportunities for balanced load. Such a case existed on the Lowell & Suburban road. They have a heavy business over a double track line to their park, some six miles from the power station. By changing to positive feeders those formerly used as overhead returns, and operating the line as a three wire one, they very greatly improved the efficiency of the distribution system.

In the selection, from the various systems of distribution, of the one best adapted to a particular instance, there is always a large number of variable factors to consider, and usually more or less speculation as to the values of certain ones on which no accurate data are accessible. This makes it impossible to work from fixed laws, and demands individual consideration of each case. For these reasons, there is considerable room for divergence of opinions in the matter. The writer has given his ideas as to the comparative infrequency of cases in which the three wire system is desirable. The booster has a very much more general application, and is suited to a greater number of cases than is any one of the other systems. Nevertheless, wherever work can be satisfactorily handled by a special generator, it should be, unless the change involves abandoning existing apparatus. The last method saves considerable over the booster, and is preferable for its simplicity. The only limiting condition to its use in satisfactory regulation.

The alternating current system, with rotary converter sub-stations, competes with the booster and special generator in cases where the load factor (the ratio of average to maximum load) is high, and where the regular 500-volt transmission will suffice during only a few of the 24 hours. In such a case, the copper losses, because of the length of time during which they are excessive, are so great that they may often exceed the entire expense of an alternating transmission system. The latter system also enters into competition with the independent power station for that class of business that is too remote from an existing station to admit of satisfactory handling by the other transmission methods, and too small to furnish load for such a station as may approach in economy the station from which the alternating transmission would be operated. Cases of each kind arise with city roads, in their needs for transmission to suburban centers of load, and with interurban roads.

The roads which the city station receives from the suburban centers have usually a very low factor. At morning and night, they are excessive, and through the remaining hours comparatively light. Were an alternating transmission system installed for such use it would probably lie idle for a large part of the time, its copper being used to transmit direct current. During the heavy hours, it would be called into service. This same service might be rendered by raising the voltage on the direct current feeders by use of the "special generators," and allowing the loss, which has been from 5 to 10 per cent during the light load, to become 25 or 30 per cent. In this way, the line may

carry three or four times as much current, and maintain the voltage at the distant end.

In comparing the systems, it is necessary to compute the annual cost of each, including the items in the following list:

### Alternating Current.

Fixed charges and repairs on main station; static transformers, if any, and on sub-station, station and rotary transformers, and accessories.

Fixed charges on sub-station land and buildings.

Sub-station labor.

### Direct Current.

Interest, depreciation, and repairs on such increased cost of engines and generators, as is occasioned by their being fitted to furnish increased voltage.

Cost of fuel to produce output representing difference between losses in direct current feeders, and those in alternating current feeders and transformers.

This assumes that the same amount of copper is used in each system, that the alternating system does not remove the need for sufficient copper to handle the load with direct current during a part of the time, and that this amount of copper will suffice for heavy loads by means of the increased direct current potential transmission. Should the load be of such a nature that the alternating transmission would be operated throughout the whole time, there may be a correction made in its favor of the annual cost on the increased amount of copper necessary for the direct current system over that for the alternating system. It is probable that the direct current generator and the engines need not be increased in cost more than 10 per cent by the requirements of the increased voltage. The writer has said that he is operating satisfactorily with machines designed for the standard voltage. Points which should be made against the alternating current system, which cannot be given exact money values, are the danger to life from the increased voltage, lack of uniformity in the equipment, making lack of flexibility in the stations (where, under the other arrangement, any generator may serve any demand), and the danger of delays due to the increased complication of the system, it sometimes requiring 15 or 20 minutes to start the sub-station machinery and get it into service after it has been stopped in the midst of load by accident. These points of disadvantage are very important ones, and operating companies can well afford to expend considerable money to avoid them. Especially is it undesirable to install for railroad work a system which may be disturbed by the extreme overloads such work introduces, and which cannot be restored to an operative condition immediately the load is brought within bounds. With the rotary transformer system, any short circuit or extreme load, which is not relieved by the sub-station direct current circuit breakers, may stop the rotaries and shut the power off the line during the long interval it takes to start them and put them into service.

In the comparative estimate, the results depend more upon the local factor than any other condition. With it sufficiently high, the alternating transmission may show an economy over the direct current for areas within a very few miles of the power station. Unfortunately, however, the yearly load factor is usually very low on railway work. With such a condition, it is cheaper to have excessive losses in copper at times of heavy loads than to carry the necessary equipment of alternating transmission apparatus to keep the losses down at such times. The railway manager naturally insists that the voltage be maintained reasonably near its normal value over the whole road at times of heaviest business. Estimates that show immense costs for copper to accomplish this under the regular distribution system make him turn to the consideration of additional power stations and multiphase transmissions. If he can be shown that he may care for his maximum loads over the existing copper by simply raising the voltage on the station end of the sections of heavy loss, and pay for the loss with coal instead of with interest and depreciation on a great amount of additional machinery, he is likely at least to determine carefully which he can better afford to do.

While, in the writer's opinion, the majority of cases may be best handled by direct current distribution, there are many instances of need for a distribution system where none but the alternating current system is applicable. Where water powers are used, they are almost always so remote from the center of load that very high potentials must be used for economical trans-

mission. Long interurban roads operating so few cars that load can be had for only one power station bring a condition where distribution must be accomplished by sub-stations, on the alternating system. The Lowell transmission presents a case where it was a problem whether to care for the new territory with a separate station, or to transmit from the existing station. So much has been written about the multiphase current system that was decided upon and installed there, that it is unnecessary to attempt a description of it. Mr. Sullivan, the general manager of the company, has kindly furnished the writer with a copy of the estimates from which the choice of systems was made. He states that operation justifies the estimate in its statement of the cost of the multiphase system. It showed the cost of power delivered to the trolley wire to be for the transmission system 70 per cent of that for the separate power station. There were no figures showing for what this work could have been done with a hooster system. Inasmuch as the latter method has been used successfully in place of the other, temporarily, it would be interesting to know its comparative cost. Tests of the Lowell system extending over 18 days show an all-time efficiency of 70 per cent as measured from alternating generator output to rotary converter output, the losses being those of two sets of static transformers, line and rotaries. The maximum efficiency for any one day was 73 per cent. The voltage regulation at the sub-station is about equal to that of a well governed steam driven power station.

The writer has said that the use of alternating currents for ordinary electric railways is limited to the rotary converter system. This is due to the fact that alternating current motors, in their present state of development, are not adapted to the needs of such railways. As yet, their use for traction purposes is limited to a few European roads, of which the best known is in Lugano, Italy. Alternating motors have the disadvantages of limited torque and tendency to synchronism. This makes them poorly adapted for the uses of any line but one having runs at practically uniform speeds, and few stops. These conditions are those of a through express service between cities. Accommodation and ordinary street railway services are such as can only be handled satisfactorily by direct current motors. At first notice, this fact seems rather contradictory to one's ideas of the flexibility of alternating currents. The ideal system has been thought to be one composed of a generating station containing large multiphase generators, with lines distributing current at a potential high enough to require but a comparatively small amount of copper, static stop-down transformers, and motors that may be regulated throughout all desired variations of speed by merely changing the impressed e. m. f. with a controller depending upon the use of various ratios of transformation. This dream included the freedom from the cars of commutators, and pictured a car equipment that would need a minimum of attention. Were it possible to realize all of those advantages, it is probable that the somewhat serious complication introduced by the necessity for two trolley wires might be tolerated. There seems to be little probability, however, of an early solution of the problem of adapting the alternating motor to the intermittent work of the street railway.

In conclusion, the writer desires to say that the title of this paper may have led some to expect rather more particular attention to the multiphase transmission system, and less about direct distribution. He has, however, given the various systems the same relative importance in the paper that he considers them to have in application. Hence, the subordination of the alternating current system in the consideration of the general subject of "Power Distribution."

Mr. Kelly, of Columbus: I move that a vote of thanks be tendered to Mr. Hoopes, for his able paper, and that it be received and placed on file. I also move that a telegram be sent to Mr. Hoopes congratulating him on the paper, and expressing the hope that he may soon be restored to health. Carried.

Mr. Hewitt: I trust the meeting will pardon a few words in reference to this paper. It is a matter which has interested me a great deal. I have done considerable figuring on such transmission, as it is the closest competitor to the storage battery and booster, of the former of which I spoke earlier in the session. As far as the problems have come up in ordinary street railway work, with such distances as ordinary roads handle, I have been unable to figure any economy in the multiphase transmission, as compared with the direct, using the booster. When you get to distances beyond, possibly, 15

miles, the problem then becomes more favorable to the alternating current. There are several things to be considered. In the first place, if you have a long line already running, you have copper which you are already using on the line. The first thing you must consider is whether this copper can be used in alternating transmission, should you use such; and, in the second place, could the cables be used economically in an alternating current transmission. Very frequently they cannot. If you have a cable of 500,000 circular mils in use, and you want to use an alternating transformer of high potential, in which you only require a No. 0 wire, you do not wish to use a wire of 500,000 circular mils, where No. 0 wire would suffice, and you do not want to throw it away.

That becomes a serious question, where the lines are underground, as they are in Philadelphia and other large cities, and the problem is largely magnified, for the reason that the insulation cost of three cables to run the three-phase transmission becomes enormous, as compared with the cost of the copper, the extra copper for the single cable to run the direct current; and in the cases that we have met with in Philadelphia, for our long lines, where we run underground cables for a large part of the area, the difficulty has been that the insulation cost of three cables made them cost more than to use the single cable and use more copper. We figured out very carefully the question of alternating three-phase transmission, in place of our battery, and we found the battery more economical; and I think the results have shown conclusively that such is the case. From what I gather from Mr. Hoopes' paper, I think he confirms the conclusions which we have reached. As I stated before, when you get to long lines, you then get to cases which are more favorable to the three-phase, and it is a question in my mind whether we are not on the eve of a very successful three-phase motor, and instead of using the rotary transformers we will use the static transformers with a three-phase motor on the car. I feel sanguine of the future possibility of this motor. I have seen such motors working experimentally, and they bid fair to give very good results.

The President: The next business is the appointment of the nominating committee to nominate officers and select the place for the next meeting. If there are any gentlemen who desire that the next meeting should be held in their respective cities, we should be glad to hear from them. I will appoint as the nominating committee, H. M. Watson, Buffalo, chairman; George B. Kerper, Dayton; Ernest Woodruff, Atlanta; W. Worth Bean, St. Joseph; Albert T. Potter, Providence; John A. Rigg, Reading; and E. S. Goodrich, Hartford.

N. H. Davis, of Cincinnati, presented an invitation on behalf of the city. Mr. Graham, of Boston, followed with an invitation for Boston, and Mr. Taylor, of Omaha, presented the claim of that city.

The meeting then adjourned until Thursday morning.

#### Thursday's Session.

President McCulloch called the meeting to order at 11 a. m.

The secretary read a letter from H. H. Vreeland, of New York, and a telegram from Thomas H. McLean, of the City of Mexico, regretting their inability to be present at the meeting.

The secretary read a letter from H. H. Littell, vice-president and general manager of the Buffalo Railway Company, inviting the delegates to visit the power houses of that company.

The President: I will say that during the meeting of the Executive Committee here last February, Mr. Littell very kindly showed us through his power house, and it is well worth anybody's time to go over to see it. There may not be anything there newer or better than many of us have, but we will all find lessons in tidiness, neatness, and care that are good things for us to see; and the manner in which they handle their coal is very interesting. I will now call for the report of the committee which was appointed two years ago, at the Montreal meeting, to confer with other societies as to the formation of standard electrical rules for construction and installation of electric wires. Frank R. Ford was appointed chairman of that committee.

Mr. Bacon: I am a member of the firm of Ford, Bacon & Davis. Mr. Ford was appointed by this Association to meet several other electrical bodies, to prepare a set of rules governing electrical installation for light and railway systems, and not being able to be present today, he requested me to make his report.

Mr. Bacon read the following report:

NEW YORK, Oct. 15, 1897.  
Secretary American Street Railway Association, Niagara Falls, N. Y.

DEAR SIR:—

Supplementing the reports of July 21, '96 and October 20, '96, made



by me as delegate of the American Street Railway Association to the National Conference on Standard Electrical Rules, I would state that upon December 11 and 12, the Committee on Code of this conference adopted its final report. The following associations were represented by delegates:

American Street Railway Association.  
 American Institute of Architects.  
 American Institute of Electrical Engineers.  
 American Society of Mechanical Engineers.  
 Factory Mutual Fire Insurance Companies.  
 National Association of Fire Engineers.  
 National Board of Fire Underwriters.  
 National Electric Light Association.  
 Underwriters' National Electrical Association.

As a result of this conference, a revised set of rules has been formulated, to which the name "National Electrical Code" has been given, a copy of which is herewith submitted.

This code has already been adopted or approved by all of the bodies forming the conference as above stated, with the exception of the American Society of Mechanical Engineers and the American Street Railway Association. At the next meeting of the former society, the question of adoption will come up and favorable action will undoubtedly be taken.

As the meeting of the American Street Railway Association is the last of the societies and associations named above, it is consequently the last one to which this code is submitted for approval.

As representative of your Association I was appointed secretary of the Committee on Code which performed the actual work of revising the rules and have kept in close touch with all the details of this work.

The new code contains many desirable amendments as to the technical requirements, having had the advantage of the co-operation of some of the most prominent electrical experts in the country representing the various associations and societies in attendance.

The form of the code has also been entirely revised, so as to obtain a more logical and up-to-date arrangement. This fact is particularly important as previous codes contain many repetitions and interpolations. It is not claimed that the code is perfect, but it can be said that each word in it was carefully considered by a number of men representing the most adverse interests and points of view. Amendments can and will be made from time to time as the progress of the art demands.

The great desideratum of uniformity has, however, been obtained so that now instead of a number of sets of electrical rules governing construction throughout the country, the "National Electrical Code" will be recognized as the one set of rules to which all electrical work must conform. The fact that it has already been adopted by almost all of important bodies represented in the conference insures this result and in order to complete the good work made possible by the co-operation of this Association, I earnestly recommend that the American Street Railway Association give its formal approval to the "National Electrical Code." Respectfully submitted,

FRANK R. FORD, Delegate.

(For an abstract of this code see the REVIEW for August, 1897, page 524.)

Mr. Bean, of St. Joseph: I move that the report of the committee be adopted. Carried.

The President: Last February there was presented to the executive committee a resolution to be acted on at this meeting, which would leave it discretionary with the executive committee to fix the date of the meeting at such time in the months of September and October, as it might think best according to the locality, so that if the convention should be held very far North it could be held a little earlier than this date, and if held in the South it might be held a little later in the season.

The secretary read the proposed amendment, as follows: Mr. Hippee gave notice of the following amendment to Sec. VII of the By-Laws: Insert in place of the words "on the third Tuesday in October, in each year, at such hour and place as shall be designated at the preceding meeting," the following, to-wit: "At such time in the months of September or October in each year as the executive committee may decide to be suited to the locality in which the meeting is to be held; the time to be decided on and each member of the Association notified of the selection by the first day of March in the year in which the meeting is to be held."

Mr. Davis, of Williamsport: I move that the date be fixed not earlier than the 15th day of September.

Mr. Newman, of New Orleans: I come from a city pretty far South, and we would like to have this convention meet in our city one of these days. We do not expect it next year, but we want you to come down there as soon as you can. We want you, when you do come, to come at the most pleasant season of the year with us, and I move as an amendment that the time be extended to include December 15th; say from September 15th to December 15.

Mr. Davis accepted this amendment, and the question being put to the house, the amendment was carried.

The President: Mr. Dimmock, of the Omaha, Council Bluffs Railway & Bridge Company wishes to address the meeting.

Mr. Dimmock: The directors of our interurban line, which I represent, have asked me to endeavor to obtain discussion at this meeting of the Association on the subject of United States mails as to the amounts to be received from the Government for carrying the same, with the object in view of obtaining better rates, and a uniform price for the same, feeling that through the Association channels is about the only way the street railways can obtain fair receipts from this class of service. We do not feel that we can get this subject before you so that you can do much at this meeting but our experience is that the Government is reducing the rates in our vicinity, 50 per cent of what we have received for the past five years; and upon making inquiries of a number of other roads, we find that they have also decreased their receipts from this source. It appears to me that there is no way in which we can do anything with the Government upon this subject except to get it before this Association; and I think, within the next year, if all the members will take this question up, the street railway companies can obtain much larger revenue from this source than they have heretofore.

All I ask is that this subject be taken up and handled between now and the next convention, so that we can find out what rates we can obtain. I do not think that the street railway companies are under any obligation to the Government to carry the mails at a less rate than the steam railroads receive, and in a great many cases they are so doing.

The President: We will discuss this question in a few moments. We have, just coming into our meeting, a body of young men who have been in session, all the time we have been in session, in the room below. It is the Accountants' Association. It is the new branch of this association of which I spoke in my opening address. They are young men; they are hustlers; and they have come here for business, and they have attended to it, and they have set us an example that we will do well to follow in their earnestness and intentness upon their work, and I guarantee that they will carry away from here better and more lasting results than we have carried away from any convention we have ever held. (Applause.) I have the pleasure of introducing Charles N. Duffy, the first vice-president; Mr. Wilson of Boston, the president, having been unavoidably kept at home.

Mr. Duffy, of St. Louis: Gentlemen, we want to thank you for the honor conferred upon us in inviting us to appear before this body, and we assure you of our appreciation of it. We want to thank Mr. McCulloch for his kind mention of our association in his address, and above all, we want to thank the members of this association for the strong resolutions of endorsement and hearty support that you have passed. That means to us a great deal, more than you probably realize; and in that connection we want to thank all the gentlemen who came to our meetings, and those who joined our association, and more especially those who are managers and not strictly accountants. The Street Railway Accountants' Association was organized in Cleveland, March 23-24 of this year. The accounting department of street railways are very diversified. They are largely the result of the ideas of the men in charge or the conditions under which the road is operated; and we feel that it is wise for us to have a convention, and better our work, and learn from one another, just as you operating gentlemen have done in this convention. And that is our purpose—to acquire information from one another and interchange ideas, and to bring out the good points of all systems of accounting for the common good; also to attend these conventions and profit by the exhibits and other advantages which you gentlemen enjoy. We desire, if possible, to promote a simple, wise and elastic system of accounting, which will be economical and uniform, so that as far as possible all street railway accounts shall be on the same basis. That does not mean that I am to know what the other man is doing, or the other man is to know what I am doing; but it does mean that if our general managers want to know how they stand as compared with other companies in the performance of the power plant, or operation of the road, or maintenance of track, or any other department of the work, they can

at least compare things on a uniform basis. (Applause.) That is our idea.

We feel that the accounting department of a street railway company is just as important as any other department, and all we hope to do is to improve our work and improve ourselves in the same way and by the same means that the American Street Railway Association is helping the operating department. Gentlemen, I thank you. (Applause.)

The President: Before discussing the mail question, we have a Committee on Rules for the Government of Motormen and Conductors, appointed at the last meeting, which will now report.

Mr. Kelly, of Columbus, presented the following report:  
To the American Street Railway Association:

Gentlemen:—Your committee appointed at the annual Association meeting in St. Louis in 1896, to consider the advisability of this Association adopting a standard code of rules for the government of street railway employes, begs leave to report, that after careful consideration of the subject, we deem it both necessary and desirable that such a code be adopted by this Association, and, therefore, recommend that a committee be appointed to formulate such a Code of Rules, and report the same in full at the next annual meeting of this Association.

The committee, in thus reporting in favor of the adoption of such a code of rules wishes to disclaim any intention of desiring to make the use of such rules obligatory on any member of the Association but desires that, if such a standard is adopted by this body, that it be left to the discretion of the members to adopt it for their roads in its entirety or select such portions as in their judgment is applicable to their local conditions.

Respectfully submitted,

W. F. Kelly.

Ira A. McCormack.

E. C. Foster.

The President: It looks as if this committee wanted to get somebody else to do the work we detailed it to do.

Mr. Kelly: It was my understanding, Mr. President, that we were to prepare such a code of rules; and so far as I am concerned, personally, I had a number of suggestions that I desired to incorporate in such a code. At a meeting of the committee, some of the members seem to be of the opinion that it was not our business to prepare the code, but simply to report on the advisability of taking action looking to the adoption of such a code. There was a difference of opinion as to what we were to do. I hope the committee will be directed to make such a report.

Mr. Akarman, of Worcester: I move that we accept the report of the committee, and that the same committee be continued for another year, with instructions to report such rules to the convention. Carried.

The President: We will now take up the discussion of the matter brought up by Mr. Dimmock, on the subject of the carrying of mail.

Mr. MacFayden, of Chester: Why would it not be a good idea to appoint a committee to investigate the mail matter, and have it report at the next convention.

The President: That matter will be referred to the incoming executive committee.

Mr. Hield, of Minneapolis: I represent the street railway systems of Minneapolis and St. Paul. In addition to the local service of the two cities we operate a line between Minneapolis and St. Paul, which for the last six years has been the official mail route. We carry box mail only, every car being equipped with a box, and the route is such that we pass the post office in each city. When we started that, there had never been any classification, and we took the lowest classification which was given to railroads, which, I believe is limited to 200 pounds. We carry nothing but letters, so that our weight never came anywhere near that. In addition to the box service we have a regular passage of mail between the post offices every thirty minutes. That is package mail, which goes direct from one post office to another. We continued in that contract, I think, for five years, and have just renewed it. We were never satisfied with the remuneration we were getting and it has been very materially increased. I was surprised at Mr. Dimmock's statement that there had been a general reduction, because that has not been the case with us. We also carry the mail in Minneapolis between one other post office, not a sub-station, but an independent post office in the suburbs. We also carry the mail to four sub-stations, and our remuneration for that service is on a basis of 3 cents a mile. That applies to pouch service; everything except our interurban box service.

Mr. Dimmock: Mr. Hield's remarks go to show that the Government is making contracts in one part of the country that are different from those in other parts; and also shows that the subject is one which can be discussed by the members of this Association to the advantage of each company. I know of a number of roads where the rates have been reduced. I think on account of the shortness of time this morning, it would be well to have this subject up for discussion at the next meeting.

Mr. Hield: I think I am safe in saying that the representatives of the Government drive as good a bargain as they can. They usually get the service at the best rate they can make. There is no legislation covering the subject.

Mr. Jones, of Memphis: Our experience has been a little different from that of Mr. Dimmock. We carry mail to a number of sub-stations, and within the last thirty days the Government notified us of a 50 per cent increase in the amount which it allows us, without any solicitation on our part whatever.

President McCulloch: I will state what occurred on one of the roads in St. Louis, which has for a long time been carrying mail from the city out into the different sections of the county. The contract expired about a year ago. The company was not satisfied with what it had been getting, and the Government declined to increase the rate. They ran the mail car into the car house, and there was such a demand for the mail service, that the Government immediately made satisfactory arrangements.

Mr. Hawken, of Rockland: The representative of the mail department in Washington came to the Rockland, Thomaston & Camden Street Railway Company, to make an arrangement with us to carry the mail, and we fitted up a car and carry open mail. We are allowed 3.5 cents a mile, the same as the steam railroads, and the Government also pays part of the salary of a postal clerk. The postal clerk looks out for passengers, express and baggage business, and handles the car.

The President: We will now listen to the paper on "Discipline of Employes," by George H. Davis, superintendent of the Canal and Claiborne Railroad Company, New Orleans.

Mr. Davis read the following paper:

#### DISCIPLINE OF EMPLOYES.

By George H. Davis, Superintendent, Canal & Claiborne Railroad Company, New Orleans.

##### SYNOPSIS.

1. Introduction and definition of railway discipline.
2. Principles of discipline.
  - (a) Confidence of employes.
  - (b) Fair dealing.
  - (c) Organization and classification.
  - (d) Issuance of orders.
  - (e) Employment to full capacity.
  - (f) Vigilance.
3. Civil service offered as a suggestion and partial solution of questions of discipline in railway operation.
4. Civil service methods as employed by the Government.
5. What features a successful civil service method should include.
6. General questions of employment and promotion, according to civil service methods.
7. Civil service methods employed by the Canal & Claiborne Railroad Company.
  - (a) System of marking.
  - (b) Principles of same.
8. Application of civil service methods to large railway systems.
9. Results of competitive civil service.
10. Conclusion.

Discipline is universally recognized as a necessity in every important industrial undertaking. It is as thoroughly essential to success in the operation of railways, as are the plans and specifications in their construction. In the broad sense it means the government of operatives through whom the equipment is made to do its work, and the efficiency of the equipment varies in direct ratio with the efficiency of its operatives.

A road has good discipline when all employes respect and kindly regard each other; when the officers do their best for the men, and

George H. Davis was born in Oswego, N. Y., in 1865, and is of Scotch and Welsh parentage. Practically all members of the family for four generations were



GEORGE H. DAVIS.

mechanics and millwrights, and were connected with mill and railway construction. The technical experience of Mr. Davis began at the tender age of 10, when he commenced work in the engine room of his father's mill. He was graduated from the Oswego Normal and Training school in the scientific course, and from Cornell University in mechanical engineering. During his college course he was the engineer for the Ithaca Street Railway Company, and upon graduation he entered the employ of J. G. White & Co. in the contract work for the various railway systems in Baltimore. Mr. Davis acted as superintendent of construction in the re-equipping of the Steiway Railroad of Long Island City. For the past three or four years his work has been done jointly with the other members of the engineering firm, Ford, Bacon & Davis, 220 Broadway, New York. Part of this was the complete design and construction of the Orleans Railroad of

New Orleans, the Bergen County Traction Company's lines in New Jersey, and the Canal & Claiborne Railroad of New Orleans. With the latter company he has held the position of general manager since it was equipped for electric traction.

vice versa, and when both officers and men sacrifice everything to the interests of the company.

It is a somewhat difficult task to maintain the conditions as defined, but the nearer this standard is approached the greater the surplus earnings.

Discipline should never be interpreted in the narrow sense that a man is to work as a machine. It is true that "cars should run like clock work" but, to arrive at this result through the constantly changing circumstances that arise, requires the services of men of thorough training, presence of mind and good judgment.

There is no fixed method of maintaining good discipline. It is frequently the result of the natural personal characteristics of the man in charge. There are, however, certain principles which are probably of universal application. First of all, a railway manager must gain the implicit confidence of his officers and men. To do this he must, in general, know the details of the design, construction, operation and maintenance of railways. He must have a universal reputation among his men of being shrewd, vigilant, industrious, honest and perfectly fair in his dealings. He must know them all personally, stand by them, and respect them as gentlemen upon all occasions. He must be thoroughly, popular and able to create among them a spirit of loyalty and enthusiasm in regard to the road and its interests.

A thing of greatest assistance in discipline is complete organization. Every man engaged in railway operation, from president to track-greaser, should have before him in printed form, a full synopsis outlining all the essential features, the exact limit, scope and character of service he is to render.

All officers should have their exact relative rank in the service, which should be thoroughly known among all employees. In this way if conflicting oral orders are given, the order given by the officer of superior rank will be obeyed without question.

Another feature of discipline is the issuance of orders. Many failures to obey orders are due to a misunderstanding or misinterpretation. It is therefore important in railway operation to issue all orders in printed form, clearly and definitely stated. These orders should be sent in explanatory personal letters to all superintendents, foremen, inspectors and starters; and be published on conspicuous bulletin boards at all stations. An order should never be issued except that it meets with the approval of the best officers and men, and, after once issued, it should be an inflexible law, applicable to all employees alike, and if broken, it should in all cases be followed by a prompt severe penalty.

Satisfactory discipline cannot be maintained unless employees in all ranks are worked to their full, natural capacity and physical strength. Idleness and easy positions in railway operation will undermine the best system of government that could be established.

Again, constant watching is a most important factor. The general manager, or whoever is responsible for the receipts, expenses, maintenance and discipline, should spend at least eight hours a day directly on the lines of the company. There should be trusted strat-

egs at both ends of all lines at all times, and at least one inspector for each 30 cars operated.

Written reports for the smallest details of both good and bad features of the services should be insisted upon from all officers of the company, and a false report or statement from any employee should be sufficient cause for his instantaneous discharge. Nothing good or bad in a man's service should be passed with out the manager's recognition. One of the strongest incentives to good work among men who are trying to do their best, is praise. When a motorman saves a pedestrian from mutilation or death from an electric car, his act should be recognized by a complimentary personal letter, thanking him for his skillful work. In general a manager should have only praise for his officers, and among the men 99 per cent of them should be above censure. However, when a man is censured it should be severe and the final preliminary to his discharge. A man should never be discharged except his case is given a thorough investigation, and he is given abundant opportunity for defense. When he is once discharged he should never be reinstated.

Railway employes as a rule, admire a policy which is open, fair and generous. When an unusually large day's work is done in handling a great crowd of passengers, it is no more than fair for the company to share its profits with the men in giving them a few hours extra time, the number of hours being in proportion to the extra receipts. The amount of money thus invested will in the future return to the coffers of the company a hundred fold or more.

Perfect management is something beyond human effort, still, if the problem is earnestly and industriously studied, railways may be operated to the complete satisfaction of the public, the stockholders and the employes.

As a partial solution of the different questions arising in connection with discipline, a competitive civil service system is offered as a suggestion. There are no new principles in this system as commonly understood. It is only a way of carrying out what every successful man has always followed in his business career. He selects the man whom he believes most efficient. He promotes the man who is of the greatest service to him, and discharges the man whose services are of the least value.

All civil service methods employed by the Government, take account only of a man's ability in successfully passing the initial competitive examination. In reality a man's work in the service after employment should have far greater weight in regard to his retention or promotion, than the mere fact that he was able to answer correctly a series of questions, at best having only an auxiliary connection with the work to be performed. Another serious weakness in municipal or Government civil service methods is that often questions are prepared and answers examined by commissioners who know nothing of the business, trade or profession for which they are conducting the examination. In all cases questions should be prepared and examinations conducted by the head of the department under whom the candidate is to work after entering the service. To insure perfect fairness, commissioners may be delegated to criticize the questions, witness the examinations, and judge of the relative merits of all answers. Any successful competitive civil service system for railways, must take into account:

1. The previous history of the applicant, including his railway experience.
2. His knowledge and skill in railway operation, which is covered by competitive examination.
3. His physical condition.
4. The quality of his work after entering the service.

The quality of his work after entering the service is the best criterion by which to judge of his relative value. However, before a man is employed it is impossible to judge of his work, and the only alternative is a broad, practical, competitive examination, which covers samples of his work under the observation of the examiner, together with answers to the most practical questions that may be framed.

In applying these methods to railway operation and maintenance, it is necessary, so far as practicable, to classify the positions of each of the various departments, so that there is a fixed line of promotion from the lowest to the highest rank. This does not mean that a man shall have worked in all ranks of a given branch of the service, or even in all branches of a given department. It does mean, however, that he shall have started at the lowest round of the ladder in some one branch and have learned some one department to perfection, and all departments in general. Railway companies vary widely in reports, insufficient number of names in accident cases, no change,



their classification of positions and the relative importance which they attach to the services of each department. It is not intended at this point to discuss the organization of railway operatives.

A classification so far as civil service methods are concerned may be compared to a river and its tributaries, where the waters of all branches, if they are not evaporated, may reach the desired terminal. In short, it is a question of all being given an opportunity, and the survival of the fittest.

There are, apparently, some difficult features in the general policy of promoting men according to their relative standing, from one department to another, or even from one branch to another of the same department. The skill and experience required in one may be totally different from that required in another, and again a man may show marked ability in one position, while in another he would prove most inefficient. However, if a man is industrious, bright and faithful in one position he will maintain the same characteristics in another, and, as every practical man knows, these qualities of character in an employe are more desirable than all others.

A competitive civil service system if correctly applied, is a most advantageous solution of the question of advancement of employes, and does not interfere with a practical line of promotion. For example, if a vacancy occurs at the head of a given department, all employes ranking highest in the various branches are eligible to compete for the position. In deciding upon the successful candidate, two things should be taken into consideration, the previous standing and record of the competitors with the company, and the result of their competitive examination.

In all departments of the Canal & Claiborne Railroad Company employes are placed upon a basis of competition. Men are employed who have the best standing according to a broad, competitive examination, and are placed in the lowest rank of any given branch of the service.

Promotions in the various branches, so far as practicable, are made consecutively from one rank to another. The company fills every position from among its own employes, provided there is any one in the service competent to take the place. To illustrate, if the position of chief dispatcher were vacant, all starters employed by the company would be eligible to compete for the position. The chief dispatcher prepares all schedules, knows the exact position of every car on the road, and the crew that is operating it. Now, if, upon competitive examination, it was found that no starter employed by the company was able to prepare a thoroughly practical, satisfactory and economical schedule, then no one in the direct line of promotion would be given the position. In this case another examination would be held in which the employes of all departments would be eligible, together with the employes of other companies or outside persons. In this way merit alone is recognized as a basis for advancement, and also the highest standard of efficiency is maintained in the various positions.

So far as practicable the same regulations apply to the transportation department, the maintenance department, and the accounting department.

In the transportation department, in the employment of motormen and conductors, when an applicant presents himself, if he is worthy of consideration after a preliminary conversation and inspection, he is given application and recommendation blanks.

To be eligible for appointment as motorman or conductor, the applicant must be between the ages of 25 and 40, for the position of motorman he must weigh at least 160 pounds and not exceed 210, and must be at least 5 ft. 8 in. in height, he must have had at least one year's experience in the position he seeks, and should be recommended to the service by at least three officers of the company, including foremen, inspectors and starters, and also by at least seven motormen and conductors, who are already in the service. He then obtains the company's physician's certificate with regard to his physical condition. If his certificate, application and recommendations fill the requirements and are apparently satisfactory, they are then given to an inspector who personally investigates his previous record among the employes with whom the applicant has worked, and also among outside persons who know the applicant. If the inspector's report of investigation is satisfactory, the applicant is placed on the lines of the company with motormen and conductors who have the best standing in the service. He rides with these men until he is familiar with the special features of the lines of the company. He is then given the competitive examination. This is intended to be extremely practical and consists of two parts:

1. The applicant takes charge of a car with an inspector who estimates the quality of his work for one trip over each line of the road.
2. He answers a list of questions covering the various things connected with this department of railway service.

Finally, the applicant presents himself at the office of the general manager, where he is questioned in regard to all orders and instructions previously issued by the company, and his understanding of the conditions under which he will be expected to work.

Based upon the above, applicants having the highest standing are given the positions as extra motormen and conductors as fast as vacancies occur.

If inexperienced men are employed at all in the service, they are taken on as conductors and kept in this position for at least six months, and for three months they work without pay. After this work as conductors they break in as motormen, with motormen already in the service who have the highest standing. After six months service of this kind, they are given their examination and are placed on the lines of the company as extra motormen.

To determine the relative standing of employes a system of marking has been adopted, which takes into account.

1. The general quality of a man's work, according to the judgment of the foreman in charge.
2. The value of the special acts in his service as reported by the foreman, and marked in the record of the employe according to a fixed scale kept in the main office.

To illustrate, in the department of transportation, for motormen and conductors, blanks are prepared which contain the names and numbers of every motorman and conductor in the service. At the head of these blanks there is a personal letter addressed to the general manager which reads as follows:

"Dear Sir:—According to my best judgment the quality of service rendered by each employe coming under my observation in my department of the service, being fairly and honestly estimated for today is as follows:"

Opposite the name of the motorman or conductor there is a blank space left for the mark of the foreman. Each foreman, inspector and starter has one of these blanks, and marks after the conductor's or motorman's name the quality of his work for the day, and sends the blank to the main office the next morning. He marks "v. e." for very excellent; "e" for excellent; "g" for good; "f" for fair; "p" for poor, and "v. p." for very poor.

In the main office these marks are reduced to an arithmetical basis and placed in the record of the employes. In determining the marks to be placed in the record, the marks of all foremen, inspectors and starters for a given man are added and the mean taken, which is considered the final mark. In this way the average judgment of perhaps 10 different foremen in regard to an employe's work is obtained.

The marking of the special acts of an employe is on a more definite basis, and has no connection with the judgment of the foremen, inspectors and starters. They simply report the acts. Based upon bulletins, instructions or orders issued, and also upon experience in good railway practice, two lists of acts of employes are made, one delineating all the desirable or commendable features of the service of an employe; the other all the undesirable or intolerable features. For each of the acts in the commendable list, a certain number of points of merit is always given. Similarly for each of the acts in the uncommendable or intolerable list, a certain number of points of demerit is given. To illustrate more thoroughly, a few of the acts mentioned in the merit and demerit list may be given. In the merit list for motormen we have, skillfully avoiding accidents, assistance on minor road repairs, suggestions as to best speed of cars, helping to clear blockades, assistance rendered on special occasions, obtaining names in accident cases, etc.

In the demerit list for motormen we have, running with hands off of brake and controller, looking around while car is in motion, not running on schedule time, feeding car too fast, untidy condition of dress, accidents to persons (serious, medium, slight injury), accidents to cars (serious, medium, slight injury), accidents to vehicles (serious, medium, slight injury), etc.

In the merit list for conductors we have, complete and perfect accident reports, reports as to where the company is gaining or losing traffic, reports as to what passengers say, kindness to aged or infirm persons, assistance rendered on special occasions, obtaining names of witnesses in accident cases, etc.

In the demerit list for conductors we have: Incomplete accident reports, insufficient number of names in accident cases, no change,

not announcing route, streets and transfer points, leaning against door, conversing with passengers inside, short register, bunching fares, ringing up fares when officer boards car, register not turned, shorts and overs, untidy condition of dress, etc.

The marking for general daily reports, together with reports of special acts, is kept in a record book, which allows four pages to each employe, each of the pages being numbered to correspond with the employe's badge number. The first two pages of each employe's record are made up in blank form, allowing space for each day of the month, together with each month of the year. The next two pages are plain ruled, and are used for explanations of each mark given.

The margin of the first page is divided into blank form giving the information regarding an employe which is usually covered by headings placed in application blanks. Each month the points of merit and demerit are balanced. If an employe's record falls below zero he is discharged.

The estimation of the value of a man's services according to the above method, is based upon two foundation principles, one being a check upon the other. Every officer of the company has his own ideal, and, due to the fact that every human being sees the world from a different standpoint from every other human being, the chances are that an employe's work is estimated upon by too thoroughly experienced railway operatives, the average judgment of these men should be correct. Acting upon this principle, favoritism among officers is almost completely eliminated. Some men might be favorites with two or three officers, due to outside circumstances, but this would never extend to the whole to, or even five. A car operative's life is not filled with opportunities to render brilliant services in behalf of the company, and, for this reason some method of estimating his work must be adopted which will give credit for every day's efficient, satisfactory conduct. The method employed has proved by experience to be simple, just and effective.

The second principle used in the estimation of the quality of the service is embodied in the fact that a more just and unbiased decision can be reached in regard to the merit or demerit of an act, if judgment has already been passed on an exactly similar case. Now, by the system of marking mentioned, a list of all possible cases is prepared, and judgment passed upon them, by the general officers of the company, the relative number of points of merit and demerit being fixed. Now, when an act occurs, it only remains to locate it in the list to pass judgment. Hasty or snap judgment passed in a fit of anger on an employe's offense usually results in the greatest injustice to the employe. The reaction among employes is such as to practically destroy their confidence in the company, and always proves detrimental to the best interests of the road.

Promotions among motormen and conductors are always made according to their standing as determined by their records without examination. The "extra" motorman or conductor having the best record is promoted to a "swing" run. Similarly, the "swing" men to "half-and-half" and the "half-and-half" men to "straight day" runs. "Straight-day" motormen and conductors are promoted to the positions of inspectors, starters and transfer agents on their records alone. No account whatever is taken of the relative date at which the employe entered the service.

As mentioned before the same general methods are employed in all departments, but, owing to the fact that the transportation department is the most important of all, the details of the civil service system are carried out most thoroughly in this connection.

To insure perfect accuracy and fairness each employe is invited to examine his own record or that of any other employe at any time. He is also at liberty to inspect the scale of marking by which the records are adjusted.

It is evident that a system of bookkeeping resulting from the methods as described would be more expensive to maintain than other forms of discipline which have been generally employed. It has been found, however, that the extra expense attached to this system is trifling in comparison with the results obtained.

The larger a street railway the more thoroughly applicable are civil service methods. This comes from the fact that, on small roads the general officers of the company come more in contact with the employes, thus being able to judge personally of the quality of their services, regardless of records kept, and too, on small roads the same employe fills several positions in comparison with a thoroughly classified organization which must be maintained in large street railway systems.

Regarding the general results of a thoroughly enforced competitive system, it may be stated that there is as much difference in the quality of work rendered by men engaged by a road operated on a competitive basis of promotion, and a road on which promotion is made according to the position of a man's name in the list, as there is between two railway companies, one having a monopoly of the traffic and the other having a direct paralleling competitor. It has been found by experience in the operations of roads where employes work on a competitive basis, that they invariably do their best. They are gentlemanly in their treatment of passengers, neat and tidy in their dress, and skillful and prompt in the discharge of their duties. They take great pride in the company's fine equipment, its large business, its management and principles of fair dealing. They never fail to praise the company and its service to patrons, and are only too glad to answer in behalf of the company, any adverse criticisms offered by the patrons or the public. They feel from the start that their present and future position in the railway business depends upon the quality of their work, and nothing else.

Legitimate competition is one of the most powerful incentives that can be employed. Men under these conditions are forced to make their best efforts. This is illustrated constantly in all professional, mercantile and manufacturing industries. The piece work system in vogue in New England factories is only one method of competition by which a man is paid according to the quality and quantity of his work.

On a competitive basis the standard of excellence is constantly being raised. When a large number of men are engaged in the same kind of work, there are always a few who will accomplish most extraordinary results, and their work stands as a most effective object lesson to the others. If a man has anything in him, competition will bring it out; if he has no redeeming features, then his services are not required.

Another advantage of the civil service system is that it effectually debars all outside influence and eliminates the "bug bear" commonly designated among the men as a "pull." It also completely obliterates political interference, which is the greatest bane to the efficient services of American street railways.

In conclusion, it may be stated that this system is not urged as a panacea for the ills of railway management, but is merely offered as a suggestion, with the hope that it may be of some slight assistance in improving the successful methods which have always been employed.

Mr. Rigg, of Reading: I move that the paper be received and filed, and a vote of thanks be extended to Mr. Davis. Carried.

The President: We would like to have discussion upon this paper. If there is none, we will proceed to the next paper on "Application of Electricity to Railroads now Operated by Steam Power," by N. H. Heft, of the Meriden Street Railway Co., Meriden, Conn.

Mr. Heft read the following paper:

#### APPLICATION OF ELECTRICITY TO RAILROADS NOW OPERATED BY STEAM POWER.

By N. H. Heft, President Meriden Electric Railroad Company, Meriden, Conn.

The New York, New Haven & Hartford Railroad Company owns and controls about 2,800 miles of main line railroad track in New York, Massachusetts, Rhode Island and Connecticut, of which about 16 miles are operated by electricity on the third rail system and 14 miles on the overhead trolley system. The company also owns the entire capital stock of the Stamford Street Railroad Company and the Meriden Electric Railroad Company, the former operating about 10½ miles of track and the latter about 17½ miles on the overhead electric system. It is through my official connection with the Meriden Company that I am permitted to be present at the meetings of the American Street Railway Association, a privilege which I thoroughly appreciate.

Electric railroading on a large scale is but the development of street railway experience, and, if the future brings success in the efforts now being made to use electricity for heavy work, it will be due, largely, to the courage and enterprise of those who have "blazed the path of progress" and forced the fighting by entering



Colonel N. H. Heft was born on a farm near Carverton, Luzerne County, Pennsylvania, about 50 years ago, and his early education was secured while attending



N. H. HEFT.

the district school during a portion of the winter months. He worked on the farm, in mines, in machine shops and for various railroad companies until he became financially interested in mining and the manufacture of oils. For the past 20 years he has been engaged in railroad construction and in street railway projects. He organized and secured franchises for the Bridgeport Traction Company, and negotiated the transfer of all the horse railway securities in that city to the Traction Company. While president of the Bridgeport Traction Company he was successful in the suits against the Consolidated Railroad Company, and the later franchises were granted to the company over the mayor's veto. About three years ago, when the Consolidated Railroad Company decided to conduct some experiments with electric traction, President Clark placed Colonel Heft in charge of the construction and equipment. The results of this work have been closely

watched by electrical and railroad men and fully described in these columns. Colonel Heft is a great lover of art and in the art gallery of his beautiful home at Bridgeport is one of the finest personal collections of paintings in New England.

into competition with an industry which believed itself, 10 years ago, absolutely secure in its position.

There is little for me to tell you of novelty in the work done by the New Haven Company in Meriden and Stamford. These are ordinary street railway systems, fairly well equipped, and we try to operate them to serve the public properly. Believing, as we do, that a good track is the foundation of a good system, we have thoroughly reconstructed the track in both cities with heavy rails. In doing so we have paid the most careful attention to the matter of the return circuit, bonding the rails so thoroughly as to make them the path of smallest resistance back to the station. We have thus avoided, to a very large extent, trouble with electrolysis. Nothing is more certain to my mind than that carelessness about making a track return circuit is a most serious mistake, and that carelessness about testing and maintaining joint connections is another. I would rather spend a thousand dollars or more in providing ample carrying capacity of rail bonds than to put the same amount of money into the overhead circuit, if, by doing the latter, I should neglect the former.

About three years ago, the New Haven Company found that various electric railways in its territory were gradually extending their operations into the field of interurban work, and that the company's passenger earnings were suffering accordingly. It was at once seen that, by no ordinary methods of changing schedules or increasing speeds could this lost traffic be won back again, and, with characteristic knowledge and courage, President Clark and the New Haven directors determined to "steal the thunder" of its new competitors, and commenced a series of elaborate experiments in heavy electric railroading. It must be confessed that this decision was reached only after some misgivings. To the average railroad man, street railways have, until recently, seemed a pretty sort of toy, fit for apprentices in the art of transportation. Lately, however, he has waked up to the fact that "the tail will wag the dog" unless some radical action is taken, particularly in suburban and short distance work, and, in the eastern sections of the country anyway, railroad men have become modest enough to be willing to look with respect upon the great work which has been accomplished in street railroading.

The first line to be equipped by the New Haven Company was a purely summer road, operated for about four months in the year on the Massachusetts coast from Nantasket Junction to Pemberton, a distance of about seven miles of double track. This line was chosen partly because the main line operation would not be interfered with in case of trouble with the electric trains and partly because of the existing heavy summer traffic which would put the new apparatus and the feasibility of the entire system to a severe test. An overhead trolley line was built, with center pole construction, and everything made very strong and more substantial than was at that time found in any street railway work to our knowledge. At the time of construction of this overhead line, there were no suitable movable switches in the market,

and we had to remodel and have built especially for our purpose those which we finally adopted. One feature perhaps worthy of note is the connection of the overhead switch with the track switch in such a way that both are controlled by a single lever at the switch stand.

The line was operated for the first summer with excellent success and, all fear of trouble having disappeared, an extension of 3.6 miles was made on the main line of the company's Plymouth division, from Nantasket Junction to East Weymouth, this section being operated by the third rail system.

In December, 1896, we commenced work on a new line running from Berlin, Conn., through New Britain to Hartford, a distance of 12.3 miles, 3 miles of which, from Berlin to New Britain is a double track, and the remainder, from New Britain to Hartford, a single track. A power station was built at Berlin, one end of this line, partly because of a desire to test transmission of power to a considerable distance, and partly because Berlin is the center of several radiating lines which may eventually be put into operation by electricity.

The physical characteristics of both these lines have been so carefully and accurately described in technical papers that I shall only refer to them more or less incidentally in the following, confining my remarks chiefly to the results which we have found, and the conclusions which we have reached in our own minds as to the best methods of applying electricity in heavy railroad work.

#### TRAIN SERVICE AND TRAFFIC.

We have learned very thoroughly, in our street railway experience, the lesson of the importance to any transportation agency, working in a thickly populated territory, of uniform fares and a frequent and regular train service—a train service which requires no printed schedule to enable people to know when cars may be found in waiting. The time has come when every progressive railroad manager must recognize that new conditions, and the new character of competition require a complete change of operating methods.

On its Nantasket Beach line, the New Haven Company gave, during the last summer, a regular half-hour service from 6:30 in the morning until 11:30 at night. When unusually heavy boat loads arrived at Pemberton from Boston, trains were run in as many sections as were found necessary to take care of the people, but still the half-hour schedule was not departed from on ordinary days. On Sundays and holidays, when boats arrived at Pemberton every 15 minutes during the greater part of the day, express trains between Pemberton and Nantasket were sandwiched in between accommodation trains in such a way as to give a 15 minute schedule of alternate express and accommodation trains. The time-table this summer required 23 regular trains daily, each way, between East Weymouth and Pemberton. During July and August, the traffic increased to such an extent as to require six motor cars in constant week day service, and on Sundays and holidays 11 motor cars have frequently been called for.

The fares charged on the Nantasket Beach line before the advent of electricity were 10 cents from Pemberton to Nantasket and 18 cents from Nantasket to East Weymouth, a total of 28 cents from Pemberton to East Weymouth. With electric traction they have been placed at a uniform rate of 5 cents from Pemberton to Nantasket and 5 cents from Nantasket to East Weymouth, a total of 10 cents from Pemberton to East Weymouth. Under these new conditions, the traffic has increased enormously on this line; the summer of 1895, the first of electrical operation, showing an increase of 92.6 per cent over the previous summer in the number of passengers carried; the summer of 1896 showing 45.1 per cent increase over 1895, while, in the summer just passed, we have carried nearly three times as many passengers as in the last year of steam operation.

The operation of the line from New Britain to Hartford was commenced in May last, with a regular half-hour train schedule from 6 in the morning to 11:30 at night, and with a uniform fare of 10 cents each way, instead of 23 cents, the former charge. The electric line carries through passengers only between Hartford and New Britain, the passengers for the five way stations being carried by the regular steam trains running on a parallel track. For ordinary every day service, a single open motor car was used during the past summer, while for extra loads, light double truck



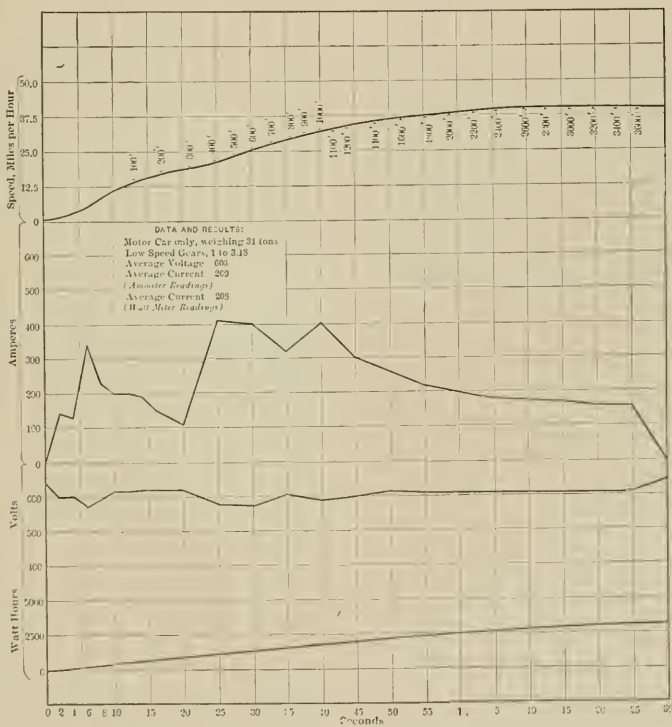
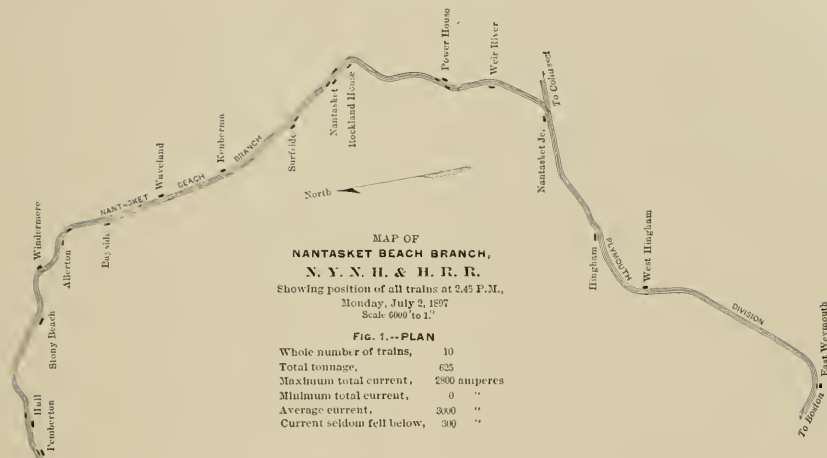


FIG. 2.

trail cars, seating 70 people, were attached. On rainy days a standard closed passenger coach was hauled by the open motor car. On holidays and Sundays, the cars pulled two trailers, the entire train seating nearly 250 passengers. About the middle of August, steam service on the Berlin-New Britain branch was discontinued, and traffic has since been handled entirely by electricity. Sixteen trains each way per day are run, connecting with steam trains.

Under the conditions named on the Hartford-New Britain line we have carried, during the three summer months, 400 per cent more passengers than we carried through the corresponding months of last year.

**SPEED, ACCELERATION AND SCHEDULES.**

I do not suppose that any but a trained railroad man can understand the impossibility of operating trains and maintaining

schedules by steam locomotives in the way that has been done by electricity at Nantasket Beach this summer. There are a great many curves on the line as will be seen by the accompanying plan, Fig. 1; and in addition several grades. There are no excessively sharp curvatures or steep grades, and it is not here that the trouble has come. The difficulty is found in the fact that there are no less than 17 stations on a line only 10.6 miles in length, or an average distance between stations of but about .6 of a mile. To make a run of 10 miles with 16 stops in 26 minutes; to be obliged to do this in order to connect with boats arriving at regular half-hour intervals and to keep out of the way of frequent regular steam trains on the main line of the Plymouth division; to allow but four minutes at each end for unloading, switching (including running around trail car), and loading; and to do this day in and day out, in regular service, through an entire summer; these are things which cannot possibly be accomplished by steam locomotives.

Now the reason why electricity can do this and steam cannot, is found in the tremendous accelerating power of properly designed electric motors, with rotary motion, as compared with reciprocal motion of steam locomotives. By examination of the curve of acceleration plotted from actual tests of a 60-ton train, (see Fig. 2), and of the practical results shown in the curve of speed between stations in a service run on the Nantasket Beach line, (see Fig. 3), as well as the accompanying time chart made up from the company's printed time cards, it will be seen how enormous is this accelerative power.

It will be seen, for example, that a 60-ton train, in running from Windermere to Allerton, a distance of only 1,800 ft., reaches a maximum speed of 31 miles per hour, while in the longer run from Power Station to Nantasket Junction, a distance still of but 5,598 ft., a maximum speed of 39 miles is reached. The entire distance is covered, in regular service, at an average speed of 24.6 miles per hour, including stops.

Between Hartford and New Britain, the 9.3 miles distance is covered regularly by motor cars with two trailers in from 18 to 20 minutes, an average speed of from 28 to 30 miles per hour, while, with a special high-g geared motor, a maximum speed of over 60 miles has been made; the entire distance of 9.3 miles being covered in 10 minutes. On this line a 52-ton train often reaches a maximum speed of 50 miles per hour. The current is cut off at 29 grade crossings when single car trains are run.

It is worthy of note, in this connection, that the line between New Britain and Hartford is in direct competition with a trolley line between the same points but following a more circuitous route. The schedule time of trolley cars is 55 minutes, as against our time of less than 20 minutes, and the rate of fare is 15 cents (including a transfer given for use on the street railways of either city), as against ours of 10 cents for the straight run between the two cities only. The ownership of right of way has a very important influence upon speed and competitive conditions under circumstances like these.

#### CARS AND EQUIPMENT.

The type of car selected for any good transportation service has a direct bearing upon the development of traffic and maximum gross receipts. It has been difficult for steam railroads to depart far from the long established custom of closed passenger coaches of the present standard type, and to adopt open cars, on account of the disagreeable effect on passengers of the smoke and gases from engines. This has naturally thrown a great deal of traffic to competing street railway lines running open cars in summer, on account of the much greater pleasure in riding.

With electric operation, open cars in heavy railroad practice are possible, even at considerable speed, particularly if the front of the car is closed in with glass, and both at Nantasket Beach and on the Hartford-Berlin line, we have used heavy open cars with great success.

The motor car which we have so far used we do not consider by any means the final type, and even now, we have in mind plans of combination cars which we believe will be, on the whole, well adapted for railroad work. The present motor car is very heavily built, with floors of a height equal to that of our standard passenger coaches. It contains 16 cross seats, capable of seating

56 passengers, and the entrance is from either side with three steps. Each car has two heavy railroad trucks, one of which is equipped with two 125-h. p. motors. The total weight of the motor car is 32 tons, and the trailer car of the same type weighs 25 tons. The motors which we have used up to date have been of a type common in heavy elevated railway work. These motors have often been in service for several consecutive days, making 321 miles each day, without apparent injury. We found the motors we are using already in the market when we commenced our experiments, and until recently no attempt has been made by us to specify changes. Under these circumstances, great credit is due the manufacturers for their efforts to meet the difficulties encountered. The experience gained with these motors has served as a basis for building larger and heavier types, better adapted for the severe work which they will be called upon to fulfill to meet our requirements. An important point which we shall specify in new motors is that they shall have the most perfect ventilation possible. The efforts of manufacturers have been hitherto directed towards completely encasing the motors, so as to make them waterproof, but in doing this ventilation has been sacrificed.

We have found it beneficial to blow out our motors several times during the day by means of a blast of air from a hose pipe connected to our air brake reservoir, but this is, at best, but a makeshift.

It is very difficult to dispose of all the necessary cables, wires, brake rods and chains, air brake cylinders and apparatus, switches and other controlling mechanism in the limited space beneath the car floor, as may be readily imagined by those familiar with street railway work. As a consequence, there has always been more or less controversy between those responsible for the placing of the different portions of the equipment, as to who shall have the first right to a given space, perhaps hardly a half a dozen square inches in section. There is also more or less trouble with abraded wires, short circuited shoe hangers, etc., and for our future work we are making an effort to simplify this mass of equipment mechanism by putting some of it, particularly the wires and cables, in a space between the true floor of the car and a false floor several inches below, specially provided for the purpose.

For operating heavy trains of this character, where currents of from 500 to 1,000 amperes are sometimes used, the controlling apparatus must be massive and strong in every part, and the greatest care must be taken to prevent arcing. We have had no trouble with controlling apparatus on our regular equipments, and we consider this branch of the apparatus well perfected.

The danger to station and car apparatus from lightning discharges, which is so important a factor in street railroading where the overhead system is employed, is avoided in third rail work, since the third rail is so close to the ground that it is practically a lightning arrester itself throughout its whole length.

The problem of braking, which is so important a one in street railroading, is found more so with us, since the train weights and speed are enormously greater. The regular Westinghouse air-brake system, with engineer's valve, is used on our electric trains, but instead of steam air compressors, we have an electric motor compressor, controlled by an automatic regulator which has given excellent satisfaction.

Our experience with trolleys on the overhead line at Nantasket Beach, originally put in two years ago, has not been satisfactory. We find it quite impossible to prevent the destruction of trolley wheels by almost continual arcing when attempting to take from the wire the heavy current required in starting and during acceleration, as well as the smaller currents taken at the maximum speed. There has been a good deal of trouble, moreover, in keeping the trolley on the wire in making speed and taking curves, and many trolley poles have been broken. The trolley difficulties have not interfered with the continuous operation of our line, but the cost of replacing wheels and poles has been rather large.

These difficulties have had an important influence in causing us to reach a decision in favor of the third rail. The contact shoes which take the current from the rail to the motor circuit have given, on the whole, good satisfaction, although they are occasionally carried away by the approach blocks at grade crossing when these blocks happen to be slightly misplaced so that the shoes strike them at the wrong angle. The contact shoes are suspended

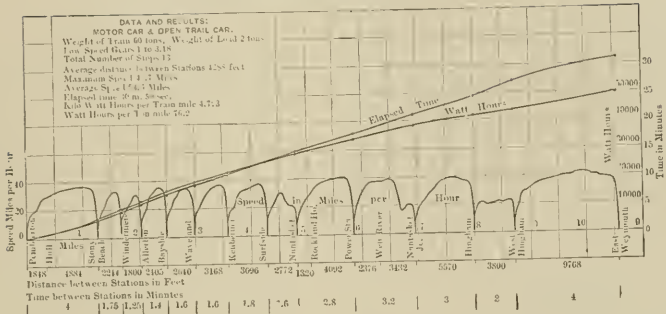


FIG. 3.

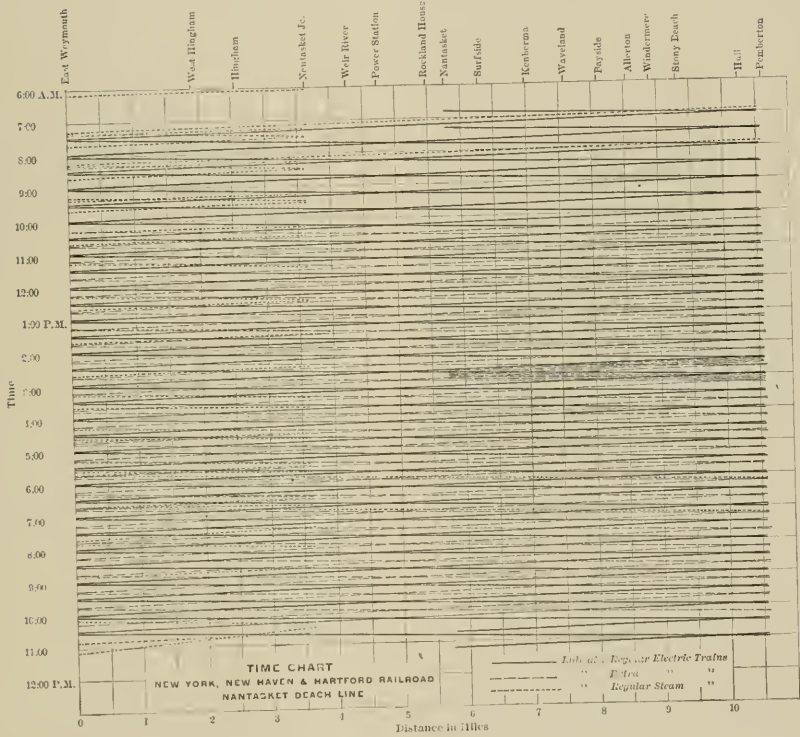


FIG. 4.

by cast iron links, which are intended to be weak enough to allow the shoe to break away easily without doing damage to the frame work of the car. The trail cars are also equipped with shoes and connected with the circuits on the motor car by means of flexible couplings, and it is possible therefore, when the cars are run in train, to bridge the longest gaps found at grade crossings and switches, so that it is not necessary to turn the current off on approaching these. This arrangement makes our trail cars independent of the motor car for heating and lighting.

It will be noted perhaps that the Nantasket motor cars have two trolley poles, as well as contact shoes, and the changing from trolley to third rail simply means the pulling down of the pole and the closing of the third rail switch.

### THIRD RAIL AND RETURN CIRCUIT.

Our third rail and return circuit experience will perhaps be of value to both street railway and railroad managers, as we have undoubtedly made a wide departure from established methods. We have solved a number of interesting problems.

First is the question of insulation. The third rail has a potential of 600 volts above the ground and rests upon creosoted wooden blocks dowelled into the ties, its edges being only 1/8 in. above the tie. Now it frequently happens that water accumulates 2 in. or more in depth over the ties, and, if it were not for our experience to the contrary, we would naturally suppose that, under these circumstances, the line would be directly short circuited between



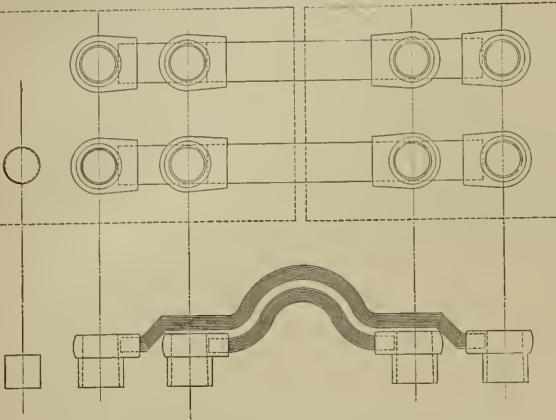


FIG. 5.

the third and service rails through the water, the distance being but about 2 ft. each way. Nevertheless, we have been able to operate our road without the slightest difficulty when this has happened, and nothing unusual has been noticed at the station, nor has the electrical output, as registered by the recording wattmeter been abnormal. At Berlin we have watched the ammeter closely when we knew the tracks to be submerged in two places 10 miles apart, during a heavy rain storm, and have found that the leakage was almost imperceptible when both cars on the line were at rest and their air pumps out of circuit. At the same time, the wattmeter was standing still. Of course, if a long length of track were submerged, the leakage might become serious, but we have yet to learn how much is necessary to accomplish this result.

We aim to so connect our third rail lines and the service rail return as to have a practically complete metallic circuit of extremely low resistance; as far as possible, disconnected with the ground. We do not believe in grounding our track, and, though ground plates are placed at the station, connected to our generator, by far the largest proportion of the return current comes through the cables connected directly with the track, the percentage coming from the ground plates being extremely small.

The joints of the third rail are bonded by long copper plates, firmly bolted to both sides of the joint, 16 bolts being used in all. These copper plates are tinned before being put into position. Owing to the large area of contact surface, the presence of rust on this surface, does not materially interfere with the conductivity of the joint, as shown by accurate tests.

The service rails are bonded with the greatest care, four copper leaf bonds, having a cross section of copper equal in conductivity to that of the rail, being used. These bonds are inserted in the base of the rail instead of the web, so as to prevent breakage through play at the joints. The copper leaves are cast into end piece blocks in such a way as to weld them thoroughly together in the blocks. The latter are formed into a hollow cylinder, 1 in. in diameter, which passes through a hole in the flange, and by which a large area of contact is secured. Tapered pins are driven into the inside of this cylinder from the top of the flange, and the connection made is very perfect. The form of this service rail bond is shown in Fig. 5. Careful tests have shown that the joints of both third and service rails have now a slightly greater conductivity than an equal length of the rails themselves. Figs. 6 and 7 show our third and service rail joints.

A few words about the danger of the third rail system would be, perhaps, in order. There have been many cases of people who have stepped from the ground to the third rail without feeling the current, and anyone can step upon it from a dry tie without the slightest effect. On all except wet days, our employes work

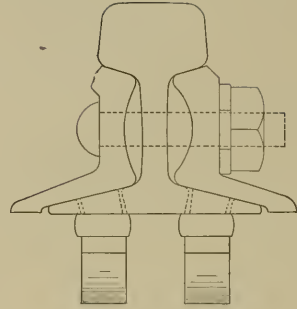


FIG. 7.

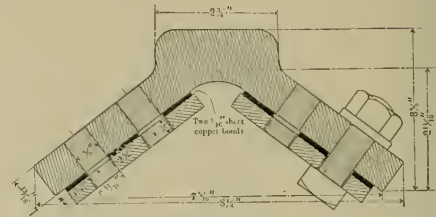


FIG. 6.

about it without trouble, avoiding, of course, putting themselves in direct contact with both service and third rails, but not infrequently "monkeying" with the current in such a way as to get shocks of more or less severity in a sort of horse play. On wet days, they refer to the third rail as being "lively," and are inclined to let it alone. Many of our employes have, however, received the heaviest shock possible to obtain, time after time, and care little about it, though those who are more influenced by electric shocks than others are sometimes thrown off the feet, but recover fully in a few minutes. We do not say that the third rail has no dangers, but we do not consider the danger as being at all serious or one which should interfere with the extension of the system.

As a result of exceptional care which we have taken in bonding our third and service rails, we have found it unnecessary, in any third rail work so far done, to use copper feeders, in spite of the fact that we are obliged to transmit current from Berlin to Hartford, a distance, as before stated, of 12.3 miles, straight away from the power station. This work is made up as follows: From Berlin to New Britain, a distance of 3 miles, there is a complete double track electric road with two 100-lb. third rails and four 74-lb. service rails, all most carefully bonded as described above. From New Britain to Hartford, a distance of 9.3 miles, there is one complete electric track, with 100-lb. third rail and 70-lb. service rails, all carefully bonded, in addition to which we have connected to the service rails of the electric track the rails of the second track, paralleling this the entire distance, at various places, in order to get the benefit of whatever conducting power there might be in this track connected only by its fish plates at the joints. As a result of this work, we are able to run two trains of 52 tons each on the New Britain and Hartford line with an average loss of but 26.5 per cent. The current output of the station at such a time averages about 300 amperes, with a maximum flow of about 700 amperes at a pressure of 600 volts. Of course, if the service were heavier, so that more cars would be required, it would undoubtedly be necessary to reinforce the third rail with feeders.

## COST OF POWER.

In our Nantasket Beach station we have installed two engine-generator units of 800 h. p. and 550 k. w. capacity each. The steam is supplied by eight boilers of 200 h. p. rated capacity each. On heavy days, both these engines are required, but on ordinary days but one only, and this is not fully loaded; the average loads being perhaps one-half the maximum.

In the Berlin station we have installed two engine-generators of 1,200 h. p. and 850 k. w. each. The steam is supplied by 10 horizontal tubular boilers, of 200 h. p. each. One unit only is required in the practical operation of all the cars on the Berlin and Hartford lines, and the average power output is hardly one-fourth of the maximum capacity.

In both stations, our aim has been not to follow out any engineering fads, but to provide apparatus proved by long experience to be of the most simple and durable character. The details of piping and arrangement of steam apparatus have been so thoroughly described in the technical papers that it is unnecessary to refer to them here. We are now running our Nantasket plant condensing and our Berlin plant noncondensing, the loads in the latter being too light to make condensing profitable.

In spite of the fact that these general conditions of operation do not point to a low cost of power, because of the fact that we are working neither station at anywhere near its full capacity, I suppose we are, as a matter of fact, producing power more cheaply than can be done in any power station in the country using coal as a fuel, the reason being that we are burning sparks. "Sparks," as we are accustomed to call them, are the half consumed coals dumped from the extension front of locomotives at the company's various round houses. Nevertheless, there is a great deal of steam generating value in these sparks, as we have found by experience, and they are being carried on the company's cars to our stations at Berlin, Nantasket and Stamford, and charged to the electrical operation at the cost of freighting (including the usual profit to the company for transportation), plus the cost of loading and unloading, a total charge of 70 cents per ton delivered.

In order to burn these sparks, we are obliged, of course, to make some changes in the furnace arrangements, chief among which is provision for the introduction of live steam under the grates, forming a blower or forced draft as well as providing the water which, in decomposition, furnishes the oxygen and hydrogen gases which greatly increase and facilitate the combustion of half-burned coal and add enormously to the furnace heat. We originally supposed that some form of shaking or self-cleaning grate would be necessary in burning sparks, but have found in practice that, with ordinary grates, together with the steam blower, there is no difficulty. In our experimental days, it was thought that it might be necessary to use a proportion of ordinary soft coal with the sparks, and we did so for a while, but it was not long before our firemen were educated to burn sparks only with entire ease, and no other kind of fuel is now used by us. Of course, we have to use a greater weight of this half consumed coal than would be the case with new coal, but still the economy is great, as a good quality of run-of-mine coal costs us, in Connecticut, about \$3.00 per ton delivered at power station.

A few figures as to the cost of power at Stamford may be of interest. This station furnishes current for our street railway system at Stamford and for lighting our railroad stations with 350 incandescent lamps. We are operating one engine only, of 500 h. p. total capacity, direct connected to one 300-k. w. generator. In the boiler room are six 200-h. p. boilers. For the first six months of full operation with sparks only, the total cost of fuel for this station amounted to 3 mills per h. p.-hour or 4 mills per k. w.-hour. For so small a station and one where the average amount of power developed is hardly more than one third the rated capacity of the engine, I believe this to be a low figure. We have recently made, for our own information, for use in larger plants, special tests of the cost of power developed in this way, using for this purpose a water rheostat, in order to load the engine up to more nearly its full capacity. As a result of these tests, we find the cost of fuel for power, with the use of coal, to be 3.2 mills per h. p.-hour or 4.2 mills per k. w.-hour. With the use of sparks, the cost is reduced to 1.9 mills per h. p.-hour or 2.5 mills per k. w.-hour.

At our Nantasket power station this season, the cost of fuel, with the use of coal, has averaged 4.2 mills per h. p.-hour or 5.6 mills per k. w.-hour, while, with the use of sparks, the cost has been 2.1 mills per h. p.-hour or 2.8 per k. w.-hour.

As before stated, our Berlin plant has not been run as economically thus far as it will be when a greater load is put on the engines and it will seem to be in the interest of economy to run compound condensing. At this station, the cost of fuel, with the use of coal, has been 9 mills per h. p.-hour or 12 mills per k. w.-hour. Using sparks as fuel has reduced this cost to 3 mills per h. p.-hour or 4 mills per k. w.-hour.

It is very difficult, of course, if not impossible, to make any direct comparisons between the cost of motive power for electric railroading and that for steam railroading, on account of the different way in which the trains are made up. The best criterion would be the cost of motive power per ton-mile hauled, but even here the results would be of little value on account of the wide difference in conditions, and, as a matter of fact, we have never attempted to make such comparisons.

I have tried to give you, as briefly as possible, some of the results of the pioneer work which the New Haven Company has been doing in heavy electric railroading. They are roughly stated and we cannot pretend that they are in any way conclusive as affecting general railroad practice. For ourselves, however, we have formed some definite ideas as to what is possible for us to accomplish, and our plans for the future are being made with great care by President Clark and the board of directors, with the intention of dealing with the new transportation conditions which confront us in a broad minded and progressive way. It is felt that a great transportation agency of this character owes it to the public from which it has obtained its franchises, to furnish the best possible service and to make the most of the natural advantages which it possesses.

There will always be room, doubtless, for railroads of two characters, the one operating on a purchased right of way, where trespassers can be kept away and high speed obtained, and the other operating on streets and highways, where passengers can be taken up and let off at their own doors. It is possible that, in some thickly settled districts, such as are found in New England and the Middle States, where population groups almost touch each other, these two classes of service may occasionally be performed by the same agency, but there is no reason, ordinarily, why there should not be the most amicable and friendly relations, and not infrequently of a business character, existing between steam railroad and street railway companies.

The reading of Mr. Heft's paper was followed by loud applause.

Mr. Bean, of St. Joseph: I move that the paper just read be received and placed on the record; and that a vote of thanks be extended to Mr. Heft for his able paper. Carried.

Mr. Palmer, of Fall River: I ask Mr. Heft what the costs he has given us represent—the total cost of power, or cost of fuel only?

Mr. Heft: I stated plainly it was the cost of fuel only.

Mr. Palmer: Can you give us any figures which will show us the total cost of power per k. w.-hour or per car-mile?

Mr. Heft: That would depend entirely on the conditions at your station. No two stations would have the same conditions. At Stamford you can notice that our power costs us a great deal less, because we are running nearer to the normal capacity of our engines. At Nantasket the economy is not so great, and at Berlin, where we are only running the high pressure side of the engine, it costs a great deal more. This is true also of the labor. The labor where the large engines are costs more than it does with the small engines, where you are running away below your normal load. If we were running our Berlin station up to its normal capacity, we would show a greater economy in fuel and labor than in the other power stations, because there is a certain fixed charge which we are subjected to at all stations, and the amount of that depends on the size of the station and the number of units.

Mr. Palmer: I appreciate that what you say must necessarily obtain, but what I wanted to find out was whether you had at hand or could give the cost for any one particular station?

Mr. Heft: We have that information in our office. I did not put it in this paper.

Mr. Palmer: It seems to me that it would be very interesting for

some of us who are operating street railway power stations to be able to compare our cost of production of power with the cost of production of power in these plants which have so recently been fitted up with everything of the latest type, and I should like to be able to compare some of the figures which we have made with some of those which the New York, New Haven & Hartford has been making in its stations. For instance, the total cost per k. w.-hour delivered at the switchboard, including all expenses which should properly come in—taxes, insurance, interest, labor, supplies, and everything so chargeable to it.

Mr. Heft: I will say through you, Mr. President, to the members of the Association, that we will very gladly furnish any of these data that you ask for, upon application at our office. We will supply any of our plans, maps or data sheets. We have nothing that there is any mystery or secrecy about, and we will be glad to place it at the disposal of any member of the Association. (Applause.)

Mr. Newman, of New Orleans: What is the cost of the sparks?

Mr. Heft: I stated that to be 70 cents for a ton of 2,000 pounds. These figures are based against coal costing \$3 a ton. While the sparks do not cost our company anything (it is really an expense to get rid of them, as every steam railroad man knows), we pay our motive power department of the road the cost of handling and loading, and the freight department the freight between the points where it is loaded and our power station.

Mr. Durbin, of Denver: Can you give me some idea of the relative cost of construction—of the third rail system, as compared with the overhead and feeder system, in this case?

Mr. Heft: I think, if I recollect the figures aright, that the third rail construction costs us, for the third rail, bonding of the rail, and cables at the grade crossings, and bonding of the surface rails, about \$3,000 per mile. Figured against our cost at Nantasket, it is about one-half; but I will also furnish those figures to any one. We have them made up in our office. I did not think of bringing these items with me.

The President: We will proceed to the next order of business, which is the paper on "Best Methods of Settling Damage Cases and Prevention of Accidents by Use of Fenders or Otherwise," by W. J. Hield, of Minneapolis.

The following subject was assigned to C. G. Goodrich, vice-president of the Twin City Rapid Transit Company, but owing to press of other work he was unable to devote to it the necessary time, and it was referred to Mr. Hield, general manager of the same company.

Mr. Hield read the following paper:

#### THE BEST METHOD OF SETTLING DAMAGE CASES AND THE PREVENTION OF ACCIDENTS BY THE USE OF FENDERS OR OTHERWISE.

By Willard J. Hield, General Manager, Twin City Rapid Transit Company, Minneapolis-St. Paul.

It is hard to handle, in a short paper, this most difficult subject which is today perplexing the officials of all large street railway systems. However, as the study of these questions is made imperative by reason of their serious importance, I venture to offer a few ideas which I trust may prove of some interest, if not of value.

Like all other professions, the law has in late years given rise to many specialists, among whom the personal injury lawyer is most prominent to the street railway manager. His untiring efforts have wrought such a change that the question of settling damage cases today is vastly different from what it was a few years ago. The general manager or superintendent can no longer personally adjust the claims against his road, but must employ men for that particular purpose. It is now necessary for him to have a claim department, the system of which should be perfect in detail and work in true harmony with his operating department, both for the prevention of accidents and the settling or fighting of damage cases. The secret of success in handling damage cases, lies, no doubt, in their being properly looked after from the start; i. e., from the time they are first reported. How to do this varies as to the different cases, but no case should ever be handled by any one but an honest, careful and experienced claim agent. For such work men must be naturally qualified; they should ever have the interests of their road at heart and yet not

be blinded by too great a prejudice in its favor; they should have sound, shrewd judgment and be pains-taking and careful of detail to the highest degree. Like the true physician, they should be of a happy, calm temperament, and also like him, should ever be ready to answer a call. The successful claim agent should have the faculty of handling all sorts of people without friction. His keen perception should reveal to him the nature of each case, but he should never betray anxiety for settlement.

Every claim department should have a good system for securing reports of accidents, for obtaining evidence, and for keeping such files and records as may be necessary for its work.

The only accidents which demand serious consideration are those in which personal injury is involved. These may be divided into the three following classes:

1. Those in which there is an undisputed liability and which, as a rule, should be settled as soon after their occurrence as possible.
2. Those in which there is a doubtful liability and which, generally, should be settled after careful investigation.
3. Those in which there is clearly no liability and which should therefore never be settled.

Frequently cases may prove exceptions to these rules, but in handling them under such a classification or any other, the following suggestions would seem to be of importance:

1. It is of great value in every case to acquire a knowledge of it as early in its history as possible. Procrastination is ever dangerous and the claim agent should have for his motto—"Time is the essence of success."
2. Evidence should be carefully secured in every case soon after the accident. Too much can never be reported to the department and what may seem of little importance at the time of the accident, may prove most valuable in preparing the case for trial.
3. In nearly all unsettled cases (particularly in serious ones), an examination by one or more surgeons in behalf of the company is desirable.
4. Assistance and kindly tender of services, immediately after a serious accident, are more in place than advances for settlement.
5. Admission of the company's negligence is seldom necessary, but the true rights of the claimant should not be denied; as by antagonizing him all chances of settlement may be lost.

6. Whenever possible a sworn statement should be secured from the claimant, giving his history of the accident and stating as nearly as possible the damage done. Such an affidavit, carefully and truthfully drawn and signed before witnesses—who should also attest it—may often prove most valuable either in settling or fighting a case. By it the claims of the interested party are clearly defined and limited, so that any subsequent intention to change them may be checked.

7. In every case the claim agent should be fair but firm. Too cheap a settlement is not the best settlement, but one too expensive is quite as bad and perhaps worse. However, the claim agent can generally keep the claimant good-natured and insist upon his acknowledging that the settlement is a fair one at the time it is made, and thus prevent his feeling or talking ugly about it later.

8. A full release of all claims should be taken from the claimant, and its contents explained to him fully. This is of great importance, as the validity of releases is often disputed, and it is then quite necessary to show that they were properly taken. On this account it is best to explain the release to the claimant before witnesses (who should also attest it), or to make him acknowledge later before them that he executed it of his own free will understanding its nature.

From these suggestions one may deduce that the method best adapted for the handling and settling of damage cases is to be prompt, thorough and careful, with a liberal use of sound, common sense. Whether a case should be speedily settled, or not settled at all, is a matter which must be decided from the peculiar circumstances which it presents and not by any fixed rule. As a general thing, however, it is well to settle all cases where the injured parties are inclined to be fair, according to the merit each case contains, and fight all cases in which the claimants are very unreasonable or where fraud is apparent. This rule carried out with the right spirit will prove a valuable policy for any road. If a case is settled, let it be done with due consideration of





WILLARD J. HIELD.

Willard J. Hield was born in Janesville, Wis., May 10, 1863, and is of English extraction. His early training was received in the schools of Janesville, in Beloit College and Madison University. Mr. Hield went to Minneapolis in the summer of 1887 and at once entered the employ of the Minneapolis Street Railway Company. He successively filled the positions of office man, book-keeper, purchasing agent, store-keeper and cashier until the strike of 1889, when there were some thrilling experiences in the various capacities in which he acted. During the time Mr. Hield was in charge of the steam line to Minnehaha Falls and Lake Harriet, he was severely injured. In 1891 he was appointed superintendent, and later general manager of the Minneapolis system, and when this was consolidated with the St. Paul Street Railway Company he became general manager of both systems.

justice, and if it be fought, let every effort be made to fight it in the fairest and most efficient way possible.

It is not usually desirable that the claim agent should make offers of settlement, but rather it is advisable for him to draw his man out and get him to state definitely, if possible, what sum he really thinks he should be paid. Generally, such a sum can be considerably cut down, no matter what the case, but if it is not an unfair amount, in consideration of the injury, it should be paid. Seldom pay more to a lawyer than to the injured party himself and do not settle a case simply because suit is threatened or commenced. Never settle out from under an attorney who has been professional and courteous in his relations to the road, yet when an unprincipled damage lawyer is interested in a case, do not hesitate to disregard him in settling it. When a good one to fight, the case should not be settled simply because it will cost less. It is ever well to remember, both, that victories in court are a great benefit and that defeats are a great loss.

While as a strict matter of law it may not be correct, yet it is always well to give some consideration, when settling a case, to the circumstances of the injured party and allowing such personal interest to enter into the transaction as will not be inconsistent with good business. As a general thing the claim agent should listen with apparent indifference to the claims of such persons as Jewish peddlers, loud-talking, and bull-doing men, sharp tongued women and all others whose claims have either the appearance of fraud or unreasonableness; with apparent interest and sympathy to those other few cases which seem to merit it.

The gist of the foregoing may be expressed in these few words: Have good claim agents of sound judgment, who will not settle cases by arbitrary rules, but who will rather consider them each in its peculiar details, weighing well the seriousness of the injury, the manner of the accident and hence the liability involved, as well as the circumstances of the claimant.

The old saying that "An ounce of prevention is worth a pound of cure" was never better applied than to the accident features of a modern street railway system. The rapid transit now in

vogue upon the busy thoroughfares of our cities, whether by means of the trolley or the cable, has greatly increased the number of street railway accidents and hence has caused the question "How to avoid them?" to be of very serious interest.

For this purpose the following points seem to be of particular interest:

1. It is very important for the prevention of accidents, as before stated, that the operating and claim department work in perfect harmony and unison with each other to this end.

2. The employing of none but good men is most essential and having employed good men, it is quite important to keep them good in the fullest sense of the term.

3. Carefully drawn, explicit rules for operating cars made with due regard to the various local conditions should be rigidly enforced and intelligently observed.

4. Speed on various lines should be regulated according to the chances of accident presented.

5. Every car should be equipped with the best controlling apparatus, gong and headlight, and also be provided with such devices for the prevention of accidents as may seem practical.

By this last statement several good devices for the prevention of accidents are rather indefinitely referred to, among which the fender and the safety gate should be placed at the head. Experience has shown that the fender is seldom a nuisance and is frequently of great value. A simple type will be found to be very practical which, while it does not insure against injury, yet very often prevents serious results. The dropping or lowering of the fender is seldom of any benefit, as motormen are generally too much occupied in stopping their cars when a collision is imminent to pay attention to the fender. In many cases where the speed of cars has been reduced from a fast to a slow rate the fender will pick up persons with no harm resulting, who, without it would surely go under the car. Where the collision occurs while the car is under great speed, serious injury is not unlikely, but even in these cases loss of life and limb may frequently be prevented and money saved in the long run.

The safety gate, with which all motor cars in Minneapolis and St. Paul are equipped, and which was not generally approved upon its introduction but a few seasons ago, has demonstrated its great value and practicability by almost annihilating those accidents which occur through boarding or alighting from cars. The danger of these accidents increases with the number of passengers carried and with nearly every road, they cause a large part of the injury and damage expense. They present to the fakir the best opportunity for making a case, and always give the jury a good chance to give the plaintiff the benefit of a doubt. The safety gate is practical for any city. In fact, we have seen its best use when our road was earning over three times its ordinary receipts. With it the conductor has but one part of his car to watch while giving the starting bell, and in case there is reason for passing persons at crossings, there is no danger from their trying to board the moving car. It also affords protection to people standing on the rear platform in case of a car rounding a curve at high speed, or on other occasions, when a passenger, through his own condition or carelessness, or the operation of the car, is liable to fall off.

The gate, being operated by the motorman, should never be opened until the car is at a stand-still, and should always be closed just before the power is applied for starting. After the public becomes accustomed to the safety-gate, its operation demands no change of running time from that used before its introduction. The most timid, whether old or young, will walk without fear to the gate while the car is stopping and thus take but little time to alight. The gate is also of great service in handling large crowds at the parks where people seem to lose their common sense, as well as all ideas of propriety, and try to board and hang on to cars regardless of the danger involved. In such instances the value of but one entrance to the car is quite obvious, as at any moment the crowd may be checked by the closing of the gate and the car started.

The value of both the fender and safety-gate can best be understood by closely watching their use. Both are eminently useful and practical. They each have also a good moral and instructive influence; they caution both the public and the trainmen against accident, and also cause the community to realize that a soulless corporation has some regard for life and property and sincerely

desires to avert accident to them. They also give to the trainmen an assurance in operating the cars which is of itself of considerable benefit.

Screens for the sides of cars (when the trolley posts are between the tracks), sand-boxes always filled with sand, and many other devices, are also of considerable importance and tend each in their way, to reduce the number of accidents to the minimum.

It is not possible, however, to operate cars entirely without accidents and in studying the problem we should not look for perfect results.

The above presents roughly a few ideas suggested by long experience after trying nearly all the remedies known, and gives one the firm opinion that it is essential, so far as possible, to have the best equipment, including practical safety devices, and the best men obtainable for operating the cars and for the claim and other departments, governed and aided by the best rules and supported by the best policy.

Mr. Rigg moved that the paper be received, and a vote of thanks returned to Mr. Hield. Carried.

Mr. Davis, of Williamsport: I move that the papers to be read at the meeting be printed 15 days in advance of the meeting, and distributed among the members. Not agreed to.

The President: The report of the nominating committee is now in order.

Mr. Watson: The Committee on Nomination of Officers for the ensuing year reports in favor of the following persons:

President, Albion E. Lang, of Toledo, O.

First vice-president, W. Caryl Ely, of Niagara Falls, N. Y.

Second vice-president, John A. Rigg, of Reading, Pa.

Third vice-president, Edwin C. Connette, of Nashville, Tenn.

Secretary and treasurer, T. C. Penington, of Chicago, Ill.

Executive committee, Robert McCulloch, of St. Louis, Mo.; C.

Densmore Wyman, of New Orleans, La.; Henry C. Moore, of Trenton, N. J.; John M. Roach, of Chicago, Ill., and Robert S. Goff, of Fall River, Mass.

For place of meeting the committee recommends Boston, Mass.

Respectfully submitted,

|                                 |   |                               |
|---------------------------------|---|-------------------------------|
| Committee<br>on<br>Nominations. | { | H. M. Watson,                 |
|                                 |   | A. T. Potter,                 |
|                                 |   | John A. Rigg,                 |
|                                 |   | E. S. Goodrich,               |
|                                 |   | W. Worth Bean,                |
|                                 |   | E. Woodruff,<br>G. B. Kerper. |

Mr. Shaw, of Boston: I move that the report be accepted. Carried.

Mr. Bean, of St. Joseph: I move that the secretary be authorized to cast the ballot of the Association for the gentlemen nominated.

The secretary duly cast the ballot.

The President: I declare the gentlemen duly elected.

The meeting then adjourned.

#### Friday's Session.

President McCulloch called the meeting to order at 10:15 a. m.

Mr. Kerper, of Dayton: I move that a vote of thanks be tendered to the president, the vice-presidents and the executive committee for the able manner in which they have conducted the affairs of the Association during the past year. Carried.

Mr. Rigg, of Reading: Mr. President, I desire to offer the following resolution:

Resolved, That the members of the American Street Railway Association in annual meeting assembled express their thanks to the several Passenger Associations of the United States for their courtesy in granting reduced rates to the members of this Association and their friends who are in attendance upon our annual meeting. Carried.

The President: These Passenger Associations are very courteous but they give us no more than any other Association with one hundred delegates can receive. I believe we should have a single fare for the round trip. I have therefore considered it wise to appoint a Committee on Transportation. I will name on that committee, the

secretary, T. C. Penington, James H. McGraw, of the Street Railway Journal, and H. H. Windsor, of the STREET RAILWAY REVIEW.

Mr. Bean: Mr. President, I move that a sincere and hearty vote of thanks be extended to his honor, Mayor Hastings, who so warmly welcomed the Association to this city; to the general committee, the committee on banquet, the committee on exhibits and the committee on entertainment, for the complete arrangements which they made for our entertainment and the thorough manner in which they were carried out; to the Niagara Falls Hydraulic Power & Manufacturing Company, the Niagara Falls Power Company, the Niagara Falls Paper Company and the Carborundum Company, for the opportunity of inspecting their interesting plants; the International Hotel Company, for unceasing attention; to the Buffalo Railway Company, the Niagara Falls & Suspension Bridge Railway Company, the Niagara Falls & Lewiston Frontier Railroad Company, the Great Gorge Route, the Buffalo & Niagara Falls Railway Company, the Niagara Falls Park & River Railway Company, and the Niagara Falls Navigation Company, for transportation facilities furnished to the delegates and visitors, and for which we desire to express our deep appreciation. Carried.

Mr. Rigg: I desire to move a vote of thanks to the ladies of the reception committee for their kindness in entertaining the ladies of the convention. Carried.

The installation of officers then followed.

President McCulloch said: Mr. Lang, I am glad to turn over to you, sir, the gavel of the Association. I hope that you will hold the office of president of the American Street Railway Association with as much pleasure and satisfaction and as much pride as I have, and I wish you the same courteous treatment and the same support in your administration that I have received. (Applause.)

President Lang: Gentlemen, I dislike very much to open my administration with an apology for my late arrival at the ball; but you all know what a pleasant evening we spent last night, and it did not end with the ending of the day, but only with the beginning of the next day. I wish to assure you of my profound pleasure in being called to this office. I deem it a great honor, from the fact that I was in no sense a candidate for the office. My place in the Association has simply been that of a quiet and earnest listener, endeavoring to learn all I can for the property I represent. We have had opened up to us in the papers presented at this meeting a number of interesting questions that will command our earnest attention, and some of the improvements suggested we will want to introduce in our systems in the course of the coming year. Other questions will arise which will require our attention at our next meeting. I do not think it is proper at this time to enter upon the discussion of any questions of a practical nature. If I am as successful as my predecessor, and as successful as his predecessors have been in keeping up the interest in this organization, I shall be very thankful. It does not lie entirely with the officers of the of the Association to make a success of the Association; it depends upon its members, and as we send out communications during the year asking for suggestions for topics to be considered at the next meeting and the assignment of persons to prepare the papers, I hope you will give the matter your prompt attention. (Applause.)

The meeting then adjourned to convene in Boston in 1898, on such dates as may hereafter be designated by the executive committee.

#### SECRETARY PENINGTON'S GOOD WORK.

The re-election of Secretary Penington was a foregone conclusion, and was at once a compliment to the excellent work of that official, and a wise selection on the part of the Association. Mr. Penington has from the first day of office conducted the business with promptness and impartiality. Last year he had the official proceedings, a work of considerable magnitude, edited, printed and delivered within 30 days. He has followed up the program with a result that the business of the Association was this year conducted with less loss of time than at any previous meeting. He conducts the business of his office with the greatest possible economy consistent with the dignity of the Association, and fully deserved the vote of thanks which was given him at the recent meeting.

At the banquet Mr. Penington surprised the toastmaster and everybody else by promptly responding with a speech when called upon, and although the hour was late his friends would gladly have listened longer.

## THE ACCOUNTANTS' CONVENTION.

**Street Railway Accountants Hold Their First Annual Meeting—Large Attendance—Good Papers—Exhaustive and Valuable Discussions—Recognition by the American Association—The Great Work of Standardization of Accounts at Last Actually Begun.**

The first regular meeting of the Accountants' Association was a most gratifying success, and promises a long and useful organization. The meeting room was convenient, being on the first floor of the convention building, and the entire proceedings from beginning to end were conducted with expedition and thoroughness. The sessions were well attended, and many managers found time to drop in and by their presence and kindly words of encouragement endorsed the enterprise. The results were highly satisfactory, and while much remains to be done, in fact the Association is now really for the first time fully equipped for work—the outlook is all that could be wished.

The American Association extended the strongest kind of encouragement and endorsement and a large number of new members were added.

The papers were good, and it was a matter of general regret that the volume of preceding work prevented the presentation of the last two papers, on the program, which were prepared by Mr. Hibbs, of Jersey City, and Mr. Davies of Cleveland. These papers will be taken up next year.

It was a matter of general regret that President Wilson, of Boston, was at the last minute prevented from coming on account of work in connection with the State Railroad Commissioners, which could not be deferred; but Mr. Duffy, first vice-president, of St. Louis, made a fine presiding officer, and wielded the gavel with great tact and impartiality.

The Accountants kept long hours, but left enough unfinished business to occupy profitably the time of another meeting. The great work, was however, the report of the Committee on a Standard System of Accounts. What this means is realized by all accountants; or they think they realize it. As a matter of fact the enormity of the work can only be appreciated by those who carried the load. The committee on this work consisted of C. N. Duffy, St. Louis, chairman; W. F. Ham, Brooklyn, and J. F. Calderwood, Minneapolis. This committee did a vast amount of work in correspondence and individual classification during the interim between the Cleveland meeting and its meeting at the Falls, where it worked for four days and nights previous to the convention. The several plans were merged into one, and the result was the most excellent report of this committee. In its deliberations, the committee had the presence and advice of Secretary DeFreest, of the State Board of Railroad Commissioners of New York. The arduous work of these gentlemen entitles them to the thanks of every street railway in the land. That a better committee could have been chosen is hard to believe.

Secretary Brockway proved a most efficient officer, and upon him naturally fell an unusually large amount of work in arranging for the meeting. He conducted his office with promptness and great efficiency, and while not seeking re-election was unanimously chosen for another year.

It was a graceful compliment also which re-elected President Wilson, who will now have an opportunity to preside in his own city.

The stenographic proceedings of the meeting fill 271 pages of type written copy and constitute a valuable fund of information. It is with regret we are unable to publish these discussions in full, but very much of it is of a more or less confidential character. The actual members will be furnished with a copy for their exclusive use by the secretary.

### Tuesday Morning.

It was 11 o'clock Tuesday morning that Vice-President Duffy of St. Louis sounded the gavel and the first annual convention of the Street Railway Accountants' Association of America was begun.

After roll call the vice-president announced the absence of President Wilson of Boston, and read a telegram from that gentleman explaining why he could not attend and wishing the meeting great success.

The reading and approval of the minutes of the Cleveland meeting followed, after which the chair announced the president's annual address, which was read by the secretary as follows:

### PRESIDENT'S ADDRESS.

Gentlemen of the Association:—

I have steadily looked forward to this occasion from the day our Association was formed and it is with the deepest regret that I am forced to delegate the reading of my address to another.

With the rapid development of electricity as applied to the street railway business has come a very decided improvement in many ways. There has been a marvelous appreciation of real estate in the outlying districts and a great improvement in the streets of both the cities and towns. The small wage earner can now afford both the time and money required to travel back and forth from a pleasant home in the suburbs to his work in the city. The rolling stock has greatly improved and the comfort of this mode of traveling has greatly increased. Everything connected with the business has received careful attention, even to the accounting and it is a matter for congratulation that although this is the first regular convention of this Association, not a little has already been accomplished toward improving this department, by the comparatively few members who attended the meeting when this Association was formed in the city Cleveland last March.

Those of you who were present at that time will remember the enthusiasm that was shown by all present, not only to learn something for their own use, but to do what they could in the way of imparting information to others, and the papers that were presented on that occasion showed that much thought and time had been expended in their preparation, and the general discussions which followed the reading of each, clearly indicated the deep interest all present took in every department of street railway accounting. Some people claim that it is hardly fair to ask them to give to others, the value of what has cost them much time and thought in perfecting, but it is a pleasure to know that this feeling does not exist to any great extent among the members of our profession, and that most of them consider that it is no more than courtesy to impart to others what their experience has taught them. It is very unusual if one does not obtain some useful information by a comparison of methods. Every one is very apt to be prejudiced in favor of the way he has been keeping his accounts, but the chances are that there may be some points which he has overlooked, that some other person has observed, and if he does not find some improvement worth adopting, may find some mistakes that he will be able to avoid.



As our constitution states one of our chief aims is "to promote the adoption of a uniform system of accounts" and the most important subject that will come before this meeting is the report of the committee who was appointed to investigate (as far as the limited time would permit) the different methods now in use and give at this meeting the conclusions at which they have been able to arrive. The three gentlemen who so kindly consented to assume this very arduous task undertook what it is sincerely hoped will be the beginning of the end of this question, and in the limited time which they have had to prepare their report have accomplished much more than could possibly have been expected when the matter was first suggested.

This question has been brought up several times by the American Street Railway Association, but they have so many important subjects to consider that they have been unable to do much more than suggest that certain methods be approved. It is a great pleasure for me to state that they thoroughly approve of this Association and most heartily endorse our aims and objects and their executive committee has assured your officers that any encouragement that they can offer will be most heartily given. They have already tendered us the use of their meeting place as well as the great privilege of attending any of their meetings, their banquet, and in fact all of the privileges to which their members are entitled and we shall always feel deeply grateful for their hearty support and endorsement.

What we greatly desire now is to increase our membership and while we are particularly strong in certain localities, we wish to represent all sections of America. Among the applications which have been favorably acted upon by the executive committee was one from the Republic of Mexico, and as the two principal street railways of the Dominion of Canada were already enrolled upon our membership, it was particularly gratifying to obtain a representative from the neighboring country at the South. Before this convention adjourns it is sincerely hoped that our membership will have increased to a very large number, and if every member will earnestly try to induce some of the many street railway men whom they will meet during the next few days to join our Association, this can easily be accomplished.

Before closing I wish to say a word or two about our very good friend H. H. Windsor, of Chicago. To his energy and ability we owe nearly all of our present success, the idea of such an Association was only suggested to him when he immediately took hold of the project and devoted much valuable time and no little money toward bringing us together, and when this was accomplished he continued in many ways to direct and encourage us, and ever since has evinced a deep interest in everything pertaining to our welfare.

We also owe our gratitude to the members of our fraternity in the city of Cleveland who so kindly entertained us when we met in their beautiful city last spring, and we shall always remember the generous hospitality which they extended to us on that occasion.

The annual report of the Executive Committee was then called for, and read by C. B. Reavis, of Augusta, Ga.

Gentlemen: The objects of our Association, the business transacted by us at Cleveland at our organization meeting, are too well known by all to need any remarks from us regarding them, but from the adjournment at that meeting to our convening here there is due from us an account of our stewardship.

At the Cleveland meeting there were represented 25 roads, since then we have received applications from and elected to membership 12 others, a list of which is given in the secretary's report, making 37 in all. We have lost one, the Cincinnati Street Railway Company, leaving us at the present time 36 companies in good standing from 19 different states and 3 countries.

The books of the secretary and treasurer have been examined and found correct, and show a balance of \$222.08. In this connection it is proper for us to say that the great burden of getting our affairs in shape, of arranging program and keeping in touch with the members has fallen upon our secretary and it gives us pleasure to state his work has been done thoroughly and well. His management has been a most economical one as his detailed report will show.

Our meeting at Cleveland has borne fruit in the way of increased membership, so let us keep up the pace set at that meeting for

hard and faithful work until we have upon our rolls every road possible.

Respectfully,

The Executive Committee  
(Niagara Falls, N. Y., October 19th, 1897.)

Secretary-Treasurer Brockway, Toledo, made his annual report as follows:

To the Executive Committee:—

In presenting this first annual report of the secretary and treasurer I wish to attract your attention to a fact which has its bearings upon the past, the present and the future of the Association, viz.: that the Association has been in existence but seven months and during that time the organization has had to be planned throughout, almost entirely by mail, and those plans placed in operation. But the matter of the most importance, that which has caused the secretary the most concern, is that every act, every letter written, every idea placed in practice has had to be in the nature of the case a precedent, many of which will still be in effect many years, perhaps as long as the Association shall live. Thus the importance of not only making progress as quickly as possible, but in the right direction and manner has always had its place in whatever has been done.

In obtaining the books of record, the stationery and circulars required, a due economy has been observed which has given you respectable stationery, but at moderate cost.

We came away from the organization meeting at Cleveland with 25 actual membership companies. Since then there have been added the following:

The People's Railway, St. Louis, Mo.  
The St. Louis & Suburban Ry., St. Louis, Mo.  
The New Orleans Traction Co., New Orleans, La.  
The Lowell, Lawrence & Haverhill Ry., Lawrence, Mass.  
The Richmond Traction Co., Richmond, Va.  
The Compania de Tranvias de Mérida, Mérida, Mexico.  
The Lindell Ry., St. Louis, Mo.  
The Missouri Railroad, St. Louis, Mo.  
The Elmira & Horseheads Ry., Elmira, N. Y.  
The Worcester Consolidated Ry., Worcester, Mass.  
The Birmingham Railway & Electric Co., Birmingham, Ala.  
The Kokomo City Street Ry., Kokomo, Ind.

Twelve in all, making 37 companies from 19 states and in 3 countries. One company, the Cincinnati Street Railway Company, Cincinnati, has withdrawn from membership, leaving a net membership on this date of 36 companies.

Receipts and Expenditures:

|                                                                                                            |          |
|------------------------------------------------------------------------------------------------------------|----------|
| There have been received from dues 37 companies, at \$10 .....                                             | \$370.00 |
| And expenditures made for stationery and printing .....                                                    | \$46.53  |
| Postage .....                                                                                              | 31.00    |
| Expenses of the committee for a standard system of accounts for stationery and postage for circulars ..... | 24.23    |
| Secretary's office expenses .....                                                                          | 18.95    |
| Secretary's traveling expenses, exclusive of railroad fare .....                                           | 8.61     |
| Expenses of Cleveland meeting .....                                                                        | 18.50    |
| Total expenditures .....                                                                                   | 147.92   |

Leaving a balance in the Home Savings Bank, Toledo, O. .... \$222.08

Arrangements have been made whereby the Association will receive interest at 3 per cent upon the monthly balances in the bank.

The secretary is under obligations and wishes to announce in this public manner his thanks to Capt. Robert McCulloch, president, and T. C. Penington, secretary of the American Street Railway Association, and to H. H. Windsor, of the Street Railway Review, and E. E. Higgins, of the Street Railway Journal, for the invaluable assistance rendered and the cordial manner in which they have responded to our needs.

Respectfully submitted,

W. R. Brockway,

Secretary and Treasurer.

(Toledo, Ohio, October 16th, 1897.)

Mr. Reavis, chairman of the auditing committee, reported on the examination of the treasurer's accounts, which were found correct, and complimented that officer for the excellent manner in which the accounts and records had been kept and the economical management of the office.

On motion of Mr. Ham, the chair appointed as a committee on Blanks and Forms for this convention, Messrs. King, of Washington; Durbin, of Denver, and Burlington, of Columbus, O.

A nominating committee was then appointed, consisting of: Mr. Durbin, of Denver; Mr. Hibbs, of Jersey City; Mr. Stratton, of Birmingham; Mr. Wallis, of Fitchburg, and Mr. McDole, of Cleveland.

The chair then called for the paper "The Care and Handling of Fares from Passenger to Bank," by C. L. Wight, auditor of the Toledo Traction Company.

Secretary Brockway: I wish to say, gentlemen, that Mr. Wight was unable to attend at the last minute, although fully counting on doing so. Reports were called for which made it impossible for him to get away in time. He has, therefore, sent his paper by me. In explanation let me say he has sent here a set of blanks which entirely cover the subject of the paper. I believe he intentionally shortened his paper, under the expectation of using these blanks in the further explanation of it, and I think you will find the blanks will explain whatever of detail has been omitted from the paper.



C. L. WIGHT.

Charles L. Wight, secretary and auditor of the Toledo Traction Company, is a native of Massachusetts. In 1870 he went to Chicago and was engaged with the American Bridge Company for a year at the end of which, without solicitation on his part, he received a government appointment at the headquarters of the railway mail service. In August, 1889, Mr. Wight accepted the office he now holds with the railway company, and later became auditor and treasurer of the lighting companies in Toledo.

## THE CARE AND HANDLING OF FARES FROM RECEIPT TO BANK.

By Charles L. Wight, Auditor, Toledo Traction Company,  
Toledo, O.

Under this title I will endeavor to explain the method at present used by the Toledo Traction Company. Please bear in mind that this company issues several different kinds of tickets, and that companies receiving all fares in cash have much advantage in economy of time, blanks and accounting.

One of the objects of our association is to enable members to compare methods of accomplishing a certain result, and in so doing, detail of method together with an exhibit of forms used should be given to be of practical value.

Following is a list of blanks, with a brief description of their uses:

1. "Conductors' Report," in which is noted the number of cash fares and of each issue of tickets received as fares; the statement of the register, the number of transfers, etc.; accompanying this report is a punch slip used to verify the 3-cent and 1-cent fares received. This report with the
- 2-3. "Conductors' Cash Envelope," containing all cash, tickets and transfers received, is deposited with the station clerk, who gives his receipt therefor. Deposits are made at the station, at the end of the run for the day.
4. "Division Superintendent's Report" of returns from the station of all money packages, which is checked up at the main office on its delivery at 8 a. m. each day. (These packages, together with the conductor's report, are kept in the safe at the station during the day and delivered to the auditor as above stated.) This method gives the conductor, and also the division superintendent, a receipt for all returns.
5. "Division Superintendents' Register Report," giving statement of register of each car at time of leaving on first trip and when arriving from last trip at night. The reports from conductors must agree with this statement, thus making a perfect check on rings as shown on conductors' reports.
6. "Division Superintendent's Punch Slips and Transfers" issued by them to conductors giving the number of the conductor, the serial number of transfer and the number of the punch slip.

The foregoing is an outline of our methods in the care of receipts from the collection of the fares to their delivery at the main office; observe that we do away with the counting of money, etc., at the station and the employment of receivers. The entire work is done in the auditor's office and under his personal supervision, at much less cost of labor and with less liability of loss.

7. "Counter's Cash Statement" used by counters to verify the total returns of the routes for the day. Each envelope received from the conductor is first examined and if in any way mutilated or unsealed, notation is made of such fact. We count the tickets and transfers first to be sure that no money is mixed with them, then the cash. No two opened reports are allowed on the table at the same time.

If the returns enclosed do not correspond with the conductor's report, an actual inventory of contents is made on the back of the envelope and certified by at least two clerks. If more money is enclosed than called for by rings as shown on report, it is returned to the conductor. The cash is thrown into a pan provided with compartments for the several denominations, and on the completion of the counting of routes, the money is placed in coin wrappers and the counter's cash statement made out and given to clerk in charge; all shortage and over-payments are also noted on this slip.

8. "Shortage Notices." The clerk in charge of the counters sends daily, all notices of shortages or over-payments to the station clerks, whose duty it is to make the collection from the conductors and forward returns to the main office.

"Bank." All metal money is placed in coin envelopes stamped with our company name and the number of the clerk enclosing it, as well as the date. In preparing the money for deposit the amount is checked in detail by two clerks. A deposit slip is made in carbon duplicate, and the signatures on all checks (giving amount) is placed thereon.—We have special strong boxes for bank use, one key of which is kept by the bank teller. We make the deposit at 10:30 daily.

9. "Record of Earnings by Route." This statement is made by the clerk in charge of the counters and is designed to be a check on the counters and the record of the earnings of each line. It gives the number of runs, conductor's and motorman's name, number of badge, car number, etc., as well as the number of cash fares and tickets received in detail. The total amount due from all conductors on the line must correspond with the counter's cash slip. (See No. 7.)

10. "Record of Earnings of all Routes." On this statement, we consolidate the footings of the route statements, thus giving the total receipts for the day.

General.

I have taken from my "General Earnings Record" a copy of the headings which are herewith exhibited. This book is divided by extra heavy leaves into five sections. In the first division the record of earnings, together with the record of the receipt of tickets in detail is kept by routes daily for each month.

The second division is for totals of all routes daily for each month.

The third is for the summary of each route each month for one year.

THE TOLEDO TRACTION COMPANY.

CONDUCTOR'S REGISTER REPORT.

Station No. of Register, Date, Foreman, 189, Remarks, Statement, Balance, On Repts., Condition of Register, In Out, In Out.

The Toledo Electric Street Railway Co.

CONDUCTOR PUNCH SLIP No. FOR REGISTRATION OF 30 TICKETS. CONDUCTOR, BADE No. 189, LINE, RUN No., CAR No., One space to be punched at the time of Collection for BADE 3 CENT TICKET Collected. This slip is to be returned with the Trip Sheet for the same RUN and THREE CENT TICKETS are to be enclosed with Cash Return to balance Amount punched. Punch in regular order of slips.

Table with columns for Run No., Car No., and numerical values. Includes a small table at the bottom right with columns 67-74 and 34-41.

SEE INSTRUCTIONS ON BACK

TOLEDO ELECTRIC STREET RY. CO.

Run No., Route, From, To, M., to, M., Date, 189, Motorman, Badge No.

Main accounting table with columns for 5c REGISTER, 3c TICKET REGISTER, 5c REGISTER, 3c REGISTER, and ITEMS REGISTERED. Includes sub-tables for CAR READING, ITEMS REGISTERED, and CAR READING.

THE TOLEDO TRACTION CO. STATEMENT OF EARNINGS.

Date, Driver, Abg., Header, A. M., P. M., No. of Conductors, No. of Tickets, No. of Punch Slips, ITEM.

The Toledo Traction Co. CONDUCTOR'S RECEIPT

Run No., Date, 189, Received from Conductor No., ONE CASH ENVELOPE SAID TO CONTAIN \$, No. Tickets, No. Transit Checks, V.A.T. 4-B-97-3M

THE TOLEDO TRACTION CO. Foreman's Daily Report OF TRANSFERS AND PUNCH SLIPS

Date, 189, DELIVERED TO CONDUCTORS SERIAL NOS. as follows:

Table with columns: No. of Conductors, Serial Number, Punch Slip, No. of Conductors, Serial, No. of Punch Slip. Includes Total Car Receipts and Ticket Sales.

OFFICE OF THE TOLEDO TRACTION COMPANY, Toledo, O., 1897

Your Report calls for, Amount Received, Date, Conductor

You will please enclose in accompanying envelope the balance due as above stated, and hand same on RETURN TRIP to Station Clerk or Collector. If you have reason to believe this above charge is not correct, come to the office and explain your report.

THE TOLEDO TRACTION COMPANY.

REMARKS.





suspense account and only credit the earnings when the ticket is returned.

Mr. Brockway: I should fancy that Mr. Wight's deposit at 10:30 is for the second day previous instead of the day previous, because the report says they do not go to the office until half past eight, and I do not think they could count the earnings of the day in an hour or two.

Mr. Green, of Chicago: We deposit today what we earned yesterday. The earnings of yesterday would be in the bank at 10 o'clock this morning.

Mr. Ham, of Brooklyn: I do not believe it is possible for them to do it with their system.

Mr. Brockway: I know I can't.

Mr. Green: The money is all turned in after 6 o'clock at night. It is not in until 1 o'clock.

Mr. Hibbs: We have ours deposited every trip.

The Chair: When do you deposit your earnings in the bank?

Mr. Hibbs: Ten o'clock in the morning; just as soon as the bank opens.

The Chair: Are you one day behind on earnings in your deposits?

Mr. Hibbs: No, sir; we deposit for the previous day. The tickets and transfers are examined, the day card is totaled up from the trip envelopes and the cash counted.

Mr. Wallis, of Fitchburg: You have receiver's safes?

Mr. Hibbs: We have abolished them all.

The Chair: I think it would be well to understand that there are a great many roads which do not use the receiver's system at all. There are a great many other roads which deposit their money every trip; there are still other roads which deposit their tickets every trip, and their money once a day. Now, in St. Louis, we have seven companies, and the receiver system is not in use on any one of them. That is pretty generally the custom so far as we know it, except with Mr. Green, in Chicago, and Mr. Calderwood, in Minneapolis.

Mr. Calderwood: We have tried all systems, I think; the receiver system, the system of depositing in envelopes each trip, depositing it two or three times a day, but the most satisfactory system in our experience is the receiver system. In fact all our stations are now so consolidated that they are large stations, and in all of them we have a receiver. He receives the money. The conductors turn in their transfers and tickets each trip, in an envelope; or in some cases each half trip as they pass the starter's stand which is located on the loop around which all the cars pass, with the exception of one line where provision is made at a drug store to receive the tickets and transfers from that line. The cash is turned in at the end of each run by the conductor, who goes in with his trip sheet and turns in the entire amount of cash on that run to the receiver. Everything is done in the presence of the conductor, and the amount received and by whom is written in ink across the trip sheet. The receivers at the stations assist in keeping the pay rolls and do other work, so their time is fully employed. The actual amount of time which they use in receiving of the cash is comparatively small. The cash is gathered up twice a day from the receivers at the stations by a man who brings it to the office. He receipts for it. The cash is counted up and deposited the next day. We deposit each day the exact amount of the receipts to a cent.

Mr. Ham: My experience has been so nearly like Mr. Calderwood's there is almost no occasion for me to say anything; but I am satisfied that if the stations are reduced in number, that is if you do not have a great many stations separated by long distances, etc., that there is no question but that the receiver system is absolutely the most economical and the most satisfactory. There is then no question between the conductor and the company as to the amount of money turned in. Before that we had shortages that sometimes ran into considerable amounts, complaints from counterfeit money being turned in, plugged money and Canadian money, and the turning in of short accounts purposely. Now we have nothing of the kind. The receiver makes no endeavor to verify the day card or the trip sheet at all; he simply takes what is given him and asks no questions. The receiver also counts the tickets, which with us is no serious problem. Our receivers go on duty in the afternoon when the morning runs pull in, and they work about 10 hours a day, or into the night. When I go into the office in the morning, at half past

eight, I have a slip on my desk which shows the total receipts for the preceding day; and half an hour, or an hour later, I know what the receipts were by each of our individual lines, of which there are 20; and a very short time after that I know what were the average car earnings for each line for the previous day.

As to the sale of tickets I should condemn very strongly the crediting up on day of sale; I think as Mr. Hibbs states it should be carried in some sort of suspense account. Unless you do this I do not see how you are going to correctly show the earnings of each line. Tickets may be sold in large quantities, but you do not know what line is going to be benefited by them, or what day they are going to come in; but when you treat each ticket as so much cash, it becomes no problem at all.

Mr. Ross, of Montreal: Before my connection with the company they used the register system and also the fare box; and concluded that the fare box was the better of the two. In this way no money is handled except at the accountant's office. We issue the portable fare box to the conductor and he collects the fares from the passengers in those boxes; the passengers have to put their fares in the box; that box comes into the accountant's office and is counted every trip by a girl. Six to eight girls are required to do this work. We have four different kinds of tickets: the cash fare is five cents; there are laborers' tickets, school tickets, 6 for a quarter and 25 for a dollar; and we carry those tickets in the ticket sales account. We only credit the earnings of the tickets as the tickets come in. The fare box makes it very easy; and we know by nine o'clock the next morning exactly what our earnings were for the previous day.

Mr. Hibbs: When you have varying rates of fare on the same line, how do you carry that; say, 5, 10, 15?

Mr. Ross: We have columns for that on the earnings sheet. We supply the conductors with a certain amount of tickets which they pay for when they start out in the morning, and they sell them to the passengers. Transfers are not deposited in the box, but are turned in by the conductor separately.

Mr. King, of Washington: We use a deposit safe of our own design, which we had made to order. In this safe is a cylinder with segmental boxes. There is a crank which these boxes fit on, which is turned. The top of the safe is numbered; conductor No. 1 has his box, and so on. In order to get his deposit into his proper box all he has to do is to turn a pointer on the top of the safe opposite his own number, and this connects the slot in the top with his individual compartment. By this means we can have our men turn in as often as desired, either once a trip, several times a day, or once a day. We have had very little trouble with fares getting mixed; and very little trouble with shortages. In the morning the contents of the safe are taken to the counting room. We handle 12 kinds of tickets. Every company in Washington is entitled to issue tickets, all of which are exchangeable and taken on any car. The night man copies the total of each conductor's book on one large sheet, which is placed out for the counters in the morning. From that total sheet is made up the receipts of the day. This is then compared with the registers to see that it corresponds with the sum total registered by the various men. We furnish each conductor with \$15 in change in the morning when he goes out, and require him to keep it and his receipts separate from any money of his own; at night the change money is turned in.

M. G. McDole, of Cleveland: Our conductors turn in their reports once each day. It is turned into the receiving safe at the station. In the morning it is taken from the safe, placed in strong boxes and sent down to the main office, to the counting room. There is a cashier in that counting room who takes charge of those boxes. We have a regular force of clerks who do the counting. Some count the cash, verify the conductors' slips, and pass the slips on to others who do the ticket counting. Our deposit is then turned over to the cashier who gives the cashier of the counting room a receipt for the whole deposit. He verifies all the tickets, they are all put up in packages of 100 each, and a label put on the package showing by whom the package was counted. These tickets are verified afterward by the assistant cashier. The deposit goes to the bank about 11 o'clock, and the ones who do the counting make out shortage slips and over slips, and the receiver at the station collects all shortages and pays the overages. Up to this summer we have always had the counting force work Sundays, thinking we could not do without it. We finally decided

that by getting down earlier Monday morning they could get out their two days' work on Monday, thereby having a day off Sunday. Saturday's run is all taken care of by itself first; then they start on the Sunday's run, and get that into the bank before it closes. This makes two bank deposits on Monday.

(In reply to a question Mr. McDole stated they used a receiving safe and not receivers, at the stations, the safes being strong boxes).

In discussing the question of shorts and overs, the Chair said: "The way we do it is this: a man is short or over either because he has taken the register wrong, because he has made a mistake in his addition or subtraction on the trip card, or because he has failed to put in the requisite amount of cash, or he may have put in mutilated money. On the sheet that we put out on the bulletin that is all posted, how the mistake occurred; and he is at liberty to get all the explanation or information he wants when he comes to the office. During the past five years we have introduced a record showing exactly how many men are in any line of work, and whether or not they were on the error list, and it so for what reason. We have a sheet with 31 spaces. For instance, we have John Jones on the short list, on the second or third as the case may be; and at the end of the month a tabulation is made of that and the list is put out. When I left home there were 40 per cent of the conductors of the Citizens line that were not on the error list at all for the month of September. We have one man that never was on the error list for all of 1895 and only once in 1896. I mention this to show that these men can be encouraged to do their work accurately."

Mr. King: We have practically the same system in force and find it very successful. We have conductors that did not make an error once last year.

Mr. Wallis: Our money, as I said before, is received in safes, and counted by a clerk who puts on the outside of the envelope the amount in silver dollars, halves, etc., and foots it up at the bottom. We require the conductors to keep their account in the same way. So far I have found the receiver's safes to be very satisfactory although we have had them in use only a short time. We have had much less trouble with shortages and overages since that time. Whether it is due to greater care on the part of conductors because they know they are responsible and cannot blame the night foreman or the receiving clerk, or what, we do not know. It makes the conductors feel secure and leaves them with a certain amount of responsibility which they did not feel before.

Secretary Brockway: I require all conductors to report on each round trip. I do not use the day card as I explained in my paper of last year. Each trip is reported separately by itself.

On motion of Mr. Burlington adjournment was taken to 9 a. m. Wednesday morning.

#### Wednesday Morning.

The chair called the meeting to order at 9:45 Wednesday morning and after the roll call, the secretary announced the addition of seven new members since the previous day.

The next order was the reading of Mr. Calderwood's paper on transfers.

#### THE HANDLING OF TRANSFERS; FROM THE PRINTER TO THE FURNACE.

By John F. Calderwood, Auditor Twin City Rapid Transit Company, Minneapolis-St. Paul.

In the management of street car transfers, as in the many other affairs of practical life, the proof of the pudding is in the eating, so I shall confine myself to a plain statement of facts—in other words to tell you, as succinctly and clearly as possible, how the Twin City Rapid Transit Company conducts its transfer business, or as the program has it: "The Handling of Transfers; from the Printer to the Furnace."

In order that the transfer system which we have evolved—for, by the very nature of the business, it must be a growth governed by local conditions, not a creation springing full-fledged from the brain of any mortal Jove—I shall dress just enough to indicate the policy of our company toward its patrons. It is to avoid all semblance of arbitrary rules wherever possible, when coming in

contact with the public, and particularly in giving transfers. We believe the street car business should be run as nearly like any other business as possible; we have transportation to sell and the better the service we can give, the more politely or considerately we can treat our customers, the more patronage we will have. We believe the public have rights which, upon a purely business basis, it pays us to respect, and in the matter of transfers we believe we more than fulfill every requirement of what was regarded, at the time of its adoption by our city council, as an exacting and sweeping transfer ordinance.

A theoretically perfect transfer system, so far as the service of the public is concerned, is one by which it is made possible for a person to start from any given point and reach his objective point by the shortest route and the quickest time.

A sincere effort is made in our system to reach this ideal. Not only do we try to give the quickest and best service for the passenger, but the conductors are expected to use judgment in carrying it out. In short, we do everything we can for the public—grant every reasonable request or concession—and do it cheerfully. And when we are compelled to refuse, we make it a point to show why the request is not reasonable. And I want to say right here that this policy pays. It pays in the harvest of nickels, for I believe that people will frequently walk or provide other means of transportation, when they would otherwise ride on our cars, because they have a real or fancied grievance against the company. But this is only a small part of the advantage of a liberal policy. I have noticed that in those cities where the first consideration—and the only one, apparently—is to snatch every nickel in sight, where arbitrary rules are imposed and the employes reflect the austere character of the management, the 3-cent fare epidemic has raged.

I think I can truly say that the people of Minneapolis and St. Paul, as a whole, are friendly to the Twin City Rapid Transit Company. We have repeated evidences of good will from the patrons of our lines, the press, the officials of our cities and public sentiment generally. We do not live over a volcano which has to be smothered with a blanket of subsidies, and I believe that one of the strongest of the bonds which bind the average citizen to us is a belief that Minneapolis and St. Paul have one of the best and most liberally managed street car systems in the country.

In the first place we have two cities, Minneapolis, with a population of over 200,000, and St. Paul only a few thousand less, lying side by side—a rectangular, or, perhaps, more accurately described as an elliptical city, with two foci the circumference of which embraces 150 square miles. The two foci—the business centers—are about nine miles apart, and are connected by a great Stamesa artery, the Interurban line running principally on University avenue, as the street is called in both cities. About each of these foci we have a loop and around the two loops, as the several car lines join the main stem, are the transfer points. Here nearly all the transferring is done, although this is slightly more general in Minneapolis than in St. Paul. The city of Minneapolis is grid-ironed by our tracks running almost parallel and brought together about the Minneapolis loop. In carrying the lines to one focal point it has been found necessary to cross them occasionally before reaching the center, and at each of these crossings transfers are effected. What I have said about Minneapolis applies, in a general way, to St. Paul, so I will not particularize further.

As stated, our policy is to give the best and most satisfactory service possible. We have a uniform 5-cent fare in both cities and a man can ride from the Falls of Minnehaha, in the southeastern corner of Minneapolis, to Shingle Creek, 12 miles; to Lake Harriet, our local Coney Island, 10 miles; or to Columbia Heights, 14 miles, for one fare. Or he can transfer to the Interurban, the greatest and most popular of our lines, and ride half way to St. Paul, where, without change of cars, he pays another fare and can reach any point in St. Paul. By transferring to the West 7th street line he can go back to the Fort Snelling bridge, but a little more than a mile from where he started, having traveled a distance of about 20 miles from the starting point.

I fancy I hear some gentleman remark, "What do they expect? No wonder your patrons are satisfied and friendly." I acknowledge his point; we give long rides, because Minneapolis and St. Paul are preëminently cities of homes and a large proportion of



our people live under their own vines and crabapple trees. But notwithstanding the length of the average ride, we believe it pays to treat the public with liberality. If any man among you doubts the wisdom of a liberal policy, let him come to the Twin Cities of Minnesota for an object lesson.

I have already said so much by way of introduction that I shall be forced to plunge right into the technique of the transfer business. I want to preface my remarks, first of all, by saying that I bring you no fine-spun theory of toy working model. I have with me the entire paraphernalia of a system of transfers, including the reports upon which they are checked up and the records of the conductors verified, so that any average business man—he need not be an expert accountant—can readily understand the plan. I need only add that it has worked well under all circumstances and is more satisfactory than we had hoped at the time it was instituted.

As most of you know, the Twin City Rapid Transit Company operates all the street car service of Minneapolis and St. Paul, all electric, except one line, the 4th street cable, running up St. Anthony Hill in St. Paul.

The ordinances of both cities require that transfers from one line to another be given "at the first intersection." No extra charge is made for the transfer ticket. A passenger, having paid his fare, is entitled to a transfer. But no second transfer is issued to the passenger who has presented a transfer, except on three or four extensions to the main lines. Transfers are registered the same as cash fares and are cancelled by the conductor receiving them by punching the head of the transfer, thus indicating who received it.

Transfers are issued by conductors at all points of intersection, entitling the passenger to a continuous ride in either direction upon the first car leaving the point of transfer, the hour and minute when the transfer becomes void being punched on the margin (a maximum limit of 10 minutes being allowed after the time of issue).

Conductors are required to issue transfers to the several lines as they are reached. After passing the first intersection, or transfer point, transfers are issued to passengers desiring them immediately as the fares are collected, thus avoiding the issuance of a transfer upon a transfer, the conductor punching the transfer (upon a 10-minute or less limit) for the time the car is due at the point of transfer.

I realize that I am not regalling you with a chapter of light literature; I incline to the prosy and the subject is necessarily technical, but I prefer to follow it out upon this line, because I believe if there is anyone here really interested in how we manage the transfer problem, with the aid of the blank forms which I have brought with me, he can find it out after he has heard me through.

One essential about any transfer system is simplicity—it must be such that the men who put it into execution can fully and clearly understand and that the public will readily comprehend. Another important feature is that it should involve as little work as possible on the part of the conductor to issue them. He is frequently crowded and it will not do to have some elaborate or time-consuming method of issuance.

Now having reviewed the conditions in a general way, my purpose is to give you next a complete story of the transfer—"from the printer to the furnace"—and then to take up, as briefly as I may, some of the principal reasons why we have adopted each feature.

The transfers which we use are our own design and are printed for us by the Globe Ticket Company, of Philadelphia. At present we are using 11 different colors of paper and ink, the idea being to have a different color for each line of tickets. The several colors of tickets enable the conductors and also the transfer clerks in the office, to tell at a glance from which line they were issued.

The transfers have the conductor's transfer number printed in a conspicuous place. They are also consecutively numbered (in red), as you will notice upon examination. The conductor's number on the transfer indicates which conductor issues the transfer, but it has no reference to the number on his badge, as will be observed by an examination of Form 379, where both are given. Samples of the transfers of the several lines are here among the other forms. They are practically self-explanatory.

The transfers are put up in tabs of 100, and when received from the printing office they are done up in bundles of 500, and enclosed in a paper wrapper for convenient handling. We carry a 60-days supply of tickets for each line, a record of the amount of stock on hand being kept in a stock record book, (of which I have several sample pages here), to show the exact number on hand for each conductor. The transfer stock is kept in a large case arranged for the purpose, at the principal office.

Transfers are sent out in quantity to the stations once a week. Each station keeps a daily transfer report book for each line of tickets. When a conductor reports for duty, before taking his car, he calls for his transfers (enough for the day) and his punch; one conductor's transfer number being used for each run. When the conductor is relieved, he turns in the punch and the unused transfers. A record is kept in the report book at the station of the first consecutive number (the red figures) of the ticket of each conductor's transfer number. This is put down when he begins and is called the "beginning number" or "commencing number," and a corresponding "ending number" is entered in the report book to show the first number on the pad of current transfers when it is turned in, whether all or only part of the time card run has been made. And the difference between the beginning and ending numbers gives exactly the number of transfers issued by the conductor. These report books are made out in duplicate, the original sheet being torn out and sent to the principal office daily and the carbon copy kept in the book for reference. The same report also shows the fact if an "extra" or "relief" conductor use the same transfer number.

For each car line there are special orders directing the issuance of transfers by conductors. As a general rule the conductor, after having collected the fares on a car going toward the loop, passes up the aisle and announces, "Transfers" which are issued just before the first intersection, or transfer point, is reached. After passing the first transfer point, transfers, if desired, are issued to passengers as they pay their fares, the conductor punching the transfer so as to allow 10 minutes after the car is due at the point of transfer, the transfer ticket being good on the first car leaving the point indicated by the punch mark.

Conductors are required to keep a record on a trip envelope, Form 150, of the number of transfers for each half-trip. This is done by the conductor putting down the first consecutive number (in red) which appears upon his pad when he starts away from the loop; also, when he reaches the other end, and again, when he has completed the first trip. The differences between these three "consecutive" numbers shows how many transfers were issued on each of the two half-trips. The trip envelope also has a report of the leaving time at each end, or half-trip, the number of fares registered and how many of these fares were transfers from other lines. Within this trip envelope the conductor puts all the transfers he has received and accepted for fare, but no money. The difference between the fares registered and the transfers turned in shows how much cash is required to be paid in by him at the end of his day's work. It also shows the maximum number of transfers which a conductor may issue during the day—that is, if he should issue one transfer for every cash fare received.

If the conductor mis-punches any transfers, or, if he takes up those already issued and issues new ones instead (as in case of a blockade, or when the passenger changes his mind and wants to take a different line than at first intended), these transfers are turned in in the current trip envelope, with Form 414 attached, giving a full explanation. If the conductor has any transfers punched and not used when he is relieved, he turns them in in the last or relief trip envelope, attached to Form 414. Transfers that are past due when presented by the passenger, or which for any other reason, are not good when presented for fare, and for which the passenger refuses to substitute cash fare, are also registered and turned in in the current trip envelope attached to Form 414 with full explanation.

The trip envelopes are dropped in a box each trip as the car passes the starter's stand on the loop. This is one of the distinctive features of our system and I want to call it to your special attention. The reason is that we want to remove all temptation to manipulate the transfers, which might be possible if the conductor retained them to the end of the day; we do the book-keeping for the conductor, and by doing it in detail—trip by trip—



we not only make it practically impossible for him to commit a great fraud, but we render it unsafe for him to attempt to do any crooked work at all. By our system of cross-checks we know more about a transfer than the conductor himself.

As every street car man knows, the hane of the business is that too many people handle the receipts, and the gentlemen here know what the public does not know, perhaps, that the great objection to a liberal transfer system is that it opens the way for fraud and dishonesty, unless properly guarded.

While I am among those who believe that there is no effectual substitution for honesty, I think we can do much toward making men reliable and trustworthy by showing them that dishonesty is sure to be found out, and that it doesn't pay. Our company has comparatively little trouble from this source; and, while our conductors and motormen are, as a class, above the average working man in executive ability and attention to their work, we regard it as the duty of the auditing department to see to it that nothing fraudulent is permitted. I think we have a system which effectually accomplishes this purpose.

I have covered half the journey of the transfer, from the printing office to where it has done its mission, been placed in the trip envelope by the conductor who took it up, and by him put in the box at the starter's stand. From there it is taken, with thousands of its kind, to the principal office to be checked up. The first verification is as to the number of transfers turned in. They must correspond with the number indicated on the trip envelope in which they were enclosed. If the number is not correct, note is made of it and the balance in cash is required. If the report is found correct, the transfers are turned over to the transfer clerks to be checked up for errors in transferring. First, we examine all the envelopes of each conductor to see if the transfers reported issued, as shown by the commencing and ending numbers, were in consecutive order; and next to see whether the conductor issued more transfers than he had cash fares on that particular trip. After this the transfers are again examined as to date, point of transfer and time, the checkers knowing the exact running time between transfer points. In case transfers are found punched ahead, they are looked up and compared with the report for that particular time upon the envelope of the conductor who issued them. These errors and any others are reported to the instructor who takes them up personally with the conductors at the stations.

The principal abuse of any transfer system is in the speculation by conductors who try to cover up their theft by trading transfers. In fact, there are those who claim that it is impossible to stop stealing so long as transfers can be turned in for cash. Perhaps absolute prevention of theft is impossible; I will go farther and say that, even where no transfers are given, men have been able to steal for a time.

One of the checkings is to test the probable trading of transfers. If one conductor is receiving four, five or more transfers at any one time, at any one point, from any other conductor, with anything approximating regularity, it may be regarded as a symptom to be inquired into. In a case of this kind an inspector is detailed to watch this transfer point and to ascertain whether the matter is as it should be. When any crookedness is in progress a checking system like this is certain to supply the clue, and it is seldom difficult to ferret it out with the pointer thus furnished.

Still another check is furnished when the transfer reports from the stations, Form 379, are compared with the consecutive transfer numbers on the trip envelopes, to see if the conductor's report agrees with the beginning and ending numbers on the relief's or station reports. Each conductor has a regular punch. It is used by no one else and when he is off duty it is kept at the station. A transfer number may be used by more than one conductor, as in case of extras or when the full time card is not run by the same conductor, but the punch is never used by more than one man. A cut of the die of each punch, with the name of the conductor to whom it is charged, is kept at the office, and regular examinations of the punch marks are also made. I believe that, with this system of checking, it is practically impossible for conductors to trade transfers without our being aware of the manipulation.

When all the examinations have been completed, the transfers are carefully gathered and thrown under the boilers of our engine house and burned.

In conclusion, I will briefly take up the advantages and disadvantages of a transfer system such as we have put into force. A

liberal construction of our ordinance, giving transfers at the first intersection, results in a considerable percentage of passengers changing cars at outlying points, which enables them to get to their destination with the least loss of time. This avoids congestion and overcrowding at the down-town transfer points, which might result if we had only a few central transfer points. On the other hand, it makes it possible for passengers to double back with a single fare. For instance, a man can come down town on the 4th avenue line, in Minneapolis, taking a transfer and getting off at the post office, which is at the transfer point. He can get his mail from his box and go back on the 1st avenue line, these two lines being only from three to five blocks apart. To what extent this is done I cannot say, but it cannot be enough to make it worth while to consider it against the moral advantage of a satisfactory transfer system.

It is true that a transfer system like ours entails considerable expense which might otherwise be avoided. I have made no close figures upon this item, but you can get some idea when I tell you that we use from 12 to 13 millions of transfers a year, which is over 20,000 every day and a corresponding increase when travel is heavy.

Owing to the transformation from horse cars to the electric system, and the fact that several extensions have been built, it is impossible to estimate to what extent our earnings have been affected as a result of our present transfer system.

Mr. Durbin: I would like to ask whether the passenger is required to take the car at the intersection or whether he is permitted to walk along in the direction that the car is going.

Mr. Calderwood: He is required to take the car at the point of intersection. If the passenger happens to make a mistake and does not understand it, we do not put him off or require him to pay his fare; simply explain to him that he should not do that. Those are the instructions which the conductors have.

Mr. Ross: Do you not think it better in case a conductor puts a wrong date on a transfer to charge him with it? We take 5 cents from them for putting in a wrong date. There is very little excuse for that.

Mr. Calderwood: We have never made it a point to collect from conductors on that. We take the matter up with them, and if they repeat it, then it counts against their record.

In response to the question by Mr. Hibbs, several members replied that transfers were not registered on their roads.

C. D. Meneely, of Brooklyn: Last spring we put on a few transfer agents to see what the result would be. On a majority of the lines on which the experiment was made the percentage of transfers issued was considerably decreased. The number of transfer agents has been increased until now we have 40 or 50 agents. The result has been in the main excellent on most of the lines. The decrease in transfers issued has been from 3 to 5 per cent, and at the same time the cash fares have kept up. At one transfer point the decrease in transfers issued has been 25 per cent. We check all transfers.

Mr. King: The transfer system has been in use in Washington a great many years. Long before transfers were reached in other cities it was a general thing in Washington, and the various companies there have been all over this ground in all its phases. The Capital Traction Company originally issued transfers; had the conductor issue and register them with the same register he used for other fares. The system was unsatisfactory and they adopted the system of transfer agents. This was before the time limit came into use and the transfer was good for all day. By the agent system a large saving was effected. Later, since the time limit transfer has come into use, they have abandoned the agents, do not now register transfers, and have the conductors issue them. The Metropolitan Company of our city did the same thing. They had transfer agents and found that hundreds of people would walk in on the transfer agents in busy hours and they found they were making serious losses. So they abandoned that plan and allowed the conductor to issue them; nor are they registered. There was a saving of 20 per cent in the number of transfer passengers carried under the new plan.

Mr. Ham: I think that everything, I do not care what it is, whether it is a pass, or a transfer, or cash, should be rung up. Now, it is impossible for anyone to ride on our road, with the exception of the man who wears a uniform with his authority right on the face of it, like a policeman, or an employe with a



very prominent badge on his cap, firemen in uniform, etc., to ride free. That means that everyone outside of these uniformed people must be rung up. We have two registers, one for cash fares and one for transfers. As the transfers are all registered immediately after passing the transfer point, and nowhere else, it makes the plan a simple and very effective one.

Mr. King: We formerly registered all our transfers, and found after we quit registering that there was no increase in the number issued.

The Chair: We will now pass to the next paper, "Pay Rolls," by Mr. Henry, of St. Louis.

## TIME-KEEPING, PAY ROLL AND METHOD OF PAYING.

By Frank R. Henry, Secretary Missouri Railroad Company,  
St. I. Louis.

### TIME-KEEPING.

The system herewith presented is one which the Missouri Railroad Company of St. Louis, has followed for some time. Our manner of keeping time is by the hour for conductors, motormen and track laborers. Other employes by the day. The time is kept by the foreman or superintendent of each department in the following manner: The foreman of the car sheds is the timekeeper of conductors and motormen and all men that are strictly under his charge. The time table indicates the number of hours and fractions thereof in tenths for each run made, and at the end of each day's run, the foreman records opposite their names in his time book the number of hours made, as indicated by the run upon which they were assigned. The total of time for the day must agree with the total hours of the time table.

The foreman is required to group the time of the day men under the classification furnished by the office, i. e., the time of car cleaners, switchmen, watchmen, stable men, shed men, etc., must be recorded under their respective headings and should an employe be taken from one class of work to another, the time must be charged upon each class separately.

The master mechanic of the repair shop keeps the time of the men under his charge. Keeping the time of labor on car bodies, trucks, car painting and motor repairs separately.

In the machine and blacksmith shops the time is kept by the head mechanic, which with an itemized statement of time and amount of work turned out is given to the master mechanic for his approval and returned to the office by him with his time book.

The time of track laborers making the ordinary track repairs is kept by the track foreman, keeping the time of all new construction separate from regular work. We find it necessary to have a timekeeper whenever a large force of men are employed on construction or reconstruction work. Each timekeeper is furnished with two time books, one printed for the first 15 days of the month, the other for the last 16 days. The necessity for this is that we pay twice a month. The time is totaled and the calculations extended in the time book by the timekeeper and it is then returned to the office, from which we proceed to check off the time and make up the pay roll. The time book is then returned to the timekeeper to be used for the same period of the next month.

### PAY ROLL.

The pay roll is ruled as follows: First column for number, second for name, the five succeeding columns in which to enumerate the class of work or classifications under which work has been rendered. The remaining columns are such as are usual to pay rolls for total time, rate, amount paid, amount due and total amount. After all the names and amounts have been copied from the time books and properly classified, the names are numbered and the pay roll totaled, each classification being footed separately so as to show the amount of each and for convenience in comparison.

### METHOD OF PAYING.

An envelope is prepared for each employe, placing thereon the pay roll number, name and amount of pay due, deducting any amount that may have been advanced thereon or other charges such as accident insurance, uniform account, etc. Having prepared an envelope for each person on the roll in this manner, they are then checked back to catch errors, and to be assorted alphabetically. The money is placed on the envelope face up,



FRANK R. HENRY.

Frank R. Henry first saw the light of day in St. Louis, July 3, 1867. His father, Wm. D. Henry, was one of the oldest railroad veterans in St. Louis. After a preliminary education in the public schools and a course in Jones' Commercial College, he became assistant to his father who was secretary and treasurer of the Missouri Railroad Company. In 1891 Mr. Henry was elected secretary and treasurer of that company, which position he now holds.

change being put inside to facilitate handling, the money recounted by another person, and put inside the envelope and the latter sealed.

The pay is delivered to each employe in person on pay day, upon calling at the office, except the construction gang; they are paid at the place of work. Each employe receipts on his envelope and drops it into a box provided for that purpose; this is done for future reference. They are then taken out of the box and assorted numerically. Should a number be missing we turn to the pay roll and see to whom such number envelope was given; the timekeeper is then requested to have him call at the office with his envelope. In case he has lost or misplaced it another envelope is prepared for him to receipt.

Mr. Wallis: I would like to ask whether the conductor receipts the envelope immediately on the receipt of the money, or at any subsequent time?

Mr. Henry: He receipts it at any subsequent time. We simply do that for future reference. We found that frequently a man would claim that he had paid the amount at some previous time, but when we show him the envelope and the amounts deducted on such and such dates, that convinces him. We sort the envelopes immediately after pay day, and see what are missing, and then get them in.

Mr. Wallis: Do you ever have any dispute as to amount in the envelope?

Mr. Henry: In 14 years' experience I have had four men claim their envelopes were short. In those cases I simply made it good; out of the four two came back to the office and returned the money, having found it in their clothes. At that time we were paying in gold, and I suppose the coin slipped out; it was a \$5 gold piece, and easily overlooked.

Mr. Babcock, Elmira & Horseheads Railway: We have recently adopted a scheme in paying off which we find works very nicely, and it furnishes a receipt for the money. We have a form reading, "Received from the E. & H. Railway Co. \$...." with a blank for the nature of the service rendered and for the date, and at the bottom, "My number is so and so on pay roll of such a date." We issue that to each man who comes to the office, he presents it to the cashier, who compares it with the envelope which has the pay roll number on it, and also the man's name. It is necessary for him to sign that ticket before he can get his money; and he can assist it and give it to any one he chooses, who can come and get the copy for him. We find that this lessens the work at the office considerably and has been an accommodation to the men. Sometimes they get their money on pay day, sometimes they wait two or three days. It works very smoothly and is a simple arrangement.

Mr. Williams: I would like to inquire if anybody here uses the bank check system of paying?

Secretary Brockway: I can explain that system on some of the

steam roads, but I have never seen it in operation on a street railway. The railroad with which I was formerly connected had something like 2,500 men. Of that number 1,500 were paid by check, covering about three divisions. The other division were paid by the pay car system on account of the line running through a mining district with no banks. The checks were simply sent out to the station agents and the section men. The station agents were supposed to cash those checks. Some trouble was experienced by the station agents shaving the checks 2 or 3 per cent, although detection resulted in dismissal. Otherwise the system worked acceptably, but it made more work in the office.

Mr. Williams: I would like to ask Mr. Brockway a question? When he gives those checks he must make them to a certain account in his bank—how does he make his division as between, say, construction and operating expenses; does he do it through the check to the bank or the check to the employe?

Mr. Brockway: The system which that company followed was that of having three bank accounts, two for operation and one for construction. But the construction men were nearly always paid in cash.

Mr. Hibbs: I was connected for three years with the Pennsylvania Railroad and their entire system is paid by check. Division superintendents and people in charge of departments make what is known as a check roll. This is forwarded to the auditor's department, where is made up the pay roll check roll and the checks are all drawn on one bank. The checks are cashed anywhere without discount. The checks are forwarded to the party making the check roll, who has a car going over the division, and they are surrendered to the men to whom they are drawn, who sign a receipt for them on the pay roll.

W. M. Barnaby, Brooklyn Heights Railroad: I was connected with the Erie for several years when they paid their entire force, some 15,000 men, by check. They had a printed form of endorsement on the back of the check which was virtually a certificate that they had been paid in full. These checks were drawn payable at the various banks along the line.

W. S. Dimmock, Omaha & Council Bluffs Railway & Bridge Company: We pay entirely by check. A man can get his money any time during the month before pay day and we have him sign what we call a due bill. We pay him by check every time. At the end of the month we surrender the due bill to him and have him sign a voucher. We have never had a dispute since we adopted this system.

Mr. Reavis, Augusta, Ga.: Our system of paying is almost identical with that of Mr. Henry. We pay by the envelope system as he does, but we have the men sign the pay roll direct. The deductions that Mr. Henry speaks of, if any, are entered in a column provided on the pay roll, for that purpose, stating for what they are made. Mr. McCarthy, formerly of the Metropolitan of Kansas City, told me their system was to make one check for the total amount. The pay rolls are distributed and charged up at that time. The check is simply for a gross amount, say \$3,000. They then have a check of a different color, that is given to the men individually for the amount due them. These checks, when they come in, are attached to the pay roll and filed away with it.

Homer Loring, Union Street Railway, Saginaw: We have recently adopted a check system similar to that just described. We make up our pay roll and then have a special account at the bank of an equal amount. We deposit a check for the amount, say two days in advance, and then give out the checks. It gives us no trouble and has worked very satisfactorily. We used the envelope system before that, but consider the checks less work. We pay twice a month. At first we took a receipt from the men, but lately have not done so and do not consider it necessary. We have about 150 employes.

Mr. Durbin, Denver Tramways: We pay all our shop men, track men and power house men by checks. We have a distinctive feature in paying our train men, allowing them to pay themselves each day. The conductor pays himself and his motorman at the end of each day's work. This has been in operation on our road for about eight years and we like it as well as anything we have. It is a very simple system and we keep a check on it in exactly the same way that you do with a register. The car is signed out in the morning and signed in again at night by the man in charge of the car house, and the conductors agree between themselves as to the time they are relieved. At the bottom of the trip sheet the conductor and motorman each sign

a receipt stating at what rate they pay themselves. We have several rates; 17½ cents per hour the first year, and 20 cents an hour after that time. They state the rate and the amount they have deducted, and sign their names. We check them up in the office the next morning, and if a man takes out too much we send him a notice, or, if he does not take out enough we send him a notice. We formerly had a great deal of trouble with garnishments, when we paid twice a month. We have not had a single garnishment since we adopted this system. Further, there is no complaint on the part of the men, if there is any it is on our side, owing to their taking out too much, for which we call them in. I know at first blush this will not strike some of you favorably, but I am satisfied that after investigation you would find it a great saving of labor in your auditor's office. No timekeeper is required; the conductors do your bookkeeping, and we have only one clerk to check 150 men. It works beautifully, and there is no trouble whatever about it.

John I. Beggs, Milwaukee Electric Light & Power Company: It would not seem to me that you had obviated a great deal of bookkeeping by that method—my company, Mr. President, is not a member of this Association, although I propose to make it one. I feel, gentlemen, that this matter of accounting is one of most vital importance in the operation and management of every street railway in the United States. I possibly pay more attention to this for the reason that a good many years ago I spent a good many years at a desk in charge of a very large corporation's books, and prior to that spent some few years in teaching in Bryant & Stratton's Commercial College. My own impression is that the system of paying with checks appeals most strongly to a manager—and I claim to be manager of the accounting department as well as of the road—for the reason that I believe you have more accurate records in your office; I believe the work is reduced; and that you have some evidence of payment. I was for many years in Harrisburg, and familiar with the check system of the Pennsylvania Railroad, and it was as a result of that knowledge of its operation that I was led in these latter days in connection with a street railway to try to convert my auditing department—I always try to "convert" my accounting department—to the advisability of getting our entire force on a basis of payment by checks, as I believe it will reduce labor in the office, and at the same time be more in accord with good commercial practice. I am likewise in charge of another corporation in the city of Cincinnati—not a street railway—and they pay by this same method of having the conductors serve as their accounting department and cashier. I must say it does not appeal strongly to me. I do not believe in having 600 or 700 men, or, as in the case of some gentlemen here, probably as many as 2,000 men, acting as cashier and first saying what portion of our receipts is theirs. I want that money first to go into the bank. It is ours first and it is for us to determine how we shall pay the men. I am one of those who believe in trying as far as possible to be fair, and to lean over backward even, in fairness toward your men; but the point I want to make is, I do not see how book-keeping is avoided. It seems to me you must go over every one of these time sheets every day with just as much care as though you were compiling them to be kept until the middle of the month, or the end of the month, which ever you make your pay day. You have every one of these men, who may possibly make a mistake, to deal with. Instead of dealing with your man who may claim you have made a mistake once or twice a month, you have the possibility of dealing with men, who do not claim to be "figure wrestlers" 30 times a month. In the matter of garnishment I do not see how you avoid it, because they can require you to hold all that is to become due to a man, as well as what is already due him, until the garnishee is released. We can much more readily pay by check than the steam roads which have been mentioned, for the reason that all of our men are in the city. Your checks are as good as cash. Many people, in fact, prefer the check; every merchant with whom they deal will gladly cash the check.

Mr. Durbin: I will try to answer the gentleman's question as to the saving. I was the auditor of our company before becoming superintendent, and originated this plan. We used to pay our men twice a month by check. We took the time that the car went out in the morning and the relief time and kept a regular pay roll. Twice a month the men would come in and get their pay. One man would say, "I am short." Now, he may not have been short, but thought he was; and immediately another man would



say, "I am short, too." Then you had to take the time and go to work to show the man that he was mistaken, and that takes considerable time. Our work of checking up the time is done by the same man who checks the registers, and in exactly the same way. The time of the car going out is put down by the starter; the time in is put down by the car house foreman; and the time that the man is relieved is agreed upon between him and the man who takes the car. It takes but a moment for the man who checks the registers to look at that and see that it is all right. There is absolutely no complaint from the men as to their time—there cannot be—because the man has it in his own power to take the money out. It is perfectly safe; just as safe in one case as in the other. We figure in the wages as so much receipts and keep an account of it on our cash book in that way. Now, as to garnishments, our courts have held that you cannot garnish a man for money that is not yet due him; you cannot garnish a day's wages. I also claim that the cash system is better for the men themselves, because it enables them to buy for cash, and they have their money in their pockets, thus having a tendency to prevent temptation.

Mr. Barnaby: I cannot see for my part how the check system is a good system, especially on a road which pays off 4,000 men every week, as we do.

The Chair: Won't you state your system?

Mr. Barnaby: I think our system is a very compact and a very easy one. Of course, I suppose local conditions affect this matter also. The pay rolls are under the supervision of the heads of the departments in which the work is done. That is, the foreman of the depot has entire charge of the line roll, of the operating department, including the starters, foremen, register takers and one or two men in the depot, conductors and motormen, and watchmen if there are any. He certifies every week when he makes up his pay roll that the time is right. He has a time book and makes his pay roll from that. This pay roll is certified again by the division superintendent, who has three or four lines, comprising a division, and then in turn that is again vided by the general superintendent. Then that goes to our pay roll department and all the calculations are gone over. Our week ends on Friday. It is then turned over to the paymaster, who takes it to the power station. The same method is pursued in making that up. That is, the man in charge of the work certifies that there are so many dynamo men so many hours; so many engineers; so many boilermen. The accounting department distributes it, showing so much for maintenance of boilers, so much for maintenance of engines, so much for the different ramifications of the accounts. The men at the power stations are paid on Saturday by just paying those men in person, the foreman of each class of men certifying to their identity.

The Chair: Is the money paid in envelopes?

Mr. Barnaby: The money is paid right out of a box. He goes to the bank and gets the amount in convenient money; looks over his roll and sees what shape he wants it in. That is the process Monday, Tuesday, Wednesday and Thursday, and the roll is completed. The roll is turned back in. Periodically he turns in unclaimed wages, which is kept until such time as it is called for. No receipts are taken; and as far as my experience goes, or my recollection, I have never heard of any trouble between the men and the paymaster. If there is any dispute as to the time, it is referred back to the head of the department. If it is a conductor or motorman, he goes to the foreman of his depot. We do not pay our men by hours, as most of you do. The men are paid \$2 a day for 10 hours on the rail in 12. The tables are made up on the basis of trips. Six trips constitute a day's work on one line; five on another; four on another, and as we know that the time tables call for so many trips, and there is a record of the trips run, it is very easy to check off. So many trips made at a certain rate is bound to make a certain sum of money, varying with the fractions where the rates are 33 1/3 cents for trips.

The Chair: I will say that I personally pay our men, about 600 of them, just exactly as your paymaster does. The money is distributed directly to the men by myself. There is no receipt taken; and I want to get away from the labor of writing envelopes, putting the money in them and then handling them afterwards.

Mr. Barnaby: It seems to me that it is just as easy to pay a man \$15 or \$12.50 by taking it out of a box and counting it right in front of him.

The Chair: That is my idea exactly. You both see the transaction.

Mr. Barnaby: Of course, you can balance in one instance, after you have made up your envelopes and find an error. If you pay a man 50 cents too much you are out. But that is a mere matter of being careful; that is all.

Mr. Dimmock: You pay four times a month because the law compels you to do so?

Mr. Barnaby: Yes; we pay practically every week. We split the week according to the end of the month.

Mr. Dimmock: Does the law of the state of New York compel you to pay four times a month?

Mr. Barnaby: Yes, it does.

Mr. Hibbs: May I ask you, Mr. President, if you do not take a receipt for the money that is paid out by the paymaster?

The Chair: No, sir; I am the paymaster.

Mr. Hibbs: I was not questioning your integrity at all—(laughter)—I want to know what protection the company has. (Renewed laughter.)

The Chair: It has none, sir.

Mr. Barnaby: In Brooklyn we have not reached the point where we believe in the total depravity of men. We have one or two men that we trust to be honest, and of course we look to them to deal honestly by us. You are bound to trust somebody. You have to trust the timekeeper, you have to trust the foremen, you have to trust the paymaster. You can't always be putting a surety company back of every man.

Mr. Hibbs: Suppose there is a question between the paymaster and the man as to whether he has received his money or not?

Mr. Barnaby: The man is paid right in the presence of his chief, you might say. That is, the foreman is right there and checks the book while the paymaster checks the pay roll. When the man comes up, he says, "Brown, what are you, a conductor or motorman,"—"How much is coming to you?" Brown answers, \$12.50." The paymaster looks at the roll, finds the amount, checks it off and passes the \$12.50 over to the man. The names are put in an alphabetical list, the conductors being on one sheet and the motormen on another.

Mr. Hibbs: In paying unclaimed wages, you merely take the check for it?

Mr. Barnaby: He gives the line on which the man works and the amount of money that has not been called for in a week, and that is turned over to the cashier. Then if the man wants his money he goes to the foreman; the foreman keeping the check on his books knows that that man has not been paid; probably designates it with an "X" as uncalled for money. He issues an order on the cashier for those unpaid wages. That is sent to the office. Either the man can call at the depot when the paymaster is there, which I think they do very often, as our office is down in the heart of the city, and the car barns are some distance away, or come to the office.

Mr. Hibbs: Our system is very similar to Mr. Barnaby's, but we require a receipt for every dollar paid out.

Mr. Beggs: I am very glad, indeed, and feel under obligations, for this discussion. I am very thoroughly confirmed in my own mind, too, after hearing it that I shall put the check system into effect with the least possible delay, both as a means of economy in the accounting department and for greater convenience to the men who are receiving this money. I think it will require very much less labor in the accounting department. A man will make out a check in almost the same time that he would make out an envelope, if you are going to adopt that system; he would make out the check with the same amount of labor, the same number of strokes of the pen and the same waste of ink. By the methods just described here these men must come at a specified time to meet the paymaster or else he must devote a whole day or parts of several days to it; he must spend three or four days a week meeting the men.

Mr. —: We have a paymaster and an assistant whose whole time is devoted to paying the men. My idea would be to have a pay roll made out in your accounting department, and sent to the different car stations, and as the motormen and conductors come in, whatever time it may be—if, for instance, you pay as we do, on the 5th and 20th of every month—as these various crews come in the check is there at any time and they have not to wait; if it is in the power house the same thing is true; at any time when they come on or go off they get their checks; they sign the pay roll and that pay roll goes back to the accounting department. If any man has not turned up for his check, that check



goes back to the auditing department; and if he has not his pay within a reasonable time, say, within 48 hours, by the time your pay roll goes back, he then puts in his appearance at the principal office of the company and gets his check there. It seems to me the amount of accounting is greatly reduced. That has been the great difficulty and the reason why I have been seeking some other means of making payment to our men; because to a certain extent our accounting department is paralyzed for two or three days on account of making up the pay roll, getting the money out of the bank, counting it out for each particular man. If you want anything from the accounting department just at that particular time you cannot get it because they are in the throes of making up the pay roll and getting the money ready to distribute to the men; whereas you can take a couple of clerks, young men who are good penmen, and make out your checks; and you have virtually a receipt from your men, and the best receipt you can possibly have, as an evidence of payment to them.

Mr. Barnaby: There is a distinction to be drawn here. The last speaker seems to have confused the work of paying with the accounting. The paymaster's department on our road has nothing whatever to do with the accounting of the pay rolls. That is done by the auditor's department. That is all checked up, the calculations and the proper headings, to see that maintenance of way is not charged against construction of buildings and so on. That accounting department is an entirely separate and distinct thing from the mere labor of paying the men. All the paymaster does is to pay the men. That is all he has to do. As far as the delay in receiving the money is concerned, the same process is pursued by us, practically, as the gentleman speaks of; that is, the first car out is paid first and just as soon as that car has made a round trip the paymaster knows he has covered the road; and he pays the people employed about the depot during the intervals between the cars.

Mr. Begg: It would seem to me then that the whole paymaster's department of your road is an unnecessary expense. You say, and I agree with you, that the matter of accounting is done in the accounting department; and if a check were drawn at the same time it would virtually increase the labor but very slightly, and you would have reduced your expenses by the whole cost of your paymaster's department, besides giving the men their money much more promptly and satisfactorily.

Mr. Barnaby: While you say it is just as convenient to pay a line having 4,000 or 5,000 men with checks as to give them the actual money, I disagree from you there. I do not know what the conditions are in other cities, but I have no doubt that in Brooklyn nine-tenths of them would find their way to a liquor saloon to get their checks cashed, for about our car houses there is always a number of saloons. That seems to be a necessary concomitant that goes with a car barn. I do not know why it is, but it is so. There is no local bank there, and in any case a bank does not do that work for nothing. You must give them some consideration for cashing the checks, or else the saloon keeper is going to cash them for a consideration. I think that would be a very disagreeable feature of that system at the outset.

Mr. Hibbs: Is it Mr. Begg's idea to have those checks drawn to bearer or to order and have them endorsed?

Mr. Begg: I should have them drawn to order with what would virtually be a receipt on the back of the check.

Mr. Williams: Although a small road, we think we have a good system with reference to paying. We pay by check to order. Previous to that we paid the cash in an envelope. We pay every week, by the way. We found it took quite a little time for the men to come in off their work if they were out a little bit; and also if there was any dispute they had to go to the foreman and the foreman would have to be brought in before the paying clerk. We consider the check system the better. With regard to the liquor question, we find, though, as I have said, a small road, that the check system has been quite a check on the liquor traffic in the vicinity of our pay station. (Laughter). The men do not feel like going into a liquor store to have their checks cashed. They take the checks, put them in their pockets, go home to their families, clean up, go down town and go to their grocers and say, "Here, will you cash this check, please?" The grocer takes out the \$6 or \$7 that the man has got tick for that week and the rest goes to the man's family. The man isn't in the habit of going to a liquor store and spending 15 or 25 cents on the cashing of his

check. He pays his honest bills, and the storekeepers in the small town we have appreciate it very much.

Mr. Babcock: I have listened to the discussion with considerable interest, and although ours is a small road also, paying about 150 men a week, we have followed the system that some of your larger roads have, but with this slight difference—and it seems to me that our system covers some of the advantages of the check system and at the same time does away with some of the objections. Our pay rolls are made up by the superintendents of the different departments, and the superintendent of the department who makes out the pay roll also makes out his little blank form that I spoke of, which is of such a character that if lost anywhere the person finding it would never dream what it was good for. It is good for nothing until it has the man's name to it, until he signs his name, and there is a place also for those who cannot sign their names to make their marks and have it witnessed by the superintendent. Our little blank form, as I said before, reads: "Received from the Elmira & Horseheads Railroad Company, \$—, in full for services rendered," with a place for the date. So you see it is a receipt in full. There is also the place for the signature, and at the bottom it gives the number on the pay roll and the date of the pay roll. Now, that is all made out by our superintendent or foreman of the shop, which ever the case may be. The man then brings that ticket to the office after 4 o'clock on Monday—Monday is our pay day. The money is then ready for him. If he cannot come conveniently at that time he can give it to his wife, or to his boy, and he signs his name to the ticket. The name and the number on that particular pay roll must agree with the amount or else the cashier does not honor it. But once he gets his money we have a receipt. That we file away among our pay rolls. That does away with all the confusion of getting a signature when you have a crowd of men all signing the pay roll at one time.

Mr. Read: We are a small road, but I would like to state how we obviate disputes with regard to payment of the men. We furnish each man with a time book, quite a small thing, with a place for the date, the number of the car, and whether motorman or conductor, the number of hours he has put in and a place for him to sign. When they put their reports in they enclose this slip daily. The relief man does the same thing. The car runs so many hours a day. When the report comes in the time ticket is checked up, and the time of the relief man, the motorman and the conductor amount to just the time that the car has run. That is done every day, checked every day, and it settles the man's time. When pay day comes around, should there be any dispute we are not obliged to run after any one to find whether the man has made that time or not. We simply take the time slips and produce them. I might say, too, there is a stub in his time book where he is supposed to keep a record of what he puts in at the office. With regard to the barn men, they hand their slips to the foreman. He O.K.'s these slips and puts them in to the office. We have no trouble at all with disputes as to paying the men.

Geo. D. Fearman, Hamilton Street Railway Company: We take the total hours that the car has run each day, and then for any extra cars the foreman hands in a slip, and we keep the record of that in a book. We pay twice a month, and at the time of each pay we take, like 13 days, the regular hours, and then add the extra hours to that; and that has to agree with the total hours. If there is any mistake we look over each day's work and get the mistake down to a particular date.

Mr. Dimmock: Those gentlemen here that are or have been connected with steam roads well know that all over the country they have a register where their conductors register in and out. Our system is the same as that of the steam roads. We simply have a register. They place their names on it when they go out, and the same thing when they come in, with the time, and that is turned over to the auditing department. The men know nothing further about the accounting until they are paid off. If there is any dispute about it it is simply referred to the register, which is in their own handwriting; and in that way we have very little dispute.

Mr. Hibbs: Ours is made up from time slips, as Mr. Dimmock states, or the register; but they are examined in the auditor's office from the day card; that is, conductors and motormen.

The Chair: This question seems, like a great many others in connection with accounting, to be one of local conditions and

individual ideas. I think we have all learned a great deal. I am very sure I have, right here, on this question. It strikes me that the three important questions are as to whether you should use checks or not, whether you should use envelopes or not and whether you should get a receipt or not. If there is no further discussion on this subject we will proceed to the next order of business, "Materials and Supplies Accounts from Purchase to Use," by W. G. Ross, comptroller, Montreal Street Railway Company, Montreal.

#### MATERIALS AND SUPPLIES ACCOUNTS FROM PURCHASE TO USE.

By W. G. Ross, Comptroller Montreal Street Railway Company, Montreal.

The purchasing and storekeeping of materials and supplies are of great importance to street railway companies, requiring careful and constant watchfulness both on the part of the purchasing agent to secure the best materials at the lowest price, and of the storekeeper to see that they are properly handled and distributed. In the purchasing of materials and supplies the company cannot be too careful in the selection of the man appointed as purchasing agent—his honesty must be beyond all question, and his capabilities and experience such as to warrant his appointment to this most important position.

In purchasing it is advisable, wherever possible, to call for tenders or quotations, and the lowest should invariably be accepted, and no favoritism shown. Price lists of standard goods should be kept carefully at hand, and catalogues systematically filed. Materials purchased should be the best obtainable, and careful watching required to purchase the most modern and best goods, it being false economy to purchase anything but the best. Especially is this the case in the electrical equipment of the cars—it is here that the great expense of maintenance come in, probably more than one-half of the supplies purchased for repairs are on this account, and experience has shown that it is only the best material that will stand the great strain that the electrical equipment is called upon to bear.

Great care should also be exercised in the purchasing of new electrical equipments, as changes, improvements and economies are rapidly taking place as the defects and weaknesses of the apparatus become apparent. By reason of these continual changes and improvements the purchasing agent should be in close touch with the manager and the heads of the shop departments, and consult with them, as also with the storekeeper, to see that the smallest possible stock of materials is kept on hand, and that no accumulation of out-of-date articles takes place. All purchases made should be ordered on an official manifold form, plainly numbered and having stated thereon the places goods should be delivered (no allowance for packing) and that all invoices must state Order No. and accompany goods.

The storeroom should be conveniently situated near the principal shops of the company, and should be so arranged that supplies can be easily handled. All material and supplies, whether for construction or operation, should be in charge of a storekeeper. When material is required a requisition on the storekeeper should be made out on a regular printed form, signed by the foreman in charge and countersigned by the superintendent of the department. The requisition should state the article, quantity, and what required for, opposite which the storekeeper fills in the value, as it is from these requisitions that he classifies the actual material used during the month under the different headings for his monthly statement furnished the office.

The storekeeper should keep careful watch on his stock, keep it as low as possible, and see that there is no accumulation of out-of-date articles. When any supplies are required by him he should make out a requisition on the purchasing agent, giving the date for which it is required.

The storekeeper should keep a stores ledger, with accounts for the principal articles, in which ledger should be entered in the debit the invoices of goods as received, and the credit material used—the balance should agree with his stock in hand.

All manufacturing or construction work should be done on a numbered shop order, appropriation for such work having first been duly made by the directors of the company.

The storekeeper should have charge of all scrap material; he



W. G. ROSS.

W. G. Ross was born in Montreal, August 6, 1867. As early as 1886 he was associated with his father as an accountant and auditor. He became successively secretary, treasurer and assistant manager of the Windsor Hotel Company. From 1892 he has been with James Ross who controls many of the large street railway interests in Canada. Mr. Ross has acted as private accountant and has reorganized the accountability of the various companies. At present he is auditor of the St. John Railway Company and comptroller of the Montreal Street Railway Company. Mr. Ross is a member of the Chartered Accountants of Montreal.

should have convenient places for safe storing, and the purchasing agent should dispose of same as frequently as possible, so as to prevent any accumulation.

All payments for materials and supplies should be made only on the company's own weights.

Returns of scrap material turned in to the storekeeper should be made direct to the office from the foreman of the shops, and no delivery of scrap material sold by the storekeeper should be made without an order from the office stating that payment has been received.

In the smaller companies it is desirable for the sake of economy to combine the position of purchasing agent and storekeeper; where this is done it is important that the purchasing should be done under the direct supervision of the manager.

In conclusion, the official in charge of the office should keep careful oversight of material and supplies from their purchase till consumption, watching the prices paid as also the returns of the storekeeper of the material used, as on him the management must depend to a great extent to see that the company receives full benefit from these important departments.

On motion of Mr. Beggs, it was voted to make the annual dues cover the calendar year, from January to January.

Adjournment was then taken until Thursday morning.

#### Thursday Morning.

Vice-President Duffy called the meeting to order promptly at 10 o'clock, and announced a discussion of Mr. Ross' paper read the previous day as the first order of business.

Mr. Brockway: May I ask Mr. Ross how he keeps track of material which is charged to the account immediately on purchase—if it is not all used this month. Say, for instance, you should buy a small quantity of anything and charge it out immediately to the account to which it referred.

Mr. Ross: I do not charge anything out immediately.

Mr. Brockway: It all goes to the storehouse?

Mr. Ross: It all goes to storage.

Mr. Hibbs: Do you carry your coal in the general store account, coal used at the power house and so on?

Mr. Ross: Yes.

Mr. Hibbs: You don't have a separate material account for power house?

Mr. Ross: No. We get a return from the power house on the coal used during the month.

Mr. Hibbs: Instead of carrying it in a separate account you carry it in the general store account?

Mr. Ross: Yes.

The Chair: Do you throw everything into your stores account, sand and salt and coal and everything?

Mr. Ross: Everything goes into stores.

Mr. Brockway: Do you find you keep such close track on it when you take your inventory that you hit it pretty closely?

Mr. Ross: Yes.

Mr. —: We buy a great deal of stuff that is not worked up, and there is quite a little labor to be put on it before the article will be charged out of the stock. What method do you have of adding the labor to this raw material? The labor, of course, would go into pay roll and would not appear in the supply account.

Mr. Ross: Mention an item?



Mr. —: Well, we buy brass and it is worked up into little castings that are used on the armatures or some electrical part. Now, the regular charge is to stock and then they merely arbitrarily charge a percentage, what they think would be the labor. Of course it is hard to compute what the labor is on any one thing, where a great many are made and the pieces are small and large together, one being probably ten times as much as the other, the labor being charge to stock and the goods being charged out at the increased cost which is supposed to take up the accumulated labor charge that has been thrown into the stock, and would ordinarily wipe it out. You didn't speak of that.

Mr. Ross: We don't have any manufacturing of that sort at all. We buy all of our brass castings complete. I should not see any difficulty in that; it is simply charged to stores.

Mr. Hibbs: We render regular invoices from the repair shops the same as any outside party.

Mr. Davies: How often do you check off your store stock account by taking an inventory?

Mr. Ross: Once a year. We just completed our inventory before I left. Our year commences the 30th of September, and we were only out about \$200 in the year on materials. It is our custom to make out requisitions, and when the requisitions come in from the shops for materials they specify for what the material is to be used, and the storekeeper keeps a blotter from which he gives a return at the end of the month showing where the different material has been used, and we give him credit for that.

Mr. Brockway: I noticed that Mr. Calderwood in his paper in the "Street Railway Review" a short time ago had an excellent article on materials and supplies. Do you have that method which I have referred to, Mr. Calderwood, of buying small quantities of material and charging it directly to the account interested instead of throwing it into materials or supplies account?

Mr. Calderwood: No; everything goes into store house, every article of supplies.

Mr. Brockway: Is that true of transfers?

Mr. Calderwood: No; the transfers go right into the operating department.

Mr. Brockway: You charge the bill for those transfers out directly?

Mr. Calderwood: Yes. We handle our transfers a little differently.

The chair then called for the report of the committee appointed at Cleveland, on a Standard System of Accounting. This committee consisted of C. N. Duffy, chairman, St. Louis; W. F. Ham, Brooklyn, and J. F. Calderwood, Minneapolis. The task was much greater than any ever assigned to any committee in either Association, and involved an enormous amount of work. Upon its appointment the committee went immediately at work to secure the necessary data, and while somewhat handicapped in its work by reason of being obliged to confer by correspondence, the work was systematically laid out, and each member devoted a large amount of his personal time. The result was that each member brought to Niagara a carefully worked out plan, and out of these three plans, the report was evolved. The committee was in session all of the four days preceding the convention, its labors lasting until after midnight each day. While each member is extremely modest in speaking of the work performed, it is due them that the fraternity know and appreciate the volume of the undertaking. The result has been most highly gratifying to all concerned. The work of the committee places the entire street railway fraternity under lasting obligations, first to the Accountants' Association which created and furnished the committee, and second to the gentlemen who actually did the work. It could not be expected that an undertaking of so much moment should be perfected in six months, and the committee intended its report should be still further studied and improved; and the Association acted wisely, although it is asking a good deal of the three gentlemen, when it continued the same committee as the permanent committee on this report.

The report was presented by Mr. Ham, who prefaced it with the following remarks:

We communicated with the state boards of railroad commissioners of Massachusetts and New York, asking them to be represented at this meeting. The Massachusetts board was unable to be represented on account of the fiscal year of the railroads of that state closing on September 30. The secretary of the State Board

of Commissioners of this state, Mr. DeFreest, has been here and we have profited very largely from what he has said to us. He has shown an interest in this work which is very encouraging; and, speaking for myself, as a New York member, and for other New York members, I believe we shall have no difficulty in getting Mr. DeFreest to work heart and soul with us in this movement. Now, that means a great deal to New York roads, because they are compelled to keep their books as the state requires, and if we can bring them to meet our views in the matter, the situation is simplified to a very large extent. Now, we differed from Mr. DeFreest in many particulars, but he says that on small things he is not inclined to quibble. He sees the advantage of this thing as a national movement and is very much interested in it. He thinks, and we are convinced by him, that we are wrong in one matter, inasmuch as we do not carry it quite far enough. What we have said is all right, except that we should have it read "Income from Sale of Power"—"Cost of producing power sold is to be deducted from cost of operating power plant," and that "profit or loss, if any, resulting from the sale of that power is to be carried directly to income account, either as income from other sources or as a deduction from income," because the point was brought up in this light, that it might be possible for a company to operate its power plant for \$500,000 a year, but it sells \$600,000 worth of power, making a very large profit on it. You cannot very well deduct \$600,000 from \$500,000 without getting into difficulty; and that seems perfectly right and logical. The only point that we then wanted to ask him, was, "How are you going to arrive at the cost of that power, that is, the true cost?" and it seemed not to be a difficult matter to take the actual cost of operating a power plant, just as we have it here; add to that the expense of maintenance of the power plant, approximation of the interest on the amount invested, depreciation and such things as that.

#### REPORT OF THE COMMITTEE ON A STANDARD SYSTEM OF ACCOUNTS.

Niagara Falls, N. Y., Oct. 21, 1897.

*To the President and Members of the Street Railway Accountants' Association of America:—*

Gentlemen:—At the organization meeting of your association held in Cleveland, March 23 and 24, 1897, a resolution was adopted appointing a committee to consider the question of a "Standard System of Street Railway Accounting," covering the classification of operating expense accounts, classification of construction and equipment accounts, and form of annual report. The character and scope of the work assigned to this committee, as understood by it, is expressed in a circular letter mailed on June 15, 1897, to 717 street railway companies of the United States, Canada and Mexico, asking for copies of their blanks and forms and for suggestions as to classification.

The following gentlemen responded to the circular letter, forwarding blanks, forms, etc., which were of valued assistance, and materially aided the committee in the work of preparing its report:

H. C. McJilton, auditor Baltimore Traction Company, Baltimore, Md.

Dana Stevens, auditor The Belt Railway Company, Washington, D. C.

S. A. Frazier, secretary and treasurer Centralia & Central City Street Railway Company, Centralia, Ill.

Frank R. Greene, secretary Chicago City Railway Company, 2020 State Street, Chicago, Ill.

H. P. Bradford, general manager The Cincinnati Inclined Plane Railway Company, Cincinnati, O.

P. V. Burlington, secretary and auditor The Columbus Street Railway Company, Columbus, O.

E. D. Hibbs, auditor Consolidated Traction Company, Jersey City, N. J.

C. Wuestefeld, manager Elgin City Railway Company, Elgin, Ill.

E. S. Doud, secretary Lehigh Traction Company, Hazelton, Pa.

F. E. Smith, auditor Lynn & Boston Railroad Company, Lynn, Mass.

Edward Daniell, secretary, treasurer and superintendent Menominee Electric Light, Railway & Power Company, Menominee, Mich.





W. F. HAM.



C. N. DUFFY.



J. F. CALDERWOOD.

C. N. Duffy was born in St. Louis, August, 14, 1859 and received his education in that city, first at a private school and later in St. Louis University. At the age of 14 he became a shipping clerk in a grain house and continued in the mercantile business for 12 years, holding various positions. In May, 1886, he was chosen secretary and treasurer of the Union Railroad Company and in 1888 he was also elected to fill the same positions with the Citizens' Railway Company. The National Railway Company of Chicago absorbed the Citizens', Cass Avenue, Northern Central and Union lines in 1889 and Mr. Duffy was chosen secretary and treasurer of these four companies.

William F. Ham, secretary of the Nassau Electric Railroad Company of Brooklyn, was born in Lewiston, Me., March 15, 1870. After fitting for college he entered

Bates' College in 1887 but was obliged to withdraw at the end of a year because of serious illness. In 1889 Mr. Ham went to New York and engaged with the Equitable Life Assurance Society, being with that company for four years in various capacities among them chief book keeper for one of the large subordinate corporations and later as private secretary to the second vice-president. He left the Equitable to go with the Johnson Company as assistant in the New York office where his acquaintance with railway men commenced. The Nassau Company having in view the lease of the Atlantic Avenue Lines, Mr. Ham was offered the position of cashier and accountant which he accepted. In April of the present year he was elected to his present position. Since his connection with this company he has had entire charge of the accounts and brought the system up to a point of high efficiency.

W. G. Ross, comptroller Montreal Street Railway Company, Montreal, Can.

John Mahoney, vice-president and general manager People's Railway Company, St. Louis, Mo.

Robert Lehman, secretary and treasurer St. Louis & Suburban Railway Company, St. Louis, Mo.

W. B. Brockway, auditor Toledo, Bowling Green & Fremont Railway Company, Toledo, O.

H. L. Wilson, auditor West End Street Railway Company, Boston, Mass.

Geo. S. Rolins, auditor St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.

Proper acknowledgment was made to each gentleman who responded, but we desire to take advantage of this opportunity to again thank those gentlemen for the interest manifested and the cooperation extended.

In this connection, we desire to express our thanks to the Street Railway Review and the Street Railway Journal for their kind offers to do everything in their power to help the committee in its work and promote the success of the Accountants' Association. Both papers rendered the committee and the association valuable assistance in publishing the circular letter and commenting on same in their editorial columns. We are also indebted to Edward E. Higgins, editor of the Street Railway Journal, for the valuable suggestions contained in his editorial, which appeared in the August number of the Street Railway Journal, on "A Standard Distribution of Street Railway Receipts and Expenses."

The committee also desires to thank the representatives of the State Boards of Railroad Commissioners of New York and Massachusetts, for their courtesy in responding to requests for the classification of operating expenses and form of annual report, as prescribed by each state board respectively.

In taking up the subject of a "Standard System of Street Railway Accounting," there are many points that present themselves for consideration. Without intending to go into an exhaustive discussion of them, your committee deems it wise to bring to your attention some of these points, as they have an important bearing on the subject.

The adoption and use of a standard system of accounts for street railways is entirely practical, notwithstanding the objections that may be urged to the contrary. The argument may be advanced that there would be serious objections to changing present methods and systems on the part of the accounting officer, manager, officers, directors, or stockholders of some roads, for various reasons; objections may be raised on the ground that

special ruled account books, form of reports, etc., would have to be discarded, because they would be useless with a change of system; it may be urged by the street railways of Massachusetts and New York, that they are obliged to keep their books and accounts as prescribed by their respective State Boards of Railroad Commissioners, and for that reason they would object to using any other system. In answer to these or any other objections that may be raised, your committee submits that they should not be allowed to stand in the way of adopting a standard system. If the difficulties referred to above prove to be insurmountable, it should be remembered that a standard system could be conformed to, without changing the methods and system now in use on any one road. Unquestionably it would be far better for all to follow, from beginning to end, any standard system that would be adopted. As far as our Massachusetts and New York friends are concerned, your committee suggests that this association should confer with the State Boards of Railroad Commissioners of Massachusetts and New York and secure their cooperation in the framing, adoption and use of a standard system. We firmly believe that this can be done. What has been accomplished in the steam railroad field, can be accomplished in the street railway field. We appeal to you to see that it is accomplished. Your committee desires to impress upon the members of this association the value and importance of the adoption and use of a standard system. We do not consider it necessary to advance any arguments in support of this proposition, as it is assumed that this association is unanimously in favor of it. We most respectfully urge that the proper action be taken by this association, now in convention assembled, to successfully overcome all difficulties, so that the desired results may be accomplished now.

With that end in view we would recommend that a permanent committee be appointed for the promotion of the adoption and use of a standard system. In order to bring this about we would suggest that the report of this committee be placed in the hands of the permanent committee with full power to make such additions or alterations as it may deem proper; with authority to confer with the proper officials of any state prescribing a standard system of keeping street railway accounts, and with street railway companies, whether members of this association or not; and to submit a printed report at the next annual meeting of this association, with instructions to have a printed copy sent to each member of this association at least sixty days before the annual meeting takes place.

There are many other questions concerning the adoption and use of a standard system that could be discussed at length; for

example, the method of making charges in operating expenses; the pro-rating monthly of the yearly expense of water, taxes, insurance, interest, or any other charge that it would be desirable to pro-rate; the extent that detailed and statistical information should be furnished, so that the management of the road will profit by such information; the difficulty of putting into practical operation, any standard system that may be adopted, because of the dependent position occupied by the accountant, with reference to relying upon subordinates and heads of departments for information as to the basis of charges; the extent to which conditions of operation affect results and comparisons, and the necessity of taking them into consideration; the proper unit as a basis to figure from, whether per car, per car-mile, per passenger, or per mile of single track operated; the care that should be exercised in making charges to construction and equipment accounts; the necessity of charging off annually a certain amount for depreciation; and the creation of a sinking fund or surplus account, that will really be what it means, with the amounts credited invested in a safe, interest earning investment. These, and many other questions could be gone into here, but your committee has thought it best not to do so, further than presenting them to your notice. It was supposed that the exhibits accompanying this report would furnish ample matter for discussion, and that all such questions would be taken care of, in discussing the exhibits.

Appreciating the magnitude and importance, as well as the delicacy of the work undertaken by your committee, as outlined in its circular letter, realizing the difference of opinion and practice that prevails among street railway accountants, as to the methods and systems used, as evidenced by the blanks and forms sent to your committee, we invite careful consideration, full discussion and the most severe criticism of the following report.

Very respectfully,

C. N. Duffy,  
W. F. Ham,  
J. F. Calderwood,  
Committee.

The following classifications are prepared to meet the requirements of a street railway constructed and operated as an overhead electric road. They could be easily arranged and adapted for use on an electric railway using an underground or third rail system, and could also be easily changed to meet the requirements of a cable railway or one operated by any other power. All that would be necessary to make the classifications practical for use on any other than a street railway constructed as an overhead electric road would be to change the technical names of the appliances used on any one of the other systems mentioned.

#### CLASSIFICATION OF OPERATING EXPENSE ACCOUNT.

*"A" Maintenance of way and structures :*

1. Repairs and renewals of track and roadway construction.
2. " " " " electrical track construction.
3. " " " " buildings and improvements.

*"B" Maintenance of equipment :*

4. Repairs and renewals of steam plant.
5. " " " " electrical plant.
6. " " " " cars.
7. " " " " electrical car equipment.
8. Renewals of horse and vehicle equipment.
9. Repairs and renewals of miscellaneous equipment.
10. " " " " shop tools and machinery.

*"C" Conducting transportation :*

#### OPERATION OF POWER PLANT.

11. Power plant wages and superintendence.
12. Fuel for power.
13. Water for power.
14. Lubricants and waste for power plant.
15. Miscellaneous supplies and expenses of power plant.
16. Hired power.

(Note.—Income from sale of power is to be deducted from cost of operating power plant.)

#### CAR SERVICE.

17. Superintendence of transportation.

18. Wages of conductors.
19. " " motormen.
20. " " other car service employes.
21. " " car house employes.
22. Car and motor supplies.
23. Miscellaneous transportation expenses.
24. Cleaning, watering and sanding track.
25. Removing of snow and ice.

*"D" General Expenses :*

26. Salaries of general officers.
27. Salaries of clerks.
28. Printing and stationery.
29. Miscellaneous office expenses.
30. General stores expenses.
31. General stable expenses.
32. Advertising and expense of park properties.
33. Miscellaneous general expenses.
34. Legal expenses.
35. Injuries and damages.
36. Track rentals.
37. Rental of land and buildings.
38. Insurance.

#### CLASSIFICATION OF CONSTRUCTION AND EQUIPMENT ACCOUNT.

1. Organization.
2. Engineering and superintendence.
3. Right of way.
4. Track and roadway construction.
5. Electrical track construction.
6. Real estate used in operation of road.
7. Investment real estate and improvements.
8. Buildings and improvements used in operation of road.
9. Power plant equipment.
10. Shop tools and machinery.
11. Cars.
12. Electrical car equipment.
13. Miscellaneous equipment.
14. Interest and discount.
15. Miscellaneous.

#### FORM OF ANNUAL REPORT SHOWING INCOME ACCOUNT.

|                                                                 | 189. | 189. | Inc. | Dec. |
|-----------------------------------------------------------------|------|------|------|------|
| <i>Gross Earnings from Operation.</i>                           |      |      |      |      |
| Passenger receipts .....                                        |      |      |      |      |
| Chartered cars .....                                            |      |      |      |      |
| Freight .....                                                   |      |      |      |      |
| Mail .....                                                      |      |      |      |      |
| Express .....                                                   |      |      |      |      |
| Total earnings from operation..                                 |      |      |      |      |
| Less operating expenses .....                                   |      |      |      |      |
| Net earnings from operation ..                                  |      |      |      |      |
| <i>Income from other sources.</i>                               |      |      |      |      |
| Advertising .....                                               |      |      |      |      |
| Track rentals .....                                             |      |      |      |      |
| Rent of land and buildings.....                                 |      |      |      |      |
| Interest and dividends on securities owned .....                |      |      |      |      |
| Interest on deposit .....                                       |      |      |      |      |
| Miscellaneous income .....                                      |      |      |      |      |
| Gross income from all sources..                                 |      |      |      |      |
| <i>Deductions from income.</i>                                  |      |      |      |      |
| Taxes .....                                                     |      |      |      |      |
| Interest on funded debt .....                                   |      |      |      |      |
| Interest on floating debt .....                                 |      |      |      |      |
| Rentals of leased lines .....                                   |      |      |      |      |
| Net income from all sources ...                                 |      |      |      |      |
| <i>Deductions from net income.</i>                              |      |      |      |      |
| Preferred stock dividends .....                                 |      |      |      |      |
| Common stock dividends .....                                    |      |      |      |      |
| Betterments and additions charged to const. and equip. acc..... |      |      |      |      |
| Sinking fund .....                                              |      |      |      |      |
| <i>Surplus for year.</i>                                        |      |      |      |      |

|                                      |       |
|--------------------------------------|-------|
| If deficit be shown, substitute word |       |
| Deficit for Surplus .....            | ..... |
| <i>Surplus for year ending.</i>      |       |
| Surplus carried forward from January |       |
| 1, as per balance sheet.....         | ..... |
| Surplus December 31, as per general  |       |
| balance sheet .....                  | ..... |

In attempting to establish a uniform and standard system of street railway accounting your committee has constantly kept in mind that it was trying to establish a system which would be applicable not only to the large roads, but to the small ones as well; to the road that runs a thousand cars as well as to the road that runs a half dozen.

This requires an elastic system of accounting, a system which rests on a common foundation, with details so arranged that they can be made to meet the varying requirements of any and all roads. Most important of all, we must have a foundation upon which all can work to advantage, which will not require more than the customary amount of bookkeeping and accounting and which will contain the general features which the street railway manager has been accustomed to look for.

It has been our aim to make the classifications so distinct and so clearly defined that there can be no mistake and that the same constituent elements will at all times be embraced in these different classifications.

The fundamental principle underlying the efforts of your committee was found in the determination to agree upon a minimum number of accounts consistent with furnishing the necessary information to place the management at all times in touch with not only the operation of their particular system, but with that of any other system.

Classification of Operating Expense Accounts.—We have divided the operating expenses into four general divisions: A. Maintenance of Way and Structures. B. Maintenance of Equipment. C. Conducting Transportation. D. General Expenses. The first two divisions have a direct effect on the physical condition of the property; the last two include only such items as are strictly operating expenses, and have no direct effect upon the physical condition of the property.

With reference to the first two divisions covering maintenance accounts, the important consideration seemed to be whether or not it was desirable and practicable to make a separation between repairs and renewals. In the operation of electric street railways, offering as they do many opportunities for adopting a variety of electrical and mechanical devices with variance in the economy of maintenance, this separation would seem of value and importance, especially so when we consider the repairs and renewals of the larger and more expensive units of our large apparatus, such as generators, etc. As an abstract proposition this looked very feasible, and recognizing the many advantages of such a separation, the committee attempted to work out a plan which would embody this separation. A closer and more careful analysis of the component parts of each of these two divisions led the committee to believe that in very many cases such a separation would be nothing more than a distinction without a difference. While it might be possible to make such a separation in the larger units, it did not seem to be practicable to make this separation throughout without causing a great deal of confusion and an endless amount of work in arriving at results which in the end would be both unsatisfactory and incorrect.

As it is essential to have information as to the amounts expended in renewals, the committee suggests and recommends that the most feasible way to present this information would be in the form of an analysis of the maintenance accounts showing the items properly chargeable to renewals, distinct from repairs.

As an illustration of the point: assume that the account of repairs and renewals of track and roadway construction amounts to \$10,000 for a given period, an explanation would be made showing that of this amount \$5,000 was expended in constructing a certain length of track and the balance consists of ordinary repairs. While the separation shown in this case is comparatively easy, the task becomes more difficult and results more unsatisfactory in attempting to make such a separation with reference to electrical car equipment.

Coming to a consideration of the accounts under the general heading of Conducting Transportation, we have grouped these into, first, Operation of Power Plant, and second, Car Service. In the former the only feature which requires special mention is the deduction of income from sale of power from the cost of operation of power plant. This is probably a radical change from the present method, as this item is usually shown under miscellaneous income.

As the cost of producing any power that may be sold has been included in operating expenses, and as all amounts received from sale of power may be assumed to represent approximately the actual cost of the production of that power, it seems proper that it should be shown as a deduction from the cost of operating the power plant. To show the logic of this proposition an illustration may be made of two electric roads, one of which has no power plant and buys its power outright from another company. In this case the first company would have no expense of operation of power plant other than hired power; and cost of operation of the power plant of the second company would be increased by the amount of power which it had furnished to the first company, throwing it out of all proportion of what would be produced for the operation of its own cars; and the actual cost of producing power for the second company can only be shown by deducting from the cost of operating the power plant of the second company the amount received from power furnished the first company. To make this even more clear, suppose in the above instance that each company operates 100 cars, making a total of 200 cars; the cost of power for operating these 200 cars is, say, \$100,000, of which \$50,000 is shown as hired power on the books of the first company and \$100,000 less the deduction of \$50,000 for sale of power, leaving \$50,000, on the books of the second company.

With regard to the accounts Cleaning, Watering and Sanding Track and Removal of Snow and Ice, the committee has recognized the wide diversity of opinion and practice in classifying these accounts. The point at issue is whether they should be treated as maintenance charges or as transportation charges. In deciding this question the committee has followed the general principles that all maintenance charges have a direct bearing upon the physical condition of the property, while transportation charges do not. The physical condition of the property is not in any way benefited by either of these accounts, and therefore they properly belong to transportation.

Coming now to a consideration of the accounts under General Expenses, the committee has thought it best to provide the account Printing and Stationery, and to include in that one account the cost of all printing and stationery of every description, except the cost of printing transfers and tickets charged in Transportation; printing of law briefs, etc., charged in Legal Expenses; and the cost of printing posters, dodgers, handbills, etc., for advertising purposes charged in Advertising and Expense of Park Properties. With this arrangement all printing and stationery except the above items, would be charged in a general printing and stationery account. Your committee deemed it preferable to do this rather than distribute the cost of printing and stationery over a number of other accounts, the result of which would be that the total cost of stationery and printing would be lost sight of. Furthermore, the amount expended in printing and stationery would not justify the expense of accounting in order to distribute it among the various accounts, although the amount in the aggregate is an important item. Should the question be asked why the cost of printing transfers and tickets has been charged to Conducting Transportation and the cost of conductors' trip sheets, envelopes, etc., left in General Expenses, the reply is that the former have no connection with accounting, and the latter have.

The committee has thought it best to have the account General Stores Expenses to provide for such expenses in the case of roads that operate a general stores department. If such an account were not provided it would be difficult to charge such expenses to any other account.

The committee has also provided the account General Stable Expenses, for the reason that it was deemed advisable to have all general stable expenses in one account rather than to attempt to distribute such expenses among the various accounts benefited thereby. Such a distribution would be difficult and unsatisfactory,



and besides, the total cost of general stable expense would be lost sight of. In the case of construction work causing an abnormal increase in this account, such charges as are proper should be taken out of this account and charged in construction accounts.

The committee has recognized the wide difference of opinion and practice in the matter of Injuries and Damages, with reference to placing it in Conducting Transportation, or in General Expenses. Many arguments can be advanced in support of the disposition of Injuries and Damages to either, and the committee has fully and carefully considered the question from all points of view. It has finally decided to place it in General Expenses for the reason that a large portion of the account is not properly chargeable to transportation. In the first place, the measure of damages assessed in many cases rests upon the prejudices and whims of juries, and their findings are beyond the control of the manager of the road and therefore should not be charged in transportation. Again, damage claims may be settled or judgments paid as the result of accidents occurring in which there is no connection with transportation. Again, it appears to be both reasonable and consistent to put damages under the same general heading as Legal Expenses, where the latter unquestionably belongs, on account of the close relationship of one to the other.

With regard to Track Rentals, the committee has recognized that this is another account concerning which there is an equal difference of opinion and practice as to where it properly belongs. Some hold that it properly belongs to Conducting Transportation, other to Maintenance of Way, on the ground that Track Rentals are really an avoidance of maintenance charges, and others still to General Expenses. As a matter of fact the occupation and use of the tracks of one street railway company by another in cities is attended by varied conditions, and in arriving at the compensation to be paid, there are many questions that have to be taken into consideration. For example, the amount of revenue that the lessee will take away from the lessor by reason of operating its cars over the tracks of the lessor; the portion of the franchise taxes on a mileage basis that the lessee should bear; the interest on cost of construction and the cost of maintenance and renewals of not only the track and roadway construction, but the electrical track construction as well; the expense of cleaning, watering and sanding track and removing of snow and ice, which should be borne proportionately by the lessee; and the hindrance to the lessor in the operation of its cars that may result by reason of conditions under which the cars of the lessee are operated. For these reasons as well as for others that might be advanced, your committee has determined to place the account in General Expenses.

In the above discussion, the committee has dwelt only upon such features as seem to require special mention. Appended to these remarks is a detailed classification of operating expense accounts intended to show clearly and beyond question the items to be charged to each account. Incidentally the committee calls attention to the fact that any money received from the sale of old material or scrap should be credited to the account to which the material was originally charged. The committee has worked under the disadvantage of prosecuting its work by correspondence and has been limited in time. For this reason it may be that improvements in phraseology and in expression will suggest themselves. We believe, however, that the classification of operating expenses as submitted contains the essential features required in a simple, concise and elastic system of street railway accounting, and that it can be adopted and used by all railroads, large or small, under all varying local conditions. If further separation and classification is desired by any or all companies to meet varying local conditions, it can be done without disturbing in the least the present classification, by the use of other accounts carried as sub-divisions of the prescribed accounts, or if still further itemization is desired each account may be carried in detail on separate distribution of expense books.

The committee feels that, under the circumstances, it has done satisfactory work, and earnestly hopes that the classification suggested may be adopted as a standard with such modifications as may be deemed desirable.

#### CLASSIFICATION OF OPERATING EXPENSE ACCOUNTS.

##### "A" Maintenance of Way and Structures.

1. Repairs and Renewals of Track and Roadway Construction. This account embraces the cost of labor, materials, supplies, tools and expenses of repairs and renewals of track and roadway construction, including renewals of ties, renewals of rails, repairs and renewals of joints, repairs and renewals of special work, such as crossings, crossovers, curves, guard rails, frogs, switches, etc.; ballasting, repairs and renewals of paving, repairs and renewals of bridges, culverts and subways; repairs and renewals of crosswalks; wages of roadmasters, track foremen, laborers, watchmen and others employed in above work; cost of punching, drilling and cutting rails, except for track wiring. When track is taken up, the labor expended therefor should be charged to this account whether another track is laid to replace it or not. The cost of tracks in car houses is included in this account.

2. Repairs and Renewals of Electrical Track Construction. This account embraces the cost of labor, materials, supplies, tools and expenses of repairs and renewals of electrical track construction, including cost of taking up, resetting and painting poles; repairs and renewals of trolley, feed, guard and supplementary wires and track bonding, underground feeders and conduits.

The expense of taking up and relaying paving when necessitated by repairs and renewals to electrical track construction is chargeable to this account and not to account No. 1.

3. Repairs and Renewals of Buildings and Improvements. This account embraces the cost of labor, materials, supplies, tools, and expenses of repairs and renewals of buildings and improvements, including power houses, repair shops, blacksmith shops, machine shops, paint shops, carpenter shops, car houses, stables, office buildings, depots, stations, switch tenders' houses, store houses, sheds, coal bins; and improvements in connection with same, including drainage, water, gas and sewer pipes and stationary fixtures belonging thereto, heating and lighting apparatus and fixtures, other stationary fixtures, sidewalks, street paving on streets in front of and adjacent to buildings, fences, sheds, out-houses, etc. Repairs of pits in car houses and shops, and repairs and renewals to docks and wharves are to be charged to this account. Repairs to track in car houses and yards must be charged to account No. 1, and repairs to electrical track construction in car houses and yards must be charged to account No. 2.

This account includes the cost of labor and material used in replacing buildings, sheds, etc., that have been destroyed or injured by fire or otherwise become unfit for use. The replacing of a better or more expensive building or parts thereof should be charged to this account to the extent of the ledger value of the buildings or parts thereof rendered unfit for use, and the balance should be charged to construction account.

This account should not include repairs and renewals of buildings and improvements not used in connection with the operation of the road.

##### "B" Maintenance of Equipment.

4. Repairs and Renewals of Steam Plant. This account embraces the cost of labor, materials, supplies, tools and expenses of repairs and renewals of steam 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 and other boiler room appliances; piping and steam fitting, including valves, separators, water and sewer connections and water meters.

5. Repairs and Renewals of Electrical Plant. This account embraces the cost of labor, materials, tools, supplies and expenses of repairs and renewals of electrical 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 electrical equipment.

6. Repairs and Renewals of Cars. This account embraces the cost of labor, materials, supplies, tools and expenses of repairs and renewals of car bodies, including roofs and bonnets, window and deck lights, platforms, sashes, bumpers, draw bars, gates, steps and grab handles, painting, varnishing and lettering, curtains and curtain fixtures, car seats and covering for seats, stoves and stove fixtures, electric heaters, electroliers, headlights, stationary fare registers, gongs, bells, bell cord fixtures, brass fixtures and trimmings, signs and sign fixtures, sand boxes, track brushes and snow scrapers; trucks, including wheels, bases and oil boxes, truck frames and parts, including pedestals, springs, etc., brake shoes, brakes and brake appliances, fenders, pilots and life guards. This account includes the cost of new cars and trucks purchased to keep good the original number, less the value of old material or insurance received.

7. Repairs and Renewals of Electrical Car Equipment. This account embraces the cost of labor, material, supplies, tools and expenses of repairs and renewals of motors, including armatures and parts, fields and parts, commutators and parts, gears, gear cases, gear case brasses and supports, pinions, brasses, bearings and brush holders, controllers, controller resistances and parts, rheostats, lightning arresters, cut out boxes, wiring and connections for power, light and heat circuits, trolley wheels, forks, poles, bases and bushings.

This account should include the cost of shifting summer and winter equipment. Electrical car equipments purchased to make good the original number are to be charged to this account less the value of old material or insurance received.

8. Renewals of Horse and Vehicle Equipment. This account embraces the cost of renewals of horses, depreciation of horses, renewal of harness equipment, renewal of vehicle equipment of every description not operated by mechanical power. The feed, stable expense and shoeing of horses and repairs of harness and vehicle equipment is charged to General Stable Expenses.

9. Repairs and Renewals of Miscellaneous Equipment. This account embraces the cost of repairs and renewals of freight, mail, express and supply cars, water and sprinkling cars, sand cars, salt cars, snow plows, sweepers, scrapers and miscellaneous snow equipment.

10. Repairs and Renewals of Shop Tools and Machinery. This account embraces the cost of repairs and renewals of shop tools machinery, and appliances, including engines, boilers, shafting, motors, etc., coal, coke, lubricants and waste, and miscellaneous supplies and expenses of general repair shops, including superintendence.

#### *"C" Conducting Transportation.*

11. Power Plant Wages and Superintendence. This account includes the wages of all employes of power plant, except when employed on repairs or renewals.

12. Fuel for Power. This account includes cost of coal or oil used as fuel or other fuel delivered at power plant.

13. Water for power. This account includes cost of water used for lubricant purposes only.

14. Lubricants and Waste for Power Plant. This account embraces the cost of lubrication of power plant.

15. Miscellaneous Supplies and Expenses of Power Plant. This account embraces the cost of carbon brushes, tools and other supplies and expenses of the power plant not otherwise provided for.

16. Hired power. This account embraces cost of power furnished by other companies. Income from sale of power is to be deducted from the expense of operation of power plant.

17. Superintendence of Transportation. This account includes the wages of division superintendents and their assistants, aids, inspectors, road officers and others employed in superintending transportation.

18. Wages of Conductors.

19. Wages of Motormen.

20. Wages of other Car Service Employes. This account includes wages of starters, transfer agents, switch tenders, trail car couplers and other car service labor.

21. Wages of Car House Employes. This account includes

wages of foremen, watchmen, car placers, shifters, etc., motor inspectors and cleaners, lamp and headlight tenders, car oilers, wipers, car cleaners, car stove firemen and other car house employes not employed on repairs. This account should include the cost of shifting cars from one point to another for the purpose of transportation. If, however, the cars are shifted for purposes of repair the cost of so doing should be charged to account No. 6 and No. 7.

22. Car and Motor Supplies. This account includes cost of supplies for car oiling, incandescence lamps, illuminating oil and supplies, supplies for car cleaning, water for car cleaning, fuel and supplies for car heating, bell and register cord, trolley rope, carbon brushes for motors, lubricants and waste for motors, tools and other supplies except for "Repairs."

23. Miscellaneous Transportation Expenses. This account includes services and expenses of special inspectors, printing transfers and tickets, cost of conductors' books, spears, punches, portable registers, tools for motormen, employes' badges and uniforms when paid for by the company; cost of getting derailed cars on track and removing obstructions and wreckage, and miscellaneous car house expenses not otherwise provided for.

24. Cleaning, Watering and Sanding Track. This account embraces labor, materials, supplies, tools and expenses of cleaning, watering, sprinkling and sanding track, including wages of curve cleaners and greasers, track brooms, curve grease, etc., expense of removing dirt from track, wages of men employed in operating water and sprinkling cars, and cost of water for same; cost of sand, including wages and expenses of hauling, drying and distributing same and of sanding track. This account does not include cost of sprinkling rendered necessary by repairs or construction of track or paving.

25. Removal of Snow and Ice. This account embraces labor, material, supplies, tools and expenses of removing snow and ice, including cost of salt delivered in car house or bins and wages of men engaged in salting track and in operating snow plows, sweepers, scrapers, etc.; cost of shoveling and removing snow and ice whether done by the company or otherwise. This account does not include rattran for sweepers or other repairs of snow plows, sweepers, scrapers, etc., included in account No. 9.

#### *General Expenses.*

26. Salaries of General Officers. This account includes salaries of president, vice-president, general counsellor or solicitor, secretary, treasurer, auditor, general manager, assistant general manager, chief engineer, general superintendent, purchasing agent, together with all officers whose jurisdiction extends over the entire system.

27. Salaries of Clerks. This account includes salaries of paymasters, cashiers, receivers and all clerks in general office and clerks for heads of departments. It should include the salaries of clerks employed in handling and counting receipts, transfers and tickets whether employed in the general office or in other places.

28. Printing and Stationery. This account includes all printing, stationery and stationery supplies, except printing of transfers and tickets, chargeable to account No. 23; printing of briefs, etc., charged to account No. 34; and signs, posters and other advertising matter charged to account No. 32.

29. Miscellaneous Office Expenses. This account includes cost of repairs and renewals of office furniture and fixtures, office supplies and expenses, including coin bags, money wrappers, money tags, postage, cost of telegrams, newspapers, periodicals, towel service, wages of janitors, porters and messengers, and all other miscellaneous expenses of general office.

30. General Stores Expenses. This account embraces all salaries and expenses in connection with maintaining stores departments, including cost of the distribution of all material and supplies and collection of scrap material.

31. General Stable Expenses. This account includes food, horse-shoeing, labor and miscellaneous stable expenses, ordinary repairs of harness and vehicle equipment. Renewals and depreciation of horses and renewals of harness and vehicle equipment are charged to account No. 8.



32. Advertising and Expense of Park Properties. This account includes the cost of advertising, together with all expenses incurred in maintenance of parks, park properties, resorts, etc., expense of all music and cost of entertainment provided by the company.

33. Miscellaneous General Expenses. This account includes cost of public telephone service, cost of operating private telephone system, subscriptions and donations, traveling expenses of gene al officers and others connected with general office; contingent expenses connected with general management, not otherwise provided for.

34. Legal Expenses. This account includes the salaries and expenses of solicitors, attorneys, their clerks and attendants and all expenses of their offices (when in the full employ of the company), such as law books, printing briefs, legal forms, testimony, etc., also fees and retainers paid, services of attorneys who are not regularly employed by the company, also fees and other expenses of arbitrators for settlements of disputed questions, cost of suits, special fees, notarial fees, expenses connected with taking depositions, and all legal and court expenses of every kind not otherwise provided for under the head of "Injuries and Damages."

35. Injuries and Damages. This account includes all charges on account of persons killed or injured, such as gratuities and compensation paid injured or disabled persons, their creditors, heirs, relatives and attorneys, salaries and expenses of surgeons, fees and expenses of doctors, coroners, undertakers, witnesses and others (except lawyers' fees and court expenses), nursing, hospital attendance, medical and surgical supplies, also wages and expenses of others occupied in connection with the adjustment of claims. It also includes injury to property damaged and all charges in connection with the adjustment of such claims.

36. Track Rentals. This account includes rents paid, for lease of track and terminals.

37. Rent of Land and Buildings. This account includes rents paid for land and buildings used in the operation of the road.

38. Insurance. This account includes cost of insurance, including Fire, Casualty, Employer's Liability, Fidelity, Profits and other insurance.

#### *Deductions from Income.*

Taxes. This account includes all taxes on real and personal property used in the operation of road, franchise taxes, taxes upon gross earnings and capital stock, car licenses, wagon and vehicle licenses. Taxes upon property not used in the operation of road should not be included in this item, but should be deducted from income from other sources, or charged direct to profit and loss.

Interest. This includes interest on funded debt and interest on floating debt.

#### **Rentals of Leased Lines.**

##### **CLASSIFICATION OF CONSTRUCTION AND EQUIPMENT ACCOUNT.**

1. Organization. This includes all expenses incurred in effecting organization, including legal expenses.

2. Engineering and Superintendence. This includes wages and expenses of engineers and draughtsmen, superintendents, etc., on preliminary and construction work.

3. Right of Way. This includes all expenses incurred in connection with the securing of or paying for right of way.

4. Track and Roadway Construction. This includes cost of track and roadway construction, including material, supplies, tools, expenses and labor, excavating, grading, ballasting, bridges and culverts, paving, ties, rails, fastenings, complete, welded joints, special work, tools and appliances miscellaneous track material, supplies and expenses; labor laying track, hauling and distributing material. The cost of tracks in car houses to be included in this account.

5. Electrical Track Construction. This includes cost of electrical track construction, including material, supplies, tools, expenses and labor; poles and pole fixtures, material for setting poles, paint for poles, wire, overhead and underground devices, tools and appliances; miscellaneous material, supplies and expenses, labor setting poles, painting poles, wiring track, put'n'g up overhead line construction, hauling and distributing material.

The cost of electrical track construction in car houses to be included in this account. The cost of underground conduits and feeders where underground wire construction is used is also to be included in this account.

6. Real estate Used in Operation of Road.

7. Investment Real Estate and Improvements. This includes cost of land and buildings not used in operation of road.

8. Buildings and Improvements Used in Operation of Road. This includes cost of all buildings and improvements in connection with same, including excavations, foundations, drainage, water, gas and sewer pipes, and stationary fixtures belonging thereto, heating and lighting apparatus and fixtures; other stationary fixtures, side walks, street paving on streets in front of or adjacent to buildings, fences, sheds, outhouses, etc. The cost of tracks and electrical track construction in car houses is not chargeable in this account.

9. Power Plant Equipment. This includes cost of steam and electrical plant complete, exclusive of buildings, including machinery, foundations and installation.

10. Shop Tools and Machinery. This includes cost of shop tools and machinery for general repair shops, car houses, etc., including foundations and installation.

11. Cars. This includes cost of car bodies, trucks and car fixtures.

12. Electrical Car Equipment. This includes cost of motors and electrical car equipment complete.

13. Miscellaneous Equipment. This includes cost of water, sprinkling, sand, salt and supply cars, freight, mail and express cars, all other cars exclusive of those charged in account 11; cost of snow plows, sweepers and scrapers; cost of horse and vehicle equipment, including tools necessary in the use of miscellaneous equipment.

14. Interest and Discount. All interest and discount paid and received in connection with funds for construction should be charged or credited under this heading.

15. Miscellaneous. This includes miscellaneous expenses, office expenses, wages of clerks and all other expenses that would not be included in any of the other accounts enumerated above.

The Chair: We have Mr. Sergeant with us, first vice-president of the American Street Railway Association, and general manager of the West End Street Railway of Boston. Mr. Sergeant, we would be glad if you would make a few remarks to the Association.

Mr. Sergeant: I thank you very much, Mr. President, for the opportunity afforded me to say a word, because, for one thing, I have always been very much interested in accounts. I feel, and always have felt, that the real foundation of the business of street railroads was correct accounts. I have seen concerns go to wreck and ruin for the lack of that very thing and an inability to get out of the slough of despond, because they did not know what they were doing. I have been very much interested in the report of your committee, that portion of it which I have heard, and the arguments advanced seem to me to be very sound; and the general position which you have taken in regard to classification, leaving it to the individual company to elaborate any detail, all within the elastic limits of the system you have provided, seems to me to be fundamentally right. It would be impossible to meet the differing conditions of all the different companies by any one complete, detailed schedule; but by a schedule such as you have suggested you are going not only to afford the most valuable information to many new corporations, small companies, people without railroad experience, who need just such a chart to keep them right; but you are going to get reports into a uniform shape so that comparisons can be made, and that, if the accounts are kept properly, under the headings that you have prescribed, will, it seems to me, be invaluable. There is one word that I would like to say here in regard to accounts in general, and one point that I think ought not to be lost sight of—that sometimes we are given, in studying the details of accounts and the question of classification for this or that item, to make that the main thing and to lose sight of the real principle underlying all accounts, namely, that the whole accounting system should be such that the results will be sound. I suppose you have all studied more or less the reports of European railroads and street railways. There is



one account in the report of every European street railway that I have ever seen that is too often missing in the accounts of our own railways. I refer to the depreciation account. I have never seen a European report without it. I have seen a great many American reports without it, or possibly having it pretty well buried. Now, there may be reasons for burying it up, but there certainly are reasons why the matter of depreciation should be fully recognized and cared for year after year, so that in the end, when our franchises expire we may have something left. I thank you very much, gentlemen, for this opportunity of addressing you.

The Chair: Now, gentlemen, I think it would be well to proceed with the consideration of the report just presented by Mr. Ham.

Mr. Hibbs: I would like to ask what the intention of the committee was as to the appointment of another committee. Is that to refer the adoption of this classification to some other committee?

Mr. Ham: The object of that is more particularly to promote the adoption of this thing. We must remember that simply to say that we approve of the report of this committee and adopt it, means nothing. That may mean that we have given the Association a satisfactory report, but I do not think that that means that any one of us would go away from here with the intention of adopting this system. Now, what we want, if we have gained anything, is to have the system adopted; and I believe that to adopt anything you have to push it. While, as railroad men, we do not believe in promoters, yet this is what we want now; we want some promoters.

The Association then took up the consideration of the report, item by item, discussing every point fully, and adopted the report as printed above. This discussion lasted all of Thursday morning, Thursday afternoon and until noon of Friday, and would fill 30 pages of the "Review." It is extremely interesting to accountants, and contains a fund of information as to the distribution of accounts. This complete report will be published by the Accountants' Association and furnished to members only. This discussion alone is worth many times the price of the yearly dues, which are nominal, and managers and accountants desiring a copy can arrange for same by addressing W. B. Brockway, Secretary Street Railways Accountants' Association, Toledo, O.

This discussion gives the reasons why the various members are in favor of certain items being charged under given heads, and goes into the minute details which are apt to puzzle the accountant with whom the item appears only at rare intervals. It really is a post graduate course in street railway accounting.

The committee on standardization was made a permanent committee for the coming year.

After discussion as to date of next year's meeting the matter was left to the Executive Committee with power to act, as to what days in the week the meeting should be; it being understood that the meeting should be in the same place and week, as that of the American Association.

The Committee on Resolutions presented the following which was unanimously adopted:

Whereas, The Street Railway Accountants' Association of America, assembled in its first annual convention feels greatly indebted to the citizens of Niagara Falls for the warm welcome and generous hospitality extended to the delegates; to the officials of the street railways who have accorded the delegates free transportation in the use of their handsome equipment; to the American Street Railway Association for its cordial sympathy and substantial endorsement in the work of the new association, and for the invitation extended by its president in behalf of the American Street Railway Association to visit its convention, and for the enthusiastic welcome there given; to Secretary Charles De Freest, of the New York State Board of Railroad Commissioners, for his frank and hearty interest and valuable suggestions which materially aided the Association in its deliberations; to H. H. Windsor, of the Street Railway Review, and E. E. Higgins of the Street Railway Journal, for their unremitting efforts to promote the success of this body. Now, therefore, be it

Resolved, That the Street Railway Accountants' Association of America, desires to express in this resolution its unforgotten thanks and appreciation for all the hospitality, courtesy and assistance thus rendered it as a body; and, further, be it

Resolved, That these resolutions be spread upon the minutes of the Association and copies of the same given to the press.

Chas. D. Meneely,  
P. V. Burlington,  
Theodore J. King,  
Committee.

Two other papers had been prepared and announced on the program, "Statistics, Their Use and Abuse," by E. D. Hibbs, auditor of the Consolidated Traction Company, Jersey City, and "Car Mileage—How Arrived at and Its Use," by H. J. Davies, assistant secretary of the Cleveland Electric Railway. The extreme lateness of the hour, however, did not admit of suitable time being given to the reading and discussion, and by motion, and with the consent of the authors, these two papers were deferred until next year.

A vote of thanks was given Vice-President Duffy and Secretary Brockway for their excellent work.

The nominating committee then reported, and on motion the secretary cast one ballot for the ticket, as read. The officers for 1898 are as follows:

President: H. L. Wilson, Auditor West End Street Railway Company, Boston.

First Vice-President: E. D. Hibbs, Auditor Consolidated Traction Company, Jersey City.

Second Vice-President: P. V. Burlington, Secretary and Auditor The Columbus Street Railway Co., Columbus, Ohio.

Third Vice-President: A. H. Ford, Secretary New Orleans Traction Company, New Orleans.

Secretary and Treasurer: W. B. Brockway, Auditor Toledo, Bowling Green & Fremont Ry. Co., Toledo.

Executive Committee: The Officers and

Wm. F. Ham, Secretary Nassau Electric R. R. Co., Brooklyn.  
H. J. Davies, Assistant Secretary The Cleveland Electric Ry. Co., Cleveland.

F. R. Greene, Secretary Chicago City Railway Co., Chicago.  
J. M. Smith, Comptroller Toronto Railway Co., Toronto.

A telegram of congratulation was sent to President-Elect Wilson, and after the installation of officers, the meeting adjourned.

The following new members were admitted to the association at the Niagara Falls meeting in addition to the companies named in the report of the secretary and treasurer that acquired membership between the Cleveland and Niagara Falls meetings:

Columbia Railway Co., Washington, D. C.  
Brooklyn City & Newton Railroad Co., Brooklyn, N. Y.  
Memphis Street Railroad Co., Memphis, Tenn.  
Metropolitan Railroad Co., Washington, D. C.  
West Chicago Street Railroad Co., Chicago, Ill.  
Union Depot Railroad Co., St. Louis, Mo.  
Milwaukee Electric Railway & Lighting Co., Milwaukee, Wis.  
Tonawanda Electric Railroad Co., North Tonawanda, N. Y.  
Denver Consolidated Traction Co., Denver, Col.  
Colorado Springs Rapid Transit Railway Co., Colorado Springs.  
Wilmington City Railway, Wilmington, Del.  
Hamilton Street Railway Co., Hamilton, Ontario.  
Fitchburg & Leominster Street Railway Co., Fitchburg, Mass.  
Manchester Street Railway Co., Manchester, N. H.  
Columbus Central Railway Co., Columbus, O.

#### SOCIAL FEATURES AND EXCURSIONS.

The many celebrated points of natural interest at the Falls, resulted in calling out a large attendance on the part of the ladies, and these were very nicely cared for by the committee of 25 local ladies who were constantly in attendance. The hall was set in motion early on the first day by the General Electric Company, which chartered all the trolley-cars and other vehicles in the city and tendered a ride to the ladies. The party of about 150 set out from the hotel at 9:00 a. m. and after crossing to the Canadian side drove up and down the river viewing the Falls. In the afternoon everybody took the cars and visited the two power plants and many of the industries which are electrically operated. In the evening there was music and a dance at the hotel, for those who desired, while others sauntered through the corridors visiting with friends, or went to the convention hall to see the exhibits.

Wednesday morning the ladies were taken down the Gorge road, and in the afternoon accompanied the gentlemen who went on the excursion over the "Canadian Route." On this trip the party walked across the suspension bridge and took special cars going up the river to Chippawa Falls, thence back through Niagara and down the river to Queenston, where a steamer brought the party to Lewiston and the return was made on the American side over the Great Gorge road. It was dark and rain was gently falling when the hotel was reached. That evening there was music and dancing at the hotel.

Thursday morning the ladies made a trip in carriages provided by the ladies of the city, and made the tour of the Islands on the American side, and in the afternoon some went to visit Ft. Niagara and others made short trips in parties of twos and threes. In the evening the exhibit hall was open to the citizens, and the annual banquet was given at the International. Four hundred guests were present, and the dinner and speaking lasted until past midnight. The toasts and speaking were as follows:

"The City of Niagara Falls," the Hon. Arthur C. Hastings; "The Association," Smith P. Galt; "Wit and Humor of the Bar," Henry W. Box; "The Evolution of Niagara," the Hon. Thomas V. Welch; "The Technical Press," Henry H. Windsor. W. Caryl Ely was toastmaster.

One of the most enjoyable incidents of the convention week was the dinner given on Tuesday evening by J. G. White, of J. G. White & Co., contractors, 29 Broadway, New York, at the Buffalo Club: The party was taken from the Falls on a special car of the Buffalo & Niagara Falls road, which is one of the many lines built by Mr. White's company; the return trip was made in the small hours, and the road showed what it could do in the way of speed. Among those present were: President McCulloch, of the association; State Railway Commissioner Ashley Cole and C. R. DeFreest, the secretary of the commission; J. G. White, C. R. Huntley, George Urban, Jr., J. B. Marston, L. B. Stillwell, H. M. Watson, W. M. Habirshaw, T. C. Martin, W. J. Clark, W. F. Zimmermann, J. H. McGraw, E. E. Higgins, G. Tracy Rogers, N. H. Parker, C. W. Price, F. S. Kenfield, C. S. Sergeant, Charles T. Ballard, W. Caryl Ely, F. W. Brooks, W. A. Brackenridge, T. C. Pennington, Captain J. Brinker, G. H. Dunbar, H. H. Harrison, D. B. Dyer, E. F. Thurston, H. J. Pierce, H. St. C. Denny and H. H. Littell.

#### LETTER FROM C. D. WYMAN.

New Orleans, La., October 12, 1897.

Robert McCulloch, Esq., President, American Street Railway Association, St. Louis, Mo.:

Dear Sir:—I have been anticipating with a great deal of pleasure the privilege of answering "Here," when the Secretary should call the name of the New Orleans Traction Company on the occasion of the assembling of the members of the Association in the Convention at Niagara Falls on the 19th. I have during the year, from time to time, jotted down a statement of problems which have arisen in my practice of the science of electric railroading, and which had caused me to stumble, to present them for solution to the many gentlemen so much more expert than myself in these matters, who would be present at the convocation. From the papers to be read, I looked for great gain and help, and from the discussions likely to arise, I expected to get at facts and figures which would be of great use to me; while on the social side, I have been longing for a glimpse of the natural beauties which surround the convention location, and for the chance of exchanging greetings with the many friends whom I have loved and respected for so many years, and to whose intimacy I have been so kindly admitted during our acquaintance. You can then readily judge of how great my disappointment is in not being able to compass any of the above list this year. To be obliged to be absent from my place in the convention hall this year causes more regret than I can express in words.

The hospitality of the city over whose principal railway system I have the honor to preside, is proverbial. When a stranger arrives in our midst, especially if he be a celebrated personage, without reference to whether that celebrity arises from good or ill characteristics, or whether his stay may prove disagreeable, subsequent to his advent, the good citizens of this Crescent City, turn out en masse to greet him, and spare no pains to make him welcome, and least he should find anything wanting in his re-

ception, and hasten his departure to bestow his attention upon other places, they do their utmost to keep him to themselves. The only instance on record where such hospitality was not in evidence, occurred, as I understand it, when General Benjamin F. Butler paid New Orleans a visit a few years ago, but even on that occasion, whatever the citizens lacked in cordiality toward the old general, it is reported, they made up to him in the liberal bestowment upon him of their spoons. Even after he had left New Orleans (the only thing I believe he did not take with him) he was invited to return, but the invitation was couched in such terms of earnestness, it is possible the general feared the citizens might overdo it, and he declined.

We have in our midst today, a guest who came to us about two months ago? He did not announce his arrival, but with the alertness peculiar to our people, some one (name unknown) found him out, and ever since he has been with us, and the recipient of most careful and constant attention. We promptly notified the world at large of his advent, and the residents of towns and villages outside of our precincts have ably assisted us in preserving from ruin our reputation for hospitality by permitting our guest to leave, and have come to our assistance by instructing the railroads in rules of etiquette through the reading to them of excerpts from "Winchester's Metallic Edition of How to Perforate the Human Body," to which lectures, the common carriers have listened with great interest, showing their appreciation of the subject-matter "in hand," by reversing levers. Thus have we been assisted by the country round about us, and in the city, old and young, rich and poor, educated and illiterate, have not failed to do our distinguished guest reverence. Wherever he has taken up his domicile, and he has been gracious enough to go about to a good many places, the premises have been elaborately decorated with his colors. Over the portal of each residence that he has visited, has been hung his flag. This is two hued; one half recalls an orange, and the other, a strawberry, the tout ensemble of the whole being not unlike a Martini cocktail with a cherry in it. In front of his abode, night and day, a committee on reception, to the number of two, are always at hand to see that the guest is not unnecessarily disturbed, and that none of the inmates of the residence wherein he is ensconced, so far forget their duties as hosts, as to leave the premises. When his lordship finally concludes to depart from any particular residence or hotel, there is such sorrow, that those he has left behind, purify their minds and bodies the better to bear up under the heart-rendering leave-taking, and so sacred are the articles that have been worn by the departed guest, that everything he has touched, even including the bed on which he has rested, is incinerated, so that mortal hands of common clay may never profane these sacred sundries. For fear that this guest when he walks the streets, should accidentally find dirt or the slightest bit of filth thereon, a coating of lime has been made to adorn the edge of nearly all sidewalks. On a bright moonlight night, when the thermometer registers 85 degrees Fahrenheit, the eye is deceived into thinking it has been snowing, but the other senses are not. Every car within my jurisdiction, which is in actual service, is daily treated to a bath consisting of a solution of bi-chloride of mercury, so that should our guest ever enter one, he will not be liable to contamination through contact with other passengers. So great is the awe and reverence in which we hold him, that his name is mentioned with bated breath, and therefore, I forbear here to pronounce his august appellation. It is possible that you and the gentlemen of the convention will, without further description, be able to recognize the one of whom I have been speaking. You will therefore see that my duties as a citizen, as a hospitable inhabitant of this southern land, cannot be easily set aside for the purposes of my own pleasure, and I am therefore denied being with you at the convention.

I trust all your deliberations may be thoroughly harmonious, engaging in interest, full of suggestion and assistance to all who shall participate therein, and that you may all have the best and jolliest time ever granted the American Street Railway Association's delegates and friends. Bear in mind please, that I am with you in spirit, and accept my most cordial greetings for yourself and all my street railroad associates.

Most sincerely yours,

C. D. Wyman.



## THE EXHIBITS.

And now for the exhibits; for what would a convention be without the display, the seductive souvenir and the genial supply man. All these have grown to large proportions, and certainly constitute a most important part of the convention.

This year we had the advantage of practically everything under one roof, and building comfortably warm,—though it was a kind providence which was chiefly responsible for the latter fact. The classification was the best yet attained, but this can be still further improved by insisting that all operating exhibits which produce much noise be relegated to a distant portion of the building, as far removed from the session rooms, and everybody else, as possible. During a good part of the time one single operating exhibit made sufficient noise to make it almost impossible to converse in the main hall, and those in the back part of the two session rooms might as well have been in the Cave of the Winds for all they could hear. We recognize the right and necessity of making a noise, (though a manager would never dare to make such a noise on the street) but the rights of others should also be recognized, and many an exhibitor lost valuable opportunities of explanation, simply because a manager had reached a point where he could longer endure having his ear shouted into.

The placing of exhibits this year was gratifying. Never before had so many been in place on the opening morning as this year. The decorations were pleasing and as a rule not overdone, and while there was a sad lack of room in which to spread out, still in the aggregate a vast amount of apparatus and goods were shown, and the exhibit as a whole was very satisfactory, and certainly was creditable to the supply men. A gentleman whose business required his presence with the display at several other conventions during the year, and who attended the street railway convention for the first time, expressed his amazement at the magnitude of the exposition, and stated that without question it comprised the largest and best display made by any association during the whole year.

The lighting arrangements were excellent, as were also the facilities for power to operate the various apparatus which it was desired to show in motion. The railroad switch to the main entrance was a greatly appreciated feature of unloading, nor were any complaints made as to excessive charges for teaming, carpenter work, etc.

The general expression among supply men was that managers devoted more time than usual this year to a careful study and inspection of the displays. Also a larger number of orders were booked this convention than in several years. In fact, we know of several managers who purposely deferred placing orders several months in order to do so at the convention after a comparative examination. There were a smaller number of fake devices this time, and it is a matter of congratulation that these exhibits are decreasing each year.

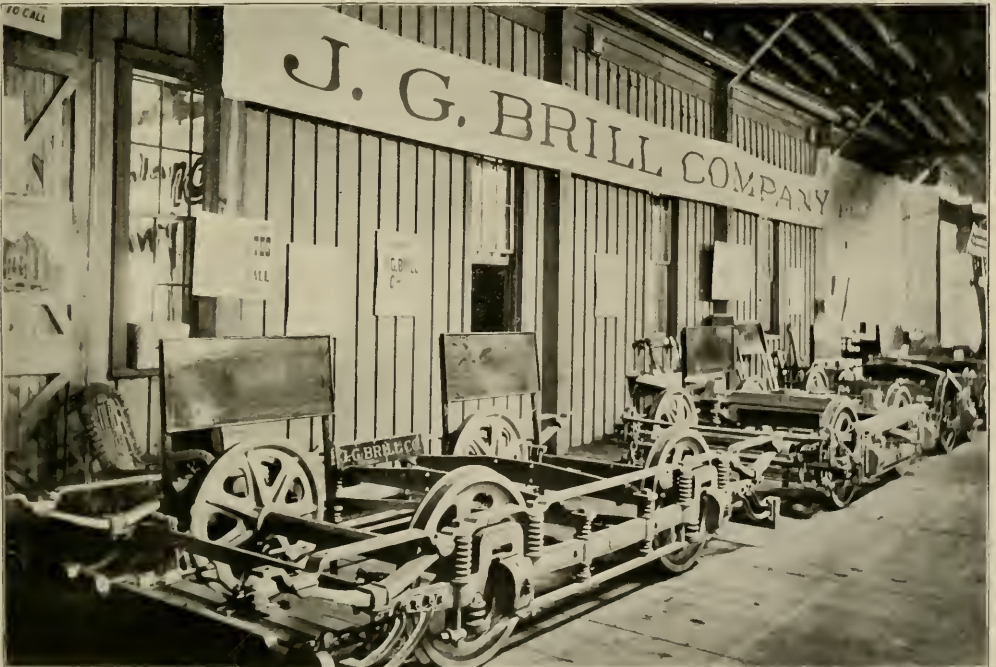
Altogether the exhibit hall was something to be proud of, and illustrated as is done in no other manner, the magnitude and importance of the industry which calls it into existence. The arrangement for barring out the general public during those hours in which the railway men desired to make inspection, was highly satisfactory; and the setting aside of Wednesday evening for the citizens was gladly availed of, and a large number turned out then.

The telegraph and telephone facilities in the building were appreciated, and the city cars were run with sufficient frequency between the hall and hotels, to accommodate everybody nicely.

The exposition of street railway appliances, of 1897, will go on record as a grand success in all respects.

The Pettingell-Andrews Company, of Boston, exhibited the Trojan jack.

Obe. Cullison, of York, Pa., exhibited the Cullison automatic car fender.



INTERIOR EXHIBIT, J. G. BRILL COMPANY.





INTERIOR EXHIBIT, PECKHAM TRUCK COMPANY.

Julian L. Yale & Co. of Chicago were represented by Townsend V. Church.

The Akron Kleant Company had an exhibit in charge of W. F. Dresler.

J. Paul Baker attended in the interest of the Baltimore Car Wheel Company.

George F. Brandon of Utica, N. Y., exhibited a new life guard of his invention.

Franklin Rice represented the Dayton Automatic Car Switch Co., of Dayton, Ohio.

Herman Falk and C. S. Jones represented the Western Gear Company, Milwaukee.

A. H. Sisson of the Jewett Car & Planing Mill Company, Jewett, Ohio, was present.

W. E. Dutton was present in the interests of the VanDorn Iron Works, of Cleveland.

E. F. DeWitt, the well known sand box man, had a nice space and an interesting exhibit.

W. E. Tench represented Craze & Tench of Buffalo, general contractors for public works.

The Watson-Stillman Company, New York, was represented by Henry A. Boyd of Buffalo.

A. G. Hathaway of Cleveland was present greeting his friends and laying pipe for new business.

F. G. Fuller represented W. R. Brixey of Day's Kerite. Mr. Fuller was warmly welcomed.

C. E. Greene, of Niagara Falls, exhibited a line of high voltage glass and porcelain insulators.

Frank McGovern, of the firm of Rossiter, McGovern & Company, did the honors for his concern.

The Seamless Structural Company, Milwaukee was represented by Garson Myers and Frank Randall.

The Paige Iron Works of Chicago were very ably represented by their engineer, E. S. Nethercut.

The John Stephenson Company, distributed a valuable little book of tables of cost of construction, etc.

John A. Stewart, president of the Stewart Electric Company, Cincinnati, represented his company.

Robert Skeen of the Skeen Electric Switch & Signal Company showed its appliances in operation.

Bailey Whipple, general sales agent of the Jandus Electric Company, was in charge of its exhibit.

H. M. Daggett, Jr., represented the Lombard Hydraulic Brake Company of 61 Hampshire street, Boston.

The Bibber-White Company, 49 Federal street, Boston, was represented by Charles E. Bibber, treasurer.

F. D. Russell, manager of the Rochester Car Wheel Company, Rochester, N. Y., represented his company.

The Chicago Insulated Wire Company was represented by its secretary and treasurer, William M. Smith.

The Heine Boiler Company, St. Louis, made no exhibit, but was represented by H. B. Ham, its Boston agent.

Frederick R. Chase was in attendance in the interest of Hoopes & Townsend, bolt, nut and rivet works, Philadelphia.



THE WESTINGHOUSE EXHIBIT.

L. A. Sayre displayed a full line of the conductor's and office cancelling punches manufactured by L. A. Sayre & Co.

M. B. Austin of Chicago and E. T. Spencer of St. Louis represented the Safety Insulated Wire & Cable Company.

B. F. Swartz was present in the interest of the Lehigh Car, Wheel & Axle Works, McKee, Fuller & Co., Catasauqua, Pa.

The St. Louis Register Company and the Hildreth Varnish Company were represented by Giles S. Allison of New York.

John T. McRoy of Chicago exhibited samples of his four and six-tube vitrified clay ducts for underground conduit work.

J. M. Jones, Jr., of J. M. Jones' Sons, West Troy, N. Y., street railway car builders, was present throughout the convention.

E. T. Warner, treasurer, represented the Parrish Signal Company of Jackson, Mich., manufacturer of automatic electric signals.

The Solar Carbon & Manufacturing Company of Pittsburg did not exhibit but was represented by F. M. Laughlin and H. E. Webb.

Joseph Pomeroy of Pomeroy & Fischer, 28 and 30 Frankfort street New York, showed with a line of paints, colors, varnishes, etc.

The Webber Rail Joint Company, of New York, exhibited samples of the Webber rail joint, being represented by Richard Devens.

Scott H. Blewett, second vice-president of the Missouri Car & Foundry Company, was another of the large delegation from his city.

Samuel W. Glover of the Post-Glover Electric Company, Cincinnati, was present and worked hard for that city for the next convention.

J. M. Atkinson began representing his firm on Monday afternoon and continued to do so with a great deal of vigor until it was all over.

Albert B. Herrick, of Herrick & Burke, of 150 Nassau street, New York, displayed that firm's portable and adjustable testing switch-board.

McCardell, West & Co. of Trenton, N. J., exhibited the "Trenton" emergency wagon on the track space. Represented by J. R. McCardell.

The Springfield Manufacturing Company, of Bridgeport, Conn., was represented at the convention by J. T. Griffin and G. W. Jackman.

O. R. Sackett & Co. of Niagara Falls exhibited their automatic trolley catcher, which attracted considerable attention and favorable comment.

The Detroit Stove Works had a line of seat and floor car heaters, all cast iron with parts interchangeable, which was in charge of H. L. Schutt.

The track exhibit of the McGuire Company of Chicago, was a large double sweeper built for the North Hudson County Railway Company.

The A. Mertes Manufacturing Company, Allegheny, Pa., was represented by J. M. Parsons, superintendent, J. A. Donaldson and Charles Surrit.

B. D. Tillinghast represented the Duff Manufacturing Company of Allegheny, Pa., which exhibited a complete line of track and other railway jacks.

The Leonhardt Wagon Manufacturing Company of Baltimore exhibited on the track two types of emergency wagon. Represented by William M. Ives.

E. J. Robinson, general manager of the Laclede Car Company, St. Louis, looked after the interests of his concern and was welcomed by many friends.

The New York Car Wheel Company was represented by John A. Gardner, of New York, J. H. Yardley, of Philadelphia, and J. D. Rhodes, of Pittsburgh.

Baker & Co., manufacturers of platinum, Newark, distributed a tasty booklet describing the source of supply and giving other interesting information.



THE STERLING SOUVENIR.

The Hunter Illuminated Sign Company and the Hunter Automatic Fender Company of Cincinnati were represented at the convention hall by Lytle J. Hunter.

The Trojan Button Fastener Company, Troy, N. Y., showed the Ham bronze sand box which is manufactured by it. The exhibit was in charge of R. H. Ham.

D. C. Sweet of Springfield, Mass., exhibited one of his car wheel grinding machines which was displayed in a conspicuous place and attracted much attention.

J. G. White & Co., engineers and contractors, 29 Broadway, New York, were represented at the convention by J. G. White, H. H. Harrison and G. H. Walbridge.

The Okonite Company had an exhibit of feeders that called for many compliments. The company was represented by Capt. Willard Candee and J. N. Partridge.

The J. G. Brill Company displayed on the track space one of its standard vestibuled snow sweepers and a standard 10-bench open car mounted on a 21-E truck.

Gustave Fischer, chief assistant engineer for the tramways at Sidney, Australia, took advantage of the convention to become acquainted with the way "we do things."

Herman Hirsch of New York, representing C. Buschner, displayed a truck model equipped with roller bearings which it is claimed save 33½ per cent in motive power.

The Columbia Incandescent Lamp Company of St. Louis was represented by its secretary and treasurer, A. C. Garrison, who was present throughout the convention.

A. W. Morrell of the electrical department of the Miller-Knoblock Company, South Bend, Ind., called particular attention to his method of refilling commutators.

The American Mutual Indemnity Company of Scranton, Pa., was represented by the genial Newton Jackson, the general superintendent, who made himself ubiquitous.

Joseph E. Lockwood, president of the Michigan Electric Company of Detroit dealer in electrical machinery and supplies and agent of the General Electric was in attendance.

J. R. Cravath of the Cravath Manufacturing Company, Chicago, exhibited his excessive current recorder and attracted more attention than any of the small exhibitors present.

John A. Roebling's Sons Company, was represented by General Manager Shippey, Messrs. Cockey, Walsh, William Doyle and Western manager George C. Bailey of Chicago.

The Partridge Carbon Company was represented by the president, E. F. McIntosh, and the general manager, James Partridge. Everybody got a "Scratch him on the back" card.

The Milwaukee Rail Joint & Bonding Company exhibited the Austin patented rail joint which is meeting with so much favor. Its representative was E. E. Warner of Milwaukee.

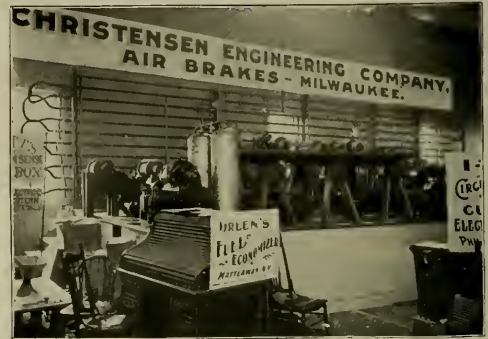
The exhibit of the Billings & Spencer Company was made in connection with that of the Central Electric, of Chicago, which had a full line of the B. & S. supplies nicely displayed.

Roland Gerry was at the convention representing Jones & Laughlin, Limited, of Pittsburgh and distributing the well known little books of "Useful Information for Business Men."

The business of the Keystone Electrical Instrument Company was cared for by J. F. Stevens of Philadelphia, who exhibited some new switchboards, meters and special apparatus.

The Clark Street Car Brake Company had brakes applied to trucks in the exhibit of the Steel Motor Company and the Murphy wheel grinder. Represented by Horace F. Clark.

Robert H. Derrah, clerk to the president of the West End Boston was present at the convention and distributed copies of his "Street Railway Guide for Eastern Massachusetts."



CHRISTENSEN AIR BRAKE EXHIBIT.

A curve-taking trolley harp and a crossing-taker patented by W. H. Russel are described in the prospectus of the Russel Manufacturing Company, represented at the convention by Mr. Russel.

The Dorner & Dutton Company of Cleveland, exhibited two of its trucks; the single truck was under the car of the G. C. Kuhlman Company and the double truck in the hall. Represented by W. A. Dutton.

The Railway Register Company, New York, was represented by its general manager, Edward Beadle, who has attended nearly every convention since the organization, and President H. W. Watson, of Buffalo.





EXHIBIT OF THE GENERAL ELECTRIC COMPANY.

The Electric Mutual Casualty Association, of Philadelphia, was well represented at the convention by the secretary, W. W. Wharton, and a large number of its members. Headquarters in the hall were at Space 40.

President Meachem and Secretary Vosburgh, of the New Process Rawhide Company, Syracuse, were both present renewing acquaintances with a large number of customers, and adding some new ones to the already long list.

The Standard Paint Company was represented by the western manager, J. G. Shainwald, who accompanied the Chicago delegation. The "P. & B." souvenirs were handsome leather books, white for ladies and black for gentlemen.

The Taunton Locomotive Manufacturing Company of Taunton, Mass., displayed two of the well-known snow plows, one of which was sold to the Buffalo railway. This company was represented by Wendell & MacDuffie of New York.

George S. Whyte of the Leschen-Macomber-Whyte Company of Chicago, western agent for the Crefeld Electric Works, represented his company and distributed leather match safes as souvenirs; also "The Clank of the Ice," by Eugene Field.

The Duquesne Forge Company, Pittsburg, was represented by David S. Bissel and exhibited forged steel gears for motors, the first to be placed on the market. This company has been engaged in making heavy forgings for the last 40 years.

George M. Brown, manager of the Pearson Jack Company, 156 Fifth Avenue, New York, was present to exchange greetings with his old friends and advise strangers as to the 15 street railway companies which use the Pearson replacing jack.

The G. C. Kuhlman Company of Cleveland exhibited a closed vestibuled car, 42 ft. 6 in. over all, provided with longitudinal seats, which was very handsome in appearance and caused much favorable comment. Mr. Kuhlman represented his company.

One of the most novel exhibits was that of the Paper Vending Machine Company, of St. Louis. It was a mechanical and noiseless newsboy for street cars—a cent in the slot machine. Robert A. Schlegel, president of the company was in charge.

Charles R. Brown represented the Pratt & Letchworth Company, of Buffalo, which exhibited a line of car castings, both malleable iron and steel, being the only company showing steel castings. H. C. Edson and President Letchworth were also present.

The Bowen face protector for motormen, the simple, cheap and safe substitute for vestibules on street cars was shown by the inventor, John Bowen. Mr. Wendell, of Wendell & McDuffie, New York, who will handle this device, was also in attendance.

Edmund G. Fischer, manager of the railway department, represented the McMullan Woven Wire Fence Company, of Chicago, which showed samples of its fencing so much used on steam roads. Green seal card cases were tendered as souvenirs.

The Mitchell Tempered Copper Company, which makes a specialty of pure tempered copper castings, commutator bars and segments was represented by J. G. Ruhl, who put in his appearance on Wednesday and remained throughout the convention.

The American Rail Joint & Manufacturing Company of Cleveland was represented by W. E. Ludlow and showed samples of its joints, the American "standard," which were displayed in the convention hall. The company also had an exhibit at the International.

D. N. Long of LaSalle, N. Y., exhibited an acetylene headlight for street cars which has been in service on the Buffalo & Niagara Falls road and proved eminently satisfactory; a recent order was taken for Kansas City. The exhibit was in charge of L. A. Dietrick.

W. J. Kauffman and L. A. Loichat represented the Kauffman-Conkell Company, of Canton, O., and displayed working models of an improved section insulator, and the K-C emergency trolley system. Both of these devices were examined with much interest.

T. C. White, manager of the electrical department of the Central Union Brass Company of St. Louis, represented his company and displayed a line of electrical and railway supplies. The souvenirs of this company were miniature commutators and were much in demand.

The Garl Electric Company of Akron, Ohio, had a handsome exhibit of portable telephones for street railways, hotels and factories, which was in charge of M. Garl. Connection was established between the Kuhlman car on the track and the space in the convention hall.

A. O. Morton of Boston showed a full line of street car jacks from 8 tons to 70 tons in capacity; also the sure drop track jack, which is claimed to be the only one with a positive trip, and the ball-bearing jack for heavy bridge work. H. A. Norton and E. T. Trefether were in charge.



THE STANDARD AIR-BRAKE EXHIBIT.

The Brandt automatic car sliding door which is impossible to jar open was the subject of much favorable comment by reason of its simplicity and effectiveness. This door and the Zimmerman eccentric brake were exhibited by S. W. Brandt of Brandt & Zimmerman, Troy, N. Y.

The Buda Foundry & Machine Company, of Chicago, exhibited the Paulus track drills, showing drills for T-rails and 11-in. girders. With this drill driven by hand a  $\frac{3}{8}$ -in. hole was put through a  $\frac{3}{4}$ -rail web in 1 minute and 28 seconds. The company was represented by Charles Parsons.

The Cambria Iron Company of Johnstown and Philadelphia exhibited sections of rails of different types, girders, guards, T's, etc., and specimens of its rail joints. Also an extensive series of drawings. W. A. Washburn of 33 Wall street, New York, represented the company.

P. C. Ackerman of New York, F. A. Donohoe of Chicago and Frank B. Porter of New York, attended the convention to represent the American Electrical Works of Providence, R. I. The souvenirs of this company were most useful for an occasion of this kind, being decks of playing cards.

Allen V. Garratt, chief engineer, represented the Lombard Water Wheel Governor Company, of Boston, and exhibited photographs of recent designs for governors for steam and water power plants. Many requests were received for the literature of this company on the subject of governors.

The Pennsylvania Steel Company, of Steelton had secured space inside the hall but preferred to exhibit outside and was located just outside the main entrance where a few of its frogs, switches and a sample of its steel tie work were displayed. The company was represented by C. W. Reinhoel.

The Cleveland Frog & Crossing Company of Cleveland, O., made a display of special work comprising one steel center frog, one cast steel center frog, one spring rail frog, one split swing switch and one derailing switch. The company was represented by G. C. Lucas, Frank A. Lapham and A. Powell.

The exhibit of the portable car safes and registers made by the Mehling Manufacturing Company of Cleveland was located at the International. The company was represented by F. B. Many, manager, and F. R. Briggs, general agent. We are advised that this safe has been adopted on seven roads since April.

John Murphy, general superintendent of the United Traction Company, of Pittsburgh, and president of the Murphy Manufacturing Company, exhibited the car wheel grinder of his name. The grinder was shown in operation dressing the wheels of a Baltimore truck. Mr. Murphy was assisted by John Daly.

The Electric Storage Battery Company, of Philadelphia, had in its exhibit 55 "chloride" accumulator cells, giving a 110-volt current; these were connected to a switchboard arranged to demonstrate the value of the storage battery as a regulator for power stations. The display was in charge of J. Y. Bradbury, of Philadelphia.

A practical test of the Rochester hose bridge was made by every car running to the convention hall and there were few exhibits that were examined with any greater interest or by so large a number of railway men. R. P. Barbour was in attendance. The bridge weighs 180 lbs. and will carry 30 tons; it collapses to 6 in. in width.

The Barney & Smith Car Company of Dayton, Ohio, occupied space near the entrance of the assembly room and exhibited its new class G single truck and its class H double truck, which is also new; both of these were equipped with General Electric motors. H. E. Esterbrook, H. Tessyman and F. E. Huntress represented the company.

The VanWagoner & Williams Hardware Company was represented by the president, C. S. VanWagoner, and by its agents, C. N. Wood, of Boston, Mayer & Englund, of Philadelphia, Hayes & Arthur, of Cleveland, Eugene Munsell & Company, of Chicago, James Clark, Jr. & Co., of Cincinnati, and Arthur H. Partridge of St. Louis.

The E. T. Burrows Company of Portland, Me., was prominently located on the aisle in the main hall. On either side were models showing open and closed car curtains in eight different styles. Within 60 days its No. 83 has been specified on over 400 new cars. The new open car fixture was highly commended by all who examined it. The exhibit was in charge of H. H. Russell and W. S. Calhoun.

D. J. Sinclair, of Caledonia, Livingston county, N. Y., displayed the automatic coupling patented by him. This coupling is simple to operate, sure in action, and while especially adapted to trolley cars or traction engines, can be used for all kinds of lifting, holding and drawing. Mr. Sinclair was kept busily engaged in explaining its operation, and it received many commendations for its good points.

The Corning Brake Shoe Company of Corning, N. Y., was represented by Francis Granger and H. T. Mercur, and had a very handsome exhibit on the main aisle. The Corning shoe has a chilled body with soft cast iron insets. Shoes were shown which had run 55,000 miles on the Buffalo & Niagara Falls line and some on the Fall Brook Railroad with records of over 25,000 miles and 11,000 stops.



R. G. Woodward of the R. Graham-Woodward Equipment Company, 26 Cortlandt street, New York, was present showing the "Standard" bicycle holders and the automatic track brake manufactured by this concern. The working model of the brake was exhibited at the Cataract House and was commended by all who saw it.

Will Christy of the Akron, Bedford & Cleveland was prominent at the convention. With him came the W. & W. oil journal box. This

corner of Walnut and 6th streets, a block above the convention hall, and nearly all the delegates took the opportunity thus afforded for seeing this switch in operation. The company was represented at the convention by its president, W. C. Wood, R. A. Baldwin and M. W. Conway.

The Clonbrock Steam Boiler Company of Brooklyn was represented by its president, Thomas F. Morrin, and showed models of



box is but a trifle longer than the ordinary box and requires that the axles be extended 2 or 3 in. In this extension is a simple form of centrifugal pump which throws the oil up into channels which conduct it directly to the bearing, keeping the latter bathed in oil.

One of the automatic electric switches of the New York Switch & Crossing Company, Hoboken, was installed on the Gorge road at the

Morrin "climax" boilers and photographs of a number of the plants which have been recently installed; among these was that at the Nashville Centennial, which aggregated 2,500 h. p. The souvenirs were sets of photographs, mounted on heavy cards and tied together by a silk cord.

The Columbia Machine Works, Buehler & Platt of Brooklyn, were



represented by George Buehler and W. R. Kerschner, who seemingly had things their own way and took 25 trial orders the first day of the convention. The exhibit comprised car trimmings, commutators, bearings, trolley wheels, bearing metals, forged commutator bars and controller parts, and was quite an attractive one.

The American Car Company of St. Louis, exhibited one of its cars on the track space in front of the convention building. It was mounted on maximum traction trucks and seated 36 persons, the seats being of the reversible cross-bench type, built by the Scarritt Furniture Company of St. Louis. President Sutton and E. J. Lawless of New York, eastern agent of the American Car Company, attended the convention.

W. T. Van Dorn of Chicago represented his company and exhibited his automatic couplers for street cars and the ball and socket joints. On the wall was a handsome collection of framed photographs and blue prints showing the couplers as adopted by various companies. Mr. Van Dorn said that he had no kick coming, having sold 140 couplers and 140 ball joints within 20 minutes after the convention assembled.

The Taylor Electric Truck Company, of Troy, N. Y., exhibited two of the Taylor double trucks, one equipped with two motors (four to the car) and the other with one motor (two to the car) and its latest design of single truck, which were displayed inside the hall. On the track outside was an improved heavy single truck with extension trucks for long open cars. John Taylor, A. T. Reynolds and G. A. Tupper were in attendance.

F. W. Sargent represented the Sargent Company, of Chicago. In addition to the "diamond S" brake shoe, composed of expanded steel and soft cast iron, the company exhibited models showing the use of expanded metal with soft composition filling. Among those displayed were shoes which had been subjected to service tests on both steam and street roads. Mr. Sargent was assisted by A. T. Herr and G. H. Sargent.

As for many years past the John Stephenson Company of New York made no exhibit at the convention. But D. W. Pugh represented the company and spent the four days in visiting with his old friends and making new ones. The Stephenson souvenir this year was the one adopted as "standard" by the company, a leather memorandum book; on the inside covers are the original tramcar built by John Stephenson in 1831 and the 1867 model.

The Monarch Stove & Manufacturing Company, of Mansfield, O., exhibited the "monarch" track cleaner. In the convention hall were a sample cleaner and a handsome full-size nickel-plated model made for exhibition purposes solely; outside, two other "monarchs" were attached to cars exhibited on the track space. All attracted a great deal of attention. The company was represented by E. C. Baxter, general manager, Fred Dew and W. T. Hurst.

The exhibit of the Steel Motor Company, of Johnstown, Pa., was in connection with that of the Johnson Company, that company's trucks being equipped with the steel motors. The single truck had the steel motor and the Clark hydraulic brake (made by the Steel Company). In all, three motors were shown, being of 25, 30 and 50 h. p. respectively. The company was represented by J. A. Rutherford, O. D. Henry, R. T. Lane, secretary, and J. A. Thomas.

The Gold Street Car Heating Company, of New York and Chicago, had a very handsome booth and displayed a full line of its heaters. Great interest was displayed in its new spiral, wrought iron enameled, on which the German silver wire is wound. The souvenirs of this company were canes, which were much sought after. The company was represented by E. E. Gold, president; W. E. Banks, treasurer; John E. Ward, manager; E. H. Gold, H. E. Beach and F. Weston.

The H. W. Johns Manufacturing Company exhibited a full line of overhead insulating material, including its latest design of toggle clamp pole insulators. These are now made and shown for clamping feeder cables from No. 0000 up to 1,000,000 c. m. in area. There was

also a full line of the H. W. J. electric heaters for both cross-seat and panel cars; these were shown in operation. The exhibits were in charge of J. Emery Meek, of New York, and H. H. Luscomb, of Boston.

The McGuire Manufacturing Company of Chicago was represented by W. A. McGuire, W. J. Cooke, George Collins and George Hubbard. There was an extensive exhibit comprising the McGuire standard suspension motor truck, the Columbia heater, the "new Columbia," ratchet brake handles, etc. Two of the McGuire double trucks were displayed in the General Electric space also. The souvenirs were aluminum-mounted magnifying glasses and were very much sought after.

Dillworth, Porter & Co., were represented by their New England agent, William F. Ellis, of Boston, and exhibited the Goldie spike and the Goldie claw safety tie plate. The Continuous Rail Company's joint with the base support rolled with the rest of the bar, and J. H. Sternbergh & Sons' "Harvey" grip, rolled thread, steel bolts were also displayed. The handsome photographs of the interior of the Boston Subway shown by Mr. Ellis were the best that we have seen of that work.

The Charles Scott Spring Company was represented by H. C. Johnson of the railroad and D. S. Roche of the street railway department. The exhibit was most tastefully arranged and included specimens of all the different types of springs manufactured for the use of street railways, from sash springs down to truck springs; among them was the three-quarter elliptic now so common on the latest types of trucks. This year the company had its usual souvenir—a leather covered memorandum book and pencil.

At the sign of "We design; others copy," was to be found F. A. Estep, president of the R. G. Nuttall Company of Allegheny, Pa. There were displayed specimens of the gears and pinions, bearings, trolleys and other lines of street railway supplies, making a very attractive exhibit. The company was further represented by its agents, C. N. Wood of Boston, George Povost of Pittsburg, Charles Mayer, of Mayer & Englund, and Hayes & Arthur, of Cleveland. A new catalog made a souvenir that was appreciated.

Wm. Wharton, Jr. & Co., of Philadelphia, were represented by R. K. Polk, manager of the rolling mill, J. C. Robinson of Harrington, Robinson & Co., New England agents, and Victor Angerer. They displayed a 9-in. girder crossing and several styles of switches; the Wharton standard; the West End of Boston standard and the Union Traction of Philadelphia standard both of which embody features of the Wharton; the Carver switch. Also the well known unbroken rail special work was shown as adapted for the use of half-groove rails.

The exhibit of the International Register Company of Chicago was an extremely interesting one. In addition to the different registers mounted as for use there were displayed working models showing the operation of the interlocking device, which is a feature of this company's double registers, having two totalizers. These models had the ordinary faces removed and plain glass substituted, and the mechanism being nickel-plated they presented a handsome appearance. A. H. Woodward, the manager of the company, W. H. Brown and C. N. Wood were in attendance.

The Duplex Car Company's car made by the Jackson & Sharp Company which was illustrated in the October REVIEW, page 701, was mounted on a Peckham extra long truck equipped with General Electric motors and electric brakes and was running on the Gorge road during the entire week. J. A. Lowell, president of the company, and George Moore, the inventor, were in attendance and were much gratified at the interest taken in the car. It is an ideal car for observation purposes. A New Haven double fare register kept tab on the number of passengers.

The Creaghead Engineering Company had a very complete exhibit of its well-known flexible brackets, both plain and ornamental, which have become standard for high speed roads. The arms are of steel and the fittings of malleable iron. It also exhibited a full line of overhead material, malleable iron pole fittings, cross arms, section



insulators, crossings and Bourbon strain insulators. The display was nicely arranged and was in charge of G. R. Scrugham. J. A. Cabot was also there. The souvenir of the company was a neat steel pocket rule in a leather case.

Pullen's rail joint box is a device which allows track repairers to tighten up loose bolts without the tearing up of the pavement. The

box lies along the outside of the rail and is just wide enough to allow the insertion of a bar where the cover is removed. It has been in service on the tramways in Sydney, Australia, the past three years and has given excellent satisfaction. Orders have recently been placed for boxes for 26 miles of track. Henry W. Peabody & Company, 58 New street, New York, represent the patentee in this country and exhibited at the convention.



The New Haven Register Company displayed the latest types of its registers, including the double type as used on the Akron, Bedford & Cleveland, the Calumet of Chicago, the Market Street of San Francisco, the New York, New Haven & Hartford, and in Louisville, and the triple type. The company was represented by Willis M. Anthony, president; F. Coleman Boyd, vice-president and general manager; John S. Bradley, secretary and treasurer; A. W. Chappell and A. N. Loper. Visitors to the exhibit received a very handsome bronze paper knife as a souvenir.

E. P. Sharp of Buffalo had "Any old thing" and was proud of it. His object in exhibiting was to call attention to the fact that he has repair parts for a large number of types of apparatus still used by street railways, but so far obsolete that the manufacturers can not be relied upon to furnish them. These parts Mr. Sharp bought when the manufacturers wished to reduce stock and can supply about anything desired. Two motors were displayed, a Sprague and an S. R. G. Sharp's combined price list and convention program was in the hands of all. E. C. Fletcher assisted Mr. Sharp.

The D. & W. Fuse Company furnished an object lesson to all who were interested in fuses. This fuse is positively non-arcing and even those in the closest proximity to it did not know that one had been burned out until told of it. They are made for currents of from 1½ to 200 amperes and from 500 to 2,500 volts, for railway, alternating, power, feeder and subway circuits. L. W. Downes and A. W. Hutchins presided at the experiments. The souvenirs distributed by this company were alleged to be working models; but on opening them, the fuse proved to be a cigar of excellent quality.

The representative of the Meaker Manufacturing Company, of Chicago, could not have been an Irishman or he never would have festooned his booth in green and orange. The exhibit included the well known Meaker registers as used on the North Chicago Railroad, the Union Traction Company's lines in Philadelphia (this company has over 2,800 Meaker equipments), nearly all the St. Louis Railroads and the Union Railway of New York. There was also a model showing the method of mounting. President J. W. Meaker presided over the exhibit in person, and ably represented his company.

The Fuel Economizer Company, of Matteawan, N. Y. was represented by P. J. Challen, and exhibited models, among them the \$1,200 one exhibited at the World's Fair, which was lost and but recently recovered, showing the construction and method of application of the Green economizer, and a number of sample castings. Leather card cases and memorandum books were distributed for souvenirs. This company has recently closed an order for economizers for the "Alley L," of Chicago, and just completed an installation in the new Harvard power house of the West End road of Boston.

Forsyth Brothers & Co., of Chicago had one of the most prominent exhibits at the convention, and were kept busy showing their curtains and fixtures to the visiting delegates. A full-size cross-section of one of the cars now building for the North Chicago Street Railroad, showed their curtains and anti-friction roller tip fixtures to good advantage. In addition to this they had a fine mahogany frame holding six curtains and fixtures; these also were of full size. George H. and W. H. Forsyth were at the convention. Elmer P. Morris also represented them and their goods were shown by the American Car Company.

The Joseph Dixon Crucible Company was represented by A. L. Haasis and John H. Baird, and exhibited its graphite paint for trucks which will stand sand abrasion and will last for four seasons, its paint for roofs and stacks which is unaffected by sudden changes of temperature, and its new compound known as graphited wood grease. This last is made up of cedar pulp, flake graphite and fats and oils; it will cause the worst gears to run without noise, and it does not ooze out between the laps and the cases. Another new compound was the graphite dynamo commutator lubricant for arresting sparking on the commutators.

The handsome and artistically arranged exhibit of the Ohio Brass Company was the first thing to catch the eye upon entering the convention hall. A full line of track-bonding and overhead construction

materials was displayed; also supplies for cars, commutators, headlights, steel gongs, bearings, bearing metals, adjustable track-brush holders, wire track brooms, type D hangers, figure 8 devices, "dirigo" insulation in its various forms, pole brackets, etc. Thermometer buttons were given for souvenirs. The exhibit was in charge of C. K. King, secretary, and A. L. Wilkinson, special representative of the company.

The Consolidated Car-Heating Company of Albany, N. Y., showed a full line of car heaters and regulating switches. The method of operating the switch was illustrated by connecting in banks of lamps to represent the heaters. This switch gives five different intensities with a six-heater equipment, the several positions giving six in series; four in series; six in multiple-series, three series; four in multiple-series; six in multiple-series; two series. The exhibit was in charge of James F. McElroy, consulting engineer of the company and he was assisted by H. N. Ransom, eastern representative, and W. P. Cosper, western representative.

J. J. Kennelly of 446 West 47th street, New York was at the Imperial and exhibited a new fare register. The model shown was for exhibition purposes and shaped like the cross section of a car body; "up" or "down" was indicated on the transom, the trip fares in the center, and the total fares in the bottom of the face. A feature of the register is the manner in which the conductor takes the reading; he carries small cards, one of which he places in the register at the end of each trip before setting it back to zero; the operation of setting the register embosses the reading of the totalizer on the card, making a record that cannot be inaccurate.

At the exhibit of the Crane Company of Chicago, the first thing that we saw was G. A. Hurd's aluminum valve; Mr. Hurd was also there. The 24-in. extra heavy steam gate valve was recognized by every street railway man because all of them have pictures of it. The fittings for the most part were extra heavy valves for street railway power houses and specimens showing the different ways of attaching the flanges to pipes; there were also back pressure valves and steam traps. A special feature was the line of brass globe and check valves in the smaller sizes which were designed for pressures of 2,000 lbs. and 5,000 lbs. R. T. Crane, Jr., was also present.

The watch-word at Space 33 was, "This is the Falk joint; make a joint affair of it." The exhibit comprised many samples of the cast-welded joint, but the thing that proved most attractive and interesting to visitors was the new process recently perfected by the company, by means of which rails may be readily and completely cleaned of scale and rust, so that a perfect weld of the best conductivity is insured. As a side issue the arithmetical paradox,  $2 + 1 = 1$ , that is 2 rails + 1 Falk joint = 1 rail, was propounded, and it remained unchallenged. H. W. Falk, president of the company, E. A. Wurster, secretary and treasurer, and H. L. Prather, general superintendent, took turns at presiding over the exhibit.

The Consolidated Car Fender Company of Providence displayed two of its fenders attached to a dummy car so that the method of operation might be easily and clearly shown. It proved of great interest to managers and was closely examined by the delegates from cities where the fender ordinance is a new thing. The fender is now in use on over 4,000 cars in 53 cities and towns. In addition there were shown the special fittings for attaching the fenders to different types of cars. The company was represented by A. C. Woodworth, general manager; A. C. Woodworth, Jr., superintendent, and George H. Hale, general agent. For souvenirs there were old-fashioned pocket books with fender data on the inside.

The exhibit of the Diamond Truck & Car Gear Company of Kingston, N. Y., was arranged along the west wall of the hall; the background was tastefully draped and ornamented with groups of photographs and blue prints showing the cars on the different roads where the "diamond" truck is in use. There were four trucks, the No. 3 and the No. 5 singles and a pair of double trucks; one of these latter was displayed on the General Electric floor fitted with motors; all were sold and immediately after the convention delivered one to Hamilton, one to Jamestown, and two to Buffalo. The company was represented by W. H. Wilkinson, general manager, W. H. Ten





Broek and E. F. Hutton. Memorandum books were distributed as souvenirs.

The "brightest spot in the hall" was the title given the space of the Central Electric Company. The "Helios" enclosed arc lamps which burn 150 hours on a 500-volt circuit without trimming, and 150 incandescents, furnished the light. The exhibit included the largest commu-

tator bar (20 lbs.) ever drop-forged, the largest piece of mica west of New York city, Billings & Spencer overhead materials, Bound Brook graphite bushings and bearings, Partridge brushes, trolley poles, gongs, harps and wheels; also the Central Electric crossover and figure 8 clip. Garton lightning arresters were shown in operation. The exhibit was in charge of W. R. Garton, manager of the railway department, who was assisted by H. E. Adams, the New York representative.

The Sterling Supply & Manufacturing Company of 141-155 East 25th street, New York, displayed its exhibit in parlor 234 at the International, being represented by William Tiffany, secretary, Louis E. Robert and Frank A. Morrell, who entertained visitors in a most hospitable manner. The register exhibit comprised the standard No. 1, of which there are 2,500 in use on the Metropolitan of New York, the No. 3 clock dial and the No. 7 square dial numeral register which were exhibited for the first time. In addition there were shown the cable and electric brake which has been in use on the Metropolitan for the past three years and the Sterling sand box. Almost all the railroad men were sufficiently interested in the Sterling exhibit to make a visit, which fact was very gratifying to the company. Miniature clocks gold mounted for desk use were distributed for souvenirs.

The attractive and interesting exhibit of the Mica Insulator Company, of New York, Chicago, London, was prominently located at the left of the main entrance. Commutator rings, segments, troughs, tubes, discs, plates and various forms of insulation were largely displayed, and were of special interest to all electric railway men. The company's new product known as M. I. C. compound was for the first time exhibited. Some to different grades and styles of mica-ite and empire cloths and papers were shown. This is probably one of the largest exhibitions of insulating material exclusively ever made and goes to show the progress which the company have made during the past four years. Charles E. Coleman, of the Chicago house was in attendance and had charge of the exhibit. Franklin Brooks, vice-president of the company, was also in attendance one or two days.

The exhibit of the Wells & French Company, of Chicago, was in charge of its eastern representative, Frederick Saxelby, of 100 Broadway, New York, and consisted of a Curtis non-oscillating truck, equipped with two Westinghouse 12-A motors and the Price momentum friction brake. In order to show the brake in operation the truck was blocked up to permit the wheels to clear the track. By this arrangement there was only the momentum of the wheels, axles and motors to overcome, and as the brake levers were designed for use with a heavy car and trailer, it was well calculated to test the adaptability of the brake for light pressures. The tests showed that the brake worked with certainty and without shock under all conditions. This particular truck was equipped for the use of either the momentum or hand brakes; when desired the hand brake is made to act on a separate set of shoes.

The exhibit of the Pantasote Leather Company was made extremely attractive by the liberal use of handsome specimens of pantasote in decorating the walls. At either side of the entrance were models, one showing the curtains as applied to closed and the other to open cars. Pantasote, as is well known, is made up in any pattern desired, and some beautiful ones in gold were exhibited. The material is waterproof, odorless and durable. The most delicate and expensive silk fabrics may be used in connection with it, so that curtains may be made which present an exterior surface that is dirt, water, and sun-proof and yet have tapestry for the inside of the car. Ten thousand of these curtains have been sold for the Wagner palace cars. The company has severed the connection that has existed for six years with Clarence Whitman & Co. as sales agents and will henceforth dispose of its own goods. John M. High of New York and H. M. Grier of Chicago were in charge.

The Christensen Engineering Company of Milwaukee had probably the most conspicuous space in the hall, as its exhibit was displayed on the raised platform at the end of the main building. There were three automatic motor compressors and one axle driven compressor shown in operation. The largest had a capacity of 48 cu. ft. of free air per minute and was connected to a rack of 12 cylinders for automatic air braking. The second was of 14 cu. ft. capacity and connected to the cylinders for a motor car and two trailers—a 60-ton train. The third was of a smaller size, 9 cu. ft. All were equipped with automatic current controllers. The axle compressor was mounted on a Dupont truck, equipped with Steel motors. This type occupies but 7½ in. of the length of the axle. There were also shown miscellaneous parts of the motors, compressors and braking apparatus. The company was represented by N. A. Christensen, of the home office, Garson Myers, of Chicago, and Frank Randall, of the eastern office.

The Johnson Company exhibit comprised crossings special work and trucks. The P. R. R. standard steam crossing shown is so called because it must be laid down by all trolley roads crossing the Pennsylvania; it was of 80-lb. T-rails with unbroken main rails, lift rails to carry bad wheels, and guard rails; the total weight was 4,072 lbs. The special feature of the Johnson standard 9-in. girder crossings is the "guarantee," a Harveyized octagonal plate placed at the rail intersections; this piece may be renewed and guarantees a long life for the work; the "guarantee" is also used on switches and on steam crossings. There were three Dupont trucks also, one single and two double trucks; one of the latter equipped with Steel Motor Company's motors was in the Christensen Air-Brake exhibit. The Johnson Company was represented by Daniel Coolidge, vice-president; A. S. Littlefield of Chicago, W. E. Boughton of Philadelphia, O. C. Evans of Cincinnati, H. C. Evans of New York, R. Clitz of Boston, W. W. Kingston of Atlanta, and E. B. Entwisle, chief engineer.

Eugene Munsell & Co., of New York and Chicago, made a very fine display of their India and "amber" mica, both in the sheet as it comes from the mines, and segments for railway motors. The exhibit was made in connection with that of the Mica Insulator Company. Several sets of a variety of sized segments were attractively displayed beneath a large signboard on which was shown a full line of Van Wagoner & Williams Hardware Company's drop forged copper segments, for whom the company is general western selling agent. At the entrance to the booth was shown India mica cut in sizes from 9 16 x 4¼ to 8 x 10 in. This large range of sizes show that the firm is prepared to furnish "mica" in almost any size, shape or pattern. A souvenir in the form of a "mica mine" puzzle was given and probably sought for as much as any one souvenir at the convention. Parties not in attendance can secure these souvenirs by writing the company at either New York or Chicago. The exhibit was in charge of Charles E. Coleman, of the Chicago house.

The Edison-Brown Plastic Rail Bond Company of 120 Liberty street, N. Y., had an attractive and interesting exhibit and was represented at the convention by Harold P. Brown, Franklin Sheble and Frederick Reeve. In the exhibit was an angle plate removed from the track of the Camden (N. J.) & Suburban after two years service; though the plate had evidently been under water and was badly rusted, the plastic was in perfect condition. The methods of applying the different bonds were all shown; in this connection it may be mentioned that the road at Hamilton, Ont., is to be rebonded, using the E. C. A. bonds. Blue prints were displayed showing the bonding for the tramways of Dublin and Blackpool, the Central Underground of London and the government tramways of New South Wales, contracts for which have been taken by this company. There was also a 2-h. p. gasoline engine with flexible shaft used for cleaning rails previous to bonding which was built after the design of Gustave Fischer, general manager of the N. S. W. Government tramways.

The display of the Westinghouse Electric & Manufacturing Company in its exhibit attracted a great deal of attention owing to the fine and large "booster outfit" which the company had on exhibition. This "booster" consisted of a compound wound motor driving a 460-h. p. series wound generator, and a marble switchboard with the necessary appliances for operating the machines. Besides this the company showed a complete line of switchboard appliances, such as lightning arresters, circuit breakers, switches, ammeters and voltmeters. On pedestals fronting the exhibit were shown the well-known types of Westinghouse motors from the ordinary standard street car motor to the locomotive size. Some other motors were placed on trucks of various make throughout the exhibition hall. The following were in attendance at the convention from the Westinghouse Company: E. W. T. Gray, E. H. Heinrichs, J. B. Lyford, Jr., R. F. Storer, B. T. Mallett, Robert Siegfried and Arthur Hartwell, of Pittsburg; W. F. Zimmerman, New York; R. S. Brown, Boston; C. A. Bragg, Philadelphia; J. R. Gordon, Atlanta, Ga.; Maurice Coster, Chicago; Paul T. Braz, Syracuse; F. T. Freneyar, Buffalo; W. K. Dunlap, Niagara Falls, and M. McLaren, Pittsburg, who was in charge of the exhibit.

Elmer P. Morris and J. C. Dolph had an exhibit of their own located in two rooms on the ground floor of the Cataract, just across the street from the International. The favorable location and the





many attractions provided made this exhibit a popular resort for the delegates in the evenings; there was a "hot time" there on the 13th. Mr. Morris represented the following manufacturers: Wheeler Reflector Company, oil and electric head lights; Hemingray Glass Company, insulators; Hope Electric Appliance Company, switches,

cut-outs and specialties; Forsyth Brothers Company, car curtains and fixtures; Harrington Illuminated Sign Company; Electrical Equipment Company, overhead line material; Simonds Manufacturing Company, gears and pinions; Keystone Electrical Instrument Company; Point Marion Manufacturing Company; McGuire Manu-



facturing Company. Mr. Dolph was present in the interests of these companies: Forest City Electric Company, roll drop and drop forged commutator bars, protected rail bonds; Sterling Varnish Company, extra insulating varnish; Catskill Foundry & Machine Works, iron and steel gears and pinions; American Mica Company, India and amber mica; D. & W. Fuse Company, railway cut-outs, enclosed fuses, etc., and J. C. Dolph & Co. dealers in carbon brushes, head-lights, trolley fittings, ratchet brake handles, incandescent lamps and sand boxes. All the goods exhibited were artistically arranged and made a very handsome display.

The Peckham Company had the most extensive truck exhibit at the convention; it comprised six double trucks, one single truck (one of 100 now building for the Cincinnati Street Railway), two side frames, a locomotive truck and one of its rotary snow plows that had been in use for two years on the Buffalo Railway. Nearly all the apparatus was of new design and exhibited for the first time. Type No. 15 is an extra heavy, swing bolster truck for interurban lines; like all the Peckham trucks it is triple cushioned. Type No. 14 is for city service. The 14-A is a swing bolster truck for heavy service; in the 14-B the motors are suspended outside of the axles enabling the wheel base to be reduced to the very short distance of 4 ft.; the 14 C is a double truck with four wheels of the same size but provided with a maximum traction device by which the proportion of the weight carried by the driving wheels may be varied within wide limits; the 14-D is a swing bolster maximum traction truck with graduated braking gear. There were also Peckham trucks in the exhibits of the electric companies. The representatives of the company present were President Peckham, E. G. Long of New York, C. S. Ackley of Kingston, Arthur Field of Boston, and J. A. Hanna and W. H. Gray of Chicago. The Peckham souvenirs were the handsome leather memorandum books and pocket books that have proved so popular at former conventions. The handsome celluloid cards displayed on the trucks attracted much notice. Headquarters were also maintained at the International, where models of the trucks were displayed. Lady visitors were presented with what was perhaps the handsomest souvenir of the convention, a transparency of the Falls.

The J. G. Brill Company had a very extensive exhibit. In the Brill space were shown four trucks of the well-known types; the 21-E single truck with solid forged side frames, of which type the West End of Boston has ordered 300 since March; the No. 27, the "perfect" truck; the No. 27-D, the "universal" truck, and the "eureka" maximum traction truck. Also, there were two No. 27 trucks in the exhibit of the Standard Air-Brake Company used to display the compressors of that company. Outside were a standard vestibuled snow sweeper equipped with three motors, and one of the standard 10-bench open cars, mounted on a 21-E truck. In addition to these which were at the convention hall, mention should be made of that other exhibit to which attention was called in a pamphlet entitled, "Brill Cars and Trucks at Niagara Falls and Vicinity;" the entire equipment of the Gorge road was by this company, consisting of 12-seat open cars mounted on "eureka" maximum traction trucks; all the rolling stock of the Buffalo & Niagara Falls line is mounted on Brill No. 27 trucks, of which the general manager, Mr. VanHorn, says: "During the two years that they have been in service here, none have ever left the rail;" the other roads in the city and vicinity using Brill trucks are the Niagara Falls & Suspension Bridge, the Niagara, Whirlpool & Northern, the Lewiston & Youngstown, the Buffalo Railway, and several of the suburban lines out of Buffalo. There were present from the company, John A. Brill, S. M. Curwen, W. H. Heulings, G. M. Haskill, Edward Brill and H. H. Archer. The souvenir presented to visitors was a graphical electric traction computer, handsomely bound in leather, designed by William Cox, of New York, and copyrighted by the Brill Company; it will prove useful in any technical man's office.

The Standard Air-Brake Company had a striking exhibit which greatly eclipsed those of former years. Not only was it an object lesson, but it showed the great progress made by that energetic company, which was the first concern to build street railway air-brakes, and the exhibit practically illustrated the different types of apparatus manufactured, from the beginning of its business to date. The apparatus was in charge of the company's managing director, E. J.

Wessels, and was assisted by the chief engineer, E. H. Dewson, Jr., George E. Pratt and C. B. Fairchild, special agents, H. B. Taylor, assistant engineer, and E. E. Robinson, foreman. On entering the exhibit on either side was to be found a Brill No. 27 truck, the one on the left equipped with the well-known duplex compressor, direct axle-driven. There are many of this type in service here and abroad; thirty are completing their third year of active service on the Buffalo Railway. On the right was shown the well-known geared compressor, which is the standard on several roads in the United States and Canada. This type has proved admirably suited for heavy traction and high speeds. Back of the duplex was shown the hollow spindle brake-cylinder with fulcrum on back head for equalizing double truck brake rigging. A handy attachment enabled delegates to see how quickly and easily pressure can be applied. The attachment embraced a graduated spring, with a pressure indicator which showed the range from minimum to maximum, the latter being equal to an emergency stop. There was also shown the well-known Standard interlocking handle for working the controlling valve and the chime whistle. Adjoining this stood the automatic current controller, which excited favorable comment from the many delegates who watched the precision and accuracy of its movements, and were surprised at the narrow limits within which it operated. Next to this was the water and dust proof electric compressor in which freedom from vibration and noise was very remarkable. The ease with which it compressed air quickly, and the remarkable small space it occupied excited much interest. The motor compressor was piped to a 14 x 48-in. special reservoir. Next was shown a No. 1 brake cylinder with attachments, showing the manner in which trail cars are braked. In addition there was a profusion of special hose, couplers, gages, regulators, and mufflers, the whole giving a comprehensive idea of the entire system, and showing its simplicity as well as the substantial character of the apparatus. The display was augmented by views of cars and trains in different parts of the globe on which Standard air-brakes are used. The World's Columbian Exposition diploma and medal were also displayed, and a striking sign proclaimed that the Standard was first in the field and the only concern which had received a diploma and medal. The company's Australian agents, Noyes Brothers, were represented by Edward Noyes, the senior partner, of Sydney, New South Wales, who was an interested spectator and gave those who inquired a graphic report of the satisfaction which Standard air-brakes had given in the distant colony in which he resides. Great credit is due Mr. Wessels for his untiring energy, which has not only kept his company at the head of the street railway air-brake industry, but has led to the building of a large and constantly increasing business.

The General Electric Company made the most extensive exhibit at the convention hall, confining it however to motors, controllers, meters and subsidiary apparatus. It occupied the southwest corner of the main hall, and, brilliantly illuminated, formed a centre of attraction for the entire fraternity. The motor exhibit comprised examples of the latest types G. E. 51, 52, 53, 55 and 57 motors. The G. E. 55 of 175 h. p. capacity attracted much attention. This was not mounted; the others were all shown in motion mounted upon trucks. One McGuire pivotal truck was equipped with a G. E. 51 80-h. p. motor on one axle, and an electric brake on the other, both controlled by a B-7 controller. Another truck of similar make and type carried on one axle a G. E. 53 50-h. p. motor of special build for narrow gage work, and an electric brake. A Brill No. 27 truck was equipped with two G. E. 57 50-h. p. motors, with an electric brake on each axle. This is the equipment used in the high speed work in the Cleveland & Lorain road. To accommodate both motor and brake on the same axle the wheels are dished. The equipment was controlled by a B-8 controller. A "diamond" truck also carried two G. E. 57 motors, without brake equipment. On a Peckham flexible cantilever truck were mounted two G. E. 52 57-h. p. motors with K-10 controller. All these equipments were arranged to show the operation of both motor and brakes. The equipments of the two McGuire trucks were controlled by one controller, and were run either singly or both together. On each of the above equipments was set a Thomson recording car meter for use on the car itself, serving to show how a check may be placed on the performances of the motorman with the controller. In the exhibit of the Barney & Smith Car Company, two G. E. 1,000 motors were mounted upon a pair of class H trucks. In the Peckham Truck & Wheel Company's exhibit two G. E. 52



motors were mounted on a cantilever truck. The Duplex Company's car running on the city tracks was also equipped with G. E. apparatus. Armature construction was exemplified by two completed G. E. 52 armatures, a full set of motor mica insulations, a series of armature coils ready for application to the core, and a number of field coils; also several complete sets of motor commutators bound and headed for shipment. The gear work was well represented, all gears and pinions shown coming from the gear plant of the General Electric Company. Three boards were erected in the exhibit space on which were mounted circuit breakers, switches, lighting arresters, meters, etc. The illumination was very elaborate; among the signs was one giving the railway record of the company: 2,137 generators, aggregating 512,213 h. p., 36,101 motors, aggregating 1,059,060 h. p. and 40,000 series-parallel controllers. The writing room of the International was handsomely decorated and served as headquarters; in a small booth here a continuous X-ray exhibition was given; parlor D was the social annex. Among the many courtesies extended was a tally-ho party to Canada on Tuesday. The interests of the company were cared for by W. J. Clark, general manager, W. B. Potter, chief engineer, Ralph H. Beach, L. D. Tandy, J. G. Barry, Lee H. Parker, F. E. Case, W. G. Carey, E. D. Priest, F. M. Boyles and H. Kernochan, of the railway department; Edgar Carolan, of the foreign department; J. R. Lovejoy, general manager, H. C. Wirt, chief engineer, and J. H. Aitken, of the supply department; C. D. Haskios, of the meter department; F. M. Kimball of Boston, T. Beran of New York, and A. D. Page, manager of the incandescent light department, Harrison, N. J., who were the convention committee; the sales offices were represented by W. G. Bushnell and A. B. Shepard, New York; T. P. Bailey, Chicago; E. D. Mullen and W. J. Crowley, Philadelphia; C. C. Pierce, of Boston; W. F. Hays and F. B. Striesby, Cincinnati; S. W. Trawick and A. C. Tenney, Atlanta; F. F. Barbour, San

Francisco; George D. Rosenthal, St. Louis; T. H. Fearey and D. F. Potter, Buffalo; Irving Hale, Denver.

- Among others who were represented at the convention were:
- The F. P. Allis Company, J. B. Allan.
  - The Washburn & Moen Manufacturing Company, H. T. Pratt and N. R. McLeod.
  - Siemens & Halske Electric Company, H. C. Spaulding.
  - C. B. Arthur, street railway supplies.
  - Missouri Car & Foundry Company, Scott H. Blewett.
  - Brownell Car Company, F. B. Brownell.
  - F. C. Boyd.
  - Railway Register & Manufacturing Company, Edward Beadle.
  - St. Louis Car Company, Jilson J. Coleman.
  - Western Electric Company, Samuel A. Chase.
  - Elliott Frog & Crossing Company, W. H. Elliot.
  - E. C. Fletcher.
  - Heine Safety Boiler Company, H. B. Ham.
  - Q. & C. Company, Edward W. Hodgkins.
  - Hayes and Arthur, Scott R. Hayes.
  - Jackson & Sharp Company, J. Montieth Jackson.
  - Simmons Manufacturing Company, John Jackson.
  - Rossiter, MacGovern & Co., Frank MacGovern.
  - Bethlehem Iron Company, E. M. McIlwain.
  - Naugle, Holcomb & Co., E. E. Naugle and George Weston.
  - Billings & Spencer Company, W. B. Post.
  - Laclede Car Company, E. J. Robinson.
  - Dick Kerr & Co., London, Charles S. Schultz.
  - Forest City Electric Company, G. A. Thomson.
  - John Stephenson Company, J. A. Tackaberry.
  - New Process Raw Hide Company, A. C. Vosburgh.



The technical press was represented at the convention as follows:  
**STREET RAILWAY REVIEW:** H. H. Windsor, F. S. Kenfield, H. J. Kenfield, Daniel Roysse, George A. Barnes, G. J. M. Ashby.  
**Street Railway Journal:** James H. McGraw, E. E. Higgins, John B. Bennett, W. A. Taylor, H. W. Blake, Charles B. Fairchild, Jr., C. S. McMahan.  
**Electrical World:** W. J. Johnson, J. V. S. Church, Charles A. Child, Clarence E. Stump.  
**Railroad Gazette:** John N. Reynolds, E. A. Simmons, Arthur J. Wood.  
**Electrical Engineer:** W. F. Hanks, J. R. MacConnell, T. C. Martin, John Balch.  
**American Electrician:** W. D. Weaver, E. E. Wood.  
**Western Electrician:** J. B. O'Hara, Frank L. Perry.  
**Electrical Review:** Charles W. Price, Stephen H. Goddard.  
**Electrical Age:** W. T. Hunt, Newton Harrison.  
**Municipal Record & Advertiser:** T. Stoddard Beattie, J. W. Spalding.  
**Power:** H. M. Sweetland.  
**Canadian Engineer:** E. B. Biggar.  
**Engineering News:** John J. Swann.

### PARLOR EXHIBITS.

Each year seems to show a decreasing tendency to exhibit in the parlors, and those who use them to do so chiefly for the convenience of having a quiet place for their friends to drop in and rest, and where a little business can be discussed undisturbed by the crowd.

At the International the General Electric had ground floor parlors, and provided various little entertainments. The rooms were hung with fine photographs of electric work.

The J. G. Brill Company, the Christensen Engineering Company, the Peckham Company and the Sterling people each occupied pleasant parlors, which were made attractive with pictures, flowers and decorations, and proved very pleasing.

At the Cataract the Garton-Daniels, Forsythe Bros., Elmer P. Morris and the Forrest City Electric, used parlors on the ground floor.

### CONVENTION NOTES.

The local roads on both sides of the river were very generous in providing free transportation. Heretofore the value of a free ride has not been to exceed 5 cents, while many of the Niagara trips which were so freely furnished represented a 50-cent ride. And scarcely a delegate but went over the best rides at least twice. Then, too, the Suspension Bridge was free to the delegates either on foot or in carriages, and the ferry at Lewiston, and the owners of the Maid of the Mist, which had gone into winter quarters, brought out the brave little craft, and she was kept busy during the entire four days. Altogether the transportation companies at the Falls did themselves proud in their treatment of the delegates, and will be long remembered for the unsurpassed trolley rides with which the Niagaras abound.

It was a graceful act of the executive committee to order the making of a steel engraving of William J. Richardson, who was for so many years, as he was the first, secretary of the Association. The portrait will appear in the official proceedings of this year, and as the Association has had but two secretaries in all these years, it was ordered to include the portrait of Mr. Penington also.

The Christensen Engineering Company, Milwaukee, was the author of a happy and much appreciated courtesy which made glad the hearts of the ladies. The supply of cut flowers in Niagara was very limited, as many discovered too late to send elsewhere. Garson Myers had ordered a large quantity of American beauty and other roses from Buffalo which he distributed among the ladies, so far as he could obtain addresses, on the evening of the banquet.

A luncheon was given in honor of President-elect A. E. Lang October 22 at the Buffalo Club by H. M. Watson. The guests were returning home from the convention and this continuation of the festivities was greatly enjoyed by all present. G. P. Kerper, of Dayton; Secretary T. C. Pennington, of Chicago; H. M. Littell, Brooklyn; C. S. Sergeant, of Boston; E. C. Foster, Lynn; H. W. Box, H. H. Littell and C. M. Bushnell, Buffalo, and others were guests with the president.

Nearly all who crossed the Suspension bridge had their attention attracted to the four barrels which hung over the side of the railing midway in the stream. Each was painted a different color and hung by a small rope. The explanation lies in the fact that these were the

barrels for the daily race, which is one of the amusements of the Falls. At a certain time every day they are cut loose simultaneously, and the contest is to see which barrel travels a given distance down the rapids and passes the goal first. Pools are sold on the race, which it must be admitted is about the fairest conducted of any race possible.

When the accident on the New York Central was known it was feared some of the convention people were in the wreck. Although two or three were on the train, none were among the injured. Mr. Peckham and J. H. McGraw had both intended taking this train, as had a number of others, but fortunately remained in Buffalo until the next train. Mr. Crossman, the official stenographer, and his wife had berths engaged, but at the last minute decided to remain a few hours longer. Their baggage, containing the stenographic notes, were in the wrecked baggage car that was under water several hours, and while the shorthand notes were somewhat blurred, are for the most part still decipherable.

### THE HEADQUARTERS' LANDLORD.

One of the most important persons in the whole Niagara town, during the convention, from the standpoint of some 600 delegates who put up at the International, was the landlord, S. A. Greenwood. He has been constantly in the hotel business for 15 years and has worked his way up from night clerk to manager of the house. In the meantime he has been connected with the Spencer House, Niagara; the St. Louis Hotel, Quebec; a World's Fair hotel in Chicago; finally bringing up as manager of the house with which he started. He has had a large number of big gatherings during the past season. Mr. Greenwood is married and has two interesting little sons.



S. A. GREENWOOD.

### PERSONAL.

S. S. Neff has been appointed superintendent of the Chicago Union Loop.

B. W. Peterson has been elected director in the Wheeling Railway Company to succeed P. B. Dobbins who died recently.

H. M. Littell visited Chicago after convention, spending two days visiting the street railways here, and calling on the REVIEW.

H. R. Conklin, who has been manager of the Citizens' Traction Company of Oshkosh, Wis., since its construction, has resigned.

Wm. H. Harrington, has resigned the superintendency of the Southbridge (Mass.) & Sturbridge Street Railway Company on account of poor health.

E. M. Green has accepted the superintendency of the Signal Mountain Railway Company of Chattanooga, Tenn., succeeding H. A. Nicholl who recently resigned.

Frank De Ronde, the genial general sales agent of the Standard Paint Company made the REVIEW office a call when on his way to Denver, Col., to attend the Bridge Superintendents' Convention.

J. L. McCreary, electrical engineer of the Citizens' Street Railroad Company, was married to Miss Blanche Moore at the home of her parents in Indianapolis, November 3. We wish for Mr. and Mrs. McCleary a long and happy married life.

Lemuel Ammerman, president of the Lackawanna Valley Traction Company, and the vice-president of the Scranton & Pittston Traction Company, died at Blossburg, Pa., October 8, at the age of 51. He was also vice-president of the Brookside Coal Company, the Spring



Brook Water Supply Company, Wilkes Barre, Pa., and the Mansfield Water Company. Mr. Ammerman was comptroller of Scranton in 1887 and was a member of the 52nd Congress.

George E. Pratt, the late secretary and general manager of the Hunt Air-Brake Company, of Pittsburg, has severed his connection with that concern and entered the service of the Standard Air-Brake Company as special agent. Mr. Pratt was an earnest worker in the air-brake field, and as he thoroughly believes in air-brakes, decided to continue in the business. We predict for him a long and successful career in this field. His hosts of friends will doubtless be interested on learning of this new connection. It is certain that Mr. Wessels is surrounding himself with the best representative men in the various branches of the company's business.

## NEW PUBLICATION.

The Colliery Engineer and Metal Miner announces that with the November and all subsequent issues the title of the paper will be Mines and Minerals. This alteration is not indicative of any change in ownership, editorial management or scope of work. Originally the paper was devoted only to coal mining but its field gradually broadened until it embraces the prospecting for, development and mining of all minerals. It is a leader in its field, and a credit to technical journalism.

## THE TERRE HAUTE TROUBLE.

To all appearances the mayor of Terre Haute has taken a most unprecedented and unfair advantage of his official position to carry out a personal spite. The Terre Haute Electric Railway was assessed for a very large sum as its share of some extensive street paving improvements; which amount, owing to the reduced earnings common to all lines during the past two years, it was unable to pay in a lump sum. The last legislature authorized the city to extend the time of payment by a lower rate interest bond than the one first made. The city council recognized the justice of the case and adopted an ordinance to carry out the plan. This the mayor refused to sign, claiming it was unconstitutional, and since its passage in June the ordinance has been reviewed by some of the best lawyers in the country who declared it sound. The mayor, however, refused to be convinced, and on October 17, before daylight, when it was impossible for the road to get funds in bank in time, made a levy on the road and placed it in a receiver's hands. Part of the indebtedness for which the road is sued is not yet due, and had the mayor signed the bonds as authorized by his city council, no part of it would have been due. The citizens declare the action of the mayor an outrage, the daily press of the city repudiates it, and at its first succeeding meeting the city council passed a unanimous and highly complimentary resolution expressing its confidence in President Harrison, and urging the receiver not to disturb the old management.

We are informed on good authority that this same officious mayor is 17 years in arrears for county taxes, and that the county is unable to collect from him. He is also in arrears for city taxes. That a man of his type should ever be entrusted with authority which makes possible so high handed and outrageous a proceeding as this seizure of the Terre Haute road, is at once a matter of regret and disgust. Mr. Harrison has given his city a road and a service equalled by few cities of its size, and is deserving of better treatment in return for what he has done. It will be a hard task to extricate the company from its dilemma, but we believe Mr. Harrison is equal to the task and will eventually come out with flying colors.

## THE REVIEW WINS A SILVER MEDAL.

We have just received advices from the Brussels Exposition that the STREET RAILWAY REVIEW has been awarded a Silver Medal and a Diploma of Honor, on its exhibit of current and bound volumes of this magazine. The award is made for the best technical publication of its class, and includes excellence in printed matter as well as typographical arrangement and illustrations.

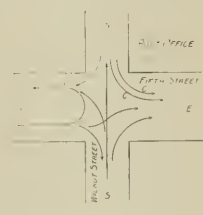
This makes the second medal we have won, the first having been awarded at the World's Columbia Exposition.

The exhibit of the Chicago Trade Press Association, of which this publication is a member, also won a medal at the Brussels Exposition for the best exhibit of technical and trade journals.

## SHORT HEADWAY IN CINCINNATI.

Ordinarily we measure the headway on street railways in minutes and we believe that there are roads where hours are the units, but there is one particularly busy street crossing in Cincinnati where a count showed 48 cars between 5 and 6 p. m., October 16, an average of one every 8.4 seconds. It should be stated that there was nothing extraordinary about this days traffic.

The diagram roughly illustrates the layout of the tracks at this corner; those marked "C" are cable lines; the others are electric lines. The traffic was as follows:



|                                     |     |
|-------------------------------------|-----|
| South on Walnut street.....         | 23  |
| East on 5th street, south side..... | 142 |
| East on 5th street, north side..... | 112 |
| West on 5th street.....             | 151 |

Sylvester T. Everett has been given judgment against the East Cleveland Railway Company for \$10,750 as commission on loans which he negotiated.

The Louisville City Railway Company on October 7 paid the judgment for \$25,117 franchise tax. The contemplated appeal to a higher court has been abandoned.

A new motor car has been received by the Cincinnati, Hamilton & Dayton Railroad from the Baldwin Locomotive Works, to be operated over its lines in competition with the Cincinnati & Miami Valley Traction Company.

A hot fight at the annual election of the Southwest Missouri Electric Railway resulted in a change in the board of directors. General Manager A. H. Rogers and Vice-President E. Z. Wallower were defeated for re-election. The new officers are W. W. Cahoon, president; J. F. Harrison, vice-president; C. F. McElroy, secretary; D. R. Goucher, treasurer, and F. H. Fitch, superintendent, all of Carthage. The Southwest Missouri Electric Railway is the longest interurban in the west. It is in good physical and flourishing financial condition, its receipts for the fiscal year having reached \$115,000, with fixed charges of but \$30,000. This favorable showing will probably inaugurate a policy for the retirement of outstanding bonds.

## TRIAL TRIP OF THE PATTON MOTOR.

Invitations were extended to the street railway, the railroad and consulting engineers of Chicago to be present November 2 at the inaugural trip of the improved Patton motor car. About 75 guests, including G. W. Knox, Electrician of the Chicago City Railway, John Lundie, consulting engineer of the Illinois Central, F. K. Dorrance of the Houston & Texas Central Railroad, A. M. Kinsman, chief engineer of the Lake Michigan Car Ferry Company, a representative of the STREET RAILWAY REVIEW and others, inspected the motor and occupied a passenger coach which was drawn over the tracks of the Chicago stockyards by the motor car. The coach was very heavy, weighing 60,000 lbs. exclusive of the passengers, which was a severe test for a motor car equipped with a 25-h. p. engine. With a lighter coach a speed of 15 miles an hour was attained.

This car was equipped with a 25-h. p. gasoline engine direct coupled to an 8-pole, shunt-wound generator, with a capacity of 60 amperes at 250 volts. The engine is fed from a 25-gal. tank of gasoline and the water jacket from a 75-gal. tank, both placed on top of the car. The steam which comes from this tank will be used in heating the trail cars. In compartments in front and back of the engine are 100 storage battery cells and these are connected in multiple with the motors. A 35-h. p. motor is geared to each of the two axles of the truck, and they are operated from a series-parallel controller of standard make. While in service the engine is run at normal speed with full load, charging the storage batteries when the motors do not take all the current. The battery takes the fluctuations of the load and at no time does it remain discharged. In this service it is stated that the batteries deteriorate very slowly. The consumption of the engine is 2½ gals. of gasoline per hour. Baffle plates muffle the exhaust so that there is little noise in its operation. The motor car has been perfected and the recent test demonstrated that it is capable of arduous service.

During a recent entertainment at Harrison Park Casino, Terre Haute, Ind., an audience of 4,000 gathered. The facility with which the street railway company handled this large crowd called forth the following comment from the Terre Haute Gazette: "The street car company cleaned up that great crowd as if it was a few paltry hundreds in number. When the last car took on its load the crowd had disappeared. All had been cared for and were carried to their homes swiftly and easily."

## MASON CITY &amp; CLEAR LAKE INTER-URBAN.

An interesting interurban line which seems to have stepped into a good paying business from the very start is the Mason City & Clear Lake (Iowa) Railway. The road was opened on July 3rd of this year, and forms the connecting link between Mason City, a place of 15,000, and the lake which is the only resort of the kind for many miles around. The resident population at the lake is only about 1,500, increased during the summer by 2,000 cottagers upon the shores. The chief revenue is in the freight business, which is good throughout the year, as the road connects with the Iowa Central and handles all its passenger and freight between Mason City and the lake. Tickets are sold through by the Central from all points on its line and pas-



ELECTRIC LOCOMOTIVE.

sengers change cars. The freight in car loads is transferred in the original car both ways. In addition the electric line does all the switching for the Central to the stock yards, and this forms a good business in itself. Switch tracks are also laid to all the manufacturing establishments in Mason City.

There are 17 miles of track, the distance to the lake being 11 miles. The heaviest grade is only 3 per cent, and short; 65-lb. T rails are laid. The rolling stock includes one 45-ft.



A LONG TRAIN—CLEAR LAKE &amp; MASON CITY LINE.



BAGGAGE AND EXPRESS CAR.

car with four 50-h. p. motors; five 40-ft. open trailers; one closed trailer 45 ft. over all; one baggage and express 35-ft. car; two combination passenger and baggage cars with 22-ft. body and 32 ft. over all on Peckham extra long trucks; two 16-ft. body city cars on Peckham 7-B excelsior trucks; two flat cars one of which is rigged as a tower car, and one dinky locomotive 16-ft. over all with two 75-h. p. motors, weighing nearly 10 tons. This has hauled eight loaded stock cars in one train and as high as 25 empty box cars.

The rolling stock is equipped with Standard air-brakes; on the electric locomotive is a 1½-h. p. electric compressor governed by the Standard automatic controller. This locomotive frequently draws trains of seven or eight trailers all braked by air. The trailers require only one pound of air and the locomotive two pounds for effective braking per stop. One of our illustrations shows the train, in the vestibule of which the Standard motor-compressor is located. An excellent opportunity for demonstrating the value of these air-brakes recently arose. The superintendent was running a train consisting of the locomotive and one trailer, and while approaching the city with speed reduced to 15 miles per hour, a runaway horse with buggy attempted to cross the track. This buggy contained a woman and three children. The superintendent made an emergency stop which brought the train to a standstill ¼ ft. away from the buggy, which had been overturned on the track by the frightened horse. The officials have been so pleased with the installation that they gave to the Standard Company a testimonial from which the following is quoted: "Our air brakes have been put on by your Mr. Taylor and are working with entire satisfaction. This work was done in a workmanlike manner and according to contract, and we are well pleased with everything." It is a significant fact that the Standard system has been so well designed that it is only

necessary to apply the air-brakes on the locomotive and three trailers in order to promptly bring the whole train of eight cars to a standstill.

The schedule time on the main line is 38 miles per hour and on a portion of the road a speed of 48 miles is reported. The wheels are 4-in. tread and 1-in. flange, and weigh 500 lbs. All the trucks are Peckham, and W. H. Gray of the Chicago office taught the motormen and opened up the road.

A fine power station was erected by the company, and two Allis engines installed, one of 150 h. p., and one of 250 h. p. The officers are: W. E. Brice, president and manager; L. Ong, treasurer and superintendent, and S. Emery, general passenger and freight agent.

### M. I. C. COMPOUND.

The M. I. C. compound is an enamel for the insulations and coatings of motors, armatures, fields, wires, cables, transformers, overhead line construction and all bare metal surfaces. This product is made chiefly of refined linseed oil, asphalt and rubber; it is black in color, and is manufactured in four grades. It does not contain carbon-disulphide or other objectionable materials; is non-corrosive, impervious to moisture, has no offensive odor, stands high temperature and can be reduced to any desired density of solution with turpentine or benzine. The Mica Insulator Company is sending out circulars to which are attached pieces of sheet copper coated with the M. I. C. compound and baked for three hours at 300°F. There is no indication of the compound cracking until the copper is ruptured.

### A NEW INTERURBAN FOR CLEVELAND.

The Cleveland, Medina & Southern Railway Company has been incorporated, and Secretary Gibson states that negotiations are now in progress for the construction of the first section, which is to be 55 miles in length. The construction will be substantial, but not excessively expensive. Steel rails, 65 lbs. to the yard, will be laid on oak ties. Side pole suspension will be used through cities and villages. The motor cars will be built for heavy service and equipped with four 50-h. p. motors. The officers of the company are F. C. Goodman, president; F. C. McMillan, vice-president; A. R. Gibson, secretary, and J. W. Roof, treasurer; with offices at Cleveland.



MASON CITY &amp; CLEAR LAKE CARS.



## A NEW SYSTEM OF DOUBLE TRUCKS FOR ELECTRIC RAILWAYS.

The question whether single or double trucks should be employed under the heavy electric cars that have become common within the last few years is no longer open to argument, as is shown by the universal adoption of double trucks on interurban and long suburban lines; while for lighter cars and lower speeds there is a tendency also in the direction of their adoption in many places. This tendency to mount even light cars for city service on double trucks is more marked in the east than in the west.

It requires but little consideration to convince one that the truck as evolved in steam road practice will not suffice for electric service, because in the latter the truck is the locomotive as well as the carrier of the car, and the demands on the electric truck are much greater than on those under non-motor cars having the same weight on the rails. Appreciating these facts E. Peckham, president of the Peckham Motor Truck & Wheel Company, has a full line of double trucks adapted to any and all conditions of service, from light suburban to the heaviest trunk line service. Last year he designed and placed upon the market his double cushioned swivel truck known as

of the No. 14 type as well as the No. 15 and No. 17 have the swing bolster, which has been adopted on steam roads. The bolster is a truss formed by the combination of a channel bar and a truss bar supported by adjustable supports which are hollow and receive the bolts holding the lower half of the swivel plate in position. The principle in view in the design of this truck was to keep the bolster as narrow and as low down as possible and the wheel base short, so that the wheels might swing between the sills of the car on curves. The No. 14 truck is double cushioned, the bolster being carried on two half elliptic springs in pockets on the upper part of side frames, which are supported and cushioned upon the journal boxes. Being flexibly supported centrally over the journal boxes, they act as equalizers and permit any one wheel to lift without communicating motion to the car. The second cushion given by the helical yoke springs supporting the side frames on the journal boxes, relieves the side frames and half elliptic side springs, relieves the bolsters from shocks and gives an easy riding car under all conditions. The brake rigging is of the standard double upright lever type; the floater is

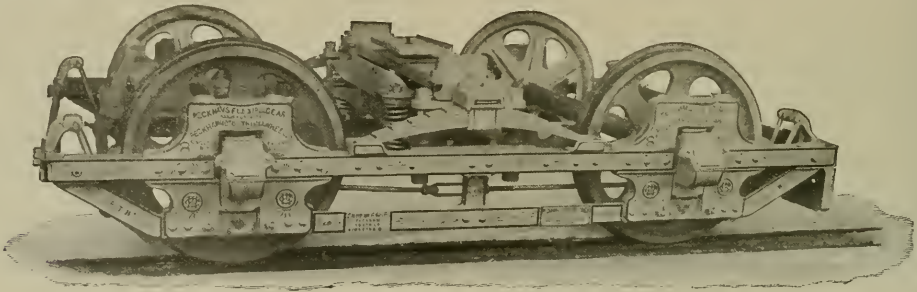


FIG. 1—STANDARD NO. 14.

No. 14, and has recently added seven other double trucks, each adapted to some particular conditions, so that the entire field of electric traction is covered. Of these, five are modifications and improvements of the No. 14, but of a heavier construction, and are as follows: No. 14-A for high speed service, suburban and elevated; No. 14-B for use where there are many curves of short radius; No. 14-C and 14-D for maximum traction service; No. 14-A C a modification of No. 14-A with the special features of the No. 14-C added; No. 15, somewhat similar in design to 14-A, but much heavier, and No. 17, a locomotive truck designed for the heaviest service.

The No. 14 truck is built in two weights; light weight, which is shown in Fig. 1, for service under light interurban cars, and extra heavy for heavy interurban service, which latter differs from the one illustrated in that heavier side bars and pedestals are used and the addition of a "bridge truss" between the top and bottom members of the side frames in order to provide increased support for the bolster. In the No. 14 truck the bolster is fixed, but flexible; the others

equipped with a curved bar upon which the connection to the sway bar moves by means of a roller, and thus permits the truck to turn under the car without altering the position of the brake shoes, making a close adjustment of the brakes possible. The brake beams are flat with M. C. B. heads, and they are provided with adjustable release springs.

The No. 14-A truck shown in Fig. 2, is more heavily constructed in all its parts than the No. 14. Instead of a stationary bolster working on guide pins provided in the latter, this truck has a swing bolster made up of two channels, set on edge and held together by cover plates and the female swivel plate. This bolster is carried on the spring plank by means of one half elliptic spring and two helical nest springs. The side bearing plates attached to the car bolster and bearing upon the cover plates, admit of a limited rocking motion of the car governed by the stiffness of the nests. This motion adds greatly to the ease of riding, as it permits the wheels on one side of the truck to rise independently of the car body.

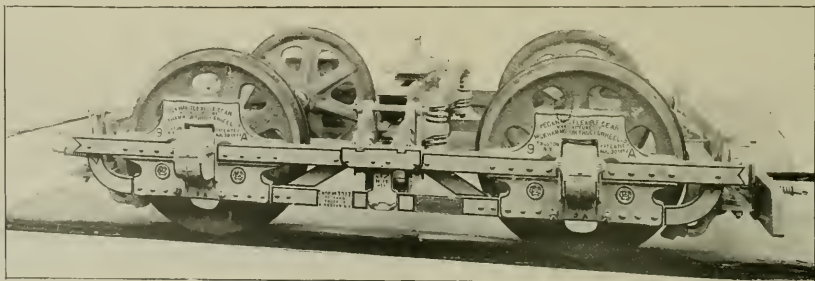


FIG. 2—TRIPLE CUSHIONED NO. 14 A.

The spring plank is supported by four links of M. C. B. standard length, which in turn are carried on two transverse bars, which rest in pockets on the side frame of the truck. At each end of these transom bars are located spring pockets with rubber cushions, one at each end, which support the male bearings, to which the links are secured. The rubber cushions, in addition to acting as springs, break the force of the blow between the rail and the car. The transom bars previously referred to are secured to both side frames, together with the end cross member, bolting them in rigid alignment. The transoms likewise act as a guide for the bolster, preventing it from moving in a direction longitudinal with the car and also carry the nose bars which support the motor through riveted pockets.

the bolster and the elliptic springs; but a portion of this weight is carried on a roller which works on a plate on the underside of the car body framing throwing 70 to 80 per cent of the weight on the two driving wheels. The casting carrying the roller is supplied with a guide which prevents the side movement of the roller and casting with relation to the truck frame, the roller permitting the truck to swivel under the car. By this method the advantages of a maximum traction truck are gained without making the bearing plates at the end of the bolster carry the car body, giving much less friction on curves. The location and relative stiffness of the springs can be so varied as to alter the percentage of weight on the driving wheels from 50 to 80 per cent of the total weight.

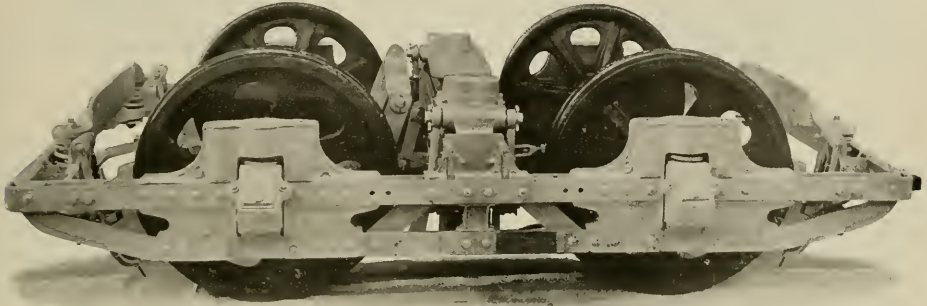


FIG. 3.—SHORT WHEEL BASE NO. 14 B.

The No. 14-B truck Fig. 3, is designed for use with two motors where a short wheel base is essential to swing between narrow car sills or around sharp curves. In order to accomplish this the motors have been swung outside the wheels instead of inside, and the motor support bars have been hung, through springs, to the outside transverse member of the truck. The cantilever construction of side frames similar to that used on the single trucks of this company renders this arrangement perfectly safe and permissible. One motor may of course be used instead of two on this truck, in which case the weight on the driving wheels will be about 60 per cent of the total weight carried. The wheel base in this truck can be reduced with 33-in. wheels, to 45 in. should it be desired but it is not recommended that the wheel base be less than the gage of the track upon which the truck is to run. The difference between the 14-A and the 14-B is that the motors are outside the wheel base in the latter; otherwise the side frame and the swinging bolster are in every way the same and the parts of the two are interchangeable.

No. 14-C, Fig. 4, is a maximum traction truck in which the wheels are all the same size and is built on the same general lines as the No. 14. The greater portion of the weight of the car body is carried on

The No. 14-D maximum traction truck, Fig. 5, is designed on the same general lines as the No. 14-C, but works on an entirely different principle. The bolster is of the swinging type used in the No. 14-A truck and is located as near as possible to the large or driving wheels, while the motor is supported on the cantilever extension projecting outside of the driving wheels, the same as in the 14-B with the double object of leaving room between the driving and pilot wheels for the bolster and increasing the weight on the driving wheels. The principle upon which the truck operates is that of increasing the weight on the leading outside pilot wheel. It has been thoroughly proved both in theory and practice that when a four wheel truck is rounding a curve the leading outside wheel is the only one which has any tendency to ride the rail; in fact, the tendency is for the rear axle to assume a position radial to the curve on which the truck is running. The truck as shown is intended to be placed under the car body so that the pilot wheels shall be turned toward the end of the car in each truck, but its construction is such that the large driving wheels may be used as the end wheels if desired. The location of the motor and bolster is such that about 85 per cent of the total weight carried on the four wheels is carried on the two driving wheels.

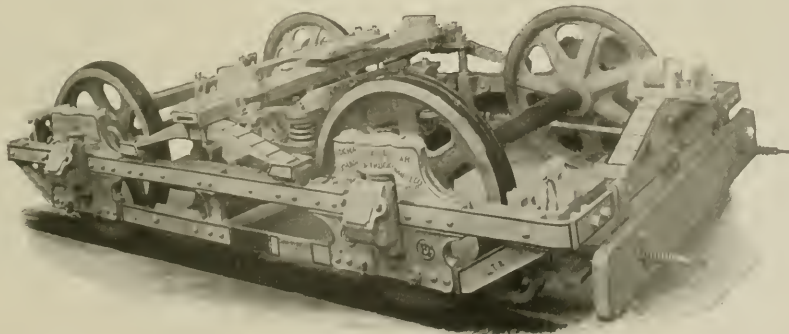


FIG. 4 DOUBLE CUSHIONED CENTER BEARING NO. 14 C.

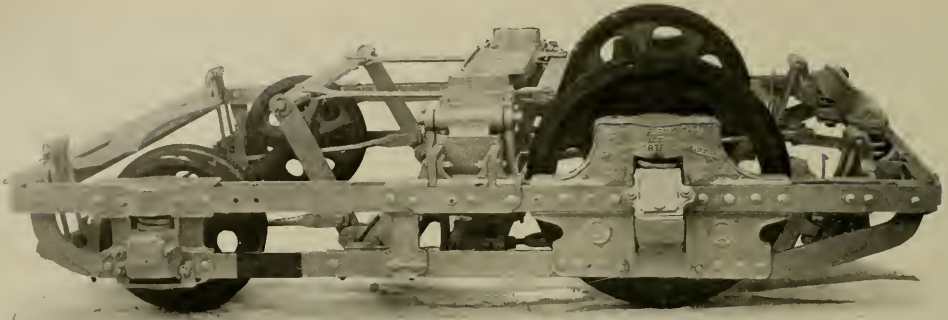


FIG. 5—TRIPLE CUSHIONED SWING BOLSTER CENTER BEARING NO. 14 D.

On the end of the truck frame beyond the pilot wheels is located a segmental track upon which works a roller to which pressure is transmitted from the car body through a spring. This pressure is capable of adjustment. The roller with its supports being secured under the car body, when the truck runs into a curve the pilot wheels swing beneath this roller in such a manner as to transfer its position on the slide toward the outside pilot wheel on the curve. In other

permit of the swinging of a half elliptic spring between them. This bolster is built up in truss form of two flat bars of a thickness and width suitable for the car bodies to be carried. These bars are trussed by the adjustable posts. Secured to the top bar of the bolster are the regular King side bearing springs to provide for a slight rocking motion of the car body. The bolster is supported at each end by one or more half elliptic springs. The number depending on

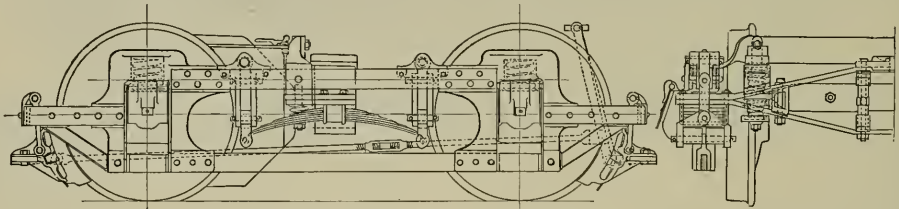


FIG. 6—NO. 15, EXTRA STRONG TRIPLE CUSHIONED SWING BOLSTER TRUCK.

words, the pressure transmitted to the pilot wheels through the roller is the same whether the truck is on a curve or on a tangent, but on a curve is so distributed that a greater portion is thrown on the outside pilot wheel than on the inside, consequently preventing the flange of the outside pilot wheel from riding the rail. The side frame of the truck is built on the cantilever principle common to all Peckham trucks, and is provided with a yoke for the pilot wheels sufficiently low to swing under the steps of an open car.

The weight of the car body to be carried. The ends of these springs are carried in the universal links, which permit of a motion both longitudinal and transverse with the axis of the truck, 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 four helical springs, making three sets of spring cushions on the truck, insuring a very easy riding truck. The bolster is guided between the transoms to prevent motion in a direction longitudinal with the car body. These guides serve to transfer the draft of the motors from the truck to the car body. The location of the half elliptic springs between the bars of the side frame 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 supplementing in this direction the action of the yoke springs located directly over the journal boxes. The motors are supported on the transoms. These transoms are rigidly secured to the side frames of the truck and together with tie rods through the lower bars, keep them rigidly in line.

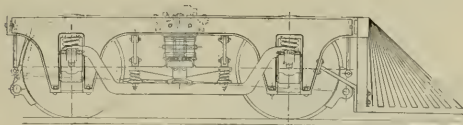


FIG. 7—NO. 17 LOCOMOTIVE TRUCK.

The No. 14-AC truck is built on the same lines as the 14-A. In addition it has the special features of the 14-C, namely, the half elliptic spring located outside of the wheels on one end and the bearing on a rubbing plate under the car body to the roller, thus throwing more weight on the pair of wheels driven than on the other pair. This truck, of course, is intended for use with one motor only. It can, however, be made interchangeable with the 14-A and either two motors may be used as in the plain 14-A truck, or the additional half elliptic spring may be placed on the end and one motor used as on the maximum traction truck.

The No. 15 swivel truck, Fig. 6, is designed for interurban and elevated road service and can be used as an electric locomotive. It is built heavier throughout than the No. 14 and the two sets of bars composing the middle of the side frame are placed farther apart to

The No. 17 truck, Fig. 7, is designed for trunk line work under heavy cars with extra heavy motors as an electric locomotive. The side frames are constructed in one piece of the best cast steel, and the weight of the car is resting upon the frames, which are supported upon double coil springs carried on the journal boxes, the same as in all Peckham trucks, while the weight of the motors is carried upon springs secured to motor suspension bars, secured at each side to independent equalizing bars resting directly upon the boxes. Swung by four links from the side frames are cross bars supporting the bolster plank. It will be noted that the construction of this truck permits the side frames and bolster to be raised off the wheels without disturbing the motor, so as to permit of easy access to the motors for repairs.



A CHARITY FAIR IN YUCATAN.

The manager of the Campaña de Tranvías de Mérida, Yucatan, Mr. Escalante y Peon, recently organized a kirmess or charity fair which was held at the pleasure resort of the tramway company, and proved to be a great success. A junta of 12 prominent citizens lent their aid, and after a few weeks of preparation the fair was opened on September 18. There were eight stands or booths provided for the sale of flowers, ice cream, cigars, beer, toys, etc., and at each booth four young ladies of the best families acted as saleswomen. Almost everything for sale was presented by the merchants and families in Mérida, and while 15 cents was the selling price fixed, that paid ranged from 25 cents to \$1. It is related that these high prices were paid by the young men who were deeply interested in the ladies presiding at the booths.

Flowers in particular brought high prices; the roses which each of the four ladies at the flower booth wore, were auctioned off, the minimum price realized being \$38. The most costly dish of ice cream was purchased by a young man who was inveigled into agreeing to pay 25 cents per spoonful for the glass eaten by his fiancée, and she ate it with a salt spoon, 120 spoonfulls.

The fair continued for three evenings and the resources of the tramway were taxed to carry the people desirous of attending. The receipts, including the earnings of all the pleasure apparatus at the park which were donated by the company, netted \$4,500, which amount was turned over to the trustees of the city hospital.

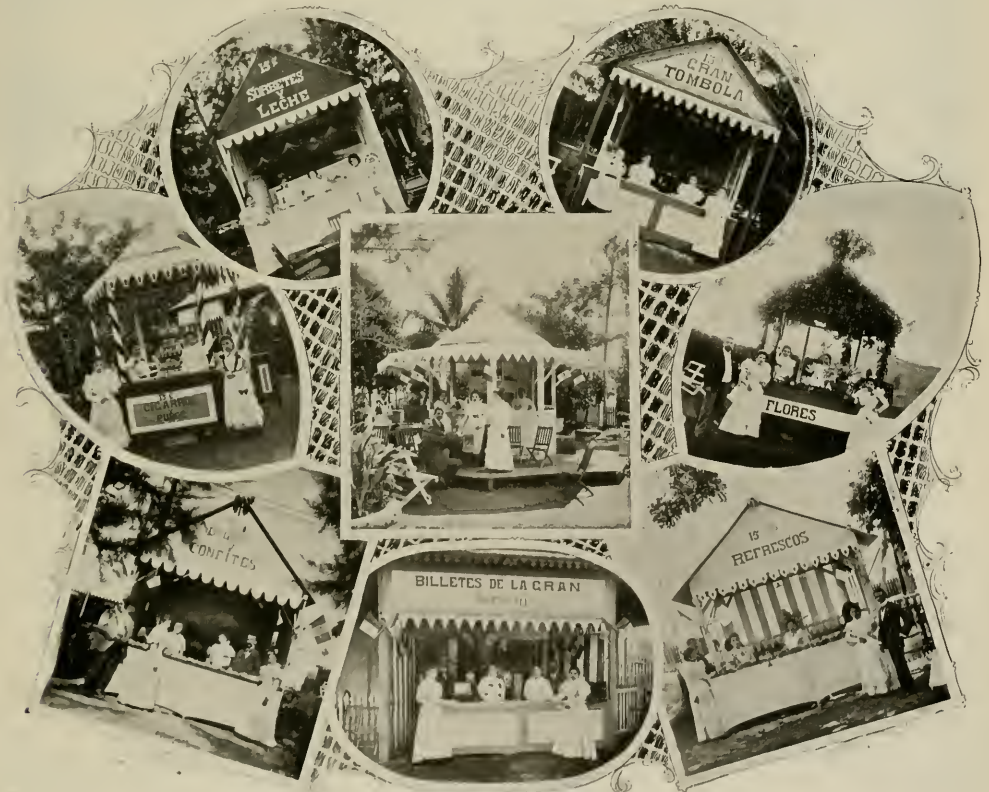
BRILL'S ELECTRIC TRACTION COMPUTER

The souvenir of the Brill Company at the convention was one of Cox's computers designed to immediately, and without any calculation whatever, give the effective horsepower necessary to propel any load at various speeds and also upon various grades, thus solving by the simplest mechanical means an often perplexing problem. It is based

$$2,000 G + T$$

on the formula  $h. p. = L \times S \frac{2,000 G + T}{33,000 \times 100}$ , where L is the

load in tons of 2,000 lbs.; S, the speed in feet per minute; G, the grade in per cent; T, the tractive force per ton in lbs. It is also specially designed to give the h. p. required for the different styles of Brill trucks. Those who did not secure one of these computers at the convention may do so by writing to the company.



SCENES AT A CHARITY FAIR IN YUCATAN.

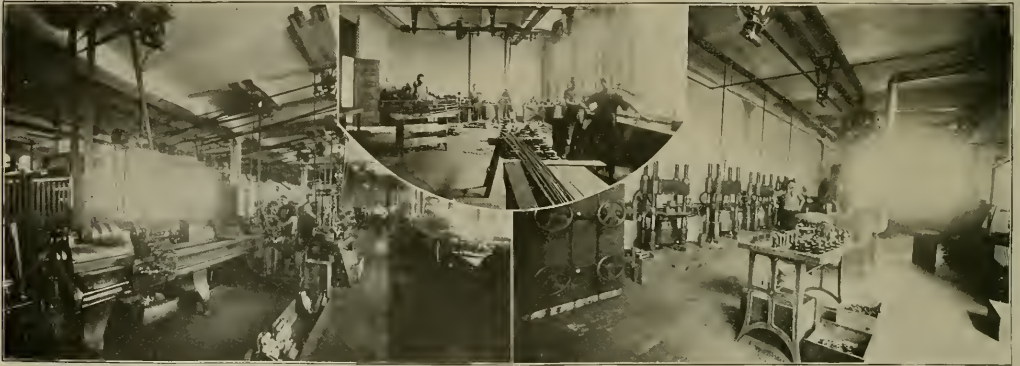
## THE CAPITAL TRACTION OF WASHINGTON.

As noted in our last issue the Capital Traction of Washington, D. C., has decided to adopt the underground electric conduit system instead of rebuilding the cable plant which was destroyed by fire, and the contracts have been let. Pending the completion of the installation horses will be used for the motive power.

David S. Carll is the chief engineer and associated with him as principal assistant engineer is William B. Upton. Dr. Louis Duncan has been appointed consulting engineer. The directors have appointed George T. Dunlop, Henry Hurt and Samuel L. Phillips as a building committee.

The system adopted is the underground conduit controlled by the General Electric Company, and that company has the contracts for generators, motors and accessory electrical apparatus. A large portion of the cable conduit work has been let to the National Cable & Conduit Company of

On February 18, 1894, the business was incorporated under the title of the Sterling Supply & Manufacturing Company with a capital stock of only \$15,000, and located at 97 Bank street. Mr. Carson occupied the double office of president and general manager. At this time he was making Sterling registers and Sterling sand boxes, having acquired the patents and business of Benton & Keyes then manufacturing the Benton register. The business was energetically pushed and in March, 1896, it was found necessary to increase the capital stock to \$100,000, the money going into new machinery and tools. Again in June of the same year the capital was enlarged to \$200,000, and in April, 1897, greatly enlarged quarters were secured in the new Lexington Avenue Cable Building, 141-155 East 25th street where the Sterling Works occupy three-fourths of an entire floor, comprising over 25,000 sq. ft. This building is undoubtedly one of the most complete manufacturing buildings in the country, and with finest machinery and conven-



VIEWS IN THE WORKS OF THE STERLING COMPANY.

New York. John A. Roebling's Sons Company will furnish and install the lead-covered paper-insulated cable. Some 214,000 ft. of 1,000,000-c. m. cable will be used. The Baltimore Car Wheel Company has the contract for 70 "Lord Baltimore" trucks, and the American Car Company of St. Louis will furnish the bodies. The street work has been let to E. Saxton and was begun the early part of this month.

## STERLING SUPPLIES BY A STERLING COMPANY.

When J. H. Carson organized and became the head of the Sterling Company, in New York, in 1892, he determined that the company and all its products should be worthy of the name he gave them; and how fully that determination has been carried out is evidenced in the magnitude to which the business has grown, and upon hundreds of street railways where one or more of the several products of the company have been adopted as standard. Like many another concern of modest beginning this company has grown to large proportions, in fact its history is one of remarkable expansion and development, made all the more creditable by reason of the depressed times with which it had to contend.

iently arranged plant, nothing is wanting to furnish ideal conditions for turning out the work.

The present officers of the company are J. H. Carson, president and general manager; Perry Tiffany, vice-president; and William Tiffany, treasurer. It is making Sterling registers, Sterling sand boxes, Sterling safety brakes, Sterling fenders, car trimmings and general street railway supplies. Within the last year it has added a department for the manufacture of overhead material of all kinds, and is not only selling to consumers, but is furnishing some of the largest supply houses in the country with their entire stock in this line. Since this company started it has been a constantly increasing success, and its registers, brakes, sand boxes and fenders have entirely equipped some of the largest roads in the country, including the great Metropolitan system of New York.

The Sterling register is too well known for its excellent work to need extended mention here, over 12,000 of these machines being in use, and are standard on some of the largest roads in the country. Notable among these is the Metropolitan Traction Company of New York. Some 2,500 Sterling machines are in daily use in that city. A new type of Sterling register has just been put on the market, which we illustrate herewith. As shown, it

# MAYER & ENGLUND,

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## Electric Railway Material and Supplies

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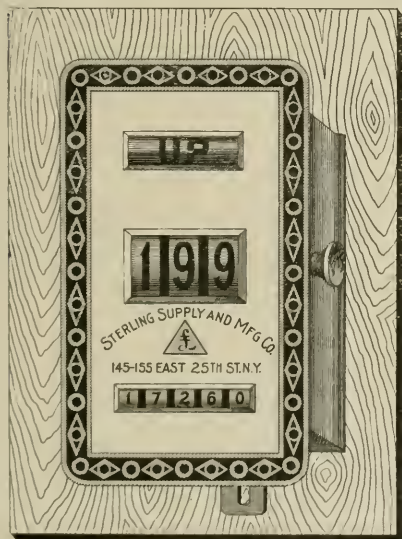
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 MOTOR AND CONTROLLER REPAIRS, ALL KINDS.

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indicates the direction of the car, the trip fares, and the total. All figures are plainly indicated and can be seen readily from any part of the car. The new numeral register is a very handsome machine, compactly built, and being

simple in construction will not readily get out of order. These registers are made in both single and double, as desired.

The mainspring of the whole enterprise has been and is J. Henry Carson, who has just reason to look back with pride on what had been accomplished in the past few years. He was born in Baltimore in 1861 and his education, begun at St. Paul's school, Concord, N. H., was rounded out at Yale and Columbia. He then spent five years in a Wall street banking house, after which he was for two years assistant manager of the factory of the Otis Elevator Company. These two positions gave him an unusually fine experience in both business and mechanical lines. Mr. Carson is happily married, a royal entertainer, and a member of several New York clubs.

William Tiffany, treasurer, was born in Newport, Rhode Island, in 1868. After finishing school in this country he went abroad, where he attended a German university, after which he spent a year in a banking house in Stuttgart, Germany. Upon returning to this country he decided to make his fortune in the far west, and spent several years in running a ranch in Washington territory, after which he returned to New York and became actively interested in the Sterling Supply & Manufacturing Company.

The traveling representatives are widely and favorably known to the street railway fraternity through their long connection with the Lewis & Fowler Company. They are Frank A. Morrell and Lewis E. Robert. The general steam and railway supply department is represented by J. A. MacDonald.





The Western Electric Company has secured the services of A. McNab Little as traveling salesman.

J. G. White & Co. have received the contract for extensions of the City Passenger Railway in northeast Baltimore.

The Detroit Construction Company has obtained the contract for the overhead work and the Carnegie Company for the rails for the Dayton & Eaton Electric Railway, Dayton, O.

The John A. Roebling's Sons Company of Trenton, N. J., has been awarded the contract to supply the Capital Traction Company of Washington with 1,000,000 ft. of cable wire valued at \$214,000.

The Western Electric Company of Chicago has adapted its long burning arc lamp for a 550-volt circuit, five being used in series. This lamp is well suited for illuminating car barns, power stations and shops.

The Railway Street Car Indicator Company has been incorporated at Edenton, N. C., to manufacture station indicators. Capital stock, \$100,000; incorporators, H. Q. Donnan, W. G. Summerell and B. E. Byrd.

The New York office of the Pearson Jack Company is now located at 245 Broadway, and is in charge of G. M. Brown, who will be glad to see his friends there. The head office will hereafter be at 64 Federal street, Boston, Mass.

G. W. Chance, railway engineer, has opened a new office in Philadelphia at 915 Rothschild building, 14 South Broad street. Mr. Chance has sent out a pamphlet giving a discussion on "Electric Railways" and some interesting estimates on cost of construction and equipments.

The Third Rail Electric Railway Appliance Company has been incorporated at Jersey City, N. J., to operate extensively in the vicinity of that city. The capital stock is \$1,000,000, and the incorporators are Postmaster Robert S. Jordan, Charles N. King and Nelson R. Vanderhoof.

Field & Co., of New York, have received the contract to build the new electric road at Port Jervis, N. Y. The officers of the Port Jervis Electric Railroad Company are Martin B. Waller, president, George N. McKibbin, vice-president, C. J. Field, treasurer, and H. J. Cox, secretary.

Forsyth Brothers & Co., who were the originators of the anti-friction roller tip curtain fixture and hold the foundation patent of a rocking or tilting head having friction surfaces of diverse holding power, have recently established agencies in Montreal and New York, and are also represented in London.

The Westinghouse Electric & Manufacturing is circulating a pamphlet on "Automatic Circuit Breakers." These are for voltages not exceeding 750 and range in capacity

from 15 to 2,000 amperes. There is a good description of the apparatus with illustrations and tables giving dimensions and connections.

The Citizens' road of Indianapolis, on October 30, closed contracts with the Consolidated Car-Heating Company of Albany, N. Y., for electrical heating equipments for 100 cars. W. P. Cosper of Chicago, made the sale. We are advised that this makes a total of 300 equipments placed by Mr. Cosper within the last 60 days.

The Sprague Electric Company has been incorporated at Watessing, N. J., to install the system of Frank J. Sprague for using electricity on elevated, suburban and branch steam roads. The company will also take over the property of the Sprague Electric Elevator Company at Watessing. The capital stock is \$5,000,000 and the largest stockholders are J. Pierpont Morgan and John W. Mackay. Albert B. Chandler will be president and managing director.

The two Siemens & Halske generators installed in the power plant of the new Lorain & Cleveland road are doing excellent work. These machines are their 400-k. w. type and run at 80 r. p. m. At no load the voltage is 630 and at full load 700 volts. They are direct connected to C. & G. Cooper compound condensing Corliss engines. Stirling boilers are used. The entire equipment of the station is high grade, the aim of the builders being to make it a strictly model plant.

In order to insure prompt delivery which is an important item to the electric trade, A. O. Schoonmaker, mica dealer and importer of New York, has placed a stock of his well known India and "amber" mica with his agents: John Child, Monadnock building, Chicago; Hayes & Arthur, Cuyahoga building, Cleveland; Central Union Brass Company, St. Louis, and Reger & Atwater, San Francisco. Orders sent to these parties will receive prompt attention and be filled at the best prices.

The Westinghouse Electric & Manufacturing Company has lately distributed catalogs, describing new alternating current apparatus, especially that used for high voltages. Railway motors No. 49 and No. 38 B, designed for interurban or heavy electric traction, are described and the principal dimensions given. All these circulars are handsomely illustrated and are of uniform size, so that they may be bound and preserved as they are issued from time to time.

The Q. & C. Company of Chicago, has issued a catalog describing and illustrating the Bryant cold metal sawing machines. These saws have met with great favor and are in use in many of the shops of the principal street railway companies, among them being the Chicago City Railway, the Brooklyn Heights Railway, the Manhattan Elevated, the Toronto Street Railway and the West End of Boston. The saws are made in many forms, namely, the portable rail saw, shop saws, circular saws mounted for different purposes, either belt or motor driven; views are also shown of machine grinders for these saws.

The Buckeye Engine Company of Salem, O., reports that the orders which it has booked will necessitate working overtime, the capacity of the works being crowded. Among

recent sales we note the following: Union Iron & Steel Company, Youngstown, one 17½ and 35 x 36-in. and two 15½ and 30½ x 33-in. tandem compounds; Sumter (S. C.) Electric Lighting Company, one 16 x 32-in.; New York Floating Elevator Company, two 20 x 18-in.; Goodnow Building, Detroit, one 13 x 24-in.; Diamond Rubber Company, Akron, O., one 8½ x 12-in. vertical and one 14½ and 26½ x 33-in. tandem compound; Diamond Match Company, Barberton, O., one 6½ x 12-in. and one 14½ x 24-in. for the factory at Rio Janeiro, Brazil; Thomas Potter Sons & Co., Philadelphia, one 13 x 21-in.; Chesapeake & Ohio Elevator Company, Newport News, Va., one 18¾ x 30-in.; Concord (N. H.) Land and Water Power Company, one 17½ and 30½ x 18-in. cross compound; United Brethren Publishing House, Dayton, O., one 16½ x 18-in.; Gibson House, Cincinnati, one 10 x 14-in. and two 13 x 16-in. direct connected engines; Greenfield (Mass.) Electric Light & Power Company, one 14½ and 25 x 24-in. cross-compound; Hamilton & Co., West Newton, Pa., one 11 x 18-in.; Ohio Valley Electric Company, Bellevue, Pa., two 14½ and 25 x 18-in. direct connected tandem compounds.

During the last month business has been brisk with the McGuire Manufacturing Company. It has delivered a part of the order for trucks recently received from the Consolidated Traction Company of Pittsburgh, and has also secured an additional order for 52 more trucks for this same road. It has delivered about one-third of the equipment for the "Alley L" road, which is now being equipped with electricity. Six cars, which have already been fitted with these trucks, have been run experimentally on the "Alley L" and on the Metropolitan, and have been found to meet the requirements for elevated service in a most satisfactory way. In addition to this the company has built a large number of combined snow plows and sweepers, among them sweepers for the Chicago City Railway, North Hudson County Electric Railway, New York & Queen's County Railway, Camden & Suburban Railway, Suburban Railroad, Chicago & Englewood Railway, and others; and the sweeper trade promises to surpass that of any previous year. The "New Columbia" stove has also proved to be a wonderful seller. In nearly every case where samples have been sent out or shown orders have been received. The magazine and other features of convenience of this stove, together with its great capacity and high ornamentation, render it very popular. Large numbers of the popular "Columbia" heater, which has been so extensively used, are also being shipped this year. A new feature is the manufacture of double key-seating machines for cutting key-ways on two axles at the same time. These are used in the factory and have been supplied to many of the car manufacturing companies, among them the Terre Haute Car Company and Jones & Laughlin. The company is also overhauling a large number of the very early types of street railway trucks of 1890, making them into the latest and most improved types, embodying the three-quarter elliptic spring and suspension features of the improved "A1" truck.

County ownership of a proposed trolley line between Elizabeth and Plainfield, N. J., is advocated by citizens of Union county, who met recently at Elizabeth and perfected an organization to effect their object. Senator Vail of Rahway is president and Lewis Quinn of Elizabeth secretary.

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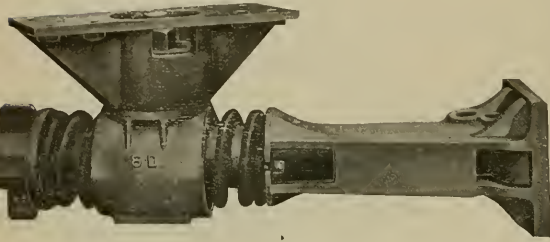
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## VAN DORN'S LATEST.

The accompanying cut represents Van Dorn's latest improved automatic coupling No. 8 for heavy traffic. This coupling and attachment was applied to the electric motor cars of the Waterloo Underground Railroad of London, England.

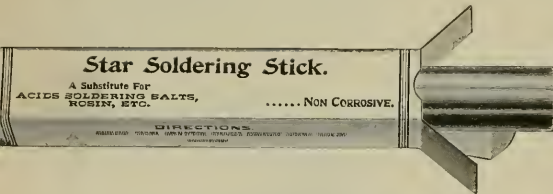
Mr. Van Dorn claims that this is the most simple and com-



compact coupling that has ever been placed on the market, and is superior to anything else ever constructed, for any class of service where they want a solid train. A slight modification can readily be applied to any class of cars and will be the leading coupling on all roads where they intend making great speed.

## STAR SOLDERING STICK.

The Western Electric Company of Chicago, has just introduced a soldering stick which is intended to obviate the dangers of poorly soldered joints. It is composed of carefully prepared and pure chemicals which are non-corrosive and at



the same time make a very superior flux for soldering. The wire is well cleansed and the flux enables the solder to unite firmly with the wire. The stick comes in convenient size,  $\frac{7}{8}$  in. diameter and 6 in. long.

## WABASH CHAIR CARS TO STAY.

When the Wabash Company opened its new Chicago-Buffalo line, it took the position that it could not afford to discriminate between the eastern and western lines in the matter of free reclining chair cars, and at once began running these cars on the new line between Chicago and Buffalo and New York. There was a vigorous protest from the eastern competitors of the Wabash against this innovation, but the Wabash officials continued running the cars. Then certain of the eastern lines took the matter up with the Joint Traffic Association with the view of compelling the Wabash to withdraw the through chair car service.

The board of managers has just announced that it has stricken the subject from the docket, thus practically deciding that the Wabash has the right to operate these cars on all portions of its lines.

Herbert W. Smith has accepted the position of manager of the railway department with the Bibber-White Company, and his headquarters will be at 49 Federal street, Boston.

The Creaghead Engineering Company, Cincinnati, has received the contract to supply overhead material for 22 miles of the Springfield & Southwestern Railway, Springfield, Mass.

The Groat Car Fender Company has been incorporated at San Francisco, Cal., with \$500,000 capital stock by Silas Groat of San Luis Obispo, Charles W. Fay, Philip S. Fay, Thomas Mahoney of San Francisco and N. W. Spalding of Oakland.

The Eastern Machinery Company of New Haven, Conn., has published a catalog describing and illustrating its improved friction clutches, clutch pulleys and friction cut-off couplings. This apparatus is built in all sizes, suitable for light and heavy work, and is guaranteed to be made of good material and free from defects in workmanship.

The Richmond Railway & Electric Company has been selling six tickets for 25 cents, the conductors having them for sale. They took this opportunity to do some speculating, turning in tickets instead of cash fares and pocketing the profit. This was not noticed until the conductors became so careless as not to punch the tickets when investigation soon revealed the state of affairs.

The Electrical Exhibition Company has closed a lease for the Madison Square Garden building for the electrical and kindred industries exhibit to be held in May, 1898. The amphitheatre, with arena circles, concert hall, assembly hall and machinery hall in the basement afford a total of over 100,000 sq. ft. of floor space, much more and much better arranged than at the former exhibition.

General Manager Wessels, of the Standard Air-Brake, is a firm believer in doing things promptly. He is always among the very first to secure accommodations at the next convention place. The following letter from Secretary Penington to Mr. Wessels explains itself: "In compliance with your request of the 9th inst. I enclose you herewith bill for twenty-five dollars (\$25) covering two hundred and fifty feet of space at Niagara Falls convention. You have established a record with the Association, as you are the first one to ask for a bill for space. You will get every inch of space allotted to you."

## CALIFORNIA.

Of course you expect to go there this winter. Let me whisper something in your ear. Be sure that the return portion of your ticket reads via the Northern Pacific-Shasta Route.

Then you will see the grandest mountain scenery in the United States, including Mt. Hood and Mt. Rainer, each more than 14,000 feet high, Mt. St. Helens, Mt. Adams and others. You will also be privileged to make side trips into the Kootenai Country, where such wonderful new gold discoveries have been made, and to Yellowstone Park, the Wonderland not only of the United States, but of the World. Park season begins June 1st each year. Close railroad connections made in Union Station, Portland, for Puget Sound cities and the east, via Northern Pacific.

CHAS. S. FEE, General Passenger Agent, St. Paul, Minn.





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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 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.

Entered at the Post Office at Chicago as Second Class Matter.

VOL. 7. DECEMBER 15, 1897. NO. 12

IT is difficult to understand, what, except the very prevalent belief that any corporation is fair game, could lead a farmer to allege that he had suffered actual damage by reason of the building of an electric railway in front of his farm. The advantages are so apparent that the award of 6 cents damages where \$5,000 was claimed in the Wisconsin case, the facts in which are given on another page, will probably excite little surprise. This case is, however, important as a precedent.

WHAT to do with the pleasure resorts in the winter? is a question which a good many managers are asking themselves just now. While the merry-go-rounds and the roller coasters are out of season, and the soda fountains are dry, there are other ways in which, with suitable weather, these parks may be made good revenue earners. The experience of such roads as have taken pains to properly care for the riding which can be worked up by providing good skating, has been that this business can be expanded into large proportions. Smooth ice kept clean, plenty of light, a shelter in which to warm, and where the volume of business warrants, a brass band, all unite to draw large crowds. Young America, and a good many who are not so young, take an interest these days in out of door sports; it is a most encouraging outlook from a physical point of view, and should be encouraged liberally. The manager who has a suitable pond or lake, and will take the trouble to provide a

program of winter sports such as prevailed 25 years ago will find his reward in loaded cars at an hour of the day when otherwise travel would be light, and besides will make himself and his road popular with thousands.

DURING the last political campaign when so much was being said about the scarcity of gold, we referred to the fact that one of the roads in St. Louis, had for years made it a practice to pay its employes in gold. The suggestion is now offered, that those companies which desire to give an object lesson, can do so in no better way than by using gold in filling the pay envelopes each month, where the check system is not employed. At first thought it would seem to involve increased work in the paymaster's office, and probably would for a few weeks until the clerks had become accustomed to its use, but those who have had occasion to handle gold report it is quite as convenient as currency. One thing is certain, if the men were paid in gold month after month they would be convinced that the yellow metal was actual money and not, as most of them now look upon it, a curiosity.

ATTENTION is being drawn to the desirability of operating funeral cars in such cities as the location of cemeteries and electric lines renders such a service practicable. The REVIEW, ever since its start has steadily advocated such a service as highly desirable and appropriate. It furnishes transportation with which carriage service is not to be compared, from point of economy either of money or of time. The drawn curtains of the funeral car enable the occupants to shut out the gaze of a curious public, and in stormy weather the car provides transportation in comfort and without the dangers incident to a long, slow ride in carriages. In all respects it is an advance and improvement on the carriage service and where a special car is reserved for this purpose there can be no objection from a sanitary or sentimental view. The cost for this service as compared with carriages is so very considerably in favor of the car, as to constitute a feature where alone merits endorsement of the funeral car. Of course there are cities where the local conditions are not so favorable, but these are growing less each year as the network of electric lines in each grows to include all parts of the town.

LITTLE is heard in these days of that once great cause for apprehension, electrolysis. Like other things it has had its day and the daily press which formerly devoted columns under the most startling scare heads, to the doom which was about to come upon the world from this new danger, with characteristic consistency never thinks to give a line to setting the public mind right in a matter which has been fully solved; and where it did exist in a few isolated cases, has been corrected. Nevertheless the old scare is raised occasionally, and if there proves to be any foundation for the fear, it need cause no anxiety for it is not only evidence of faulty construction, but involves a waste which no company can afford to continue even if it were not otherwise disposed to remedy it.

In this connection a very interesting fact is developed. One of the best railway electricians in the country discovered what to all appearances is a most pronounced case of electrolysis in a gas pipe in this city, but which at the time he made the excavation was many miles removed from any electric line, and indeed was separated from the nearest line

by a river. It is valuable evidence and convincing, that destruction of water pipes can and does occur without the presence of trolley lines, and the question naturally arises whether the electrolysis in the past which has been discovered since the advent of electric lines was due to them to any such extent as has been supposed. While there were in the early days unmistakable cases traced to these lines, it is not unlikely that natural earth currents and acids in the soil largely contributed to the results in many cases, which were discovered by reason of the construction of electric railway lines.

A NOVEL arrangement has been in operation in Denver during the past three months, which has proved very popular and successful, and is a scheme which might be copied with advantage in many other cities. One of the roads leased a large observation car to local parties, who obtained the privilege of using the tracks of the several companies. This car makes one trip in the morning and another in the afternoon, picking up its load at the leading hotels, and a complete detour of the city is made. In this way for a nominal sum the thousands of tourists who visit Denver are taken to all the points of interest, and the guide in charge explains everything as the trip is made. The company is sure of a stated revenue in rental, the city profits by being seen, and strangers do not miss some of the best sights as is likely when they try to pilot themselves about.

CLEVELAND has become one of the principal centers for electric interurbans in the country, and the advantages both to country residents for 30 miles in all directions, and the business interests of the city, are already well established. There has been a growing demand for the transportation of freight in addition to the excellent passenger and mail service rendered, and the several lines are making preparations to take care of this new department. The steam roads running into Cleveland threaten to take steps with a view to blocking this additional drain on their revenues, and announce proceedings will be taken to have the transportation of freight within the city limits declared a violation of franchises. It is doubtful if they can succeed in this movement, and even if they do, the public demand for the service will surely compel the city council to adopt such a general ordinance as will specifically provide for freight transportation. There can be no more objection to freight being drawn through the streets, enclosed in neat cars, than to the teaming of the same merchandise in wagons; and the wear upon the streets is saved by the rail transportation.

WE chronicle this month two bad accidents; both head-on collisions, and both alike due to heavy fog. The accidents were on suburban lines, where high speeds are in vogue. In each case both motormen were killed. In one a passenger was killed, and on both occasions the passengers were more or less injured. As will be presumed, each line was a single track road. Blame cannot be attached wholly to the car crews; in fact one of the cars was being operated by the superintendent, who was one of the killed. It was an accident that the accident occurred.

That there is a lesson in these disasters no one will try to deny. It does not appear that there was any intentional disregard of orders—only a misunderstanding; and one car one minute ahead of time in passing the turnout. Those to

whom any censure might be due, are beyond the reach of mortal tongue; but even were they here, it could not bring the other dead to life, comfort the fatherless or mend the broken bones.

This is one of the problems which suburban and inter-urban roads must take up and solve at once if they have not already done so in a satisfactory manner. Only a few weeks ago a similar accident occurred just outside this city, and it was only through rare good fortune that none of the injuries were fatal. A system must be provided at once which is absolute. We cannot afford to leave undone anything reasonable which will make a repetition unlikely. Not a moment should be lost; in the meantime let the greatest possible care be used.

THE year closes with greatly improved conditions over twelve months ago, while the outlook is decidedly better. In our pages devoted to trade news will be found the reports of a large number of important concerns, many of which are running full time with a strong list of orders ahead; while others are running night and day and are already behind. Engine builders are particularly busy, and while not all their output is destined for railway power plants, every machine is being bought to put in motion additional wheels of industry, which necessarily means the employment of more men who will once more need the street car in getting to and from their daily work.

\* \* \*

Capital for legitimate railway extensions, and new lines, is becoming more easy to secure, and the indications are for a fine year's business in all departments of railway supplies. A very considerable amount of reconstruction is already determined on for next spring, and this will increase in volume after the annual meetings in January. As an evidence of better earnings we note that many roads are reporting larger earnings for the fall months than for the summer months preceding. As the summer earnings have always been counted on to average up the winter season, the lesson of increased revenues is especially encouraging.

\* \* \*

As a rule we find the manufacturing industries of the west more active than those of the Atlantic states, but this is easily accounted for in the fact that the farmers west of the Mississippi have had a very prosperous season and have been paying off millions of mortgages long past due, and this money is now again seeking investment. That portion of it which cannot be put back on farm mortgages is now turning its attention to other investments, and is being put into new enterprises and operations which have been trying to struggle into existence for several years past.

\* \* \*

The improved condition of the great army of western buyers will soon make itself felt in the demand for eastern manufactured products and in the course of the next few months we should see a general resumption of work in hundreds of eastern factories not yet in operation.

All these various conditions take time to work themselves out, but are sure to come with time; and then the street railway interests of the whole country will feel the benefit in the increased volume of that regular every day traffic which constitutes the bone and sinew of their earnings.

The car builders have not yet regained the activity they formerly enjoyed, but after the first of the year the orders for summer cars for early spring delivery may be counted on, and the probability is that these orders will come in such a rush that resumption in this department will be very rapid. This will naturally lead to better prices for the builders, and companies which know they must enlarge their equipment next year, and can see their way clear to place orders now, will undoubtedly save money by taking advantage of the present prevailing low prices.

\* \* \*

Interurbans will command more attention this year than ever before. The success which has attended the operation of these lines, and their varied possibilities, has been a surprise to the public, and we anticipate the large proportion of new tracks laid in '98 will be for this service. Where the interurbans have come into competition with established steam roads they have been able to divert almost the entire passenger business, and are already cutting into the freight revenues. The frequent service and lower fares possible with electric operation, make competition by steam lines both difficult and expensive. Investors are waking up to a realization that when the difference in cost of construction and freedom from the burdens imposed in cities is considered, the interurbans are by no means less attractive than city lines. Hence the development of these country lines is surely destined to grow into large proportions during the next few years.

#### AMERICAN ASSOCIATION REPORT FOR 1897.

Secretary Penington has mailed his official report of the Niagara Falls convention, an interesting document of 266 pages—the largest ever issued by the American Street Railway Association. It has been brought out with promptness, particularly in view of the difficulties which attended the work this year. The stenographic and other records were for some hours in the Hudson River, having been submerged by the wreck, and it was a matter of no small moment to decipher and study out the blurred and water soaked notes. However they were not sufficiently damaged to make them illegible and the report covers all the doings and discussions of the Association and the people who participated in it.

As usual a steel engraving of the president appears; and this year, by instructions of the executive committee, the portraits of the only secretaries the Association has had in all the 16 years of its existence:—Wm. J. Richardson and T. C. Penington. In addition to the list of delegates and their ladies, the names of exhibitors, and all attending supply men are given, a desirable feature for reference.

#### OFFICIAL REPORT OF ACCOUNTANTS' ASSOCIATION.

The official report of the first annual meeting of the Street Railway Accountants' Association of America, is out and is being mailed to members of that association by Secretary W. B. Brockway, the compiler. The report covers 216 pages of fine type, and contains not only all the papers read before that body at the recent Niagara Falls convention, but a verbatim report of the entire discussion which ensued, and which was not published elsewhere and can

only be obtained in this way. Each copy is numbered and registered and obtainable only by members of the Association. The amount of information of the highest possible value to every company is worth many times the cost of the annual dues which are nominal. Many companies are unable for various reasons to send a representative from the accounting department to the meeting, but no roads in good standing are debarred from becoming members and securing the report for their own use.

The report is highly creditable to both the Association and Secretary Brockway, and has been issued with great promptness, especially in view of the fact that this is the first volume and there was no precedent to guide. Every street railroad in the country ought to be in possession of a copy, and information as to how this can be secured may be had by addressing W. B. Brockway, Secretary Street Railway Accountants' Association of America, Toledo, Ohio.

#### STORE ENTRANCES TO ELEVATED STATIONS.

The Union Loop passes most of the large department stores in Chicago, and it was suggested at an early date to build passageways from the elevated stations to the second floors of the stores. This met with opposition, as the small dealers thought such an arrangement would give the larger stores undue advantage and one suit it now pending on this question. This did not deter one large mercantile firm from connecting its sales rooms with an elevated station on



BRIDGE TO UNION LOOP, CHICAGO.

Wabash avenue. The bridge is 33 ft. long and 6 ft. wide, and made of steel and glass. The two steel girders supporting the structure are securely attached to the building, but the opposite ends rest on rollers to provide for the vibrations of the elevated tracks. As seen in the illustration there are eight large plate glass windows on each side and the roof is of glass. The wainscoting and doors are of mahogany. Above the the windows inside and out are rows of incandescent lamps. The steel work is all decorative and painted white, giving the bridge a handsome appearance.



## THE DETROIT COLLISION.

On December 4, about 1 o'clock in the afternoon, two cars on the Detroit & Oakland Electric collided, head on, near Pontiac. The accident occurred at the bottom of two hills, down which the cars were moving at high speed, in the attempt to recover lost time; the situation was rendered worse by icy rails. A heavy fog prevented the motormen from seeing more than a few rods. The superintendent, John Savage, who was operating one car, the motorman of the other car, and one passenger who saw the danger and stepped into the vestibule to warn the two men were killed. Of 42 passengers, 22 were more or less injured, and the cars which were new 40-ft. double truck, were reduced to



JOHN SAVAGE.

fragments—a total wreck. The dead were frightfully mutilated, Superintendent Savage having both legs completely severed from his body.

The sleet which had been falling all day, had thrown the system out of schedule, on account of the extra time consumed in making stops and starts, and it was in the effort to restore regular running time that the superintendent boarded the wrecked car. As he often did when on a car, he relieved the motorman, who stood beside him, and was nearly killed. The company did everything in its power in caring for the dead and injured, which it did promptly and regardless of expense.

In this connection it is proper to call attention to the fact that the presence of the vestibules made it impossible for men inclosed therein, to escape, although it was evident that two of them made a desperate effort to do so, after current was cut off, and succeeded in getting part way through the window.

John Savage, the dead superintendent, had been engaged in railway work in Detroit for the past 16 years, and was very highly thought of by both officials and the men. He had held his present position one year. He was 38 years of age, and leaves a wife and five children.

## STREET RAILWAY MAIL SERVICE.

The report of the general superintendent of the railway mail service just issued for the fiscal year ending June 30, 1897, shows a gratifying increase in the use of street railways, though the superintendent expresses himself as doubtful whether this class of service can be made to accomplish what was hoped of it when the system was inaugurated and says:

"The runs are as a rule too short to admit of the distribution of any great quantity of mail either way. It was hoped that on outward trips from the main office or depots we would be able to distribute the mail for carriers, so that upon arrival at the several branch offices the mail would be arranged in such shape that the carriers might start immediately upon their runs, and that on inward trips the mail taken from the branches or collectors might be distributed and pouched to outgoing trains, and thus avoid delay in the main office. We do indeed accomplish a great deal in that direction, but lack of time, as already referred to, and lack of facilities on account of the

limited space obtainable, has prevented us from accomplishing all we wished to do. I am still of the opinion, however, that the service is worth all it costs, and that it would be a step backward to abandon it. By arranging matters so that collectors can connect with the postal cars on street-car lines, considerable time can be saved by having the mail properly sorted up, canceled, and distributed in part before arrival at the main office or railroad station. More to this end could be accomplished, probably, if what might be strictly called the city service were placed in charge of the postmaster or superintendent of mails in the postoffice than if retained, as at present, under the jurisdiction of the railway mail service. It is all performed within the territory covered by the delivery of the postoffice, and does a class of work for the proper performance of which the people have always been accustomed to look to the postmaster. It is so closely in touch with the collection and carrier service, and its successful operation depends so much upon its relations with these branches, that in my judgment it could accomplish the greatest good if placed under the same control.

"There are, of course, a number of electric lines throughout the country which perform the same service practically as a regular railroad line, running, as they do, beyond the limits of any one city, and supplying a number of independent offices. Such service should, of course, be controlled by the railway mail service, but the lines running entirely within the limits of a city can be handled more harmoniously and satisfactorily, I think, through the local office.

"If this change is made, these cars should, of course, be manned by clerks from the postoffices and not by railway postal clerks, as is the case to a great extent at present; and such clerks should be taken up on the postoffice rolls, as an offset for the postoffice clerks on railroad lines working city mails, who can be taken up on the railway mail service rolls, as suggested in a preceding section of this report.

"I merely suggest these changes for your consideration. If, in your judgment, this service should still be controlled from this office, I assure you it will be my constant effort to promote its efficiency and extend its usefulness."

The statistics for the year ending June 30, and those for the previous year, are given below:

### STREET RAILWAY POSTAL CAR SERVICE.

|                                                     |         |           |
|-----------------------------------------------------|---------|-----------|
|                                                     | 1896.   | 1897.     |
| Number of routes.....                               | 21      | 33        |
| Miles of routes.....                                | 198.58  | 303.68    |
| Number of cars.....                                 | 45      | 65        |
| Number of round trips with clerks per day.....      | 195½    | 343       |
| Annual miles of service with clerks.....            | 907,863 | 1,619,820 |
| Estimated pieces of mail handled daily.....         | 505,481 | 593,860   |
| Average number of closed pouches handled daily..... | 398     | 568       |
| Number of crews.....                                | 60      | 87        |
| Number of clerks appointed to lines.....            | 75      | 102       |

### CLOSED POUCH SERVICE ON STREET RAILWAYS HAVING NO POSTAL CARS.

|                              |           |           |
|------------------------------|-----------|-----------|
|                              | 1896.     | 1897.     |
| Number of routes.....        | 126       | 146       |
| Miles of routes.....         | 726.84    | 798.24    |
| Annual mileage.....          | 1,986,838 | 2,368,786 |
| Pouches handled per day..... | 1,924     | 2,485     |

On December 1 the street car postal business in that division comprising the North Atlantic states and the peninsula of Maryland and Virginia was placed under the charge of postmasters in the several cities where such service exists. Four large cities are included in the division, New York, Philadelphia, Brooklyn and Rochester.

## CONNECTICUT STATE ASSOCIATION.

The Connecticut Street Railway Association meets January 12, at the office of the Fair Haven & Westville Street Railway in New Haven.

An interurban to connect Morris, Ill., with Lake Geneva, Wis., has been incorporated.



As the year draws to a close we pause for a look backwards to observe the progress made and to compare our present condition and future prospect with those obtaining a year ago. At that time the country had just emerged from one of the most bitter and hardly fought political contests in its history, and business was completely prostrated. The situation during the latter part of 1896 was the worst ever known and yet we were all thankful at the end of the year that we had escaped a great calamity. The business done this year was on the whole satisfactory though it was disappointing to many, but because of low prices and small profits, for the volume was fairly good. The immediate future apparently holds no such frightful nightmare as we experienced in 1896 and the prospects are bright.

In reviewing the year in the field of street railroading we first turn to the

## ELECTRICAL PROGRESS

The past year has witnessed advancement in every branch of electrical industry, although no remarkable discoveries or developments have been made. The latest and perhaps the most far-reaching electrical innovation is Edison's method of electro-magnetic separation of iron from low grade ores. Great advancement has been made in the utilization of water powers, and once more the water fall seems destined to regain its lost prestige as a source of power. The adaptation of the dynamo and the motor for such service has made this possible, and what is of equal importance—improvements in the transformers and line materials have permitted very high voltages and the transmission of current for long distances. America is in the lead in this work, for already 70,000 h. p. is available for manufacturing, light and the operation of street cars, and plans are complete for developing several times as much more. Niagara has attracted the attention of the whole world this year, not on account of its natural grandeur but for its power facilities. Not only the street cars of Niagara Falls and Buffalo receive current from water power, but the past year has witnessed the application of such power to the railway lines of Minneapolis, St. Paul, Salt Lake City, Ogden, Tampa, Fla., Sacramento and other cities in California.

In street railway appliances the advancement has been made along lines already laid out. The generators built are larger and a little more efficient, but are the same type of multipolar 500 to 600-volt machines. The motors have increased largely in capacity, but without a corresponding increase in weight. The cars are larger and more elegant in all their appointments. The universal use of the bicycle for pleasure and business made noticeable reductions in the receipts, but even this has been turned to profit. Bicycle

racks have found wide application, and in some cities have proved quite profitable. With many companies the carrying of U. S. mail is now a factor. This can be done with little inconvenience and greatly facilitates the collection and distribution of mail. The street railway companies do not receive sufficient compensation for this service, but it has become indispensable and will receive its due reward in time.

## NEW ROADS

Nearly every city in the United States has an electric railway system, yet during the past year the increase in trackage has been no less than 1,635 miles. The actual increase has not been so great as this, as the mileage of cable lines has been decreased by 60 miles and the horse lines by 272. The greatest activity in railway building has been in the eastern states, 611 miles having been added. Illinois is the banner state, the past year showing an increase of 236 miles; but Massachusetts and Pennsylvania closely follow with 230 and 207 miles respectively. In New York 2,086 miles of street railways are in operation and in the United States, 15,718 miles. The increase has been chiefly due to the building of suburban branches as feeders to the city lines, and interurban lines.

The completion of the Union Loop in Chicago is an interesting and important event in elevated work. The trains of one steam and two electric roads now use the structure, and the Northwestern Elevated, on completion, will run over the same tracks as the Lake Street. There is very short headway during rush hours, and there are few if any railways which accommodate such heavy traffic. Since the loop was opened there has been an increase in the traffic of all the roads, being at the present time over two-thirds on the Metropolitan and South Side roads with a fair increase on the Lake Street.

The extensive conduit system, now building in New York by the Metropolitan Street Railway Company, will be the largest and most costly in the world. The previous experiments on the Lenox avenue line convinces the management of the practicability of the system. The disastrous fire in the power station of the Capital Traction Company of Washington, gave the opportunity to convert that system from cable to electric conduit, which is now being done.

Several extensive interurbans are planned, notably one from Cleveland south through the principal cities of Ohio, one from Detroit to Port Huron and one from Indianapolis through cities in the gas belt.

These long lines have produced some interesting problems in transmission; the "booster," the "special generator," the "three-wire," and the alternating current systems have been tried, but what is the best method is not yet fully determined.

Many interurbans are resulting from the combination of two street railway companies in neighboring towns and the building of a connecting track. In many cases, where one or the other of the power stations is favorably located, it can furnish current for both systems with a considerable saving in power house operation. This method is recommending itself wherever applicable, for many of the smaller roads are not on a paying basis on account of the burden of cost of management, lack of facilities for repairs and high cost of generating current.

## IN FOREIGN LANDS

Although the total mileage of electric tramways in foreign lands does not equal the past year's increase in the United States, yet there has been much comment about the awakening interest in traction affairs. America is the acknowledged authority on this subject and the experience of this country has been drawn upon in the construction of the various tramway lines in Europe. In Great Britain the railway systems of Bristol, Cork, Dublin, Brighton and the Central London have been equipped in whole or in part with apparatus of American make. One of the principal street railway companies of St. Petersburg has abandoned horses for the trolley. Berlin will soon open a combined elevated and underground railway with electricity as motive power. Barcelona and Madrid are initiating electric systems, and there is activity both in promoting and building street railways in France and Germany. This progress is by no means confined to Europe. In Kioto, Japan, electric cars are running and the government officials in Tokio will soon be enabled to take an electric car in place of the old horse cars. An American tourist starting for the pyramids will take a car in Cairo, transfer at the Kaser-el-Nil bridge across the Nile, and ride seven miles on a trolley car to the historic Sphinx. Electric traction has been very successful this year in Bangkok, Siam, where so large a portion of the population lives in house-boats on the river. The trolley system in Alexandria has been open for traffic during the past month.

## TRACK CONSTRUCTION

During 1897 by far the greater portion of the track work has been reconstruction. There has been more attention than ever before given to the effort to secure a permanent way deserving of the name. There were no "wild-cat" roads, the kind made to sell, built this year, the hard times having driven their promoters to the wall, and the smaller companies, for the most part have preferred to await a more favorable opportunity for all work that could be postponed; so the work done has been by the larger companies.

The fact that here, as elsewhere, true economy consists in buying the best, where financial conditions make it possible, is realized to a greater extent than ever before, and the policy will bring its own reward. The increased investment necessary will be offset by the decreased consumption of power, the decrease in the cost of repairs and maintenance both of the rolling stock and track, and finally in an increased value of the bonds. Another influence which has, perhaps,

in cities, had much to do with bettering the track construction, is the laying of better street pavements. This has forced a more permanent track construction, and has been, on account of this expense and the cost of the paving itself, a heavy burden on the railways—in some instances more than they could bear.

In construction details there is still to be noted an increase in the weight of the rails used; the West End, Boston, laid over 6,000 tons of 95-lb. rails in reconstruction; the Metropolitan, Kansas City, used 103-lb. rails in the new work done by it, and the Metropolitan, New York, adopted a 106-lb. girder rail as standard and is using it in relaying the 50 miles of track to be operated by the underground conduit system. In Denver, the Consolidated Tramway Company has, during the past year relaid a number of its most important lines.

Further experience in concrete work without ties shows it to be substantial and economical, and each year finds roads using trench work. There is also an increased tendency to the use of T-rails in paved streets, and where the municipal authorities can be persuaded to permit them, they have given satisfaction.

The joint problem continues to receive much consideration both from mechanical and electrical standpoints. The greatest care is given to the bonding originally and to its maintenance afterwards, and the systematic testing of the track joints continues to become more important.

## THE OUTLOOK FOR '98

It is generally believed in street railway circles that this coming year will be a period of great progress. Nearly all railway interests are on a sound financial basis under conservative management, for it has been the "survival of the fittest" during the years of financial depression, and the weaker ones have long since reached the receiver's hands. Such a strict economical policy has been pursued that, with most companies, any increase in traffic will demand new equipment. Numerous large orders late in the summer and fall indicate a prosperous season in '98, for car builders and supply dealers.

A very gratifying feature of the trade is the large export business. Foreign prejudice against the trolley is rapidly declining, the reports of the tramway committees of Birmingham, Douglas, Glasgow and elsewhere being of great educational effect, as electric traction has been unanimously endorsed. American engineers and agents have been called upon in building and equipping the new lines. Birmingham has selected an able Canadian manager to take charge of the tramways there. The most prominent railway engineer in France is a young American who is interested in street railway projects in more than 30 cities.

It is hard to believe that Europe with its 300,000,000 population will long be content with 1,000 miles of electric lines. The dawn of railway enterprise is just breaking in the Old World, and the Americans should be the most favored by it. Selling agents are in all of the chief European countries and the latest statements from the Bureau of Statistics indicate that their most sanguine expectations are being realized. During the first half of the year over \$2,000,000 worth of electrical machinery was exported, England being our largest customer.



In some departments of street railway work the application of present methods seems to have reached a limit, and 1898 promises some interesting developments. A substation of storage batteries has proven a success for one of the long lines of the Union Traction Company in Philadelphia, and the Buffalo Railway has announced its intention of putting in a very large plant of accumulators in its central station. The storage battery cars on the Englewood & Chicago have been in operation nearly a year and a good service maintained. The operators claim the station runs at good economy, and that the batteries have not shown any inherent weakness; a statement of the operating expenses alone will reveal the success or failure of this experiment. One or two magnetic contact systems have been put on the market this year, the General Electric Company having perfected one.

The South Side Elevated Company of Chicago has commenced the substitution of electricity for steam. The Sprague system is novel in many details and a practical test will be watched with interest. The success of electric traction on the N. Y., N. H. & H. R. R. has influenced many railway engineers to make a close study of the problem. The Long Island Railroad Company announces it will build a tunnel under East river and equip its suburban lines for electric traction. The number of suburban trains of this company is about 600 daily and such service is eminently fitted for the application of electricity.

The subject of electric locomotives for terminal work is engaging attention; the railroads entering Boston have already let contracts for such service there, and a similar service will undoubtedly be decided on soon for the Union Depot at St. Louis and the bridge tunnel.

Compressed air for railway work attracted a great deal of attention during the first half of the year. Three motors which were placed in service on 125th street, New York, completed a year's operation on August 2. The daily papers gave their heartiest support to the enterprise and the notices were widely copied throughout the country. The system, however, has not yet commended itself to the street railway fraternity, and we have not been advised of its adoption by any road as a result of the demonstration. The American Street Railway Association appointed no committee to report on the subject, nor was it a general subject of discussion either upon the floor of the convention or among members outside of business sessions. Compressed air, evidently, has a long road yet to travel before it reaches the point of displacing present mechanical motive powers.

Now that so many of the immediately pressing improvements in apparatus have been successfully worked out, the manager is turning his attention, as he could not do a few years ago, to a more careful study of economies in operation. He knows that his machinery and motors can be absolutely depended upon for faithful performance, and he is now taking up what were formerly considered matters of less importance, but which now combine to make a quite significant figure in the ledger balance. Leakages of the most trivial character are being ferreted out and stopped, without any impairment in the service. This feature will characterize one of the most important efforts of the coming two years. The organization of the Street Railway Accountants' Association is especially timely and is destined to greatly assist the operating department in this desirable work; in fact, a large proportion of the savings are only

possible through an intelligent division of general expense accounts.

The pleasure resort has become a permanent institution with a very large number of roads. As a rule there is less attempt to present the high priced attractions which were found too expensive, and instead a more varied, but to the general public quite as satisfactory, program has been selected.

Some interest was aroused early in the year through the promises of the gas engine men of the improvements in their machines which were to make gas engines desirable for railway power stations. But little progress has been made, however, and the year closes with the gas engine no more of a factor than it was in January. Experiments are still making, and we are promised a surprise before another New Years.

### OVERHEAD CONSTRUCTION AT BASLE.

An electric railway connecting the two railroad stations in Basle, Switzerland, has been so successful in its operation since its opening in May, 1895, that several extensions are to be made. The streets of Basle are crooked and very narrow, which necessitated some important alterations from standard construction. The gauge is about 39 in. and the distance between centers of double track is only 8 ft. 6 in. Span wire construction is employed, but the wires are gen-



STREET IN BASLE.

erally connected to rosettes attached to the houses on either side of the street. Poles are only planted at corners and at points where the rosettes cannot be used. Although a great part of the road is single track two trolley wires are strung to avoid joints and turnouts. The span wires are at intervals of 115 to 135 ft. and at the Rhine bridge, where a span of 300 ft. is necessary, auxiliary steel cables are strung across to poles at the center of the bridge. The construction work was all done under contract with Siemens & Halske of Berlin. The accompanying illustration, a view in one of the principal streets of Basle, is from the Railway World.

The daily papers have been widely circulating a story that Sioux City, Iowa, was about to purchase, and consolidate and operate the street railways in that place. Investigation shows that there is absolutely no truth in the rumor, although a consolidation of all the lines in the city is highly desirable and ought to be effected.

## THE SPRAGUE SYSTEM ON THE ALLEY L, CHICAGO.

When the tracks of the Union Loop Company were leased in part to the South Side Elevated Railroad Company it was stipulated that the motive power was to be changed from steam to electricity. While investigating the different methods of electric traction the officers of the company were much impressed with the merits of the Sprague system, and the tests carried on at Schenectady proved satisfactory to them. The system has been accepted. The passenger cars of the company are now being altered for the electric service and the five cars, which are fully equipped, are running daily on



FIG. 2.

In the reconstruction, the old trucks have been supplanted by McGuire trucks, each of which carries a G. E. 57 motor of 50 h. p. capacity. At either end of the car the portion of the platform to the right of the door is partitioned off for the motorman's vestibule as shown in Fig. 1. Only the air gage, the engineer's air-brake valve and the contact box of the controller are visible. The vestibule is very cleverly designed, the partitions on either side being doors which can readily be folded back and fastened so as not to obstruct the passageway on that side of the platform. Fig. 2 is a view of the car showing the arrangement of the vestibule.

The hood over one of the platforms has been enclosed, lined with asbestos, and three doors provided so that all parts of the electrical apparatus in this improvised box are accessible from the platform. The controller, which is of the standard K-2 type, is suspended horizontally from the roof of the vestibule. It is connected through a spring coupling and bevel gears to a  $\frac{1}{4}$ -h. p. 500-volt Sprague motor. At



FIG. 1.

the Metropolitan West Side Elevated tracks.

Although the Sprague system has received a great deal of attention, detailed information has been very jealously guarded. The essential feature is that every car is a complete unit and can be operated separately or in unison with any other number. Such a plan gives the greatest flexibility conceivable on a road where the traffic is widely different at different hours of the day. A maximum tractive effort can be secured in this way, as 60 per cent of the weight of each car with passengers rests on the driving wheels. What a valuable feature this is may be determined by the conditions of elevated service.

The first requisite is that an elevated line must give a faster service than the surface lines, or else people will not walk up and down stairs and wait for the trains. The distances between the stations are from 1,000 to 3,000 ft. and the greater part of the schedule time is taken up in accelerating and stopping the train. It is very essential that there be great tractive effort and good brakes. In the morning and evening the passenger carrying capacity must be very much increased and this should be done quickly and conveniently.



FIG. 1-A.

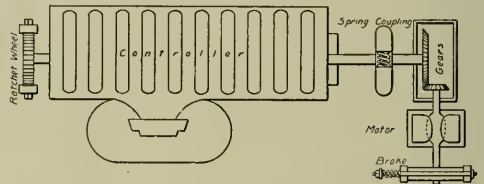


FIG. 3.

the other end of the controller shaft is a ratchet wheel and pawls, as in Fig. 3. The bevel gears are in the ratio of about 1 to 20 and are encased.

The spring coupling is placed in the controller shaft and takes up a portion of the motion and when the pawl reaches the top of a tooth on the ratchet wheel the springs in the coupling act, breaking the controller contact suddenly and preventing the formation of an arc.

At the outer end of the pilot motor shaft is a brake, indicated in Fig. 4. By the motion of the iron core in the solenoid, brake shoes acting on a small pulley are applied or relieved. The brake is always set except when the con-

troller is being rotated. It is very quick in action, stopping the motor within one revolution.

The contact box, or pilot motor control, is located in the vestibule, and its lever is the only part of the electrical apparatus which the motorman handles. The lever can readily be adjusted and taken off just as on an ordinary controller, except that its normal position is vertical. Fastened to the shaft, as in Fig. 5, is a spring which automatically brings the contact lever back to the zero position. Inside the box is a partition of insulating material with copper contacts, as indicated, and between this and the outer iron cover is a spring contact fastened to the shaft. The wires, leading to the relay board, pass from the contact box through a 1-in. pipe.

The reverser and relay, or throttle board, are placed under two of the side seats. The reverser is about 15 in. long, and in form is as shown in Fig. 6. It consists of a wooden cylinder, pivoted at the ends and separated into five divisions. On the cylinder in the middle division is screwed a plate to which are attached two chains extending down on either side to two plungers partially in solenoids, the windings of which are beneath the floor. On the periphery of each of the other divisions are contact pieces. Finger con-

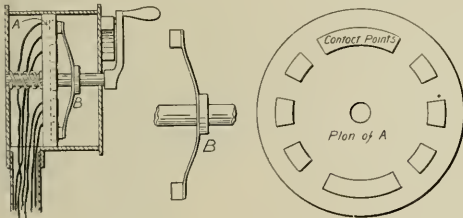


FIG. 5.

tacts, in a vertical position, are fastened to terminals which are in the motor circuits. When the reverser is in a neutral position the circuits are broken. When the car motors are to be started in one direction the solenoid on one side of the reverser is energized, drawing the iron core down and completing the circuit to the motors. The direction of the current can be reversed by the opposite electro-magnet being energized and the reverser rotated in the opposite direction.

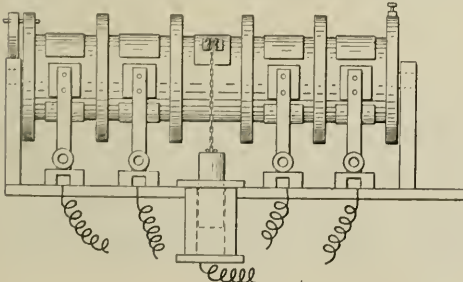


FIG. 6.

The throttle board, Fig. 7, has some important functions to perform. It is put in readiness for operation by closing a five-contact switch to the circuits to the five electro-magnets which govern the circuits to the controller motor. Each solenoid is in an iron case and at the lower end of the

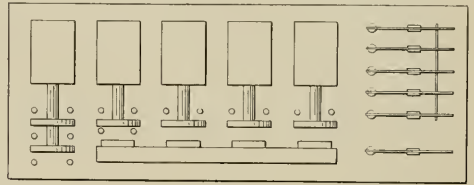


FIG. 7.

plungers are carbon disks, as shown. By the operation of the lever on the contact box the circuits are completed to each solenoid in turn, the plungers being drawn up and the circuits to the pilot motor made by the carbon disks touching the contacts. The different circuits are for contact, series, coasting, series-parallel and parallel connections to the controller. The throttling feature comes from the action of the solenoids when an excessive current passes into the car motors. The weight of the plunger in the solenoid is carefully predetermined and figured for 100 amperes or any other desired maximum current which is to be allowed to pass into the motors. Whenever this maximum current is reached the plunger drops, breaking the contact, and brings the controller back to the zero position, but immediately it is rotated back to the point below which the excessive current passes. In this manner the control of the car motors is taken partially out of the motorman's hands, and whenever an excessive current is flowing the motors are automatically controlled.

Under the car is a 2-h. p., 500-volt motor direct connected to an air compressor. This

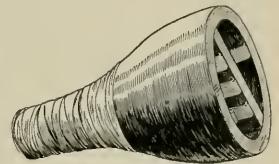


FIG. 8.

motor is automatically started and cut out by a regulator in which a spring acts against the pressure in the air reservoir. In this way the air is kept between two predetermined pressures. The cars are heated and lighted by electricity.

Each car is equipped with a complete set of apparatus and is entirely independent in every function. When two or more cars are in a train the air coupling is made in the usual manner and the only electrical connection is in the five circuits of No. 14 wire which are combined in one insulated coupler as shown in Fig. 8. This coupler is as easily and quickly connected as the air coupler. These five circuits connect the armatures and fields of all the pilot motors in series so that they work in synchronism. If any of them should lag the throttle board prevents the motors of that car from doing an excessive amount of work.

The train of five cars so equipped is operating satisfactorily on the Metropolitan and there is little question but that the system will be a success. The little defects always found in new apparatus are rapidly being remedied and minor changes are being made. Some very desirable results have been attained in this system although this has been accomplished at the sacrifice of simplicity.



At the meeting of the American Institute of Electrical Engineers held in July last, the discussion of Mr. Gerry's paper on "Electric Traction" brought out several remarks concerning the Sprague system.

Dr. Perrine said: "In the first place, Mr. Sprague holds that the simple question of cheapness would not be one which would entitle a heavy road, such as an elevated road, to substitute electricity as its motive power. He makes the statement that if on the elevated railroads of New York a system of power were applied which would lead to the hauling of one more passenger per car, per station, in each train, the added revenue so acquired would amount to more than saving one-half the coal bill as at present used; and, starting from this premise, what is demanded from the application of electricity to steam railroading is not so much cheapness as increased facilities. He attaches much importance to the rapid acceleration of trains, as it has been shown that rapid acceleration reduces the total amount of energy required to move between two stops a certain distance apart; and in order to accomplish this, Mr. Sprague is now attempting to control from one end of the train a series of motors all located on the separate cars; so that not only do we have the track adhesion of our locomotive car, but with any loaded train we have the track adhesion which may be given by the entire weight of the train; and particularly on grades and curves this facilitates the rapid handling of trains. It seems that too much importance cannot be attached to this question of the rapidity of acceleration, for rapid acceleration means not simply the reduction in the amount of power necessary to move a train, but means what is of still greater importance, the facility of getting trains out of the way and permitting new trains to come in. In other words it means the handling of the whole service on shorter headway, and in consequence, a greater possible number of trains, the handling of a definite amount of traffic with a less concentrated load on the structure, and also a more satisfactory service, which will induce increased travel."

President Crocker pointed out that another advantage was that the same headway could be maintained throughout the day by simply reducing the length of trains for periods of light load.

Professor Thomson said: "There is one remark to be made, however, in this connection, that complexity is introduced by having the cars all equipped with motors, and the difficulties of making connections from car to car are greatly increased, of course, in coupling; so that it may become a serious question as to whether we are not paying too much for some of the advantages; whether, in other words, we ought to extend the complexity so far as has been proposed to obtain the advantages which follow, or whether there is not some other way out of it. Each car is possessed of a controller system of its own, and that controller manipulated by some automatic mechanism. Of course this means a great deal of change of mechanism, some of which may get out of order, and a few stoppages might be of more serious import to the success of the road than the disadvantages of having a similar mechanism which did not fulfill so many conditions, although, if the mechanism on one car or two cars does get out of order, the others will carry the train right along, and by this means such a chance is largely reduced."

Press dispatches state that 3-cent fares are to blame for the troubles of the Detroit Electric.

## REPORT OF THE WEST END, BOSTON.

We present below some data from the annual report submitted to the stockholders of the West End Street Railway, of Boston, for the year ending September 30, which speak eloquently for the excellence of the management.

The gross earnings for the year were \$8,719,932 (an increase of 4.5 per cent over the previous year), the operating expenses \$6,213,709 (a decrease of nearly 2 per cent), and the net earnings \$2,505,323 (an increase of 23.6 per cent). Out of the net profits after paying taxes, interest and sinking fund charges, dividends of 8 per cent on preferred and 7.5 per cent on common stock were paid and \$16,793 carried to the surplus.

Two portions of the subway have been opened for traffic, that from the Public Garden to Park street on September 1, and that from Tremont street and Shawmut avenue to Park street on October 1; these portions are at present open from 6 a. m. till 12 midnight; there are 1,790 regular trips run through the subway per day with extra ones as the traffic demands; this gives during the busy hours of the day two to three cars per minute leaving Park street which is a severe tax upon the capacity of the station. The records show that 7 per cent of the passengers carried on the entire system are carried through the subway. Nearly 20 per cent of those taking the cars in the subway do so between the hours of 5 and 6 p. m., and 90 per cent of them at the Park street station.

During the year extensions have been made to four of the existing car houses and two new ones built making space for 355 more cars. The Harvard power house also was built this year.

The number of employes in all departments is 5,095.

The total track operated is 304.5 miles.

Traffic statistics are as follows:

|                                                |              |
|------------------------------------------------|--------------|
| Round trips, passenger cars.....               | 2,055,197    |
| Round trips, U. S. mail cars.....              | 15,454       |
| Revenue miles, passenger cars.....             | 20,450,078   |
| Revenue miles, horse cars.....                 | 335,058      |
| Revenue miles, U. S. mail cars.....            | 166,655      |
| Revenue passengers, electric cars.....         | 171,227,459  |
| Revenue passengers, horse cars.....            | 1,327,054    |
| Total revenue, passengers.....                 | 173,554,513  |
| Free transfer passengers on electric cars..... | 23,777,726   |
| Total passengers.....                          | 196,332,239  |
| Receipts from passengers.....                  | \$ 8,536,285 |
| From U. S. mail cars.....                      | 19,379       |
| Average receipts per revenue passenger.....    | 4.647 cents. |
| Average receipts per total passenger.....      | 4.348 cents. |

The increase in number of revenue passengers over the number carried the previous year is 3.4 per cent and the increase in the free transfer passengers 35.5 per cent.

Contrary to expectation the lease of the West End Street Railway Company by the Boston Elevated Railroad Company has been disapproved by the Massachusetts Railroad Commissioners whose consent was necessary to its validity. The principal reasons given for the decision are two in number: 1. The West End road would be taken out of the special class of railways that are subject at all times to special legislation 2. The term (99 years) is too long and the compensation to the West End (8 per cent on all stock) was too great a burden on the new company.

A new proposition to lease for 25 years, guaranteeing dividends on the common stock at 7 per cent, has been accepted by the West End.

**THE STREET RAILWAY SYSTEM AT NEW CASTLE, PA.**

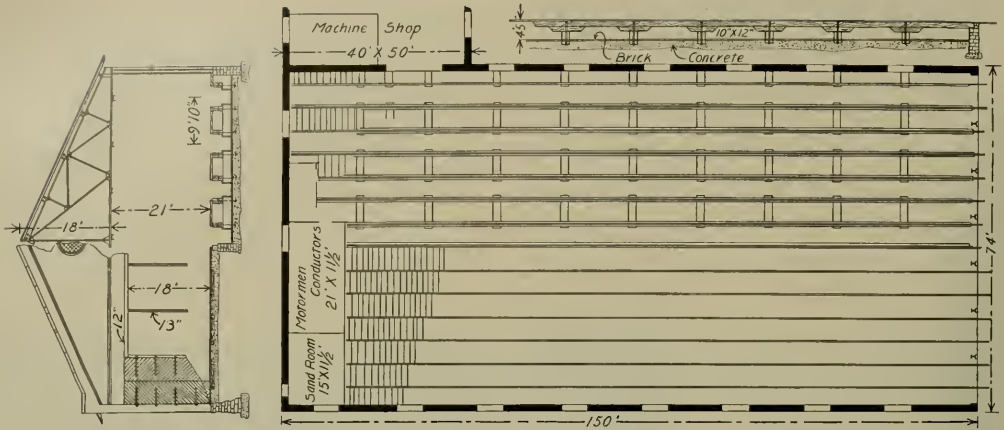
New Castle is a small city of 12,000, its population being chiefly occupied in various iron industries. For some years electric cars have been in operation in the city, but within the past 12 months the service has been improved and a considerable sum of money spent in reconstruction and new equipment. Last spring the company purchased a large tract of land and converted it into a park. Frank M. Blaisdell, a prominent landscape gardner of Boston was engaged, and the views showing the smooth roadways, rustic bridges

and pavilions testify to his quick and careful work. The natural scenery is very beautiful and the splendid water fall gives the resort its name, "Cascade Park."

The railway lines are supplied with current from the station which furnishes the electric power and light for the city. The station was well designed and built under the supervision of Wm. Cummins, superintendent of the New Castle Traction Company. The plan shows the arrangement of the machinery in engine and boiler rooms. There are two batteries of water tubular boilers, one consisting of two 150-h. p. and the other of two 250-h. p. boilers equipped with automatic stokers. The live steam purifier and the



ALONG THE ROAD AND IN THE PARK - NEW CASTLE, PA.



CAR BARN, NEW CASTLE TRACTION COMPANY.

boiler feed pumps are of the latest design. The two engine-dynamos, nearest the boiler room, are for the railway service and consist of two 250-k. w. generators connected direct to two Buckeye cross compound condensing engines. In addition the lighting plant contains four 80-light arc machines, two 75-k. w. and one 125-k. w. alternators, belted to tandem compound condensing engines, built by the Buckeye Engine Company of Salem, O. The switchboard is at the side of the engine room near one end; the wires are all carried to it in conduits under the floor.

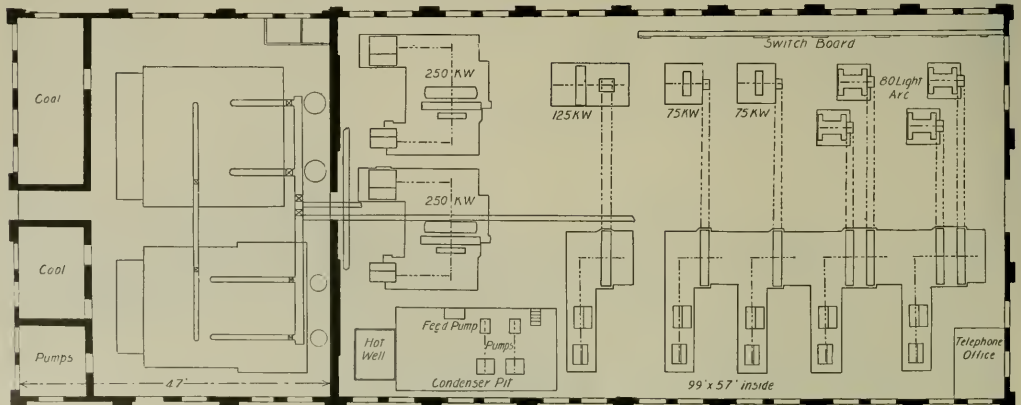
The plan of the car-barn and repair shop shows an arrangement well suited to the needs of such a road. Ample pit room has been provided in order that the cars may be thoroughly examined every night.

This building is of brick, 74 ft. x 150 ft. outside; the roof is iron trussed and covered with slate; the ends of the trusses rest on the tops of 13-in. I-beams built into the walls. In the rear end of the car barn are a sand room 15 ft. x 11 ft. 6 in., a room for conductors and motormen 21 ft. x 11 ft. 6 in., and a lavatory. At one side is an addition 40 ft. x 50 ft. in which is the machine shop. There are seven tracks

in the building aggregating 1,000 ft. in length; four of them are pit tracks. The tracks are 9 ft. 10 in. between centers; in the pit side of the building the rails rest on 10 x 12-in. stringers carried on and anchored to brick piers built at intervals 14 ft. 8½ in. The flooring between the pit tracks and on the other side of the building is of 2-in. oak. The pit itself is floored with brick at the level of 4 ft. 5 in. below the bottom of the track rail. At the front end are seven pairs of double doors hung to the side walls and 13-in. I-beams, and these constitute the front wall. The doors are 18 ft. high; above them the end wall is of brick, resting on two 12-in. I-beams carried on the I-beam posts.

The barn is heated throughout by steam. The repairs are simply of a general nature as the management does not consider it advisable to do any manufacturing. The machine shop is also used for making repairs for the Electric Light & Power Company and the Lawrence Gas Company, both being under the same management as the Traction Company.

In the roadbed construction, blast furnace cinders were used; the cinders have been rolled into a bed 6 in. in thick-



POWER STATION, NEW CASTLE TRACTION COMPANY.



ness. The ties were spaced 2 ft. between centers and concrete filled in between them. There are 16 miles of 80-lb., 60-ft. girder rails in the city, and four miles of 70-lb., T-rails on the private right of way to Cascade Park. The Park line was constructed at great cost in order to keep the grades below 1.5 per cent. One large cut required the removal of 70,000 cu. yds. of material and one fill had to be made 20 ft. high and 900 ft. long. The girder rails and the special work were made by the Johnson Company, and the steam road special work was constructed by the Cleveland Frog &

1,000 ft. are lightning arresters, made by the General Electric Company.

The rolling stock consists of 10 vestibule cars, with 16-ft. bodies, and 20 nine-bench open cars and five 16-ft. vestibule cars, all mounted on McGuire Columbia trucks; a sweeper and a sprinkler. The cars are equipped with Westinghouse 12 A, 30-h. p. motors and G. E. B-3 controllers; electric brakes are attached. The cars are all heated by electricity.

Although this system has not a large population from which to draw patronage, yet every detail of construction



SCENES ON THE LINE OF THE NEW CASTLE TRACTION COMPANY.

Crossing Company. White oak ties 6 x 8 in. x 7 ft., were used. The joints were staggered and bonded with two No. 0, solid copper wires to each joint. The sharpest curve on the road is of 30-ft. radius.

Side pole construction is used; white cedar poles 30 ft. in length, 8 in. top, and 40 ft. long and 7 in. top, being planted according to needs. The trolley wire, No. 0, was furnished by the John A. Roebling Sons Company. The lengths of sections of line range from 4,000 ft. to three miles, depending on the conditions of service. All the lines are independent of the others and each one is connected to a circuit breaker at the station. The feeders tap into their respective lines at the square where all the divisions center and at every fourth pole thereafter. At intervals of about

and equipment is as complete and substantial as may be found in the large cities. The officers of this enterprising company are: R. R. Quay, president; Arthur Kennedy, vice-president; DeWitt Dilworth, secretary and treasurer, and Wm. Cummins, superintendent.

The camera proved a very valuable adjunct in the defense of the Lexington Avenue Railroad Company against a \$25,000 damage suit. Helen Rovatzos, a Greek girl 17 years old, claimed that she received permanent injuries by being thrown from a car on October 10, 1896. Photographs were produced by the defense showing her hanging out clothes and rowing in Central Park. In consequence of this the suit was withdrawn.

# 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.

On the night of September 21 a large frame elevator located 70 ft. distant from the power house of the Toledo Traction Company took fire and burned to the ground. The space between the two buildings was used by the Traction Company for the storage of coal, but by keeping water constantly flowing over the pile it was prevented from igniting. Higher up the heat was intense and the power house was fully exposed, but being of fire-proof construction it was not injured. During the fire the power house was filled with a dense smoke but the operation of the plant was not interrupted. The only loss suffered by the company was a small portion of its dock which it will cost about \$100 to repair.

\* \* \*

During several months past the Franklin Institute has discussed the "smoke nuisance" in an extended manner and proposes to conclude the consideration of this subject at the stated meetings in April and May. Invitations have been extended to the inventors and manufacturers of improved furnaces and automatic stokers to present descriptions of the operation and construction of their devices and the claims of efficiency. This we think is much to be commended as it will place upon record the progress which has been made, and enable one contemplating the installation of a furnace or stoker to find in one place all the available information regarding them.

\* \* \*

The Montreal Street Railway Company has 75 miles of track and operates from 170 to 200 motor cars daily; the cars make about 7,000,000 car-miles per annum and carry 30,000,000 passengers. The speed through the streets is 7½ miles per hour and the service is kept up from 5 a. m. till 2 a. m. G. C. Cunningham, who was formerly manager and chief engineer of the road gives the following data as the average of some three years' operation of the power house:

|                                                    |                   |
|----------------------------------------------------|-------------------|
| Coal consumed per car-mile.....                    | 7lb.              |
| Coal consumed per ton-mile.....                    | 1lb.              |
| Coal consumed per electrical horse power.....      | 2.75lbs.          |
| Power consumed per motor car-mile.....             | 2,000 watt-hours. |
| Power consumed per ton-mile.....                   | 293 "             |
| Resistance to haulage per ton (draw-bar pull)..... | 147lb.            |

\* \* \*

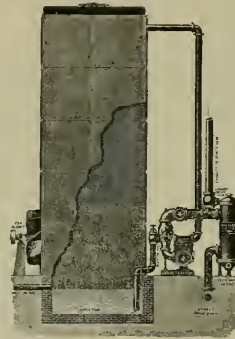
Very few power houses are built these days without some provision for lifting heavy machinery, the traveling crane running the length of the engine and dynamo room being the most generally accepted form of apparatus. Very many substitutes for this can be found however by traveling around among power houses. The Central Railway, at Peoria, has a four legged derrick high enough and large enough to go over any of its generators. This is slid around from place to place over the floor as it is needed. Of course the manipulation of such a huge four legged affair around among the generators and supporting pillars of the room is

rather awkward but it suffices and is better than a temporary derrick, as it is always ready.

\* \* \*

### Some Notes on Cooling Tables and Towers.

The decision of the South Side Elevated Railroad, Chicago, to make use of a tower for cooling the condensing water at



the power station, now building, indicates that the economy of these devices is becoming better appreciated. We have described several such towers in these columns during the last two years and herewith illustrate another, which is known as Barnard's. In common with most cooling towers it occupies but little space and may be placed upon the roof if desired. It is preferably built of steel plate; the upper portion is filled with steel wire mats, galvanized after weaving, through which the

water percolates. The arrangement is very clearly shown in the illustration.

\* \* \*

E. J. Philip, chief engineer of the T. Eaton Company, Toronto, recently gave at the open meeting of an engineer's association the following data regarding a cooling tower for condensing water, built by his company:

The tower is a rectangular structure, 19 ft. high, with a vapor stack on the top 9 ft. in diameter and 26 ft. high, the body of the tower being 10 x 12 ft. It has an 18-in. water space at the bottom and two 5-ft. fans. The filling is 12 ft. long. The distributor is made of pipe, and works very nicely. The tower runs in conjunction with a 500-h. p. surface condenser with combined air and circulating pumps. The condenser has 800 brass tubes 8 ft. long, making over a mile of tubing, with 1,600 stuffing boxes. The water leaving the condenser has a temperature of 120° to 128°; it cools in the tower down to 68° to 80°, according to conditions. It has been cooled down to 10° below the outside atmosphere, and by supplying plenty of air this could be done at any time.

\* \* \*

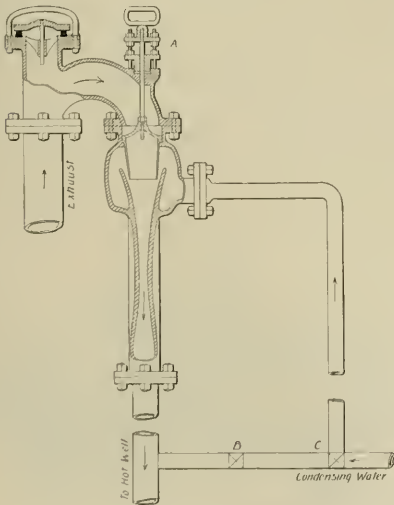
The reservoir and tables for cooling condensing water which are in use at the power station of the Calumet road, Chicago, were illustrated and described in the Review for September 1896, page 546. At this plant the discharge from the condensers is at a temperature of from 110° to 130° and that at the intake from 100° to 108° F. Ever since the con-

struction of the reservoir the boiler feed has been drawn from the this source, being delivered to a Hoppe's feed water heater where the temperature is raised to 208°. In order that the initial temperature might be as high as possible the supply was taken from the condenser discharge pipe, but this method was open to objection because of the feed pumps drawing air.

General Manager Sloan has recently made a slight change in the arrangement of the condenser discharge by which this trouble is cured. A wooden box, 6 ft. square inside and 8 ft. deep, with a partition down the center extending nearly to the bottom was placed at the end of the cooling tables. The discharge from the condensers is into one side of this box, down under the partition and up the other side onto the tables, instead of onto the latter direct as formerly. The intake for the boiler feed is near the bottom of the box on the up-current side; a temperature within a degree or two of that of the discharge is secured at this point; that is, almost as high as was formerly obtained by taking the water from the pipe.

\* \* \*

The Hyde Park Thomson-Houston Company has just completed a cooling tower at its station at 53rd street, Chicago. The present equipment of the station comprises four compound engines with an aggregate capacity of 800 h. p. when running non-condensing, and the addition of another 250-h. p. unit is contemplated. The use of condensers will

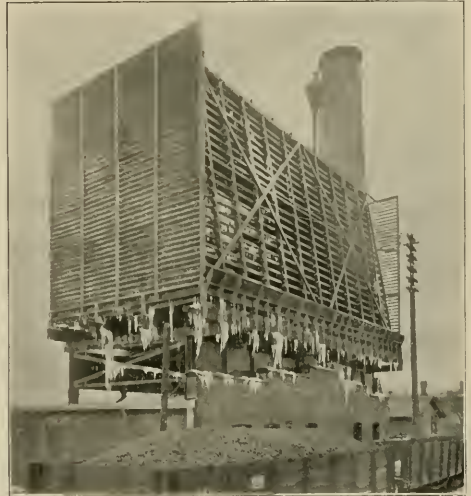


INSPIRATOR JET CONDENSER.

further increase the capacity of the station about 40 per cent, making it ultimately 1,400 h. p. As the station will not be running at its maximum load all the time it was considered that a 1,000-h. p. tower would be sufficiently large.

The tower was erected over the boiler room and is built for the most part of undressed pine lumber, making it comparatively inexpensive. In fact the entire cost of the tower, condensers, piping, tanks, iron work, etc., is probably within

\$6,000, that is \$6 per h. p. The tower rests upon two 48-in. steel girders 50 ft. long, which are supported at the ends on posts consisting of two 8-in. channels with lattice bracing. These posts are placed close to the wall on the interior of the boiler room. On top of the girders, which are suitably braced at the ends, are laid six 12 x 12-in. cross timbers and on top of these four 12 x 12-in. longitudinal timbers. On these are laid the water-tight floor of the tower which slopes slightly and delivers the water to two steel tanks, 9 ft. x 4 ft. 6 in. x 5 ft. 6 in. deep. The tower is in the form of a frustrum of a pyramid 21 x 48 ft. at the base and 13 x 41 ft. at the top and is 20 ft. high. The trays over which the water



COOLING TOWER, HYDE PARK T.-H. COMPANY.

flows are 17 in number and placed 12 in. apart; they consist of 1 x 6 in. rough pine boards laid  $\frac{1}{4}$  in. apart, the cracks being staggered. The total area of the trays is about 15,000 sq. ft. These trays rest on pieces 2 x 4 in., nailed to the posts, which are 4 x 4 in., spaced 4 ft. apart along the sides and ends of the tower. The top or distributing tray differs from the others in that the planks are laid close together; there are a sufficient number of  $\frac{3}{4}$ -in. holes that their combined area equals that of a 10-in. pipe. Around the edges of the trays are strips 3 in. high. The tower is surrounded on three sides by a wind-break 17 ft. high, the top being the same height as the distributing tray, in order that a high wind may not blow the water off of the trays. It is divided into panels of louver work, the slats being inclined inward, however, instead of outward, in order that the vapor may more readily find an exit.

The pipe which delivers the water to the top of the tower is 10 in. in diameter and branches into four 5-in. pipes, in each of which are three  $2\frac{1}{2}$ -in. openings. The main pipe also terminates in a  $2\frac{1}{2}$ -in. opening.

The condensers that have been installed at this station are of the inspirator jet type, or as they are sometimes called water jacket syphon condensers, and were furnished by Wm. Baragwanath & Son, 14 West Division street, Chicago. The



## 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.....                                        | Aug.   | 1,030,308                       | .200                                               | .245  | .040                       | .025   | .031      | .634                                   | 3.5                                       | 1.4                      | 10.5                   | 3.2                                 | \$2.10       | Bituminous. |            |
| 1.....                                        | Sept.  | 1,063,384                       | .302                                               | .200  | .040                       | .030   | .045      | .627                                   | 4.1                                       | 1.0                      | 10.3                   | 2.8                                 | 2.10         | "           |            |
| 2.....                                        | Aug.   | 152,107                         | .560                                               | .360  | .110                       | .....  | .030      | 1.060                                  | 5.32                                      | 8.11                     | 6.11                   | 4.24                                | 2.60         | Bituminous. |            |
| 2.....                                        | Sept.  | 137,105                         | .605                                               | .385  | .033                       | .....  | .....     | 1.023                                  | 6.12                                      | 9.40                     | 6.64                   | 4.21                                | 2.60         | "           |            |
| 3.....                                        | Aug.   | 157,388                         | .600                                               | .366  | .060                       | .....  | .004      | 1.030                                  | 6.5                                       | 10.0                     | .....                  | 5.67                                | 2.38         | "           |            |
| 3.....                                        | Sept.  | 150,178                         | .590                                               | .355  | .080                       | .....  | .017      | 1.063                                  | 8.31                                      | 9.75                     | 8.                     | 5.64                                | 2.38         | "           |            |
| 4.....                                        | Aug.   | 236,320                         | .438                                               | .270  | .049                       | .....  | .003      | .005                                   | .765                                      | 4.3                      | 7.8                    | .....                               | 4.06         | 2.42        | Cumberland |
| 4.....                                        | Sept.  | 230,080                         | .420                                               | .265  | .043                       | .....  | .....     | .003                                   | .748                                      | 4.7                      | 7.5                    | .....                               | 4.04         | 2.42        | "          |
| 5. Metropolitan Elevated, Chicago.            | Aug.   | 933,623                         | .420                                               | 2.24  | .010                       | .....  | .105      | .781                                   | 5.2                                       | 2.0                      | 5.81                   | 3.22                                | .....        | .....       |            |
| 5.....                                        | Sept.  | 933,147                         | .420                                               | 2.20  | .020                       | .....  | .010      | .720                                   | 5.2                                       | 2.0                      | 5.48                   | 3.77                                | .....        | .....       |            |
| 6.....                                        | July.  | 405,930                         | 1.130                                              | .258  | .078                       | .....  | .056      | 1.522                                  | .....                                     | .....                    | .....                  | 2.68                                | .....        | Oil.        |            |
| 6.....                                        | Sept.  | 475,620                         | 1.098                                              | .262  | .065                       | .....  | .058      | 1.483                                  | .....                                     | .....                    | .....                  | 2.76                                | .....        | "           |            |
| 6.....                                        | Aug.   | 473,760                         | 1.024                                              | .249  | .070                       | .....  | .087      | 1.430                                  | .....                                     | .....                    | .....                  | 2.70                                | .....        | "           |            |
| 8.....                                        | Aug.   | 927,389                         | .649                                               | .697  | .056                       | .....  | .064      | 1.625                                  | .....                                     | .....                    | .....                  | .....                               | .....        | Bituminous. |            |
| 8.....                                        | Sept.  | 984,106                         | .446                                               | .493  | .093                       | .....  | .100      | 1.115                                  | .....                                     | .....                    | .....                  | .....                               | .....        | "           |            |
| 9.....                                        | Aug.   | 125,010                         | .417                                               | .277  | .257                       | .....  | .022      | .764                                   | .....                                     | .....                    | .....                  | .....                               | .....        | "           |            |
| 9.....                                        | Sept.  | 160,783                         | .444                                               | .218  | .156                       | .....  | .020      | .855                                   | .....                                     | .....                    | .....                  | .....                               | .....        | "           |            |
| 10. Metropolitan Kansas City, Mo. Central Av. | July.  | 302,825                         | .295                                               | .156  | .017                       | .....  | .007      | .486                                   | 2.36                                      | 2.05                     | .....                  | 4.79                                | 1.20 to 1.40 | Bituminous. |            |
| 10.....                                       | Aug.   | 310,502                         | .280                                               | .147  | .012                       | .....  | .007      | .489                                   | 1.67                                      | 2.00                     | .....                  | 4.61                                | "            | "           |            |
| 10.....                                       | Sept.  | 313,399                         | .235                                               | .148  | .010                       | .....  | .008      | .423                                   | 1.01                                      | 1.01                     | .....                  | 3.80                                | "            | "           |            |

principle on which they operate and the arranging of the piping, etc., will be readily understood from an examination of the sketch, Fig. 2. The exhaust pipes are carried up so that the condenser may be placed 34 ft. above the hot well into which it delivers, this being of course to prevent the water from being carried back into the engine by reason of the vacuum formed. At the top of the exhaust pipe is a relief valve to provide an escape for the exhaust in the event of an accident causing an excessive back pressure. Above the brass nozzle in which the condensation takes place is a gate by which the supply of water is regulated according to the output of the engine; this adjustment is made at A. When starting, the two valves B and C are opened admitting the condensing water, which meets the steam in the lower part of the discharge pipe and forms a partial vacuum; the valve B is then quickly closed, and the water is drawn up through the right hand pipe to the top of the condensing tube.

### A GRADE CROSSING AT COLLEGEVILLE, PA.

The suit of the Perkiomen Railroad Company against the Collegeville (Pa.) Electric Street Railway and the Schuylkill Valley Traction Company to prevent the construction of a grade crossing, was on December 1 decided in the lower court permitting the electric road to cross at grade. The court found that "the topography favors a grade crossing, or rather makes it reasonably impracticable to avoid one." The steam road has only 13 trains per day and as the railroad station, at which nearly all the trains stop, is but 150 ft. from the proposed crossing, they would necessarily move over it at a slow speed. A good view of the tracks can be had from the highway, and a good view of the highway from the railroad tracks. Further, the grade of the highway is already too steep to permit of depressing it so as to run under the tracks, and the expense of avoiding the crossing at grade would be \$15,000, which is as much as the entire road in the borough of Collegeville (about a mile of track) would otherwise cost.

The Schuylkill Valley Traction Company, which built the

road as lessee, laid the track on August 16, though opposed by the steam road with force, and maintained its position until the court came to its rescue and caused a cessation of hostilities; now it has won the suit. While the Collegeville road itself is short it is an important link in the interurban system. General Manager R. M. Douglass is to be congratulated on the successful manner in which he handled the matter.

### IN THE EARLY DAYS.

When the Metropolitan Street Railway Company, of New York, a few weeks since celebrated the completion of its Fourth avenue electric line between Astor place and 42nd street, the new electric cars were accompanied over the route



OLD NEW YORK CAR.

by one of the horse cars used by the predecessors of the company in the early days. One of these vehicles, called by the employes a "bone-shaker," was taken out of its quarters and driven by an employe who drove it nearly 40 years ago. Several members of the Board of Aldermen were guests, but before the trip was finished they had all the enthusiasm shaken out of them.

## A CHAPTER ON BLUNDERS.

No man likes to advertise his own mistakes. They usually cost him something both in money and reputation. If some one could institute a mistake publishing bureau for collecting and publishing the blunders made in the street railway practice, taking always extreme care to conceal the identity of the victims, the industry would be much better off than it is today; for after all information is mostly obtained only by costly experience and mistakes, and the better these blunders are known the less money will be spent the country over in learning. Such a bureau will never be started for the reason hinted at in the first sentence, but rumors come to us constantly of blunders which have been and are being made and which are either too amusing or too full of useful lessons to hide under a bushel.

Our first story is about a mistake made away back in the beginnings of the electric street railway of today by one of the prominent pioneers in the field. The same mistake has been made by hundreds of lesser lights since, and it relates to electric railway return circuits. Said pioneer and his right hand man were standing beside the track near the power house one day when the right hand man averred that there was considerable resistance in the rail joints, and that the simple fish plates did not make very good electrical contact at the rail ends. The chief expressed his contempt for any such opinion and the right hand man, wishing to do a little experimenting on his own account walked over and put one foot on the end of one rail and another foot on the end of the next. This may properly be designated as one of the earliest attempts at rail bonding. But the bond was not very permanent in this case. In fact as soon as contact was established it performed several kinds of gymnastics, partly voluntary, partly involuntary, the main idea being to get out of the circuit as soon as possible. The chief was convinced that he made a mistake in relying on the electrical conductivity of the fish plates.

One of our friends had occasion recently to visit an armature winding room where an elaborate system for testing the coils and all the materials used in armature winding by the use of the high voltage breakdown test has been in use. The system is all right, and properly used will save much money by preventing poor and defective materials and coils from going into the make up of an armature. But in this case it was operated so as to be far from a money saver as the tests were made so severe that about 40 per cent of the finished armature coils broke down under test and were thrown out. That road has a fine large scrap heap of copper wire.

There was much trouble in the shop. Motors were remonstrating at having so much work put upon them and although the work they were doing was much less than that for which they were intended they were offering vigorous protests in the way of burned out armatures and commutator leads hot enough to melt anything but the hardest solder. At last an "expert" was called in, who looked over the ground and finally announced that he had discovered the whole cause of the many trials and tribulations. The "nigger in the wood pile" had been found. The field magnet collars were of malleable iron instead of brass. A grasping manufacturing corporation had been trying to save a few cents in the

manufacture of its motors. Great was the rejoicing from president down that the end of all troubles was in sight. The manager of another neighboring road who happened to have brass field collars on his motors was telephoned to in haste and asked if he could spare a few brass field collars. Said manager replied that he had nothing but malleable iron collars in the store room, but since it didn't make a particle of difference whether the field collars were brass or malleable iron and since his neighbors seemed to want some brass collars so bad, he would, to accommodate them, take some off of motors in service and put on malleable iron so that his neighbors could have the brass. This was done but it hasn't been observed that there has been any recent demand for brass field collars from the road where the great discovery was made.

Some of the most amusing blunders, to American electricians, are the attempts made by foreign manufacturing concerns when entering the electric railway field to use shunt wound generators for railway work. An American engineer who recently visited England was somewhat dumbfounded on entering one of the largest railway plants there to find immense shunt wound bipolar machines doing the work; and he was still more surprised when he learned that an extension to the station was planned on the same lines. It would be putting it mildly to say that the voltage fluctuates on that road. Even worse was the attempt once made by some German engineers to operate a small road from a motor generator in which both motor and generator were shunt wound. To make matters still worse the source of supply was a shunt wound dynamo. The voltage on the trolley varied all the way from 250 to 500.

It is all right, perhaps, sometimes to keep figures as to costs of materials, etc., a secret, but it is certainly a mistake to carry out this plan to the extent it is on one road where the heads of operating departments have great difficulty in finding out what anything costs in their own department. When the master mechanic for example turns out a piece of work that might have been bought in the open market he naturally wants to know whether it is paying the road to do this. But not an inkling can he get from the auditing department as to the cost of anything and he is obliged to "go it in the dark" or make up his own figures for his own use. It can easily be imagined how pleasant it is for department heads who are a great portion of the time studying how to reduce expenses, not to be able to know without unnecessary trouble how the present expenses run.

## CHICAGO GENERAL RAILWAY'S NEW SCHEME.

It is stated that the Chicago General Railway will seek to avoid complying with the ordinances of the city by extending its services to Hammond, Ind., and thus become an instertate line subject only to the regulations of the interstate commerce law, and the regulations of the railroad commissioners of Indiana and Illinois. The proposed route to Hammond is over leased lines, a considerable portion being those of the Chicago City Railway. It is possible that the fender and paving ordinances may be thus avoided, but it is also possible that the city may at the same time acquire the right to insist that the track be elevated at streets so as to do away with grade crossings.

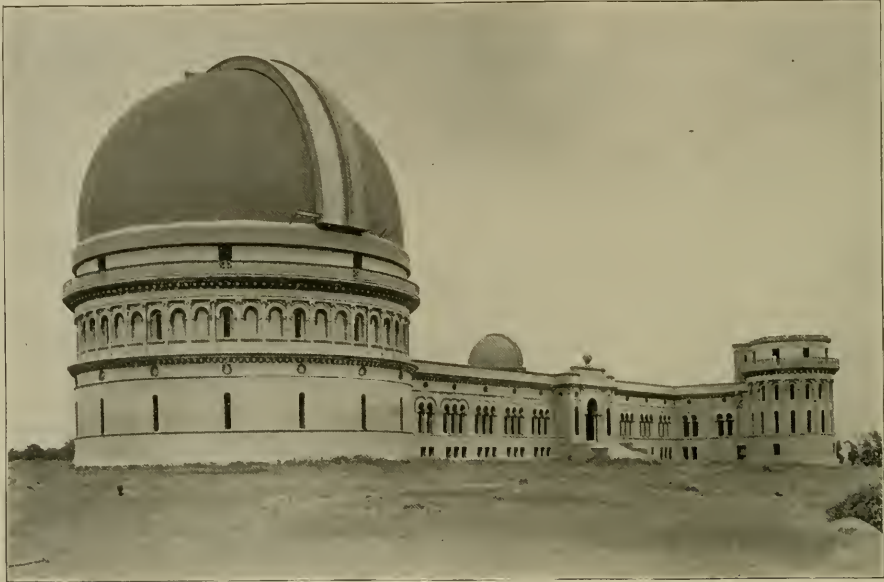
## THE YERKES OBSERVATORY.

## THE PROPER SPEED OF MOTORS.

The scientific world is indebted to the munificence of a street railway man for the largest refracting telescope as yet constructed. The Yerkes Observatory, with its great telescope and the subordinate instrumental equipment, was the gift of Charles T. Yerkes to the University of Chicago. The observatory is located on an elevated tract of land 53 acres in extent, the gift of John Johnston, on the north shore of Lake Geneva, Wisconsin, some 75 miles northwest of Chicago. The air is free from smoke, there are no electric lights nearer than seven miles, the nearest railroad is a mile away, the soil is largely gravel, and the location is probably

It is only very recently that due consideration has been given to the important part that the speed for which motors are wound or geared, plays in the economy of operation of a road. Failure to consider this has caused a number of very expensive mistakes in the past few years and it is certainly high time that both operating and manufacturing companies should awake as they are doing to the fact that motors must be geared or wound for the work they have to perform and that the speed should be a matter of careful study before the purchase of an equipment.

From the abandonment of horse cars until the present



YERKES OBSERVATORY OF THE UNIVERSITY OF CHICAGO.

as favorable for astronomical work as any that could be secured in this country. Our illustrations show the building and the telescope. The building, which is in the Romanesque style with somewhat of Saracenic details, is of brown Roman brick with elaborate terra cotta ornamentation; it is in the form of a Latin cross, the long axis being east and west and 326 ft. in length. The large tower at the western end is 92 ft. in diameter, and the northeast tower 30 ft. in diameter; in the latter is the 12-in. telescope formerly in the observatory at Kenwood. The machinery for handling the instruments, movable floors, etc., and also that in the shops and laboratories, is all motor driven, the power house being located to the northeast of the observatory about 800 ft. away.

A decree of foreclosure and sale of the Mount Lowe Railway was ordered by the court in the suit brought by the Los Angeles Safe Deposit & Trust Company as trustees for the bondholders against the Pasadena & Mount Wilson Railway Company.

year the cry has constantly been for motors of higher speed and the manufacturing companies have been conforming to the demand. A few managers have found out to their sorrow that they have purchased motors that are too fast, but naturally they have not been anxious to talk about their mistakes and it is only the past few months that the best electric railway engineers have become thoroughly awake to the importance of this detail of an electric car equipment. In numerous cases which have come under the writer's notice, equipments have been purchased which were so fast that nine-tenths of the time in service it is only practicable to run at half speed or in series, the parallel notches being for various reasons too fast for the service. In some of these cases the distance between stops was so short that the motors could not be run up to full speed in parallel without taking such an enormous starting current as to require a power plant capacity much larger than that planned, and overheating the motors so that the size of the repair bills staggered the manager. In other cases the maximum speed was too high for safety.

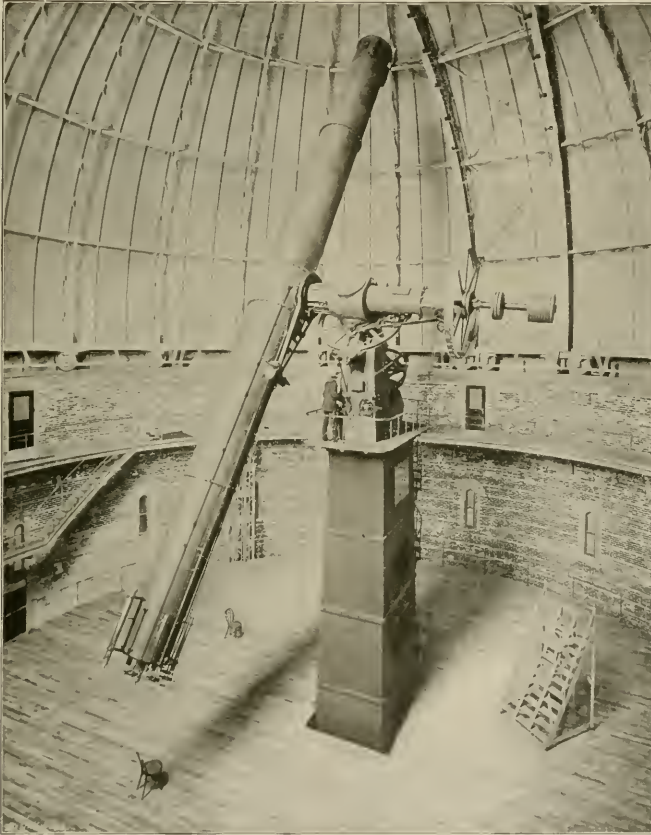


The following table shows the comparative amount of current required to accelerate a given car up to a given speed in a given time with a motor of the same type and size under the car in each case but with different speed gearing or winding.

| Speed for which motor is wound or geared, miles per hour. | Comparative current required to accelerate cars at any given rate, amperes. |
|-----------------------------------------------------------|-----------------------------------------------------------------------------|
| 5                                                         | 10                                                                          |
| 10                                                        | 20                                                                          |
| 15                                                        | 30                                                                          |
| 20                                                        | 40                                                                          |
| 25                                                        | 50                                                                          |
| 30                                                        | 60                                                                          |

motors were wound for the maximum desired speed of 15 miles an hour, and furthermore the motors can never be allowed to attain their maximum speed. If on the other hand it is attempted to start more slowly than with the slow speed motors and make the same schedule by running up to a higher maximum speed between stops more energy must be wasted in the brake shoes when the car is stopped.

A rather inconsistent practice has been that of using the same size motors under a given weight of car, no matter whether the motor is to be run 10, 20, or 30 miles an hour maximum speed; and very often the power plant is designed on the same basis, without regard to the speed of the cars. The size of the motors should usually be increased somewhat more than directly in proportion to the maximum



THE FORTY-INCH YERKES TELESCOPE.

From this comparative table it is evident how inefficient a high speed motor is in city service where it can not attain its speed and where most of the time it is at work accelerating a car up to a lower speed than that for which it is built. For a concrete example suppose that a road is equipped with motors wound for 25 miles per hour maximum speed, but that only 15 miles an hour is allowable. The starting current used will then be 40 per cent greater than if the

speed of the cars for it is evident that the power required to maintain a car at 30 miles an hour is more than twice what it would be at 15 miles an hour, and further from the foregoing table it is seen that the energy expended in acceleration is also double. More than this as the heating of the motor windings is according to the square of the current, the motor windings of the faster motor must be somewhat more than double the capacity of the slower speed motor.

Many motors have been rewound for lower speeds in the last few years as gradually the facts above enumerated have forced themselves into the attention of electric railway engineers and there are still many running which managers would gladly reduce in speed could they do so without great expense. In many places, as said before, the motors are operated the greater part of the time in series and are rarely thrown in multiple, with the practical effect that there is no gain in economy by having the car equipped with a series-parallel controller.

This article is not intended to teach anything to electric railway engineers who have studied the subject of car speeds but is intended as a warning to those purchasing new equipment that they may not fall into the same error as many another manager. And furthermore, it may explain to some managers who have not given the matter thought why such a large power plant capacity is required to move their cars and why so many motors burn out as compared to other similar roads.

Where high speed is to be attained between frequent stops it must be done at the expense of much heavier motors and a much larger power plant than if the road were to operate on a slower schedule, and all attempts to make a high speed equipment do slow speed work or vice versa can only result in poor economy and dissatisfaction with the apparatus.

### IMPORTANT INTERURBAN VERDICT.

#### Farmer Claimed \$5,000 and Gets 6 Cents.

By an act of the Wisconsin legislature approved April 2, 1897, electric railways in that state are authorized to acquire a right of way outside of incorporated towns and cities by condemnation proceedings, and on April 14 the supreme court decided that an interurban electric railway is a commercial railroad and constitutes an additional burden on the abutting property for which compensation must be made, thus placing electric and steam roads on practically the same footing. This act and the ruling of the court may be found in the REVIEW for May, page 290. The first damage case resulting from this decision has recently been decided and cannot fail to be of great interest to railway companies. The facts are briefly as follows: James Ruan is the owner of a large farm in Milwaukee county, the land lying on both sides of the route followed by the Milwaukee, Racine & Kenosha Electric Railway Company. Mr. Ruan claimed that the construction of the road in the highway in front of his property damaged him to the extent of \$5,000 and petitioned the circuit court for the appointment of three commissioners to assess damages as provided by the statute; the commissioners appointed were three business men who viewed the premises, heard testimony and the arguments of attorneys, and awarded damages to the amount of 6 cents, all concurring.

The introduction of X-ray photographs as evidence in damage cases proved to be a novelty a short time ago, and now the fluoroscope is used to determine whether or not bones have been crushed or displaced. In the suit against the Nassau Electric Railroad Company for injury to a nine-year-old boy, the jurymen made examinations with the fluoroscope.

### MINIATURE TROLLEY CAR AT DES MOINES.

During the annual Iowa State Fair at Des Moines, the citizens of that progressive place invariably endeavor to make their city present an attractive appearance to welcome the thousands of visitors which flock to the capital to celebrate what is one of the important events of the year in that great agricultural state. The Des Moines City Rail-



A FEATURE OF THE IOWA STATE FAIR.

way fully enters into the spirit of the occasion along with the rest, and this year Superintendent W. G. Owens had constructed a trolley car one-half the size of one of the standard closed cars in use on the road, exact in every detail. It was placed on top of the company's central transfer depot and waiting room, and brilliantly illuminated with 300 colored lights. The wheels and trolley wheel were revolved by a  $\frac{1}{8}$ -h. p. motor, which also changed the color of the lights while revolving, giving a beautiful effect. It was indeed a novelty and attracted the attention it deserved.

### VESTIBULES IN NEW JERSEY.

It will be remembered that at the last session of the New Jersey legislature a law was passed which after attempting to remedy a bad blunder now reads that the street railways of that state equip their cars with vestibules for use between November 1 and March 1 of the same year. There appears to be division of opinion among the New Jersey managers as to whether the law can be enforced and at the present time but a few roads have complied with the spirit of the law. The Newark & South Orange Company, while doubting the wisdom of the act provided all its cars with the vestibules prior to November 1. The Consolidated Traction Company has decided to make a fight on the ground of the wording of the law, which it will be noticed calls for vestibules during the summer months, and will make a test case of the first conviction against it. The police of Newark and Jersey City have been very active in securing data as to the violations (a penalty of \$50 per day for each car run without a vestibule is provided) taking the number of each car and the conductor's name.

The employes of the Cleveland, Berea & Elyria Railway Company received an increase of 10 per cent in wages on December 1.

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

BY J. D. DE GURCHY.

With a new station equipment, it would seem that little trouble should be experienced and that after the preliminary adjustments, regulations and tests, the plant ought to run in first-class order for sometime without repairs. However, there are sure to be some faults which, if not anticipated and remedied in time will lead to serious loss. It is the object of this article to present some of these troubles as they have been found to occur in the writer's experience.

In some of the older type of four pole 500-k. w. and 10 pole 750-k. w. dynamos, the terminals of the field windings of the series coil, will be found to be brought out dangerously near the brass spools, upon which the shunt and series field coils are wound.

With a ground on the field frame which is at all times possible, a very little dirt or copper dust would be sufficient to start a destructive arc, which would render necessary the taking out of the pole piece and field spool in order to repair the damaged insulation and terminal. Two or three turns of the series winding should be unwound to insure thoroughness in renewing the insulation, and to facilitate the work of putting in a new terminal. The insulation between the field spools and terminal should be kept scrupulously clean, a coat of insulac or some other good insulating paint applied, and the field frame frequently tested for grounds with a magnet or a bank of lamps. In dynamos of recent design this fault has been obviated by bringing the terminals out in the center of the field spools.

The shunt field circuit should be given a frequent and thorough overhauling; the field spool connections must be clean and tight, and the terminal connections on the rheostat firm and mechanically strong. When the shunt field wire is soldered into a terminal on an insulating block upon the field frame the wire should be run so that it will not be exposed to careless or accidental bending. The conductor might be broken, and if the insulation held it together long enough for the e. m. f. to build up, an arc would probably be formed and the circuit burnt in two. In such an event the machine switches should be immediately opened. An open circuit in the shunt field would be distinguished from any other trouble by an excessive sparking at the brushes, an abnormal increase in speed, and a falling off in the apparent circuit output indicated by the ammeter of the dynamo on which the trouble occurred. As the dynamo increases in speed, the counter e. m. f. becoming higher, the current will gradually diminish. The dynamo will not reverse in a case of this kind. It would run as a series motor, and in the same direction of rotation that it was driven as a dynamo. The fallacy of the notion that one, of two or more compound wound dynamos running in multiple, will reverse and run away in the opposite direction is evident, if the fact is considered that before the dynamo comes to a state of rest the current load, due to the low internal resistance of the armature windings would be sufficient to open the other circuit breakers, thus preventing any further trouble in that direction. No one would be so reckless as to close the machine switches of an idle dynamo, connecting it to the

main bus bars of other machines running at working pressure. The result would be practically the same.

Let us suppose that a dynamo runs in multiple with one or more others, but refuses to take its proper share of the load. Upon investigating, it is found that the dynamo is running at normal speed, all the connections tight, the commutator clean and brushes in good order. The dynamo in question has previously been working properly and the equalizing circuit of sufficiently low resistance to assure good regulation. It would now be advisable to test the shunt field coils, which can be readily accomplished in the manner illustrated in Fig. 1. Let G, H, I, J, represent coils to be tested; arrange a series of five contacts or binding posts  $A_1, B_1, C_1, D_1$  and  $E_1$  and run heavily insulated wires from  $A_1$  to  $A_2, B_1$  to  $B_2, C_1$  to  $C_2, D_1$  to  $D_2$ , and  $E_1$  to  $E_2$ . Voltmeter readings between  $A_2$  and  $B_2$  will give e. m. f. of coil G;  $B_2, C_2$  coil H;  $C_2, D_2$  coil I and  $D_2, E_2$  coil J. Trouble in any of the coils would be known by its relatively low e. m. f. and would account for the dynamo shirking its load.

It is important that the commutator brushes be kept as near to the neutral or non-sparking position, as the variations in load will permit. It is necessary with nearly all dynamos to set the lead forward or backward when the load

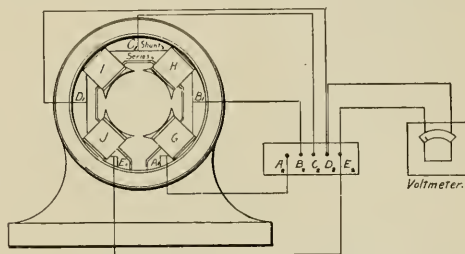


FIG. 1.—CONNECTIONS FOR TESTING COILS.

makes a pronounced change either increasing or decreasing. Machines should be compounded so that the load can be kept equally divided between the different units. The leads should be the same, then if a sudden load should come on or a heavy short circuit should occur, the load would not be thrown on one machine because of an excessive forward lead weakening the fields of some, and a less lead of brushes leaving the other with a stronger magnetic field. This is due to the distortion of the field, by the magnetizing effect of the current flowing in the armature.

Short circuits in commutators are caused in most instances by the pitting or burning away of the mica insulation between the segments; carbon and copper dust get in and are burned into a hard mass of sufficiently low resistance to short circuit the coil to which the segments are connected, and produce an excessive flow of current in the coil. This causes the brushes to spit and flash as the segments affected pass under them. The segments and coil being alive when leaving the brushes, destructive arcing results. If the dynamo is not soon shut down, the arcing will burn the segments low. A short circuited commutator should not be run until it becomes necessary to use a turning tool to obtain a smooth and even surface. If the short circuit were removed the commutator would still be liable to arc at that point, owing to the dirty, low and rough contact caused by the previous burning. After segments have been repaired, the



commutator should be sand-papered until smooth. All such pitting and burning of the mica between the segments, should receive prompt attention. The best and most permanent way to repair is to clean out the burned insulation and fill with mica, for all other substances and preparations are too short lived to warrant their continued use. If possible, disconnect the ends of coil from the segments and test the insulation between short circuited segments with a magnet, before filling with mica.

Very few tools are required for this work, and the necessary skill can be acquired with a little practice. Chisels for cleaning and shaping the hole can be made from  $\frac{1}{4}$ -in. tool steel. Two pieces, 6 in. long, are heated and flattened on one end of each to about the thickness of the insulation between the segments. One is ground or filed to a point as shown at A in Fig. 2, leaving the thickness of the blade a little less than the space between the segments. This tool is used to cut down to clean mica, and to square the ends of the hole preparatory to receiving the new mica, as seen at E. The other piece should be formed to the shape of a car-

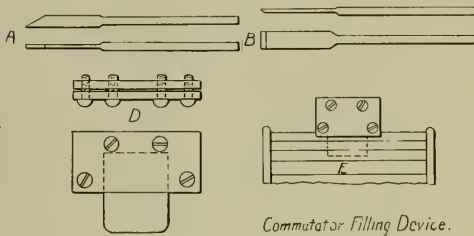


FIG. 2.

pen's chisel, B, and filed thin for use in stripping off the thin flakes of mica which may adhere to the sides of the segments. If the sides of the hold are cleaned no difficulty will be experienced in driving in new mica. After the tools are finished they can be tempered, care being taken not to make them too brittle.

A pair of clamps for holding the mica to be driven, can be made of an old file  $1\frac{1}{4}$  in. wide, the file being preferable because the rough surface will hold the mica firm when being driven. After the temper is drawn, cut two pieces 3 in. long and drill 4 holes in each piece in about the positions shown at D, tap one piece for  $\frac{1}{4}$ -in. machine screws, and drill the holes in the other one sufficiently large, that the screws will not bind upon being hammered. A small hammer completes the outfit. After the hole has been prepared, cut a thin strip of mica the same size, then cut two more pieces using the first as a template, and have them thick enough to fill the space between the segments. Force these in just enough to hold them, and enter a very thin strip between the two already in the hole. This will wedge it tight. Now fasten on clamps, hammer slowly and carefully into place, cut off by drawing the keen point of a knife repeatedly across the mica and finish with fine sandpaper.

(To be Continued.)

The Metropolitan of New York, has adopted service stripes, using one blue stripe for each of the first four years, and after that one gold stripe for each five years. Some of its men have been with the company over 25 years.

## TESTING ARMATURE COILS.

In the shops of the Cincinnati, Newport & Covington Street Railway the practice is to test each coil for insulation after it is put on the armature, and just before the leads are connected up to the commutator. The voltage used is 1,000, furnished by a small rotary transformer. One lead of the transformer is connected to the armature shaft and core, and the other to the coil to be tested, and if the 1,000-volt current does not break down the insulation between the coil and core it is pronounced O. K. This is the only breaking-down test made during the assembling of an armature, as the management of the shop believes that this is all that is necessary, and that additional tests and higher voltages take more time and destroy more material than they are worth.

## NEW SOUTH WALES TRAMWAYS.

Through the courtesy of the railway commissioners for New South Wales we have received a copy of their report for the year ending June 30, 1897. The results of the working of all the tramways are given below for the last two years:

|                                                 | 1897.        | 1896.        |
|-------------------------------------------------|--------------|--------------|
| Total spent on construction and equipment.....  | \$ 7,030,923 | \$ 6,944,897 |
| Total cost per mile open.....                   | 112,496      | 113,851      |
| Total mileage open for traffic.....             | 62.5         | 61           |
| Gross revenue.....                              | \$ 1,484,403 | \$ 1,399,636 |
| Working expenses.....                           | 1,204,584    | 1,143,610    |
| Net profit (after paying working expenses)..... | 279,819      | 256,026      |
| Percentage of working expenses to revenue.....  | 81.15        | 81.71        |
| Gross earnings per tram-mile.....               | \$ .475      | \$ .505      |
| Working expenses per tram-mile.....             | .385         | .415         |
| Net profit per tram-mile.....                   | .090         | .090         |
| Percentage of profit to capital invested.....   | 3.98         | 3.69         |
| Number of passenger fares collected.....        | 72,343,812   | 68,109,264   |
| Tram-miles run.....                             | 3,088,138    | 2,736,260    |

The tramways are operated by steam, cable and electricity; the data per car-mile are not given for the electric lines alone. On the city and suburban lines the cost of working per tram-mile is 25.04 cents for the steam lines and 12.32 cents for the cable lines.

The engineer reports that during the last year  $1\frac{1}{2}$  miles of electric lines were added, and  $3\frac{1}{2}$  miles of track relaid with 60-lb. and 80-lb. T-rails. There is a considerable length now laid with 42-lb. rails that must be relaid at an early date.

## IMPORTED DUTCH TAPE FOR ARMATURES.

The Metropolitan West Side Elevated road, of Chicago, finds that for covering its armature coils, where high insulation is required in an extremely small space, an imported Dutch linen tape is by far the most reliable material yet found. Its superiority lies in the fact that it is of such close and even texture throughout. American linen tape can be found which at first sight looks the exact duplicate of the Dutch imported, but on closer inspection it will be seen that it is uneven in thickness and the threads of which it is composed are of varying size. The Metropolitan Elevated made to make special importations of this material and order months in advance, but the superior quality of the goods makes it worth the trouble and expense.

**TRANSPORTATION TO THE NASHVILLE EXPOSITION.**

The facility and satisfaction, with which the Nashville Street Railway Company handled the crowds at the Tennessee Centennial Exposition, have called forth much praise. In the first place the company improved its roadbed, laid heavier rails, put down new lines to the grounds and added 37 new cars to its equipment. Transfers were given between all lines, thus making one fare of 5 cents from any part of the city to the Exposition grounds. The schedules were at all time conveniently arranged and not a serious delay or accident occurred. The improvements are all permanent, and the citizens of Nashville feel that one good result of the Exposition is that they now have as fine a railway system as any city in the country of the size of Nashville.

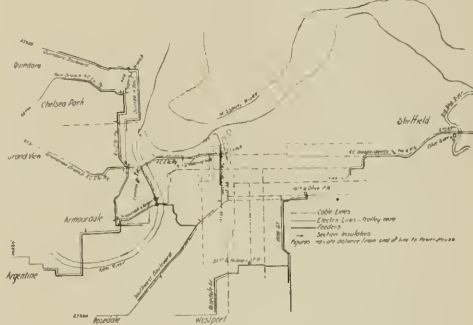
**FEEDER SYSTEM AT KANSAS CITY.**

The Metropolitan Street Railway Company of Kansas City, Mo., has an extensive system, comprising 60.6 miles of cable track, 62.6 miles of trolley and 12.8 miles of horse car lines, but the latter is being or soon will be electrically equipped. To furnish power for these lines there are five stations as shown on the map. The Blue River station is equipped with two direct coupled General Electric generators of 250 and 400 k. w. capacity, respectively. Power is furnished for the Kansas City, Independence & Park line with 17 miles of track. Both cable and electric machinery are in the station at 18th and Olive streets. There are two D-62 T. H. dynamos and one 125-k. w. four pole Westinghouse generator belted to the fly-wheel of the cable engine. The D-62 dynamos are driven by high speed engines and are held in reserve, being used only at times when it is necessary to stop the cable machinery. The Vine street electric line and the 18th street cable are operated from this station. The 31st and Holmes street power house is similarly equipped, having a Westinghouse generator driven in the same manner. The Holmes street cable and the Rosedale electric are supplied from this station, the feeders of the last two stations being so arranged that both the Rosedale and Vine street lines can be operated by either or both. The Central avenue power house described in the August REVIEW has one 14 pole 1,300-k. w. generator which supplies current for the Kansas City Railway, the Armordale & Argentine line, the Quindaro boulevard, the Southwest boulevard and the Westside lines; also for a 400-h. p. motor which drives the cable machinery at the 9th and Washington street station for operating the Summit street cable. The 9th and Wyoming street station is equipped with cable machinery, also two 300-k. w. four pole General Electric and four D-62 T. H. generators. These dynamos are maintained in reserve in case of an accident to the machinery at the Central avenue station. Two of the T. H. dynamos are run from 1 a. m. to 5 a. m. to supply current for the owl car service and lights over the system.

An addition of another 1,300-k. w. generator is contemplated at the Central avenue station this year and the engines now driving the cables will be supplanted by motors. The use of alternating currents in the transmission of electricity to these motors is under consideration. The whole system has been so designed that an increase in any part can be effected from time to time when required and at minimum

cost. The average daily load is about 84 per cent of the breakfast and supper loads.

The voltage on the system varies from 500 to 550; the average maximum drop from the stations to the farthest end of the various lines is less than 50 volts. No. 0 trolley wire is used on all the lines. The feeders are calculated for a loss of 5 per cent on the positive side when carrying from 25 to 50 per cent more than the estimated maximum current, the area in circular mils per ampere varying on different lines. Some of the lines are divided into sections, but these are of no regular length, varying according to the conditions of roadbed and the number of cars; the headway ranges from 3 to 15 minutes. The length and number of feeders are governed by the same conditions; besides provision is made for the grades and the distance from the stations. All feeders on the positive side are covered with a braided weatherproof insulation and are carried on either glass or malleable iron clad insulators, depending on the length of the span and the size of feeder. Return feeders are also insulated in the same manner where they parallel or cross telegraph, telephone or electric light wires; at all other places bare copper wire is employed. The conductors consist of copper cable made up of seven strands of seven wires each. This applies to all conductors from 250,000 to 1,000,000 c. m., but the smaller feeders are solid. As a rule



the feeders follow the trolley lines and the poles are used for both trolley and feeder wires wherever practical. Connection is made from the feeder to the trolley by No. 0 stranded weatherproof copper cable used as a span wire with double globe strain insulators at the pole fastening. Soldered cars are used on the trolley wire, and a brass body sprung on the No. 0 cable with a cap screw for screwing the body and car. The No. 0 cable is tapped on the feeders the joint being well soldered and taped; the car is soldered to the trolley wire, but the brass body is not soldered to the span. The distances between the spans which are tapped to the feeders vary with the headway of the cars, the grades, the length of the section of the trolley line, and are arranged so that the feeders are tapped to the trolley on or close to the heavy grades.

There are some heavy grades on the lines, one being 9 1/2 per cent and 1,000 ft. long. The cars with 30-ft. bodies and G. E. 1,000 motors make an average speed on this grade of 5.86 miles per hour with motors in parallel. Car bodies, 16 and 18 ft. in length, equipped with Westinghouse No. 3 motors, are run over an 8 1/4 per cent grade 738 ft.

long with an average speed of 3.05 miles per hour when the motors are in series or 8.38 miles when in parallel. On some of the grades where the cars stop for taking on or letting off passengers, or other causes, the motormen are required to start up and operate the motors in series for the rest of the distance up the grade. No special provisions have been made in the feeders for supplying current on the grades other than increasing the size sufficiently for carrying the amount of current required and arranging the taps for connecting the feeders to the trolley wire on the grades.

No boosters are in service on the system. General Manager Holmes believes that it is not advisable to use more than 550 volts for a maximum at the motor terminals on grounded circuits with the present method of operation. If an efficient transmission system could be devised it would be much more desirable to lower rather than raise the voltage at the motor terminals, as it would be a saving in cost of insulation and in all electrical repairs.

### SPECIAL WORK FOR THE CHICAGO CITY.

The Indiana avenue line of the Chicago City Railway Company crosses the tracks of the Lake Shore & Michigan Southern Railroad and beneath the elevated structure of the South Side Elevated Railroad Company. The tracks of the railroad parallel the elevated at a distance of 16 ft. An ordinance requires that all trolley lines be 22 ft. 6 in. above railroad tracks. The lower part of the elevated structure is only 15 ft. 6 in. above the street; the trolley wire must then drop 7 ft. in 16 ft., but it was found impossible to keep the trolley on the wire with this inclination. To obviate the difficulty the trough shown in the figure was designed by G. W. Knox, electrician of the company. The trolley wire is clamped to the trough made of 9-in. channel iron, which is a part of the circuit. At each end the run off is so formed that the trolley wheel is guided right to the wire. The trough is supported from an oak plank  $1\frac{1}{4}$  in. thick and 6 in. wide, and is insulated from another piece of oak of the same size by five pairs of the Anderson fiber insulators. The bracing and method of suspension from the elevated structure is shown in the cut. All the work was done in the company's repair shop.

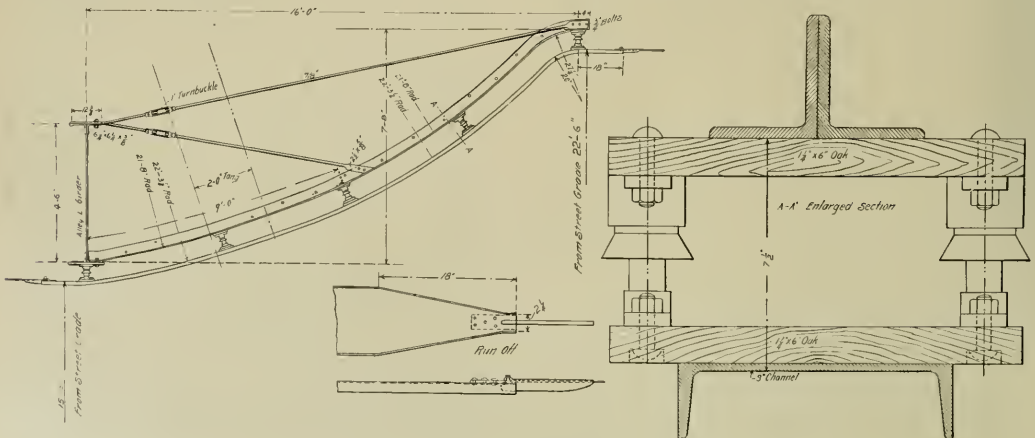
### MONTREAL STREET RAILWAY COMPANY.

The annual report of the Montreal Street Railway Company for the year ending September 30, has been received from Vice-president James Ross and it records a very prosperous year. The first financial statement is that there is a net profit resulting from the year's business of \$507,855.60, out of which two dividends of 4 per cent each and a bonus of 1 per cent were paid, beside adding \$139,522 to the surplus. During 1897 the gross receipts were \$1,342,367, an increase of 6 per cent over the preceding year; the operating expenses were \$736,428, an increase of only 3.6 per cent, and the net earnings were \$605,939; over 9 per cent more than last year. The passengers carried numbered 32,047,317. One interesting point is that since 1892 the ratio of operating expenses to car earnings has declined annually, the operating expenses being for the last six years, 83, 79, 71, 59, 56 and 55 per cent, respectively. It is readily seen that the company is on a sound financial basis, is being managed in a conservative and economical manner, and is giving a good service to its patrons.

### AMERICAN APPARATUS FOR DUBLIN.

W. M. Murphy and J. B. Concannon, of the Dublin United Tramways Company, have been on a purchasing tour in Chicago, New York and other cities in the United States, and have closed contracts to the extent of \$750,000 for apparatus to equip the street railway lines of Dublin for electric traction. Mr. Murphy stated that he was well pleased with the results of the tour, as the machinery was procured at very much less than the estimated cost, and that American manufacturers are undoubtedly leaders in street railway appliances. It is expected that \$1,500,000 more will be spent in converting the horse car lines to electric, and this will be accomplished in the next 18 months.

Electric heaters have been discarded by the Union Depot Railway Company, St. Louis, in favor of the coal stove. General Manager Scullin says the change was made because the generators could not furnish all the current needed to run the cars, to light them and to heat them.



SPECIAL OVERHEAD WORK—CHICAGO CITY RAILWAY.



## PROTECTION FROM LIGHTNING.

The disastrous effects of lightning were experienced soon after the introduction of electrical apparatus for street railway service, and it was evident that some means must be taken to preserve the armatures of generators and motors from damages by electric storms. The first types were quite simple, consisting simply of two serrated surfaces with a short air gap. The air gap was not of proper length and the arresters were not placed as they should be, consequently they were ineffective. A number of designs were evolved for station, car and line service. With the air gap it was found that after a stroke of lightning the arc was maintained by the dynamo current; to prevent this a fuse was introduced into the earth circuit. As soon as the fuse would blow the arrester was useless, and when another discharge quickly followed the first, as is often the case, the apparatus was unprotected. The air gap was employed in preference to other resistance, as it is a good insulator under ordinary circumstances, but offers very much less impedance to the

coil is placed in the circuit and connection is made to the water into which the discharge passes. The objection to this form is that there is a constant consumption of energy. The high resistance arrester consists of a series of iron and mica washers. The high potential of a discharge will bridge the insulating washers and pass to earth, but in so doing it is liable to fuse a little of the iron and a metal contact is made with the iron washer below and soon the circuit is complete to earth. The next step was to not only provide a discharge path, but also

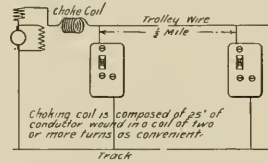


FIG. 2.—LIGHTNING ARRESTER CONNECTIONS.

to blow out the arc. This was accomplished in the mechanical magnet and the magnetic blow out arresters.

The Thomson-Houston magnetic blow out arrester is perhaps the best known of any of that type, a modification and outgrowth being the type MD line and car arrester made by the General Electric Company.

Fig. 1 represents the arrester in a box with a cover so arranged as to be convenient for inspection and repair. The air gap between the two spark terminals is .025 in., which permits a discharge at 2,000 volts. In series with the spark gap is a non-inductive resistance of 100 ohms, through which the generator current passes in following the lightning discharge to the ground. The resistance permits a current of about five amperes to pass the air gap and the blow out magnet coil instantly ruptures the arc. To eliminate reactance in the magnet winding, it is connected in parallel with a part of the non-inductive resistance. As shown in Fig. 2 a reactance coil is placed in the circuit between the arrester and the apparatus to be protected. The reactance of the coil reinforces the insulation of the machine, and thus the discharge passes across the air gap and to the earth, that being the path of least resistance.

Another type is the non-arcing arrester made by the Westinghouse Electric Company. Between the spark terminals are blocks of charred lignum vite, having grooves  $\frac{1}{32}$  in. deep. The carbon offers too great a resistance for the passage of dynamo current, but is low enough for the high potential of the lightning discharge. With the use of carbon, no metallic vapors are formed to sustain the arc.

Fig. 4 represents the Garton lightning arrester with iron case for pole use. This arrester is of the magnetic blow out

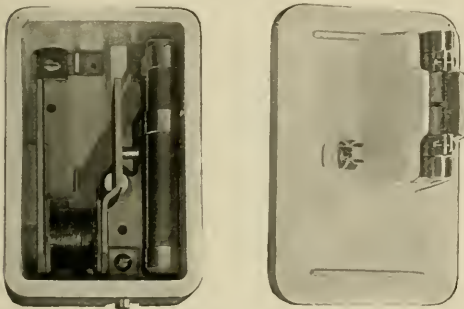


FIG. 1.—G. E. TYPE MD ARRESTER.

passage of a stroke of lightning than any other kind of insulation, and is instantly restored to normal.

The oscillatory character and the disruptive discharges of lightning give rise to complicated phenomena and make absolute immunity from danger almost impossible. The line may receive a direct stroke, or excessive current may be induced from a primary discharge quite apart from the line. After the line has received the discharge there are what are known as "nodal" points, or points which, because of the oscillatory character of the lightning, are at a very much lower potential than other parts of the line. For this reason arresters must be distributed at intervals. The successful operation depends largely upon the systematic arrangement of the arresters and choke coils, and also the installing of short and straight earth connections. The number of pulsations of a lightning discharge is so great that a few turns in the circuit over which it passes induce a very high self-induction, and this offers great impedance to the flow of current. This is made use of by introducing a solenoid of wire or choke coil between the lightning arrester and the apparatus to be protected. This offers a greater resistance to the discharge, which consequently passes to earth through the arrester circuit.

Among the first types were the high resistance and "tank" arresters. In this type each feeder passes over a metal lined tank which is connected to the water mains. A

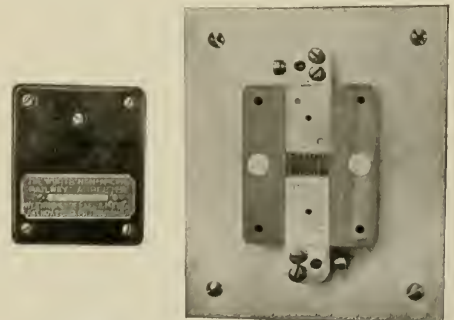


FIG. 3.—WESTINGHOUSE NON-ARCING ARRESTER.

type and is extensively used in street railway service. The spark gap is of such length that its resistance is considerably below that of the insulation resistance of the motor fields and armature. The lightning arrester circuit should offer less resistance to the discharge than any other, to be a reliable protection to the apparatus.

It would seem that after so much time had been spent in studying the conditions and in developing such excellent safe-guards against damage by lightning that little trouble would be experienced on street railway lines. Recently in one of the large eastern cities one road lost 40 motor armatures during a severe electric storm. An official of a small western railway wrote the REVIEW, saying: "We have arresters on cars, also kicking coils and pole arresters every mile, and still our armateurs go. We are beginning to think that the only safe way is to pull the trolley down and lie still until the storm is over, which is unbusinesslike even in a small city." It was evident that the question of protection from lightning is a very live one with some railways at least, and further inquiry was made.

On the Canton-Massillon electric lines the Wirt's non-arcing and the Keystone arresters are employed on the cars, but none on the lines, as all that have been tried have given trouble by getting grounded and short circuiting the whole system. As there is a considerable number of motor armatures lost, the company thinks it would be very advantageous to put a reliable arrester on the lines. It has been the experience of this company that the armatures on the suburban lines are in greater danger than those operating in the city, because the cars being farther apart, there is a more violent discharge at one time. After every storm each arrester is inspected.

The Springfield (O.) Railway Company has little trouble from lightning, having lost only two motor fields. The cars are protected by the Westinghouse and General Electric arresters with kicking coils, and the lines have one Garton or Wirt arrester every mile. After each storm the arresters are inspected and cleaned, and they are repaired frequently, which probably accounts for the immunity from damage on this road.

Elgin, Ill., has had 21 storms during the past three years, and the railway company has passed through a rather trying experience. On the suburban lines Westinghouse and General Electric arresters are placed at intervals of one-half mile. Each feeder running to the bus bar has a lightning arrester, and there is also one in each dynamo circuit. In the city, barbed wire is stretched over the feeders and grounded every second pole, and still armatures are lost.



FIG. 4.—GARTON ARRESTER.

studying the conditions and in developing such excellent safe-guards against damage by lightning that little trouble would be experienced on street railway lines. Recently in one of the large eastern cities one road lost 40 motor armatures during a severe electric storm. An official of a small western railway wrote the REVIEW, saying: "We have arresters on cars, also kicking coils and pole arresters every mile, and still our armateurs go. We

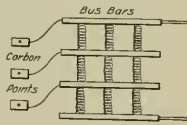


FIG. 5.—CONNECTIONS FROM BUS BAR TO TANK.

Last year the bus bar was divided as shown in Fig. 5 and three choking coils of three coils each were put between the bars and these connected to three carbon rods by plug switches and the rods dipped into a tank of running water. As soon as there is a storm in sight or one reported the plugs are inserted, making a direct ground connection through the water resistance. This has been a protection so far, but there is a loss of from 10 to 15 amperes while connections are made. To further protect the machine armatures the series fields have all been changed to the positive side to act as choking coils. In case a discharge did reach the machine the fields would be lost, but these are easier to replace than the armature coils.

The Wirts non-arcing arresters with no kicking coils are in use in the cars of the Urbana & Champaign Railway and on the lines at intervals of a mile or less. The line arresters are grounded to the rails and also to damp earth. Twice a year they are inspected, cleaned, repaired and tested. No armatures have been lost in four years, and this is thought to be due to the fact that the later types of railway motors and multipolar generators offer a greater resistance to lightning than the old types.

On the lines of the Akron, Bedford & Cleveland, Garton arresters are placed every half mile, Wirts are used on the cars, and tank arresters are in the stations. The tank arresters are grounded to the rails and to the water pipes. On the cars, the arresters are connected to the trucks and to the motor ground wire. They are inspected after each storm and are repaired and cleaned whenever burned out or taken out for renewals. Choke coils are provided in all the cars and good connections are made from the line arresters to the rails, and there is little damage due to lightning.

The Akron & Cuyahoga Falls Rapid Transit Company has arresters on the cars only, and these are the General Electric make with choke coils. As there have been few storms in that vicinity, few armatures have been lost.

At Aurora, Ill., the Garton and General Electric arresters are in service on the lines and cars, being one mile apart on the line; on the cars choke coils are also used. After each storm the arresters are inspected, but are not cleaned or repaired at any specified times. Occasionally an armature is lost, but not often. There is more danger on the suburban lines, as they are longer and catch more storms.

The arresters on the cars of the Detroit Electric Railway consist of carbon combs made from old brushes, and in the same circuit is a fuse which breaks the circuit after a discharge. The fuse is easily replaced. On the lines, according to the apparent needs, are placed the Garton, Wirts, and Ajax arresters, with choke coils. These are connected through the earth to the rail by a bare copper wire. After each severe storm the arresters are inspected, cleaned and repaired. No armatures have been lost on this road on account of lightning.

At Grand Rapids none of the lightning arresters tried were satisfactory, so the electrician designed the one shown

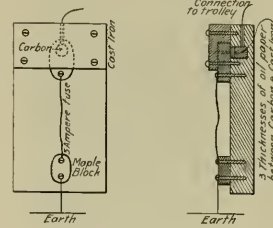


FIG. 6.—HOME MADE LIGHTNING ARRESTER.

in sketch Fig. 6. There are about 100 of these in service, and during one storm they worked successfully 150 times. Whenever the fuse is blown it is replaced and the arrester is cleaned and inspected. The only difficulty is that if a second stroke quickly follows the first the armature is not protected; otherwise none of the car apparatus has been damaged by lightning.

It seems from the experience of railway electricians that if care is taken in installing and keeping in repair the lightning arresters there should be comparative safety. On city lines two arresters should be placed to the mile and in the suburban districts four to the mile, and these should have good electrical connection to the track. On the cars great care must be taken in making as good connections to the truck as the motor ground. The arresters should be inspected the same as the motors and trucks and always kept clean and in good repair.

**TO SECURE DATA ON MUNICIPAL OWNERSHIP.**

The United States Commissioner of Labor has undertaken the collection of statistics regarding the gas, electric light and water works of the country, both private and municipal, with the object of securing such data as will serve as a reliable basis for estimates as to the cost of such service. This work should receive the hearty co-operation of all parties interested whether favoring or opposing municipal ownership, which so many believe to be the panacea. Allen R. Foote, well known as one of the authors of "The Law of Incorporated Companies Operating under Municipal Franchises," in an able paper before the League of American Municipalities, in September last, lays down as the proper basis for comparisons of the relative advantages of private and municipal ownership, the "cost of service to the users and taxpayers." This is, indeed, a most proper and equitable basis, but one which the most radical of our socialistic friends who do not believe in profit-taking will probably not accept, in the event of the verdict going against them.

If the cost to the public is to be the basis of comparison we believe that the private corporations have nothing to fear when the truth is told, but let it be the whole truth. The argument is commonly made that public management is necessarily more expensive than private management, and the proposition is as vehemently denied as affirmed. We believe in the affirmative; first, because in the present advanced state of civilization in this country, public management means partisan political management; second, because a strong executive head is necessary to the economical conduct of a business, and our multi-headed boards with divided responsibility do not furnish this.

Below are presented some data concerning the lighting of the city of Chicago. The report of the Comptroller for 1895 gives the capital invested in the plants and apparatus of the electric light department as \$766,446.97 and the report of the Department of Public Works for 1896 gives the amount expended for construction in the electric light department for 1896 as \$31,676.32 making the total capital invested \$798,123.29. During the year 1896 the average number of lamps maintained and operated was 1,140 and the cost of such operation and maintenance was \$96.40 per

lamp. There is no mention made of any fixed charges, so we must add:

Interest, at 5 per cent on capital invested (\$700.11 per lamp)... \$35.00  
 Depreciation, 10 per cent on machinery, 5 per cent on poles, cables and conduits, (depreciation of buildings is supposed to be compensated for by appreciation of lots)..... 40.60

making the total cost per lamp \$172.00. These lamps burn all night, from dusk to daylight, every night in the year. The city rents 517 2,000-c. p. lamps from private companies and these are required to burn the same number of hours as the city lamps. The total cost for the year was \$56,996.41; cost per lamp, \$110.24. From this it appears that the city could rent all its lamps and thereby save \$70,406.40 per annum, and we will add, get better light for many of the city lamps do not furnish even half the candle power called for.

The following is an extract from the report of a committee appointed by the city council of Lafayette, Ind., to investigate the subject of electric lighting for that city:

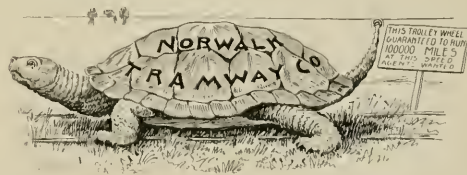
The committee \* \* \* finds that the cost of establishing a first-class plant, capable and suitable for the requirements and needs of the city of Lafayette and the people thereof, will cost approximately \$100,000; that the cost of maintenance, not estimating the additional costs for commercial purposes, making the estimate on the basis of 300 street lights, will be approximately \$63.57 per street light. This estimate does not include any interest on the money invested.

The city subsequently made a contract with private companies for lights at the rate \$76.80 and \$67.20 per year.

In this connection might be mentioned the recent decision of the city council of Philadelphia to lease the gas works in that city, for the last 50 years operated by the municipality, to a private corporation; the surprising thing is not that the venture was a costly failure as managed by the city, but that the council could be prevailed upon to acknowledge it and take steps to remedy it.

**PROGRESS IN SOUTH NORWALK, CONN.**

It is difficult to predict just what a city council will do; as a rule we know that it will be foolish, but the degree of idiocy we cannot know in advance. In South Norwalk, Conn., the Norwalk Tramway Company has always sprinkled the principal streets through which its lines run. The council thought that the company should be required to



sprinkle all the streets where tracks were laid, and passed an ordinance to that effect, providing that in the event the streets were not so sprinkled the speed of cars should not exceed one mile per hour, in order that there might be no dust raised. The company is chartered by the legislature, and of course paid no attention to the ordinance which would in effect be a repeal of the charter. As the press and the public also only laughed at the council's action, the absurdity of it was soon realized and within a week it was repealed. The illustration is from the Bridgeport Herald.



## SURFACE CONTACT STREET RAILWAY SYSTEM.

The demand for a commercially practical system of surface contact electric traction, has existed since electric traction was first introduced, but such a system had to come to its appointed place after the overhead and underground contact systems. Various schemes have been evolved in the past which have either been discarded as impracticable or have appeared before the demand for them has become acute enough to encourage their development. Today the demand for a surface contact system exists and peculiarly enough, this demand comes from Europe. In a European city, the first practical surface contact electric railway is already far advanced towards completion.

The experiments at Schenectady have been carried out upon a stretch of the track which forms part of the extensive factory tramway system of the General Electric Company's works. The addition to the roadbed between the rails of the track, consists simply in two parallel rows of iron

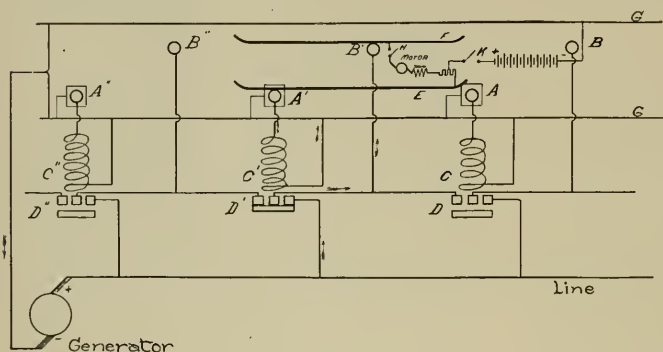


FIG. 1.

disks, elevated to a height of about one inch above the level of the rail. The General Electric Company is now engaged in changing over to the surface contact system the entire trolley tramway system in the yards.

The main requirements in a surface contact system are four: Low cost of installation and maintenance; absolute absence of current from all disks not covered by the car; freedom from leakage of current, and reliability under all possible conditions of weather, service and location. It is the attempt to meet simultaneously all those requirements that has rendered the problem one of considerable difficulty, demanding long study and costly experiments to overcome.

The only live portions of the General Electric surface contact system on the street surface are the contact plates immediately beneath the car. This is true whatever the position of the car and whatever the speed—each plate in turn communicating current to the motors and becoming inert as the contact shoe on the car leaves its surface; these contact plates are placed in parallel rows between the two rails of the track and staggered. Each positive contact plate is made alive by the operation of an automatic magnetic switch, which, instead of being placed in immediate juxtaposition with its plate or opposite it outside the track, is placed in a manhole with a large number of others each connected to its own respective plate. Through each negative plate is performed the double duty of closing the contact in the switch,

which "cuts in" the positive plate and of receiving the return current from the motors. Fig. 1 shows the arrangement of the plates on the street surface.

The operation of this system will be understood from the diagram Fig. 2; A, A', A'' are the negative plates B, B', and B'', the positive contact plates, placed equal distances apart, a little less than one-half the total length of the shoe; C, C', C'' represent the automatic magnetic switches and D, D', D'' their armatures or contact makers. F is the positive or collective shoe, E the negative or return shoe and C the track return; H and K are switches which form part of the controller, the latter connecting in, or cutting out, the cells of a small storage battery, which is used only to energize the coil of the first switch through the plate over which the car passes in starting. After the armature of the first switch has been raised into contact and the line current has completed its circuit, the battery is cut out by the forward movement of the controller handle. In the diagram the bar is to move to the right and all the magnetic switches are open.

The handle of the controller is turned to the first notch and switches H and K closed. Current from the battery flows through a small portion of the motor resistance to the shoe, thence to contact plate A and the coil C', completing the circuit to the ground. The coil C' thus energized raises the armature D', closes the circuit through the automatic switch and the line circuit completes its path through the motors and through the greater part of the motor starting resistance, shown by the arrows through the positive plate B and shoe F. Part of the return circuit goes to the storage cells, which are kept continually charged, and part through shoe F, negative contact plate A', and coil C' to ground, keeping the latter energized and the automatic switch closed so long as

the shoe E remains on contact plate A'. Moving the controller handle forward from the first notch to the second notch opens the switch K, cuts out the battery and sends all the return current through the coil C'. The shoes E and F in the diagram are a little longer than the distance between contact plates. Thus, when the car moves forward slightly, the shoe F will be in contact with the two contact plates A and A' and the return circuit will divide, half going through coil C' and half through coil C, energizing both, and closing the armatures in the switches D' and D. The car moves forward and the shoe E passes beyond the contact plate A'. The circuit in the coil C' is broken, the armature D' drops, cutting out entirely positive plate B', leaving it dead, but allowing B' still to receive current through the closed switch at D. Shoe F moving forward then makes contact with plate B before it leaves plate B' and the current is uninterrupted in its flow.

The automatic magnetic switch is the heart of this system. It has been designed to endure under the severest strains and to act with such uninterrupted precision that the working of the system may not be impaired. The development of this automatic magnetic switch marks a decided step forward. Mechanically the switch is simple, strong and durable, with all chances of derangement reduced to a minimum. In the course of the experiments this switch has been subjected to the roughest possible usage and has withstood it unharmed.

If the leakage is great an arc is likely to form when the armature of the switch drops, and so long as this is held the contact plate in the street will remain alive, while the arc would burn the switch. It is not practicable to allow the armature to drop far enough to break the arc, and, to extinguish it, the magnetic blow out principle is brought into play. By the use of this, retention of this arc is impossible. But there is also the possibility of another arc forming in case of accidental ground on one of the leads to the positive contact plate or if the forward switch fails to close when the handle of the controller is on the first notch, giving a path to ground through the battery. This is also taken care of by the magnetic blow out. All surface contact systems have similar conditions to meet, but none have incorporated the magnetic blow out principle.

The form of the contact plates is shown in Fig. 1. They are first set in iron boxes and then surrounded by insulation. The contact plates consist of two parts, a wearing piece screwed into a support and held by a spring washer. This wearing piece can be removed readily without disturbing the support. The standard shoe is about 13 ft. long, the ends

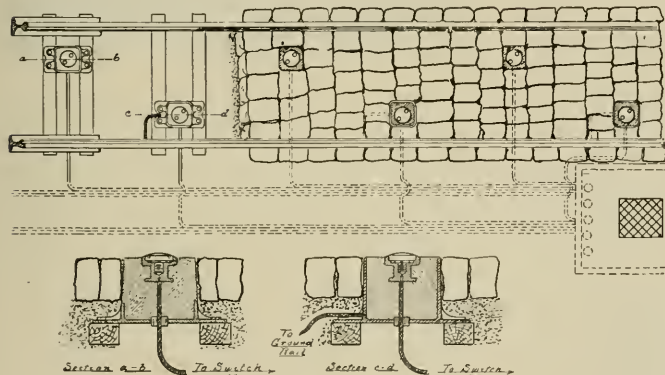


FIG. 2.

being curved upward slightly to prevent catching. The shoes are supported from the axles and have a slight upward and downward movement to allow for any irregularities in the height of the contact plates. The amount of drop in the shoe is regulated by a set screw.

The automatic magnetic switches are grouped in manholes where inspection can be readily effected. Each manhole will contain about 20 switches, and the wires from the contact plates to them will be protected in similar manner to underground wires for any other purpose.

The battery on a car consists of 10 cells with normal capacity of 50 ampere-hours at 5 amperes. It is equal to all emergencies, being called into requisition only momentarily, while being in charge the balance of the time the controller handle is on the first notch.

A close examination of the design and operation of this system will show that it possesses many striking advantages. The operation of the automatic switches is perfect under all conditions as the full line voltage can be secured to close them and they open by gravity. There is no possible chance of the contact remaining electrified after the car has passed, as by the use of the blow out on the switch and the

switch itself, which opens as soon as the current is shut off, all danger and trouble due to live contacts is eliminated.

Grouping the switches in manholes renders the working part of the system easily accessible for inspection.

In the city of Monte Carlo, in the principality of Monaco, this system is being laid down by the Thomson-Houston Company over a distance of about 3 miles. It is expected that this will be in operation very shortly.

## SUBSTANTIAL RECOGNITION OF LONG SERVICE.

W. F. Kelly, general superintendent of the Columbus Street Railway has announced a schedule of substantial recognition of long time employes, and took advantage of Thanksgiving day to post the bulletin which came as a pleasant surprise to the men. The notice reads as follows:

"At this season of the year when others are rejoicing in the pleasures of the home festival, we wish to express our pleasure and appreciation of your labors during the year now drawing to a close. During many weeks of heavy travel and crowded streets you have operated your cars skillfully with the result that serious accidents have been few and personal complaints rare. While all engaged in this service are entitled to their full share of credit and we fully appreciate their skill and ability, we desire especially to remember in a substantial way those who may fairly be termed "veterans" in the service. To this end we will each year present to motormen and conductors, inspectors and foremen who have been five years in the service of this company, one complete uniform suit and to those who have been in such service ten or more years two uniform suits, all of which will be made to order.

"As a badge of merit, indicating faithful and satisfactory services, the coat sleeve of each five year man will be decorated with one gold stripe, each ten year man with two stripes and so on, adding a stripe for each five years' employment.

"It is earnestly hoped that this testimonial of our good will may be received in the same spirit in which it is given, and that all may take a just pride in maintaining a high stand-

ard of efficiency and the good name and good character of all our employes.

"Following is a list, as shown by our books, of those who have been five or more years in the employment of this company. If there are any errors or omissions we will be glad to make corrections. Those whose names appear in the list please call at my office and receive order for suit.

"Wishing you all a joyful Thanksgiving, I am, very truly yours,  
"W. F. KELLY,  
"General Superintendent."

Columbus, Ohio, November 25, 1897.

In the 10-year list are 18 men, and in the 5-year service are 64 men.

The Staten Island Electric and the Staten Island Midland railroad companies waged a legal contest during the past year for the possession of South street in the village of St. George. After the vacating of the injunction which had been secured the Staten Island Electric put several hundred men to work and built 500 ft. of track in a day. Another injunction was obtained and the village trustees had the tracks torn up. The men who tore up the rails were arrested but released on bail. The situation is now just as it was originally.

## THE MEN WHO MANAGE THE METROPOLITAN OF WASHINGTON.

At the annual election of officers of the Metropolitan Railroad Company of Washington, D. C., held July 14, 1897, Robert D. Weaver was elected president. Mr. Weaver has long been identified with the Metropolitan Railroad Company as a director and vice-president, and this long association with the affairs of the company has amply qualified him for the position to which he was elected. The election of Mr. Weaver was most gratifying to a large majority of the stockholders, representing as he does the largest interest in the road, the stockholders felt that in looking after his own theirs would be well cared for. Mr. Weaver was educated in the schools of Washington, leaving them, however, at an early age to engage in business with his father. By his energy and business acumen he soon accumulated a fortune, and to-



ROBERT C. WEAVER.

day at the age of 40 years, is reckoned one of the solid men of his native city. No enterprise of large magnitude is complete without his presence, and his personality is shown in them all. He is progressive, energetic and at the same time prudent, and under his management the Metropolitan Railroad Company will be kept abreast of the times.

Griffin B. Coleman is secretary and general manager and his name is almost synonymous with that of the Metropolitan Railroad Company, he having entered its service as a bookkeeper when quite a boy. By his integrity, ability and industry he has advanced step by step to his present position. Upon the retirement of Samuel L. Phillips from the presidency of the company in October, 1896, Mr. Coleman, who was then secretary, was elected general manager in order that his scope of usefulness might be enlarged. At the annual election of the officers held July 14, 1897, Mr. Coleman was elected for a second term as secretary and general manager, his administration of affairs having been so eminently successful. To his energy and ability is largely due the success of the company, which stands today preeminently one of the best equipped street railroads in the United States, if not in the world. While the road is managed with due regard to economy, still no expense is spared to keep the equipment in the best possible condition, and by his liberal management and uniformly courteous personality, Mr. Coleman has won many friends for the company and its advanced street railroad methods. The stockholders of the company are highly pleased over the success which has attended his control, and at the last meeting elected him a director.



G. B. COLEMAN.

## DENVER OBSERVATION CAR.

The Denver Consolidated Tramway Company has given the very appropriate name "Seeing Denver" to its observation car. During the past summer the car has been leased by the Mayham Investment Company and two trips were arranged daily. Framed notices were put up in the hotels and drug stores advertising the car. At 9 a. m. and at 2 p. m. each day the car started at the Brown Palace Hotel and made a circuit past the other principal hotels for passengers. A trip, of about 40 miles requiring 2½ hours, was then taken on the lines of the different railway com-



DENVER OBSERVATION CAR.

panies in the city. A neat souvenir, illustrating the interesting features of the city and state, was given to each passenger. A guide, who was thoroughly posted, accompanied the party to explain the various sights and buildings about the city, as well as to give general information regarding the resources of Denver and Colorado. The fare for each trip was 25 cents. The car comfortably seats 80 passengers. The scheme was liberally patronized, and the Mayham company made money out of the venture as well as advertising its investments.

## TROLLEY FIGHT IN NEW JERSEY.

The Brunswick Traction Company, fearing injunction proceedings, worked during the early morning hours on November 1 and succeeded in laying a track across the Albany street bridge in New Brunswick, N. J. There is a sharp fight between this company and the New York & Philadelphia Company, the former having secured an injunction restraining the latter from operating a line recently constructed by it in Bridgewater township, Somerset county.

## VANDALS AT ITHACA.

The Ithaca (N. Y.) Street Railway Company has offered \$100 reward for information which will lead to the arrest of miscreants, who on two occasions recently, have endangered its property and the lives of passengers. The chief engineer of the company noticed some emery on the engines while examining the machinery before starting up, and investigation revealed that the oil cups were filled with emery. A short time afterwards a motor car in turning the curve at the Cascadilla shot down the incline at dangerous speed in spite of the brakes. It was found that the rails at this point had been greased. A detective has been placed on the case and if the guilty parties are found they will be vigorously prosecuted.



## STREET RAILWAY LAW.

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

*Rights of Transfer Passenger — Insufficient Accommodations.*

John Hanna was a passenger on one of the lines of the Nassau Electric Railroad Company on Bergen street, in Brooklyn, N. Y. When the car reached the intersection of Fifth avenue he got a transfer slip entitling him to continue his journey on the line upon that avenue. When a car came along he boarded it by the front platform. He surrendered his transfer ticket, after which he was directed by officials of the road who were riding on the front platform, to enter the car. Finding this to be impossible, he refused to leave the platform, and was then ejected from the car by force. The Second Appellate Division, in affirming judgment secured by Hanna in his suit against the company for assault, held that the court properly charged the jury that if the plaintiff's ticket had been taken from him by the conductor, and there was not sufficient room in the body of the car to permit him to enter, his ejection was illegal; but that, if there was room in the car, he was bound to enter it, his removal from the car was lawful, and the defendant was entitled to a verdict, unless excessive force was employed. A railroad corporation which has accepted a passenger's transfer ticket can not, the court said, remove him from its car until it has either returned, or tendered a return, of the ticket to him. A transfer passenger has not necessarily, it was held, the right to board the first car that approaches him on the line, regardless of whether there is accommodation for him, and to force himself into a dangerous or improper position upon the car; his duty is to wait until a car approaches in proper condition to receive him, and should no such car appear, he can maintain an action against the corporation for its breach of contract to carry him.

(Supreme Court of New York, *Hanna v. Nassau Electric Railroad Company*, 45 New York, supplement 437.)

*Nonuser of Street Railway Franchise.*

The nonuser of a street railway franchise for more than four years in a period of great industrial depression and extraordinary financial difficulties on the part of its owners, during which the street is paved with wooden blocks at the expense of the adjoining property owners, and the old rails and ties taken up with the knowledge and consent of the company when they were substantially worthless, but electric poles and wires, except a trolley wire, remain in place, does not constitute such an abandonment or nonuser as to raise a presumption of the surrender of the franchise, and entitle property owners to enjoin the relaying of the track, when the company has given assurance of its intention to resume operation of the road and no proceedings have been taken to declare a forfeiture.

By the acceptance of the terms of the ordinance, the railroad company assumed a public trust. It undertook to serve the public by affording it rapid transit; and it became its duty to continue that service, not simply because it had contracted so to do, but because it had become charged with such duty by legislative grant. It could not lay down the burden when it chose, nor emancipate itself by merely ceasing to operate its cars. In case of an attempt on its part to so shirk its duty as to a part of its road, it could doubtless be compelled, in proper proceedings, to resume its operation, and carry out the public duty which it voluntarily assumed. *Atty. Gen. v. West Wisconsin R. Co.*, 30 Wis. 100-107.

Certainly in such case, action could be brought under section 3,241, Rev. Stat., by the state, to forfeit its franchises and vacate its charter, for failure to exercise its public powers and perform its duties.

Coming now to the question whether the franchise has been extinguished in the case before us, it is quite apparent that there are only four ways in which it can be claimed that such extinguishment could take place, viz.: (1) by operation of some self-executing forfeiture clause in the grant; (2) by surrender of the franchise, and acceptance of such surrender on the part of the state; (3) by the decree of a court of competent jurisdiction, in an action brought for the purpose; (4) by abandonment or nonuser for so long a period that a surrender and acceptance will be presumed. There are no facts in the case upon which it can be claimed that the franchise has been extinguished in either of the first three ways above mentioned. There was no self-acting forfeiture clause in the ordinance which granted the franchise. There has been no surrender thereof and acceptance of such surrender by the state, and no action has been brought to declare and enforce the forfeiture. There remains, then, for consideration, only the question whether it has been wiped out by a nonuser for more than four years. It is argued that from this fact an abandonment of the franchise has resulted. It is evident that the term "abandonment," as applied to a corporate franchise, 36 L. R. A., of this kind, is a misnomer. A mere privilege of right may, perhaps, be properly said to be abandoned in a proper case, although even in that case there must be something more than mere nonuser to constitute such abandonment. There must be also an act clearly indicating an intention to abandon. *Washb. Easem.*, 3d ed., p. 661. But while a mere easement or right may be abandoned, the word is plainly inapplicable to a duty owing to the state. A public duty is not to be laid down at will. In the case of a mere easement there is but one party interested, and he may voluntarily abandon his right; but in a case of a public duty there are two parties beneficially interested, i. e., the party who owes the duty, and the state to which the duty is owing. The necessary results must be that, in order to extinguish the duty, there must be concurrence on the part of the state. It has been held that a total nonuser of the franchises of a corporation may exist for so long a period and under such circumstances that a surrender of its franchises by the corporation, and acceptance of such surrender on the part of the state, will be presumed. The cases holding this doctrine are cited in *Combes v. Keyes*, 89 Wis. 297, 27 L. R. A. 369; and *Mylrea v. Superior & St. C. R. Co.* (Wis.) 67 N. W. 1138. The doctrine cannot be said to have been adopted by this court, however. In *Combes v. Keyes*, which approaches nearest to it, there had been complete nonuser for 26 years, and legislative acts impliedly accepting the surrender, and it was held that the corporation had passed out of existence. Similar is the case of *Henderson v. Central Pass. R. Co.*, 21 Fed. Rep. 358, where nonuser of a street-car franchise for 10 years, followed by a repeal of the franchise, and a legislative grant of the same right to another company, was held to extinguish the first franchise. The present case, however, is not such a case. The period of nonuse here was

about four years and eight months. It was a period of great industrial depression, and of extraordinary financial difficulties on the part of the various corporations which successively owned the franchise. The old track became, by reason of the change in means of locomotion, practically worthless, and its entire reconstruction a necessity. It appears by affidavits of officials of the roads that it was always the intention to resume operation of these two blocks as soon as the financial atmosphere cleared. An ordinance declaring this franchise, with others, forfeited, was introduced in the common council; but, upon representation by the company that it was the intention of the new company to operate the road over these blocks in the near future, the clause forfeiting the franchise on the two blocks in question was stricken out. The only fact which can be claimed to indicate an intention to abandon the franchise, is the fact that in 1892 the street was paved with wooden blocks, at the expense of the adjoining property owners, and that the old rails and ties were taken up, with the knowledge and consent of the company. This fact, however, loses much of its apparent significance, in view of the changes in roadbed made necessary by the introduction of electricity, and in view, also, of the other facts just referred to.

This, then, is the situation: There has been no cesser to use, accompanied by any act clearly indicating an intention to abandon the right. Even if it could be said that there was any such act, there has been no consent on the part of the public to such abandonment, nor acceptance of a surrender. The nonuse has not existed for such a length of time, nor under such circumstances, that a surrender and acceptance of the franchise can be presumed. It follows that, when the plaintiffs commenced their action, the franchise was still in existence, and consequently the injunctive order was erroneous.

(Supreme Court of Wisconsin, *Wright v. Milwaukee Electric Railway & Light Co.*, 36 Lawyer's Reports, Annotated, 47.)

[NOTE: Relaying of street railway tracks after nonuser of the street for nearly five years where the franchise was properly granted by the city, and has not been surrendered, or any action taken to forfeit it, and cannot be prevented by the city, in an action in equity where the state has not granted to the city any power to forfeit the franchise but as provided for an action by the attorney general to assert such forfeiture. *Milwaukee Electric Railway & Light Co. vs. City of Milwaukee*, 36 Lawyer's Reports Annotated, 45. The power of a city to make a condition of its assent to a street railway that it shall be forfeited unless the road is completed within a specified time to a certain point outside of the city, is denied in *Galveston & Western Railway Company*, 38 Lawyer's Reports, Annotated, 33, where the legislature has given the right to use the streets if the city consents.—E.D.]

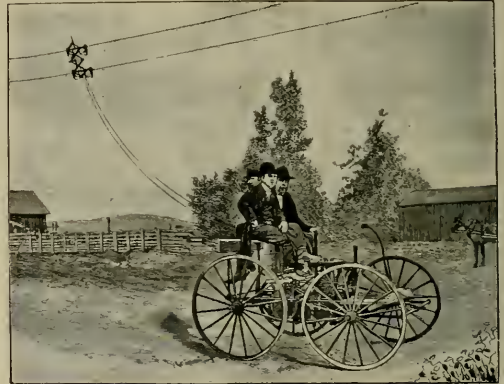
#### *Injury to Lineman by Falling of Electric Pole—Notice of Latent Defect.*

The lineman of the defendant company, in the discharge of his duty, was ordered to take down a guy wire from an electric pole and guy tree. The pole had not been securely planted. It fell on the lineman, inflicting injuries of which he died. The vice of construction was latent and concealed. The officers of a preceding board of management had been notified of the defect. The company is not relieved under the plea of want of notice, although the present general manager has not been notified, but the preceding manager or superintendent.

(Supreme Court of Louisiana, *Bland v. Shreveport Belt Railway Company*, 36 Lawyer's Reports Annotated, 114.)

## A TROLLEY WAGON.

A trolley road wagon for running on country roads has been built and tested by W. G. Caffrey of Reno, Nevada, and satisfactory results obtained. Two No. 0 trolley wires are held by insulators 18 in. apart on poles which are placed at intervals of 125 ft. The two wires are about 17 ft. from the ground. The trolley consists of a metallic frame having two overrunning wheels and underneath two locking wheels which prevent the top wheels from leaving the wire, and for the lower wire a similar device is used. The two trol-



A TROLLEY WAGON IN NEVADA.

leys are connected by an insulated pantagraph with guides to provide for unequal tensions on the two wires. The trolley cables to the wagon run on an automatic reel in the wagon, and this arrangement permits the wagon to run 200 ft. from the pole line. The rear wheels are attached to a shaft geared to a 2-h. p. Westinghouse motor, suspended on springs. Rheostat control is used and the wagon has a suitable steering device. It is stated that with a load of 2,500 lbs. the wagon reached a speed of 15 miles an hour. This trolley wagon was designed for localities with good roads, heavy traffic in farming produce and where cheap power can be obtained. This data and illustration were furnished by the *Scientific American*.

## THANKSGIVING AT A SOUTHERN PLEASURE RESORT.

J. B. McClary, general manager of the Birmingham, Ala., lines, sends us a copy of the program he laid out for Thanksgiving day, at the company's pleasure resort. Other roads may find in it a suggestion for next year. The principal features were two foot ball games, with such other amusements as 100-yd. foot race, bicycle races, half-mile foot race, old men's race, throwing hammer, quoit contest, three-legged race, hurdle race, and several foot races for boys under 16 years. The event was a great success and called out a big crowd. The prizes other than the cash prizes were donated by local merchants.

## FUNERAL CARS IN SAN FRANCISCO.

The principal cemeteries of San Francisco are located in San Mateo county, about 12 miles distant from the ferries. Although many interments are still made within the city limits, persistent agitation against further burials and for the removal of the cemeteries which are now being gradually surrounded by the city, has caused the development of several beautiful cemeteries, sufficiently removed from the metropolis to ensure the eternal rest of those laid there.

The main line of the San Francisco & San Mateo Electric Railway Company passes the gateways of five cemeteries, and into one of which Cypress Lawn, and probably the most beautiful west of the Mississippi river, the company owns a spur track, the rails of which barely show through

faction on the part of the public and all the high class undertakers who have used the car has amply demonstrated the fact that it is strictly in line with modern ideas and progress. The charge for this service is \$15 while the cost of an equal service by hearse and carriages is \$70 a fact keenly appreciated by many who find other burdensome charges at a time when they are frequently least prepared to meet them.

The average time required in making the round trip is about  $2\frac{1}{2}$  hours which includes the lay-over at the cemeteries, whereas fully double that length of time is required by carriage. The car is called for principally through the agency of undertakers who maintain regular monthly accounts with the company and at whose service the car is held whenever desired.

Upwards of 250 funerals have been conducted with this car the greater portion being within the past year.



FUNERAL CAR AT SAN FRANCISCO.

the velvety green lawn. The funeral car "Cypress Lawn" owned by the company, has now been in use about three years. It is a substantially built double truck car of the passenger coach type, the interior being finished throughout in black walnut and is carpeted and upholstered in harmonious colors. One end of the car, completely separated from the remainder, is set apart for the reception of the casket and family of the deceased while the other portion is fitted out similar to the regulation Pullman cars.

For many reasons when the car was first introduced it was cautiously received by the public and there was but little call for it; but notwithstanding this fact, the present era has witnessed the destruction of many old time ideas and customs, and in San Francisco at least, the electric funeral car has become a well established institution which appeals alike to the reason and common sense of the public. True, the funeral car is still regarded with an evil eye by hackmen and certain classes of undertakers as an invasion of their time honored rights which, of itself is a good reason for its existence. The invariable expression of satis-

The construction of an additional car will be necessary in the near future as the company is unable at times to meet all the demands with a single car.

The experience in San Francisco is directly in line with what has been advocated by the REVIEW for many years; and in cities where the location of the cemeteries is at all distant and adjacent to company's lines we firmly believe the funeral car services' will be found both acceptable to the public and remunerative to the company.

## FLOODED CONDUIT AT WASHINGTON.

As a result of a recent rain storm the electric conduit of the Metropolitan Traction Company was completely flooded for 150 feet along F street in Washington. The cars were operated on this line during the two hours the conduit was flooded, the load increasing from the normal, 300 amperes, to 600 amperes. This has occurred a number of times and is conclusive evidence that the General Electric open conduit is not short circuited by rain water.



### A SUCCESSFUL FREIGHT LINE.

The management of the Lewiston & Youngstown Frontier Railroad Company has found the freight business an important factor as an income earner on that road. This road is familiarly styled "The Old Fort Route." It runs between the villages of Lewiston & Youngstown in Niagara county, N. Y.

Before the road was built Youngstown and Fort Niagara



LOADING FREIGHT.

had no rail connections of any kind. In the summer time the river boats carried freight between Lewiston and Youngstown, and during the winter a time-worn stage was the only regular means of communication. Therefore it was necessary to team much of the freight and express from Lewiston, where it was brought by the New York Central. When the electric road was built connection was made with the Central tracks at Lewiston, and now freight cars are regularly transferred from the Central tracks to those of the electric road. During the past summer and fall this service has been greatly appreciated by the farming community along the electric road. Especially was this true in peach and apple time, when refrigerator cars were taken down the trolley line to the four specified points of loading. During peach time the scene at these points was instructive in the extreme, showing quite well how a trolley line aids a farming section. Long lines of wagons could



FREIGHT TRAIN ON THE "OLD FORT ROUTE."

be seen, each waiting its turn to get up to the cars to unload in order to hurry back to the orchards for more fruit. The close presence of the freight cars saved the long haul to Lewiston, and was quite an economical factor in handling the crop. In previous years the trip to Lewiston consumed time, took more men and teams, thus creating expense. Furthermore, the crop reached the markets quite a few

hours earlier, owing to the rapidity with which it was handled at the loading point.

In anticipation of a heavy freight traffic the Lewiston & Youngstown Company ordered a motor car especially designed for freight business, and it proved to be a very valuable part of the road's equipment. The extreme length of the car is 20 ft., the box being 14 ft. long. From the top of the rail to the top of the car the height is 10 ft. 8 ins. It rests on a single truck of very strong pattern, the wheel base being 7 ft. Heavy oak timber was used in its construction, its weight being 7 tons. A Gould automatic coupler and a radial draw bar are provided so that it can be coupled to freight cars or trolley car trailers, this latter feature being valuable during the picnic season. The car is equipped with two General Electric four turn motors, wound in such a way as to exert a high tractive effect for a given amount of power. While these motors are not rated at any specified horse power they are practically 50 h. p. each. On level grades the car will pull 10 loaded freight cars with ease. It is equipped with a snow plow and track scrapers in order that it may be used during the winter in keeping the road open.

One day as many as 19 cars of freight were turned over to the Central from this electric road, Lewiston, as stated, being the transfer point. The average during August and September was nine cars, and during October it was five cars a day. The rate the electric road charged for peaches was 1 cent per basket, and from 750 to 1,100 baskets were put in a car, the average weight being about 20 lbs. to a basket. The crew of the motor car consists of a motorman and a conductor, the latter being the all-around man. Superintendent W. A. Heller speaks very highly of the work and value of the motor car.

### CONTROLLER NOTCHES AND RESISTANCE DIVISION.

Increasing attention is being given by manufacturing companies to the proper adjustment and subdivision of resistance in connection with controllers. The tendency is to put more points on the controller and provide plenty of terminals on the resistance frame, so that the amount of resistance on each notch can be adjusted to the weight of the car. The mistakes of the past have been either that too much has been cut out at a step, or that the successive steps have not been even. On one class of motor car equipment put in use several years ago the resistance on the first controller points is made so as to start the car smoothly with the heaviest trailer load it is ever called on to pull. The result is that with a light load the car starts off with a jerk. It would have been a very simple matter to put in enough resistance on the first point to start the light load smoothly, and with a heavy load the motorman could pass over the first notch without stopping.

A. E. Lewis, a Montreal man interested in a street railway deal in St. Louis Du Mile End, has mysteriously disappeared and a reward of \$1,000 has been offered for information as to his whereabouts. It is suspected that he has been foully dealt with on account of the railway project as it was unpopular in some quarters.



# CROSSINGS OF STEAM RAILROADS AND STREET RAILWAYS.

PART II.

Many, if not all the states, have passed laws regulating the construction and operation of grade crossings with two objects in view, the protection of the senior franchise, and the protection of the public from injury. Also, most states have delegated more or less authority to regulate crossings to the municipal corporations within which the crossings are located, and the result is that in nearly every city and town there are ordinances limiting the speed at which crossings may be run, and ordinances providing for flagmen or gates at such crossings.

To protect the senior franchise it is usually provided that when one road is crossed by another the crossing shall be made in a manner that shall interfere as little as possible with the operation of the one first on the ground. The cost of installing the crossing was placed upon the junior road, but the cost of maintenance and of flagmen, etc., borne jointly. At the present time, however, the tendency is to throw the cost of maintenance entirely upon the road seeking to cross.

As a district becomes more thickly populated the danger of serious accidents at grade crossings becomes proportionately greater, and as the number of accidents increases, the measures adopted by the state for their prevention become more drastic. In several states in the east the policy of abolishing grade crossings wherever it is at all practicable to do so has been adopted, while some farther west have provided for the protection of crossings by interlocking or other safety devices.

The courts are continually rendering decisions in crossing cases which are of great interest, and without attempting to cover the subject fully, we shall endeavor to give a general idea of the laws at present obtaining and some recent decisions of the courts.

In Alabama street railways may cross steam tracks at grade, but they must do so in such a manner as not to interfere with the steam road and must make arrangements satisfactory to the latter. In the different cities there are special ordinances as to the watchmen, etc., at particular crossings.

Georgia has no law prohibiting grade crossings and they are therefore made at grade. The railroad which is crossed may, however, select such a crossing as will in its judgment be safe, and it is installed at the expense of the company desiring to cross. City ordinances vary as to the speed permitted at crossings; for the most part no flagmen are required.

Iowa follows the general rule that street railways do not constitute an additional burden on the abutting property, unless the motive power be steam. And a company having franchises from the city may extend its tracks beyond the city in highways 100 feet or more in width, and by permission of the supervisors, for two miles in 60-foot roads, in order to reach a state institution. In this state, cities are in general empowered to regulate the crossings of

railway tracks, to regulate the running of engines, cars and trucks within the city limits, and to make rules and restrictions for the purpose of preventing accidents at crossings. The street railways and the steam roads in this state usually manage to settle all the questions arising between them in an amicable manner and therein furnish an example that many of their brethren would do well to follow.

In Kansas cities of the first class are authorized to regulate the crossings of railroad and street railway tracks, and provide precautions and prescribe rules regulating the same, and to require railroad companies to erect viaducts at street crossings. The cost of constructing and maintaining crossings is borne by the junior road which in practice submits an agreement to construct the crossing and maintain it in such a manner as not to impair or abridge the full and free use of the tracks crossed.

In Michigan the question of permitting crossings, the apportionment of their cost, and in fact the whole matter is placed in the hands of the state railroad commissioner. City ordinances regulate the stopping of cars at crossings; where two street roads cross, the cars of the senior company have the right of way.

The city of Duluth, Minn., has an ordinance on the protection of grade crossings which is as follows:

Whenever so required by the resolution of the common council it shall be the duty of every railroad company, whose track crosses any street or road in the city limits, to keep and employ a flagman at such particular street or road crossing, as the common council may direct and such flagman shall give the necessary warning of the approach of all locomotives, trains or cars, to avoid danger to persons and property.

In this city all the grade crossings of the street railway system are bunched on one street, where there are 16 grade crossings within a distance of about 10 squares; 10 of these are in a group, all lying within a distance of two squares. At this point, in addition to the flagman required by the ordinance quoted to be provided by the steam railroad companies, the street railway voluntarily employs a flagman of its own.

The city is at present attempting to have a viaduct built over the bunch of crossings at the expense of the steam roads.

In Wisconsin there are no statutes regulating the crossings of railroads. In the case of the Milwaukee, Racine & Kenosha Electric Railway against the Chicago & Northwestern Railway, the supreme court in a decision rendered April 11, 1897, held that an electric railway is a commercial railway, and in consequence an electric road imposes a new burden upon abutting property and can not claim the right to cross at grade because the highway in which it is laid crosses a steam road at grade. The crossing which was in dispute in this case was effected by building a subway at a cost of \$25,000. By ordinance of the city of Milwaukee street cars must stop 20 ft. from the crossing and the con-

ductor must advance to ascertain whether the crossing be clear before the car is again started. We believe that this is a precaution observed by nearly all roads whether required to do so or not.

In Texas the municipalities have full control over the streets, and the grant to lay tracks on a street carries with it the right to make all necessary crossings. The regulations for safety of crossings vary in different cities as regards the use of flagmen, gates, etc. In most instances mutual agreement between the two classes of roads have proved to be satisfactory. The cost of maintenance of the crossings is equally divided between the two roads.

In Tennessee steam roads are required to flag all street crossings, and roads crossing must maintain the track at joint expense.

In Montana street railways may cross steam roads by making safe and satisfactory crossings.

Rhode Island has no law prohibiting grade crossings.

#### MISSOURI.

In this state all public and quasi public corporations may exercise the right of eminent domain, but in case the land so desired is held by any other corporation the junior one can not make such use of it as will materially interfere with the "uses to which by law the corporations holding the same are authorized to put said lands." By a law passed in 1895 all street railways operating by electricity are required to construct their wires not less than 20 ft. above the top of any railroad track that they may cross, and the wires must be so guarded that they shall be prevented from coming in contact with cars, track or telegraph line. At crossings street cars must come to a full stop not less than 10 ft. nor more than 20 ft. from the tracks of steam roads, and the conductor or other employe go forward to see that the track is clear.

In Kansas City the municipal authorities have passed special ordinances relating to special crossings but no general ordinance. In most cases where such action has been taken regarding the construction of tunnels or viaducts at street road crossings the cost has fallen upon the street railway. Such viaducts and tunnels are open to the public.

The Metropolitan road in that city has built three viaducts of 500, 1,000 and 3,000 ft. in length, and in addition five steel bridges over railroad tracks, these latter costing \$95,000.

#### PENNSYLVANIA.

In Pennsylvania railway companies may acquire exclusive rights in streets as against other companies, the first one entering upon the street having the exclusive right, and the right to cross tracks at grade is an important one. By a law passed in 1889 it is provided that any corporation incorporated under that act shall have the right in its construction to cross at grade, diagonally or transversely, any railroad operated by steam or otherwise, now or hereafter built. This has been held to mean, however, that the crossing must be so made as not to violate the rights of the senior companies. And also, this act must be construed in connection with an earlier one (1871) by which the courts of equity are empowered to impose such regulations as may be necessary to make the use of the crossing less dangerous to life and property.

In the Pennsylvania case decided in 1897 mentioned in the former article on this subject the supreme court says:

"The act of 1889 gives the right to cross at grade, but then we are met by the act of 1871 which says that the court shall, by its process, prevent it, if an overhead crossing be reasonably practicable. This leaves only for the court the physical problem to be solved by the influence warranted from the character of the two roads, the business done upon them, the topography of the territory, and like facts."

Street railways have not the power of eminent domain in Pennsylvania and our understanding is that the tendency of the courts is to require electric roads to comply with the terms of their charters in all respects. As the steam roads own their rights of way in fee they can throw considerable difficulties in the way of interurban lines by withholding consents.

The regulations in regard to the maintenance of watchmen at crossings are quite various and depend largely upon the temper of the city council in the particular place. The railways usually settle the matter amicably, having due regard to the special circumstances surrounding each case.

In the case of the Pennsylvania Railroad against the Greensburg, Jeannette & Pittsburgh Street Railway Company, the supreme court held that a railroad is not such an abutting property owner that it can contest the right of a street railway to use a bridge over the railroad tracks.

#### MAINE.

In Maine the street railways are subject to the supervision of the state board of railroad commissioners. The commissioners have power to determine, subject to the review of the supreme court, all disputes between companies regarding crossings and connections. The customary procedure is for the road desiring to cross to secure a decree from the commissioners. The law provides that the junior road shall bear the expense of the installation and maintenance; if a flagman is considered necessary the wages are usually assessed against the two roads in equal portions.

When grade crossings are prohibited the cost of viaducts is assessed according to the discretion of the commissioners on the street railway, the steam road and the city or town. When built such viaducts are used by the public.

#### MASSACHUSETTS.

In this state the only regulations governing crossings of steam railroads and street railways are by statute. The operation of cars over steam railroad tracks and the construction of tracks over the same are practically synonymous with respect to regulations. Prior to 1894 all the older companies could cross steam railroad tracks at grade by obtaining a location upon the street or highway from the local authorities. At that time, however, an act was passed which prohibited the construction of street railway tracks across the tracks of steam railroads without the consent of the board of railroad commissioners.

The board examines each case and gives or refuses consent, but looks with great disfavor on grade crossings and its policy is against granting permission when it can be avoided. In giving consent it usually apportions the expense of flagmen in about equal proportions, but where the use of flagmen is created because of the construction of street railway tracks the greater portion of the expense is usually put upon the street railway company. The law with respect to crossings is the same regardless of the location.

It is a question whether it is possible under the laws of Massachusetts for a street railway company to build even a



viaduct or tunnel over or under the tracks of a steam railroad without the consent of the railroad. The whole expense in such a case, however, is borne by the street railway company. There are instances where the railroad commissioners have seen where a viaduct would be beneficial, and the consent of the steam railroad has been obtained, but should a steam railroad refuse absolutely, it is not possible to cross without a special act of the legislature. There are instances where the railroad commissioners have refused consent and the street railways have obtained special legislation.

Where viaducts or tunnels are constructed it depends entirely upon the circumstances whether the public may make use of them. If the street railway should join with the local authorities for the purpose of discontinuing an old crossing and constructing a viaduct or tunnel the way thus created is open to all the public, otherwise it is private. There are no regulations for viaducts other than the general regulations which apply to the street or highway at each end of the tunnel or viaduct.

The railroad commissioners in their last annual report to the legislature recommended that the street railways be permitted to purchase or condemn land for the purpose of avoiding a grade crossing, subject to the approval of the local authorities. A bill looking to that end was introduced in the legislature, but was "hung up." Under the general street railway law of the state no street railway company can take land and operate cars thereon. The operation of cars must be upon a public way which is under the jurisdiction of the local authorities.

#### DELAWARE.

Delaware is a small state in which there are but three street railways, all in Wilmington, or directly connected with the Wilmington system. The Wilmington & New Castle Electric Railway Company is the only one not entirely owned or controlled by the Wilmington City Railway Company. The charter of the latter company permits it to cross at grade any steam or other road within six miles of the city of Wilmington. The rights of the company under the charter have been recognized, but notwithstanding this the Philadelphia, Wilmington & Baltimore Railroad sought to prevent the building of a crossing which was necessary to bring the cars of the Wilmington & New Castle road into the city under a traffic agreement with the Wilmington City. The case was decided in May last and the chancellor said in summing up:

"After carefully considering and weighing these affidavits, I am satisfied that it does not clearly appear from them that the crossing under the trolley system at this point would be more dangerous and a greater menace to the complainant's traffic than would the crossing by horse power, against which no injunction is asked, so that even should it be granted that these allegations are relevant and material to this application, yet as the evidence before me leaves the relative danger to a railroad crossing of the two systems an unsettled question, they cannot avail the complainant, since in the application for a preliminary injunction the complainant's case must be clearly made out.

"As has been seen already, the complainant does not claim any property rights as abutter or owner in fee which will be affected by the proposed crossing of its right of way by the respondent under the trolley system, and does not claim to be in danger of receiving any damages other than those already considered, it is therefore manifest that it has no standing in this court for its application for a preliminary injunction, and that for the purpose of this motion it is not open to the court to consider the question whether the respondent railway company has or has not power or authority, under its charter

or under the laws of the state of Delaware, to use electricity as a motive power for the propulsion of its cars in the said city of Wilmington."

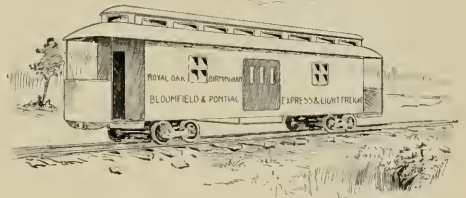
There is no specific statute in regard to grade crossings, but the steam roads have the first right of way and can compel the street railways to conform to specifications as to how the crossings shall be made. The Philadelphia, Wilmington & Baltimore in one case compelled the Wilmington & New Castle to build a bridge 100 ft. long over a single track.

There are no regulations, state or municipal, as to flagmen, gates, etc.

Where viaducts are necessary the question as to which party shall bear the cost is an open one to be passed upon by the courts.

#### FREIGHT SERVICE IN DETROIT.

At the session of the Michigan Legislature last winter an act was passed authorizing any suburban or interurban street railway to carry light freight, but no freight cars can be run within the corporate limits of any city or village between 8 a. m. and 8 p. m., without the consent of the municipal authorities. The Detroit & Pontiac Railway Company has taken advantage of this amendment and has established a



CAR ON THE DETROIT AND PONTIAC.

freight service between the two cities. An old suburban car has been rebuilt as shown in the sketch. Each day the car leaves Pontiac at 6:10 a. m., stops at Royal Oak, Bloomfield and Birmingham for farm and dairy produce, and arrives in Detroit at 7:50. The return trip commences at 8 p. m., and requires an hour and 40 minutes. The load generally consists of purchases made in the city, trunks, grips, and dry goods, etc., which the wholesale merchants send to the country stores. This is a most convenient service for those living on the line of the road and is a source of considerable income to the railway company.

#### A ROAD THAT FAILED.

A correspondent in the west writes us of the stockholders of the road in his town as follows:

"They know all they wish to know about street railways. They have quit—liquidated and retired. The tracks are torn up; the cars moved into shady yards and converted into summer houses where stockholders may enjoy the only successful trips the cars have ever made. It is a run to oblivion over smooth tracks without a jolt or a jar from flat wheels or flat-headed councilmen; with no monthly deficit to be met, no franchise to hold, no mules to feed; and is a happy dream that ends the nightmare of unsuccessful operation."

## GEAR MAKING AND CUTTING.

It is estimated that there are about 100,000 street car motors in use, and to supply these motors with gears demands an output of 20,000 to 30,000 per annum. The cast iron gear and the gun-metal pinion have been replaced by gears of cast steel and pinions of raw hide or hammered steel. This change has reduced the weight 60 or 70 lbs.



FIG. 1.

and the life of the gears has been lengthened to an average of two years. The teeth of the old cast iron gears were frequently broken but this breakage is practically unknown with steel gears. At the River Works, Lynn, Mass., the General Electric Company makes all its pinions and gears. The foundry is equipped with every modern appliance for the manufacture of steel castings of the highest grade. In the gear cutting shop there are milling and key-seating machines and special drill presses, these being designed for

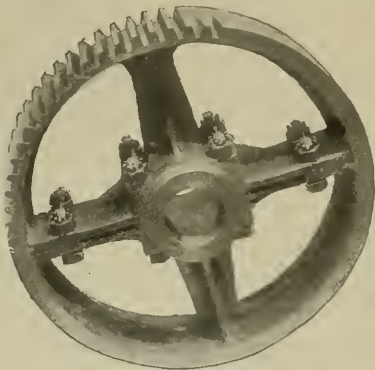


FIG. 2.

very accurate work. Fig. 1 shows the pinion forging, the pinion blank, milled, bored and seated, ready for the teeth to be cut, and the finished pinion. Fig. 2 represents a steel gear, bolted together and machined, with part of the teeth cut. Recent tests have shown that a worn gear and pinion require about 400 watts more power to operate than a new pair, and from these results the question between the extreme life and the proper economic life has come up for consideration.

## ELECTRICITY ON TRUNK LINES.

"The Engineering Side of the Application of Electricity to Standard Railroadings" was discussed at the October meeting of the New York Railroad Club. Among those present was Dr. Cary T. Hutchinson, who made the following remarks:

"Something has been said about electricity, but nothing regarding trunk line conditions. I am of the opinion that the latter is by far the more important side of the question, and if electricity is ever applied to trunk lines it will be due chiefly to changes made in the conditions of the trunk line service and very little to improvements in electrical machinery. Although the electric locomotives which are built today are as far superior to the one shown on the board as is New York Central 'No. 999' to the first 'Rocket,' yet I think that the application of electricity to trunk line service is no nearer than it was at the time this locomotive of Mr. Edison's was built. The electrical appliances have improved steadily, but the trunk line conditions have become worse, from an electrical point of view; that is to say, freight trains are heavier, express trains run faster and are more numerous, and the entire tendency has been away from conditions favorable to electricity.

"The chief condition for economical electrical service is that the train service shall be frequent; that is to say, that the machinery, including the copper feeders, be always kept loaded, doing work to its full capacity, nearly all the time, instead of two or three minutes out of the hour, as would be the case were an attempt made to run the present trunk line service with electricity.

"The only place in the country where there is anything approximating to the application of electricity to trunk line service is at Baltimore, and here the reasons leading to this application were not primarily those of economy. Incidentally the change has proved economical, but the cause for this application was the comfort and convenience of the passengers, rather than any saving in the operation. The locomotives here, as you may know, weigh about 200,000 lbs., and have given on test a drawbar pull of 65,000 lbs., probably as heavy duty as any steam locomotive has ever given.

"This question is not changed materially in my opinion by the use of alternating currents in any form; it is purely and simply a question of keeping the machinery at work all the time and of supplying sufficient track facilities.

"I wish to disabuse your minds of the impression that probably prevails that the work at the New York, New Haven & Hartford on its third rail system has advanced in any degree this application of electricity to trunk line conditions. The service given by the N. Y., N. H. & H. is nothing more than trolley service on a large scale, with heavier cars and higher speeds, and with the trolley wire put on the ground in the form of a third rail. Engineering difficulties have, of course, been met with and overcome, but there is no relation between this work and the topic under discussion. I think a great deal of harm has been done by the indiscriminate laudation of this third rail system, much of it coming from the N. Y., N. H. & H. officials. It has created an impression on the minds of the public generally that electricity is applicable to any kind of a steam line. In one case particularly that I know of this loose talk was the cause of a loss of nearly \$150,000. The people in question had gone to the expense of developing a water power plant for operating an electric road under conditions that were utterly unsuitable for electric service. I was sent out to examine it, and advised them to discard all their electrical machinery and use steam locomotives. The head of the enterprise told me that he had been led to the adoption of electricity by the fact that the N. Y., N. H. & H. road was using it."

To us it appears that the man deserving of adverse criticism in the last paragraph of the foregoing is he who spent the \$150,000 without using his head, and not the N. Y., N. H. & H. people, who so far as we know, devote themselves to managing their own business. When the chicken emulates the swimming powers of the duck and comes to grief, do not blame the duck.

The Western Electric Company is mailing to its customers a handsome 11x14 half-tone engraving of a lion, reproduced from nature,

## TWO CASES OF ELECTROLYSIS.

Periodically the bug-a-boo of electrolysis appears to the newspapers, the water companies and the city officials. A pipe pitted by the action of electricity is discovered, and then the newspapers begin to calculate how many million dollars damage has been done to the water and gas pipes all along the trolley lines. Electrolysis has been discussed and remedies suggested in these columns before. The only excuse for introducing the subject again is that in several places, notably Chicago, Cleveland and Salt Lake City, there is at present some agitation about the damage done by the current in seeking a return circuit to the station.

F. C. Kelsey, city engineer of Salt Lake City, to whom we are indebted for photographs, sent this report to the city council and Figs. 1 and 2 are from the photographs taken of the pipes described:

In September, 1895, a break occurred in the 6-in. water main on the north side of Second South street, near the end of the street car track, between Fifth and Sixth West streets. This pipe was laid in 1891. Upon examination it was found that the pipe where the break occurred was badly affected by electrolytic corrosion, the action being more marked along a longitudinal crack in the side of the pipe. This would appear to indicate that it had been cracked for sometime and that the greater part of the current flowed from the pipe along this crack where the water oozing from the pipe had moistened the ground.

On February 10, 1897, a second break occurred in this line about 80 ft. west of the first one; the pipe at this point was nearly destroyed, the shell in some places being less than 3-16 in. thick. Some portions of the pipe where corroded resembled graphite and the iron could be easily cut with a knife.

I have examined the pipe for some distance on each side of where the break occurred and also the length put in in 1895, to replace the one destroyed, and find it to be corroded. Measurements taken with a voltmeter show that the pipe in this locality is positive to the ground and consequently there is a flow of electric current from it, with the resulting electrolytic action. There is no doubt but what the

prevent it. The present condition of the street railways in this city as regards return conductors is as follows:

Salt Lake City Railway: I am informed by Superintendent Read: "That the rails within the paved district are well bonded and in addition a supplemental bare copper wire is laid between the rails and connected with the bonds every 200 ft. Outside the paved district the only return conductor provided beside the rails is an insulated overhead wire on Second East street, extending from the power house and having one connection each with the tracks where it crosses them on Second, Third and Fifth South streets. Outside the paved district the rails are bonded with No. 4 copper wire fastened to the flange of the rails with rivets."

Salt Lake Rapid Transit Railway: President J. S. Cameron states: "That the only return conductor beside the rails provided for the system is an overhead No. 0000 wire extending from the power house

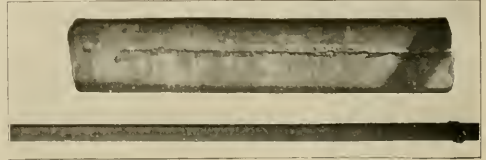


FIG. 1.

to the intersection of State and Seventh South streets; at this point it connects with two No. 0 wires, one running north on State street to the intersection of First South street, the other following the Calder's Park line to the intersection of Ninth East and Tenth South streets. These conductors are connected with the rails at intervals of from 200 to 400 ft. Inside the paved district the rails are bonded with No. 0 bare copper wires fastened to the rails with 3/4-in. rivets. Outside of this district the rails are bonded with two strands of No. 12 or three strands of No. 16 bare copper wire riveted to the flange of the rail. When the lines were constructed connections were made at several points on each line between the rails and the fire hydrants and also a connection was made with the water pipe in front of the power house."



FIG. 2.—WATER MAINS IN SALT LAKE CITY.

corrosion in this case was caused by the return currents of the electric railways, accelerated by the soluble salts contained in the ground around the pipes.

The results in brief of the investigations and tests made by electrical engineers to determine the cause and remedy for electrolysis are:

That on all single trolley railways where the current leaves the rails for the ground it will flow to and along the underground pipes and wherever it leaves them corrosion is sure to result.

That ample metallic return conductors provided by thoroughly bonding the rails and connecting them every two or three hundred feet with overhead or underground conductors extending to the power house will reduce the action to a great extent but will not entirely

These statements show that the street railways in this city are not provided with ample return conductors. The rails outside of the paved district are not sufficiently well bonded and the return wires are a protection to the pipes only in the district which they cover.

Before making any recommendation as to a general plan for protecting the pipes I respectfully ask that I be authorized to purchase a low reading voltmeter and make a complete electrical survey of the pipe system to determine the location and extent of the pipes that are in danger. If, however, you decide not to authorize the survey, I would recommend that the pipe on each side of where the breaks occurred on Second South street, be uncovered as far as there is any indication of corrosion, carefully examined, and where badly corroded so that there is any danger of bursting, that the pipe be



removed. For the protection of this pipe in the future an overhead return conductor of sufficient size should be put in, extending from the power house to and along Second South street to the intersection of Eighth West street and connecting at this point with the rails of the Lake Breeze line. This conductor should be connected with the rails on Second South street every 200 ft. If, after this is done, the pipe at this point is still positive to the ground, an insulated conductor should be laid along the pipe that is in danger connecting with it every 100 ft., and extending to and connecting with the overhead return conductor.

In Chicago E. B. Ellicott, superintendent of city telegraph, made the following report to L. E. McGann, Commissioner of Public Works, after the readings as shown in Fig. 3 was taken:

I have had an examination made of the ground return of the street railway company operating an electric railroad line on South State street with the following results: At the corner of 51st and State streets a test was made between a 30-in. gas pipe and the rails of the street railway company. It showed that there was a current of 25 amperes flowing from the pipes to the rails at a point where this large main was intersected with a 6-in. gas pipe at 51st street. In the block between 50th and 51st streets there was found to be a difference of potential of three volts between the hydrant and the rails, and a current flow of 16 to 20 amperes. Between 51st and 52nd streets, near which latter street is located the power house of the street railway company, there is a gradual decrease in current flow, which shows that the ground return at a point on 51st street and State street is very poor.

The railway company should be required to run the proper return wires from this point in order to decrease the flow of current from the pipe to the rails. The 6-in. gas pipe which was removed was found to be very badly pitted from the action of the current, and it is no doubt affecting the water mains in this vicinity and at other points along the line which have not as yet been tested.

The difference of potential between the rails and the gas and water pipes should be reduced to practically nothing in order to prevent the deterioration of the pipes. I do not know of any other way of securing this result except to run the proper-sized copper return cables

I would suggest that a competent man be detailed for this work and the tests be made at an early date in order that the railway companies may have an opportunity to correct the defects before winter. The test above referred to was made with a representative of the Chicago City Railway Company present, and his reports will probably show the same results as above given.

In the Salt Lake City report it seems evident that there has been damage from the action of the current although the soluble salts in the earth may be a large factor in the results.

The Chicago report is based on the readings taken in the locality shown by Fig. 3. The railway company was instrumental in making the tests in order to determine whether or not the return circuit was in good condition. It is the policy



FIG. 4.

of the company to have adequate returns, for it costs many times the amount to generate power to force the current through the earth and water pipes than any damage that might result from electrolysis. In order that any current which may be in the pipes may have a good return circuit and no electrolytic action result a strip around the circumference of the pipe is filed and a copper band is bolted firmly in place and connected by an equalizing wire to the rails. The faults in this locality, shown in the map, will soon be removed and it is improbable that there is another place in the whole system where such results can be found.

It cannot be denied that there is danger of electrolytic action to any underground pipes or metal conduits in the vicinity of electric railway tracks if proper care is not taken with the construction and maintenance of the return circuit. With the track rails well-bonded and the conductivity supplemented by return feeders or copper wires in the middle of the track and connected to each rail, which is the usual practice, there is little reason to believe the current will overcome the high resistance of the earth and flow along an iron pipe, every joint of which is a poor electrical connection. The current takes the path of least resistance and in a good return circuit this may amount to a fraction of an ohm. When current is flowing in the gas or water pipes the danger points are the places where the current leaves the pipes to return to the station or at the joints where electrical contact is poor.

To obviate the danger copper bands are placed around the pipes at the points where the current is likely to leave them to return to the generators, and connected to the rails.

General manager M. R. McAdoo of the Paterson, (N. J.) Railway Company, has had some experience in this line. About a year ago the water pipes within a radius of a half mile of the power station were found pitted by the action of the current, and electrical experts were engaged to make a survey. All the tracks in this area were thoroughly re-bonded and more feeders were strung to the station and connected to the water mains. Since that time the number of breaks has been less frequent. It is the opinion of the general manager that the question of electrolysis may be solved by having a good return circuit and connecting the water mains in the neighborhood of the station to the return circuit.

Oftentimes the tests made by city authorities are uninten-

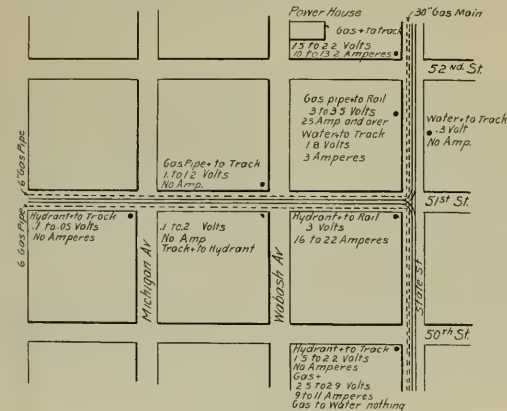


FIG. 3.

and make connections to the rails at such points that it will prevent the flow of current between the pipes and the rails; or to connect the pipe to the rails at different points along the line and give the current a path to the rails through a good connection.

I would not want to recommend the latter method without first making some very careful and extended tests. There is no doubt that within the next year or two it will be necessary to replace many of the water mains, owing to their being affected by carrying the street railway return current, and I am of the opinion that a complete test should be made of all the street railway lines which parallel water mains with a view of determining where the dangerous points are, and that the railway companies be required to remedy the defects in the return conductors.

tionally misleading and grossly wrong conclusions are drawn. Perhaps a test is made with a millivoltmeter and the current flowing from the tracks to the pipes calculated. Such readings as these may be found in localities where the trolley lines are unknown, and a difference of potential exists between gas and water mains regardless of the fact that there may not be a trolley line within miles of them. Not infrequently when the pipes are uncovered the metal has been reduced to a mere film or even perforated. Such a pipe is shown in Fig. 4 and its emaciated condition might easily be ascribed to trolley currents, but fortunately the reverse can be proved. This piece of gas pipe was taken out of a lamp service at the corner of Ogden avenue and Polk street, in Chicago, being accidentally broken in the setting of a railway pole. No electricity had been used on the west side of the river at that time. Had it been discovered a few months afterwards when the electric cars were in operation the gas company would undoubtedly have claimed that the entire service was being jeopardized by the current. Such evidence as this is not even reliable and the street railway companies would do well to fully investigate every phase of the case before accepting such proofs.

**NEW REPAIR SHOP FOR THE ALLEY L.**

The repair shops and yards of the South Side Elevated Railroad Company between 61st and 63rd streets in Chicago present a scene of great activity. The work of altering the cars and assembling the electrical apparatus for the Sprague equipment is now in progress. There are 20 cars near completion and ready to take the place of the steam locomotives. The steam service will have to continue until the completion of the power station at 39th street, which will

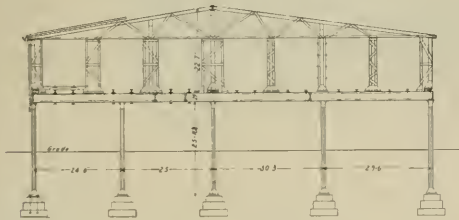


FIG. 1.—CROSS SECTION.

require at least two months. It is probable that some of the cars equipped with motors will have to be recalled into service for trailers, but this can be readily done by removing the pinions and the contact shoes. The vestibules are very compact and only occupy the portion of the platforms to one side of the door.

The present repair shops are provided with facilities for keeping the locomotives and passenger coaches in order. It was found necessary to construct another building to care for the motor cars. This will be done by extending the elevated structure north to 61st street and using the building now occupied by the lighting plant. This is of brick, two stories high, about 50 ft. square; on the first floor are the engines and dynamos which furnish the light for the elevated stations, and the second floor is used for office purposes. The electric lighting machinery will be removed and sold. As shown in Fig. 1 the structure is supported on piers and iron columns and provides for seven tracks.

The girders and columns were in stock, having been left from the World's Fair. Light brick walls will be built around the iron frame work.

On the first floor will be the carpenter and tin shop, large store rooms, waiting and toilet rooms for the employes and the repair shop for small parts. An elevator of sufficient capacity to elevate the trucks from the first to the second

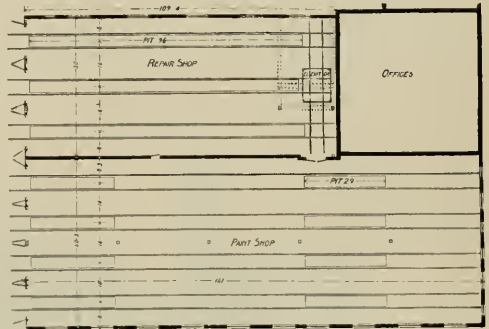


FIG. 2.—FLOOR PLAN.

floor will be installed, but the car bodies will remain on the second floor on a level with the elevated tracks. In the paint shop there will be eight pits located as shown in the floor plan, Fig. 2.

The old machines to be removed into the new shop consist of a wheel lathe, a 52-in. double headed lathe, two engine lathes, one a 15-in. and one a 21-in., a bolt cutter, an 18-in. shaper and a drill press. Other machinery necessary to repair the electrical equipment will be procured later.

**MORE NIAGARA POWER FOR BUFFALO.**

The demand for electric power in Buffalo has been so great in the last few months that it is necessary to add a new circuit of three wires to the transmission line. The Niagara Falls Power Company has placed an order with the General Electric Company for seven new 1,250-h. p. step-up transformers of the air-blast type. The voltage will be raised from 2,200 to 11,000, but ultimately to 22,000, and the current is changed from a two phase to a three phase. From the step-down transformers of the Cataract Power & Conduit Company, which controls the general distribution of the current in Buffalo, three phase circuits will run to a number of induction motors which are being installed in the grain elevators. The Buffalo Railway Company is also increasing its step-down transformer and rotary converter capacity in its Niagara street power station. In addition to the two 500-h. p. converters in operation two more of similar size are being constructed by the General Electric Company. Three 275-k. w. step-down transformers will also be added. These transformers reduce the voltage of the three phase current from about 10,500 to 375 volts and the rotary converter delivers a direct current of 550 volts to the bus bars of the station switchboard.

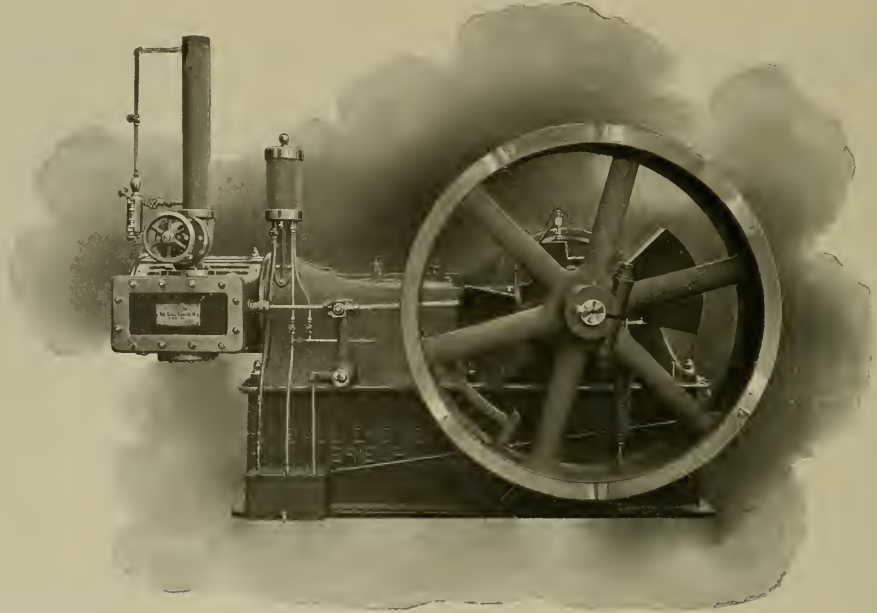
The Metropolitan road, Kansas City, Mo., has installed a motor to drive its machine shop at 12th and Charlotte streets.

### NEW FEATURES OF THE BALL ENGINE.

The illustration shows one of the engines manufactured by the Ball Engine Company of Erie, Pa., whose work is well known in electric railway plants. The engine shown is equipped with the Rites governor and automatic lubricating system. This governor was described in our September issue, page 593. The lubrication is accomplished by a gravity system of supply to sight feeders distributed at necessary points over the engine. By means of a pump driven continuously from the valve motion the oil is delivered back to the supply tank after use, making the system automatic. A direct pressure may be established on the oil

the introduction of a gas capable of combining with them. The new process insures a perfection of vacuum not obtainable in lamps exhausted in groups.

For street car purposes it is essential that the lamps have mechanical strength, uniformity in current consumption and long life without a decrease in brilliancy. A long life lamp can be secured which gives a dim light but these are not economical as there is little return for the current consumption. The Edison lamp has an efficiency of 4 watts per candle power. The lamps being in series it is important that they be uniform, so the railway lamps are made in three different classes—for 500, 550 and 600-volt circuits. The filament of cellulose with a hard graphite carbon coat-



THE BALL ENGINE.

supply pipes to remove any obstructions in them. The oil after leaving the bearings runs down to the bottom of the frame and from there to a receiving tank near the floor level, where screens remove some of the foreign matter; the oil is pumped up to the supply tank in greater quantities than necessary for the engine and the overflow runs back to the lower tank. Such a gravity system supplies the oil free from bubbles which are so great a cause of annoyance with direct systems.

### INCANDESCENT LAMPS FOR STREET CARS.

At the lamp works of the General Electric Company the output of incandescent lamps is 6,500,000 yearly. For two years or more experiments have been in progress to perfect a new exhaustion process, which would do away with the mercury pumps. This has been accomplished by means of a small mechanical pump which exhausts one lamp at a time. The natural residual gases, which are always a source of much trouble, are thoroughly removed from the lamps by

ing is so shaped and anchored as to be free from injury from vibration. In this lamp the anchor is set in the stem and this combination checks the vibrations rather than holds the filament rigid.

### ELECTRICITY ON LONG ISLAND.

The management of the Long Island Railroad announces that a considerable portion of its suburban system is to be equipped for electric traction, and does so without any qualifying statements as to the equipment being experimental. The officers of the company say that they are confident that electricity will do the work better than it is now done by steam locomotives. The reason for the change is the construction of a tunnel under East river to connect the present Flatbush avenue terminal in Brooklyn with the business center of New York, which could scarcely be used with steam for motive power. The preliminary steps for the building of the tunnel are now in progress and it is estimated that two and one-half years will be required for its completion. The change to electricity will not be made until that time.





### Alabama.

**BIRMINGHAM, ALA.**—Bids will be received by the Birmingham Traction Company until December 15 on 6.5 miles of track, 60 and 56-lb. rail, 12 crossings, 12 switches, 8 curves, bonds, furnishing and stringing No. 0 trolley wire, furnishing and stringing No. 0000 feeder wire, two 125-k. w. generators and switchboard, engines, boilers and traveling crane; 4 cars, 4 trucks, motor equipments for 4 new and 2 old cars. George H. Clark is engineer and G. M. Williams, general manager.

### California.

**SAN LUIS OBISPO, CAL.**—R. E. Jack has been granted a franchise to build a car line in Higuera street.

**OAKLAND, CAL.**—The Piedmont & Mountain View Railroad has been practically absorbed by the Realty Syndicate.

**SAN FRANCISCO, CAL.**—It is said that Spreckles will ask the supervisors for a franchise to build an electric railway in Bush street.

**SAN DIEGO, CAL.**—Receiver A. E. Dodson offered the road of the Citizens' Traction Company for sale by auction November 18, at the minimum price of \$40,000, but no bidders appeared.

**REDLANDS, CAL.**—To promote the construction of an electric railway the Redlands Orange Grove & Water Company offers to take \$2,000 of the bonds of any company formed for such purpose. A horse car line is now operated.

### Chicago.

**CHICAGO.**—Consents for the long-desired trolley line on Evanston avenue have been obtained by the North Chicago Street Railroad Company.

**CHICAGO.**—Charles T. Yerkes has declared his intention of equipping North and West Chicago Street Railroad cars with fenders in compliance with the ordinance.

**CHICAGO.**—Charles T. Yerkes, it is said, has succeeded in financing the Northwestern Elevated Railroad, and it is expected that construction will be resumed the coming year. The Northwestern was projected in 1892. Two years later work was begun and continued until 1896 with an outlay of \$5,200,000. Nearly all of the concrete foundations have been laid, rendering it possible to erect the iron superstructure in a very short time. A suitable location for the power house has been acquired, with an ample supply of pure lake water for condensing.

**CHICAGO.**—The Englewood & Chicago Electric Street Railway Company will equip its cars with fenders in compliance with the city fender ordinance. The Chicago Electric Transit Company, a Yerkes corporation, has obtained frontage consents for the construction of four miles of road on which work will begin immediately. The North Chicago Street Railroad has obtained frontage consents for a trolley line in Dearborn avenue. Right of way for an electric railroad along the Illinois and Michigan Canal is asked by a syndicate of Chicago, Ottawa and Streator men. Among those interested are W. H. Holcomb and H. D. Judson of Chicago.

### Colorado.

**DENVER, COL.**—President George H. Holt says the Denver City Cable Company will discard the rope and put in an electric system with a view to reducing the heavy operating expenses.

### Connecticut.

**SHELTON, CONN.**—It is said the Shelton Street Railway will be extended along the river to Paradise Green.

### Delaware.

**WILMINGTON, DEL.**—The Wilmington City Railway Company contemplates an extension across the Washington bridge.

**WILMINGTON, DEL.**—Jacobs & Vandegrift, of Philadelphia, have begun work on their contract to build the Wilmington & Brandywine Springs Railway.

**WILMINGTON, DEL.**—The Elsmere & Wilmington Electric Railway, 1.5 miles in length, was formally placed in operation recently. D. W. Taylor is president of the company.

**NEWPORT, DEL.**—The Newport, New Castle & Wilmington Railway Company has been organized with Thomas Holcom of New Castle president, and J. A. Cranston of Newport secretary. An electric road will be built from Newport to Wilmington, via New Castle

### Georgia.

**ATLANTA, GA.**—The Consolidated Street Railway Company has decided to equip its cars with the Security fender.

**SAVANNAH, GA.**—The council has granted radical changes in the routes of Savannah's street railway, adding many miles of double track.

### Illinois.

**ROCK ISLAND, ILL.**—Contracts have not been let for the new machinery for the Tri-City Company's power station.

**ELGIN, ILL.**—The Elgin City Railway Company has filed a mortgage to David S. Wegg, securing an issue of \$200,000 of bonds.

**FREEMONT, ILL.**—The management of the electric car line is figuring on extending to Beebe's wood and converting it into a pleasure resort.

**QUINCY, ILL.**—Business men are reviving the project to build an electric railway from Quincy south through Payson, Plainville and other points in Pike county.

**PEORIA, ILL.**—The Central Railway Company plans an extension of its lines north to connect with its recent acquisition, the Glen Oak & Prospect Heights Street Railway.

**SALEM, ILL.**—The Illinois & Southern Construction Company has been incorporated to build an electric railway. Capital stock \$2,500; incorporators, C. H. Neff, W. C. Irwin and A. N. Rooks.

**EAST ST. LOUIS, ILL.**—John F. Day, one of the promoters of the East St. Louis & Belleville Electric Railway, says that the grading of the roadway will begin before the end of the year. Condemnation proceedings cause the delay.

**SALEM, ILL.**—The Wabash & Mississippi Construction Company has been incorporated to build and operate an electric railroad from East St. Louis through the counties of St. Clair, Madison, Clinton, Clay, Richland and Lawrence. Capital stock, \$2,500; incorporators, C. H. Neff, W. C. Irwin and A. N. Rooks.

**ROCKFORD, ILL.**—James S. Ticknor has sold his interest in the Rock River Electric Railway project. E. M. Hopkins of Chicago is to be the president, J. S. Ticknor, Rockford, the secretary, and Mayor Schuelder of Oregon the treasurer of the new company. The company is now completing the right of way.

**EAST ST. LOUIS, ILL.**—An electric railway 11 miles in length will be built by the St. Clair Turnpike Company. D. P. Alexander, a director of the company, represents capitalists who have acquired control of the stock, and who have ample capital to build the road at once. Surveyors are laying out the route.

**AURORA, ILL.**—Promoters of the Aurora, Yorkville & Morris Electric Railway are awaiting with interest the decision of the court in the condemnation suits brought by the Aurora & Geneva Railway. If it is decided that companies organized under the horse and dummy act can not condemn land they will incorporate under the general railroad law.

**JOLIET, ILL.**—Col. John Lambert, manager of the Consolidated Steel & Wire Company, is the principal backer of a company which is getting the consents of the property owners to build an electric railway, taking in the principal business streets not already used by the Joliet Street Railway, and branching out to Rockdale, three miles southwest.

**EAST ST. LOUIS, ILL.**—The St. Louis & Belleville Suburban Railroad Company has been incorporated to build a line over the St. Clair Turnpike. Capital stock \$350,000; incorporators, George Townsend and William T. Reed, general contractors, of Chicago, Wilber N. Horner, attorney, of Chicago, ex-Judge Alonzo S. Wilderman, of Belleville, and John Niemes, contractor and mason, of East St. Louis.

**PEORIA, ILL.**—Stockholders of the Glen Oak & Prospect Heights Electric Railway met November 26 and authorized President Monroe Seiberling to sell the property to Walter Barker, president of the Central Railway. A few minutes later a deed was filed for record and Mr. Barker took possession. The Central now controls all lines in the city and is better prepared to fight the new Peoria & Pekin Traction Company, which is making great headway.

### Indiana.

**ANDERSON, IND.**—Noah J. Clodfelter has obtained for his Indiana Traction Company an extension to July, 1898, from the Fairmount council.

**JEFFERSONVILLE, IND.**—Storage batteries will be placed on the street cars as an experiment by the new owner, Capt. Edward J. Howard.

**HUNTINGTON, IND.**—The Huntington Street Railway Company, which expects to build eight miles of track, was granted a franchise November 24.

**TERRE HAUTE, IND.**—Receiver Jump's petition to the court for authority to borrow \$25,000 to buy boilers and enlarge the capacity of the street railway and electric lighting plant has been allowed.

**JEFFERSONVILLE, IND.**—Captain Edward J. Howard of the Howard Shipyards in Jeffersonville will take possession of the Jefferson City Street railway at once and equip the cars with electric motors. The dynamos supplying current will be set up at the shipyard planing mills, where he has ample power.

### Iowa.

**DES MOINES, IA.**—The Des Moines Street Railway Company contemplates extending its system two miles, to Valley Junction.

**BOONE, IA.**—The Boone Electric Street Railway went into operation November 15. President L. W. Reynolds expects to extend the line next spring to Incline, and to establish a pleasure resort.

**COUNCIL BLUFFS, IA.**—A special election will be held December 1 to vote on the question of extending the lines and franchise of the Council Bluffs, Lake Manawa & East Omaha Construction Company.

**MASON CITY, IA.**—The success of the Mason City & Clear Lake Traction Company's freight and passenger line is causing the promotion of similar roads. One of these is to run northwest through Fertile to Lake Mills, also southeast through Coldwater to Rockford. Another line is to run from Charles City to Hampton and from Clear Lake to Belmont.

### Kansas.

**PITTSBURG, KAN.**—Work is soon to begin on the extension of the Pittsburg, Frontenac & Suburban Electric Railway from Chicopee to Weir City and Columbus. Weir City has granted a franchise to the Pittsburg & Columbus Railway Company.

**FORT SCOTT, KAN.**—The Citizens' Railway Company has been incorporated to operate an electric road and power plant in Fort Scott. Capital stock, \$50,000; directors, W. B. Hurst, W. H. Frost, H. C. Post, C. B. McDonald, W. D. Lowry, D. P. Thomas, Grant Hornaday, W. C. Perry and John H. Crain, all of Ft. Scott.

### Kentucky.

**ASHLAND, KY.**—The Ashland Improvement Company, largely interested in the Ashland & Catlettsburg Street Railway, has made an assignment to Willis L. Ringo, general manager of the railway.

### Maryland.

**BALTIMORE, MD.**—The Central Railway Company has installed 265 cells of storage battery to equalize the load on the Preston street power house.

**BELAIR, MD.**—Water power will be used by the Belair & Havre de Grace Electric Railway Company to generate electricity. The turbines and generators will be located on Deer Creek.

**BALTIMORE, MD.**—The Garrison Avenue Railroad Company has been incorporated to build a line. Capital stock, \$100,000; incorporators, Nelson Perin, W. A. House and Mr. Offutt.

**SANFORD, ME.**—C. A. Bodwell, superintendent of the Mousam River Railroad, says that everything is favorable to the construction of the new road in the spring. The line will extend a distance of 20 miles from Sanford to Cape Porpoise.

**BALTIMORE, MD.**—The Central Railway Company has begun work to connect its Canton extension with the Canton, Sparrows Point & North Point Railway. Fifteen closed cars are being built by the City Passenger Railway Company for the Green line.

**BALTIMORE, MD.**—A mortgage to cover an issue of \$1,250,000 of bonds has been given by the Baltimore & Northern Railway Company, which is a consolidation of the Falls Road Electric Railway Company and the Pikesville, Reistertown & Emory Grove Railroad Company.

**BALTIMORE, MD.**—The petition of the Baltimore, North Point & Bear Creek Railway Company for permission to lay track on the Mount Carmel road has been taken under advisement by the Baltimore county commissioners. The application is opposed by the East Baltimore & North Point Railroad.

**BALTIMORE, MD.**—It is said that the Columbia & Maryland Railway has passed into the control of John E. Searles' railroad and steamboat syndicate, William L. Elkins and P. A. B. Widener of Philadelphia selling their interests. David M. Newbold and Robert S. Carswell of Baltimore retain their large holdings.

**BELAIR, MD.**—W. P. Husband of the Havre de Grace & Belair Electric Railway Company has applied to the county commissioners for right of way between Belair and Aberdeen. Seventeen miles of single track is to be laid through Fountain Green, Fulford, Churchville, Carson's Run and Aberdeen to Havre de Grace, thus penetrating the most thickly populated districts of the county. Freight will be carried as well as passengers.

### Massachusetts.

**MARSHFIELD, MASS.**—An electric street railway is to be built from Marshfield depot to Brant Rock.

**NEWTON, MASS.**—The Newton Street Railway Company is said to be planning a new power station and car house.

**FITCHBURG, MASS.**—The Fitchburg & Suburban Railroad Company has been granted a franchise over the route asked.

**SPRINGFIELD, MASS.**—The ties distributed along the route of the Springfield & Southwestern Electric Railway have been attached on claims for transportation, etc.

**NEWBURYPORT, MASS.**—Right to extend to Groveland has been granted to the People's Street Railway Company. The capital stock will be increased \$200,000 to provide the funds.

**NORFOLK, MASS.**—Permission to establish a pleasure resort half way between Dedham and Norwood has been granted to the Norfolk Central Street Railway Company by the Railroad Commissioners.

**NATICK, MASS.**—The Needham selectmen have granted a franchise to the Natick & Cochituate Street Railway Company for an electric railroad through Needham from the Wellesley line to the Dedham line.

**BOSTON, MASS.**—The state railroad commissioners have refused to ratify the lease of the West End Street Railway to the Boston Elevated Railroad Company on the ground that a lease would be against public policy.

**MILTON, MASS.**—The petition of the Boston, Milton & Brockton Street Railroad Company for a franchise has been given a hearing by the Milton selectmen. The petition of the Quincy & Boston Street Railway Company was also heard.

**PALMER, MASS.**—The directors of the Palmer & Monson Electric Railroad Company have chosen C. F. Grosvenor, president; E. G. Hastings, vice-president, and Rufus Flynt, secretary and treasurer. It was voted to accept the franchise granted by the town of Palmer.

**WEBSTER, MASS.**—Directors of the Webster & Dudley Electric Railway Company have voted not to accept the franchise and to dissolve the company. Edgar S. Hill is making arrangements with the New England Railroad Company to have an extra track put in from Webster station to Elliott's Shore and run electric cars during the summer.

**MARSHFIELD, MASS.**—The Brant Rock & Duxbury Beach Electric Railroad Company has been organized to build six miles of road from Marshfield station to Brant Rock and Duxbury. Work is to begin at once. Capital stock, \$50,000; I. L. Currier, 105 Main street, Worcester, president and treasurer; Bradley S. Bryant, secretary; George H. Thomas, Charles J. Sprague, Henry C. Phillips, Charles Atwood and Walter Peterson of Brant Rock, directors.

**NORFOLK, MASS.**—The Norfolk Southern Street Railway Company has been incorporated with a capital of \$150,000. The board of directors are John C. Lane, Norwood, Robert S. Gray, Walpole, Joseph J. Feeley, Walpole, Edward E. Draper, Boston, George S. Forbush, Brookline, Frederick S. Lane, Foxboro, and Aaron R. Sanderson Boston. The road will be seventeen miles in length, starting at the junction of Washington street and Railroad avenue, in Norwood and extending through Walpole and Foxboro to the railroad station in Mansfield.

## Michigan.

**THREE RIVERS, MICH.**—The proposed electric railway from Three Rivers to Leonidas is being actively promoted.

**DETROIT, MICH.**—Dearborn township has granted a franchise to the Detroit, Ann Arbor & Ypsilanti Street Railway Company.

**ESCANABA, MICH.**—The Escanaba Electric Street Railway has ceased operation, President J. Lillie having found it a losing venture.

**LANSING, MICH.**—The scheme to build an electric railway from Lansing north through St. Johns, Ithaca and St. Louis is still being agitated.

**ADRIAN, MICH.**—Once more has the sale of the Adrian Street Railway been postponed, as it is doubtful whether Judge Chester will confirm the best bid of \$625.

**DETROIT, MICH.**—Springwells township has granted a franchise for an electric road over Michigan avenue to the Detroit & Ann Arbor Electric Railway Company, in which John A. Russell is interested.

**MONROE, MICH.**—The council has granted a street railway franchise to A. E. Kiopelle, C. W. O'Brien and Leopold Freud, who will give a bond as an evidence of good faith, and construct a steel bridge over the River Raisin.

**LANSING, MICH.**—A company is being organized by Judge Montgomery and Senator F. L. Dodge of Lansing; Senator E. Mudge of Maple Rapids; George W. Stone of Ithaca, and C. C. Vaughan of St. Johns, to build the long-talked-of electric railway between those places.

**DETROIT, MICH.**—Col. Seymour Brownell, of 28 High street, West, has succeeded in interesting Detroit capitalists in his scheme to build an electric railway. His associates have purchased a controlling interest in the capital stock of the Detroit & Howell Plank Road Company.

**GRAND RAPIDS, MICH.**—A new franchise is asked by the Consolidated Street Railway Company on the ground that it cannot do business under the present burdens. In return for more liberal provisions the company promises to make extensions and improvements costing \$100,000.

**FLINT, MICH.**—The council has voted a franchise to Hon. Samuel W. Smith and Joseph E. Sawyer of Pontiac and George E. Taylor of Flint for the proposed electric railway from Pontiac to Flint. A survey of the road has just been completed. Mr. Taylor says work will be begun by May 1, 1898, and cars will be running before November, 1899.

**DETROIT, MICH.**—The Detroit & Northern Railway Company has been incorporated to construct an electric line between Mt. Clemens and Marine City, 32 miles in length. Right of way has been obtained and construction is expected shortly to begin. Capital stock, \$350,000; incorporators, Fred Woodbourne, St. Paul; Luther S. Cushing, St. Paul; John Townsend, St. Paul; Arthur P. Lothrop, St. Paul; George E. Smith, Detroit; Clarence A. Lightner, Detroit, and Edwin Denby, Detroit.

**DETROIT, MICH.**—The old power house of the Fort Wayne & Belle Isle Railway, at Detroit, which has been out of use since the consolidation of the street railway companies has been purchased by the Detroit, Ypsilanti & Ann Arbor Suburban Railway Company. The property will be removed to Wayne to furnish power for the new line that will connect Detroit with Ypsilanti and Ann Arbor. The work of removing the power house will be started within two weeks. It is thought that cars will be running over the new line by January 1.

**DETROIT, MICH.**—The Detroit, Ann Arbor & Ypsilanti Electric Railway Company has been incorporated. Capital stock \$100,000; incorporators, James D. Hawks, president of the Detroit & Mackinac Railway, S. F. Angus, John C. Liggett, Obadiah Bingham and M. J. Griffin of Detroit. The road will be 43 miles in length, extending from the terminus of the Detroit Electric Railway to a connection with the Ann Arbor & Ypsilanti Motor Road at the city limits of Ypsilanti. M. J. Griffin, as contractor, will immediately begin work in Springwells.

## Minnesota.

**ST. CLOUD, MINN.**—Receiver Clark of the car line has been given leave by the bondholders to expend \$3,500 for new motors, etc. The road is now said to be paying expenses.

## Missouri.

**KANSAS CITY, MO.**—W. C. Weaver, superintendent, is buying material with which to improve the Northeast Electric Railway.

**ST. LOUIS, MO.**—Construction is soon to begin on the Lindell Railway Company's 14-mile extension to Creve Coeur Lake. Specifications are being prepared.

**ST. LOUIS, MO.**—The Russell Place & Oak Hill Railway Company has been incorporated with \$2,000 capital stock by G. W. Parker, T. G. Russell and C. G. Russell.

**ST. LOUIS, MO.**—The North & South Railway bill, granting unknown persons right to construct 100 miles of street railroad, has passed the house of delegates.

**KANSAS CITY, MO.**—A franchise has been granted the East Side Electric Railway Company by the lower house of the city council. It is said Mayor Jones will veto the ordinance.



SHELBY, MO.—Orville G. Wales, 1509 Chemical building, St. Louis, is promoting an electric railway between Shelby and Shelbyville. Interested in the project are Dr. McCully, W. H. Warren, and T. F. Hughes of Shelby.

### Nebraska.

LINCOLN, NEB.—Ernest C. Ames, master in chancery, will sell the Lincoln Street Railway December 17, by order of the United States court, on petition of the New York Security & Trust Company.

### New Hampshire.

PORTSMOUTH, N. H.—The Portsmouth, Kittery & York Electric Railway will be extended through Newcastle and Rye to Hampton as soon as conditions will permit in the spring.

### New Jersey.

NEW BRUNSWICK, N. J.—The Brunswick Traction Company has received permission from the Piscataway township committee to extend its line from Bound Brook to Dunellen.

MOUNT VERNON, N. J.—John H. Starin, owner of Glen Island, and others have applied for a franchise to build an electric railway from the railway station to the Glen Island dock.

HACKENSACK, N. J.—The Bergen County Traction Company, operating between Fort Lee and Englewood, it is said, will apply for a franchise next spring for a line through Hackensack.

SOUTH ORANGE, N. J.—The South Orange & Maplewood Traction Company has been incorporated to construct a line. Capital stock, \$100,000, with \$25,000 paid in; incorporators, Henry A. Page, South Orange; Edward D. Page, New York, and Frank Brewer, West Orange.

MORRISTOWN, N. J.—The Speedwell Lake Railroad Company has been incorporated to build and operate a line from the terminus of the Rockaway Valley Railway to Speedwell avenue, Morristown. Capital stock, \$50,000; incorporators, Frederick H. De Coster, Richard B. Moriarty, Mahlon Pitney, Frederick V. Pitney and Frederick S. Smith of Morristown, Byron K. and George W. Stickle of Rockaway, N. J.

### New York.

SCHENECTADY, N. Y.—The Schenectady Railway Company, it is said, will make extensions.

NYACK, N. Y.—The Nyack Traction Company has applied for permission to construct an electric street railway.

ROCKAWAY, N. Y.—The Rockaway Village Railway, has been purchased, it is said, by the Long Island Railroad Company.

WESTFIELD, N. Y.—The Princess Bay Electric Railway Company has been granted a franchise by the Westfield highway commissioners.

BUFFALO, N. Y.—The Buffalo Traction Company has given a bond of \$200,000 to guarantee the construction of its lines as provided in its franchise.

NYACK, N. Y.—George F. Kissam of New York, is president of the new Nyack Traction Company. A. B. Wilgus of New York, is also interested.

BUFFALO, N. Y.—East Aurora has granted a franchise to the Buffalo, Hamburg & Aurora Electric Railway Company for a line along Main street.

BROOKLYN, N. Y.—The Sea View Elevated Railroad has been purchased and will be equipped with electricity by the Brooklyn Heights Railroad Company.

PATCHOGUE, N. Y.—The Patchogue & Port Jefferson Traction Company will decline the franchise granted by Patchogue, hoping to obtain a more liberal one.

STATEN ISLAND, N. Y.—The Princess Bay Railroad Company, which was recently incorporated to build 1.5 miles of electric road, has received its franchise.

BROOKLYN, N. Y.—The Brooklyn Heights Railroad Company will apply to the aldermen for the privilege of building from Flatbush to Bath Beach and Bensonhurst.

MARCELLUS, N. Y.—The Marcellus Electric Railroad Company has filed its consents for the construction of an electric road from Marcellus to Marcellus Station.

NEW YORK, N. Y.—The state railroad commissioners have given the Metropolitan Street Railway Company permission to change from horses to electric conduit on the 86th, 106th and 125th street lines.

WHITEHALL, N. Y.—G. S. Leavenworth has made preliminary surveys of the 20 miles of road to be built between Whitehall and West Paulet, Vt., by the Whitehall & Granville Electric Railway Company.

NEW YORK, N. Y.—The Fulton, Wall & Cortlandt Street Ferries Railroad Company's property was sold December 2 by L. J. Phillips & Co., under foreclosure of mortgage instituted by the Central Trust Company.

ALBANY, N. Y.—T. D. Welch of Ravena, N. Y., has taken the contract to build the electric railway from Nassau village to Brainard Station, a distance of seven miles. Several teams and 100 men are at work grading.

PATCHOGUE, N. Y.—An amended franchise has been granted the Patchogue & Port Jefferson Traction Company, of which J. B. Swezey is secretary. Sixty days are given in which to accept or decline the franchise.

NEW YORK, N. Y.—Electric cars were placed in service November 4, on the Fourth and Madison avenue lines of the Metropolitan Street Railway. By January 1 the company will have installed electricity on 40 miles of track.

NEW YORK, N. Y.—Permission to construct a horse car line in Wall, Pine, Liberty, Cortlandt, and William streets is asked by the Fulton, Wall & Cortlandt Street Ferries Railroad Company, under franchises granted in 1885.

JAMAICA, N. Y.—The Long Island Electric Railway Company has been given more time in which to complete the construction of its line on South and Hay streets. The company also asks a franchise to run its cars on Fulton street.

ALBANY, N. Y.—The Greenbush & Nassau Electric Railway Company has contracted with the Columbia Power Company for 300 horse power, thereby postponing the construction of its own power plant. Cars are expected to be running by February 1.

PELHAM MANOR, N. Y.—The Pelham Park Railroad Company has petitioned the board of aldermen for a franchise to construct two extensions of the horse car line from Bartow Station to City Island, with a branch to the city limits at Pelham Manor.

SARATOGA, N. Y.—Civil Engineer Robert E. Dunston, Samuel J. Mott and W. S. Winchester of Saratoga Springs are making a survey of the projected electric railroad between Saratoga and Ballston, which is being promoted by the Saratoga Traction Company.

ALBANY, N. Y.—Laborers working on the Greenbush & Nassau Electric Railway are murmuring because their pay is not forthcoming. It is said Belden & James have not succeeded in floating the \$180,000 of bonds which they took to New York with that object.

WATERTOWN, N. Y.—The Consolidated Watertown and the Watertown & Brownsville Street Railways were sold November 27 under foreclosure of mortgage held by the Central Trust Company. Mayer Lebkuecher of Newark, N. J., and C. T. Cornell of New York bought the roads for \$28,000 above the incumbrances.

LITTLE FALLS, N. Y.—The trustees of Frankford village have granted a franchise for an electric railway to Clinton Beckwith of Herkimer and John V. Quackenbush of Mohawk, N. Y. Col. Beck-

with says the franchise will not be accepted on account of the provision requiring the company to pay the village 2 per cent of the gross earnings.

**BROOKLYN, N. Y.**—The Brooklyn Rapid Transit Company has obtained nearly all the consents required for the 16th avenue line, which is to be built next spring to connect the Eastern District and New Utrecht. For the 12 months ending October 31 the company earned a surplus of \$89,529, against a deficit of \$78,753 for the same period preceding.

**SIDNEY, N. Y.**—The Delaware Terminal Railroad Company has been incorporated to build 15 miles of electric railroad from Sidney to Franklin. Capital stock, \$150,000; incorporators, Charles L. Burgess, Sigmund T. Meyer, David S. Meyer, John Neff and H. S. Meyer of New York, Louis F. Raymond of Franklin, and Edmund R. Halsey of Newark, N. J.

**BROOKLYN, N. Y.**—The Brooklyn & Jamaica Turnpike Company has been incorporated by the backers of the recently incorporated Cross Country Railroad Company. The road will connect Brooklyn and Jamaica with Flushing and the north shore of Long Island. It is said that the franchise for a trolley line from Rockaway Park to Wave Crest is owned by the same men.

**COLLEGE POINT, N. Y.**—The Cross Country Railroad Company has been incorporated to construct 15 miles of electric road in Kings and Queens counties from Flushing Bay to Liberty avenue, Brooklyn. Capital stock, \$250,000; incorporators, Joseph McLean, Andrew A. Halsey, Theodore Bernard, Charles H. Kelby, James Crowley Francis Bacon, James Erwin and Charles Brandon of Brooklyn.

**SYRACUSE, N. Y.**—The chamber of commerce held a meeting recently to promote the electric railroad. As surveyed, the road would extend a distance of 41 miles, to Solvay, via Oswego, Mandana, Skaneateles, Marcellus, Camillus and Fairmount. The survey has just been completed, under the direction of J. W. Ackerman, chief engineer of the Lehigh Valley Railroad. To build the line there has been incorporated the Syracuse, Skaneateles & Moravia Railroad Company with \$1,000,000 capital stock. Wing T. Parker of Moravia is president; Henry J. Hubbard of Skaneateles, vice-president; Joseph Parker of Moravia, secretary, and Thomas W. Downing of Moravia, treasurer. Heavy freight is to be carried as well as passengers.

### North Carolina.

**SALISBURY, N. C.**—D. L. Risley of Philadelphia, Pa., is said to be interested in the Salisbury Street Railway & Electric Company, which has been organized to build a trolley road.

### Ohio.

**TORONTO, O.**—Edward McElvaine, the Pittsburg capitalist, is said to be promoting an electric railway to connect Toronto with East Liverpool and Steubenville.

**SANDUSKY, O.**—J. W. Flowers of Toledo has been getting right of way for the electric line to be built by the Cleveland, Fremont & Toledo Electric Railway Company.

**YOUNGSTOWN, O.**—The application of the Mahoning Valley & Southeastern Electric Railway Company for right to build a line has been granted by the county commissioners.

**TIFFIN, O.**—A large quantity of rails, iron poles and trolley wire has been received for the Tiffin-Fostoria Electric Railway, construction of which is being rapidly pushed by Manager A. F. Kaup.

**KENTON, O.**—A scheme is on foot to build an electric railway through the Scioto marsh. From Kenton the road would extend through Foraker, McGuffey and Alger to Ada. It is said that Calvin S. Brice is interested.

**DELAWARE, O.**—W. A. Hall asks the court to appoint a receiver for the Delaware Street Railway. Mr. Hall is director of the Deposit Banking Company which recently got judgment for \$2,000. A reorganization will be attempted.

**CINCINNATI, O.**—John Martin and the Ohio Turnpike Company are about to construct an electric railway from the terminus of the East End Electric Railway to Bethel, Clermont county, passing through California, Mt. Washington, Fruit Hill and Williamsville.

**LIMA, O.**—Promoters of the Lima & Huntsville Electric Railway are active. Right of way is fast being obtained. The car house will be located at Huntsville. Another project is on foot for the construction of an electric road from Huntsville to West Liberty, DeGraff and Quincy.

**DAYTON, O.**—The Dayton, Spring Valley & Wilmington Transit Company has been incorporated to build the electric railway noted in DAILY BULLETIN from time to time. Capital stock, \$50,000; incorporators, J. M. Wilson, Wallace Berryhill, J. H. Racer, George Truman, and Frank E. Robbins.

### Oregon.

**SALEM, ORE.**—F. R. Anson, receiver of the Salem Electric Street Railway, is taking bids on 1,000 ties for renewals.

### Pennsylvania.

**PITTSBURG, PA.**—The United Traction Company has taken out a permit in Allegheny for the erection of a pumping station.

**HARRISBURG, PA.**—The Tower city council has granted the Lykens & Williams Valley Electric Railway Company right of way through the town.

**MEADVILLE, PA.**—Isaac A. Walker & Son, who have the contract for the construction of the Meadville Street Railway, have reorganized and are proceeding with the work.

**ROYERSFORD, PA.**—The Royersford & Trappe Electric Railway Company is being formed to build a line connecting with the Schuylkill Traction Company at Collyerville.

**READING, PA.**—Holders of the Reading & Southwestern Railroad securities are asked to vote a lease to the United Traction Company for 99 years on a guarantee of 5 per cent.

**NORRISTOWN, PA.**—Thomas Butcher, S. Powell Childs and Chalky Styer have been appointed a committee to obtain right of way for the proposed trolley line from Norristown to Ambler.

**PITTSBURG, PA.**—Negotiations have been closed whereby the control of the United Traction Company is acquired by a syndicate represented by Alexander Brown & Sons, bankers, of Baltimore.

**TAMAQUA, PA.**—The Tamaqua & Lansford Electric Railway, 8.5 miles in length, has been placed in operation. It is said the Lehigh Navigation Company will equip the "Switchback" for a trolley road.

**MEADVILLE, PA.**—John W. Shryock, president of the Meadville & Edinboro Electric Street Railway Company is negotiating with the Erie Electric Motor Company for track privileges at the Erie terminus.

**PHILADELPHIA, PA.**—A banking firm has disposed of its controlling interest in the Hestonville, Mantua & Fairmount Electric Railway to parties closely identified with the management of the Union Traction Company.

**MECHANICSBURG, PA.**—The Susquehanna & Western Railway Company has been incorporated to build six miles of road from Wormleysburg to Mechanicsburg. Capital stock, \$50,000; president, B. F. Myers of Harrisburg.

**DOYLESTOWN, PA.**—The Doylestown & Willow Grove Traction Company has been incorporated with \$10,000 capital stock by D. N. Walmsley, Carroll R. Williams and Joseph Jones of Philadelphia, and Samuel Steckel and G. P. Brock of Doylestown.

**ASHLAND, PA.**—The Ashland-Centralia Electric Railway Company has been granted the right of way to construct a road two miles in

length, connecting with the Shamokin-Mt. Carmel Railway at Centralia and the Shamokin-Mahanoy City Trolley Line at Ashland.

**PITTSBURG, PA.**—The West End Traction Company has been incorporated to consolidate a number of small roads running to Carnegie, Crafton and other places southwest of the city. Capital stock, \$15,000; incorporators, J. C. Reilly, W. J. Burns, Thomas S. Bigelow, J. D. Callery and W. V. Callery.

**CONSHOHOCKEN, PA.**—The Stoke-Pogis Railway Company has been incorporated to build 3.5 miles of electric railway from Rosemont to West Conshohocken. Capital stock, \$50,000; incorporators, Frederick Phillips, president, Clinton Gage, J. M. Whitham, William M. Kerr, George C. Schoff, Henry C. Landis and J. N. Kerr, all of Philadelphia.

**WHITE HAVEN, PA.**—The Wyoming & Pond Creek Railway Company has been incorporated to build six miles of electric road from White Haven to Sandy Run Junction. Capital stock, \$60,000; incorporators, A. J. Lathrop and S. J. Lathrop, Pittston; D. F. McCollins and A. M. Freas, Wilkesbarre; C. L. Hoover, Sandy Run; L. L. Rogers, M. G. Lathrop and L. C. Bacon, New York.

### Rhode Island.

**NEWPORT, R. I.**—The Middletown and Portsmouth Railroad Company has been incorporated to build an electric line through Middletown, Portsmouth and Tivertown, connecting with roads in Newport and Fall River. Capital stock, \$300,000; Melville Bull, president; W. A. Tucker, Charles Peirce and Mr. Saltonstall of Boston, directors. The construction is in charge of the Tucker-Anthony Company of Boston.

### South Dakota.

**YANKTON, S. D.**—The Yankton Street Railway will take up its track on Douglas avenue and surrender its charter.

### Tennessee.

**KNOXVILLE, TENN.**—The Knoxville Street Railway Company has accepted its franchises.

**OBION, TENN.**—The Obion & Tiptonville Rapid Transit Company has been organized to build a line between the two towns. The incorporators are G. B. Morris, W. M. Wilson, R. S. Lyons, T. J. Ogilvie, J. H. McDowell and T. C. Wilson.

### Texas.

**BEAUMONT, TEX.**—J. A. Hanson, one of the incorporators of the electric railway company, says a bond will be filed immediately and the construction of the road begun.

**GALVESTON, TEX.**—On application of the Guaranty Trust Company of New York, R. B. Baer has been appointed receiver of the Gulf City Street Railway, which was absorbed by the Galveston City Railway Company some years ago.

**SHERMAN, TEX.**—J. McGeagh, representing an eastern syndicate, has acquired the Sherman City Street Railroad, the Electric Belt Railway of Sherman, and the Denison Street & Electric Railway. A double track connection between Sherman and Denison will be built by the new company known as the Sherman & Denison Twin City Electric Rapid Transit Company. Mr. McGeagh has bought 200 acres of land on which will be established county fair grounds, race tracks and pleasure parks. The contemplated extensions will increase the mileage from 14 to 27.

### Vermont.

**BENNINGTON, VT.**—The Bennington Electric Railroad Company and the Hoosick Railway Company have filed with the secretary of state a certificate of consolidation as the Bennington & Hoosick Valley Railway Company. Capital stock, \$160,000.

### Virginia.

**NORFOLK, VA.**—John L. Williams of Richmond is at the head of a syndicate which expects to acquire all the street railway lines of Norfolk.

### Washington.

**MYERS FALLS, WASH.**—W. B. Aris of Myers Falls and A. J. Ross, vice-president of the Exchange National Bank, Spokane, are said to be interested in a project to build an electric railway nine miles in length from Myers Falls to the Columbia river, using water power.

### West Virginia.

**PARKERSBURG, W. VA.**—Brown & Hazlett of Wheeling have been retained as consulting engineers for the new electric railway.

**PARKERSBURG, W. VA.**—Howard and Edward Hazlett, brokers of Wheeling, contemplate building a street car system in Parkersburg. They expect to organize a company to obtain franchises and put in the road.

**CHARLESTON, W. VA.**—The Capital City Electric Railway Company has taken possession of the Charleston Horse Railway, which was purchased some time ago at receiver's sale. Besides equipping with electricity the new owners will extend the line three miles, and have all in operation before January 1.

**PARKERSBURG, W. VA.**—As predicted in the DAILY BULLETIN of November 10, the promoters of the new electric railway have purchased the Park City Street Railway. The deal was closed November 24, and transfers the franchises, real estate and 500 ft. of 60-lb. rails. The new company was represented by W. N. Chancellor, C. H. Shattuck, John Busch, George A. Burt and their attorney, W. W. Van Winkle. Howard and Edward Hazlett, brokers and bankers of Wheeling, represent outside parties who are putting money into the road.

### Wisconsin.

**OSHKOSH, WIS.**—The Citizens' Traction Company has been granted right to lay additional tracks.

**RACINE, WIS.**—Citizens of Racine talk of building an electric railway to Waterford via Union Grove and Burlington.

**OCONOMOWOC, WIS.**—An electric street railroad scheme is promoted by the Oconomowoc Advancement Association.

**OSHKOSH, WIS.**—The Citizens' Traction Company's new ordinance is of doubtful legality, having been vetoed by the mayor and approved by the acting mayor.

**MILWAUKEE, WIS.**—A private telephone system including 100 miles of line and costing \$10,000 is being erected by the Milwaukee Electric Railway & Light Company.

**MILWAUKEE, WIS.**—It is said that the apparently defunct Citizens' Street Railway scheme has been taken up by parties interested in the Falk Manufacturing Company, and that the road will be put through if a liberal franchise is granted.

**MILWAUKEE, WIS.**—The council has indefinitely postponed the ordinance to extend the franchise of the Milwaukee & Waukesha Company. The project is believed to be dead. A coal storage and handling plant will be installed by the Milwaukee Electric Railway & Light Company.

**MADISON, WIS.**—The Madison City Railway was sold under foreclosure December 1, for \$110,000, being bid in by Trustee Newcomb for the bondholders. The bonds and interest due aggregate \$174,412. The plant, which is now a paying property, has been in the receiver's hands a year and a half.

### Canada

**STRATFORD, ONT.**—The city council has decided to call for tenders for a street railway franchise.

**VICTORIA, B. C.**—An extension of two years' time in which to complete its works is asked by the British Columbia Electric Railway Company.



## THE NIAGARA FALLS POWER COMPANY.

In the REVIEW for October brief mention was made of the work in progress of enlarging the plant of the Niagara Falls Power Company and a view of the new wheel pit was shown. The illustrations herewith show the building as



POWER HOUSE.

now extended to cover the entire pit and a later view of the new section of the wheel pit. The new section is 294 ft. long, making the total length 434 ft. The depth is 179 ft. The average width is 20 ft., which is increased at the top to make room for masonry walls 6 ft. wide, the distance



THE NEW WHEEL PIT.

between the walls being 21 ft. The new portion of the pit is to be lined with brick throughout, and it is the intention of the company to eventually so line the original pit also.

In the new section several important changes have been made in the details of construction. In the first installation the girders were built into the walls; in the new portion,

they rest on castings built into the brick work. Also the new turbines and the lower penstock elbows instead of resting on the girders built in the walls are to be provided with lugs and rest on castings in the brick work.

There will be four turbines placed in the new wheel pit to operate four exciters, thus providing an absolutely independent source of power for the exciters for the large generators.

## THE AMERICAN INVASION OF ENGLAND.

(As seen by an English Engineer.)

English engineers and those interested in the adoption of electric tramways are much exercised at the present moment on the subject of the equipment of tramway systems. It is held by many that the methods which have been so pre-eminently successful in the United States are not fitted for English conditions, and it is this opinion which forms the basis to the opposition to American plants. The question has become acute during the past few weeks, from the fact that the Central London Railway has placed its electrical equipment in the hands of American firms and that Glasgow has likewise determined upon adopting an American plant for working the experimental line. It is not difficult, however, to explain the reason why American interests are somewhat dominant in English traction tramway matters at the present moment. It has been the practice for some years when advocating the claims, the advantages and the economies of the over-head system of electric traction to quote largely from American experience and it will be within the recollection of many American engineers that it was quite a customary part of the proceedings, when considering electric tramways in England, to send a deputation to America to examine and report upon the latest practice that prevailed there; nor has this custom yet completely died out.

There is hardly a report published in this country by any of the authorities that is not in a great measure based upon the results that have been achieved in the United States. When a municipal corporation or a tramway company, therefore, proposes to equip its tramway lines for electrical working, it is not surprising that there should be a distinct leaning towards American methods. Moreover, it must not be forgotten that the most active exponents of electric tramway principles in England at the present moment are of American origin or have gained their experience in the United States. Speaking without any bias in the matter, the writer affirms with the greatest confidence that a great deal of gratitude is due to Americans, whether manufacturers or consulting engineers, for it is to their pioneering efforts that the progress we have already made is due. The most successful of the modern electric systems at present working in this country are American throughout and it would be idle to deny the usefulness as object lessons of the Dublin, Bristol, Dover and other systems which are built on American lines. It is claimed that there are numerous English contractors who are ready and willing to completely equip a tramway for electrical working if they are only given a chance, but there is nothing unpatriotic in being businesslike and it is obvious if an American house can offer a complete scheme in competition with an English house which may lack experience, it ought not to be surprising that any company or municipality which is doing the best it can for itself should hesitate to adopt an English system. It is a little

curious, also, to note that in some of the systems in this country that are reputed to be English throughout how many of the details in line construction are of American origin.

In the opinion of the writer, there will be in the near future considerable extension of American work in this country, and it is also equally clear that as soon as English engineering houses put themselves into a position to compete with Americans and will be disposed to copy the best American practice, there will be an adjustment in the market, and the Americans may find it difficult to beat us on our own ground. History will repeat itself. In the early days of electric lighting Americans showed the way in this country, and no doubt there were considerable heart-burnings on the part of English contractors, that they were frequently left out, but directly they began to improve their electrical work, it soon became apparent that home-made machinery could be made as well and as cheaply as American; there was practically no extension of American systems. There is this difference, however, that when electric lighting was first commenced in this country, there was not a great deal done in America; but in tramways you have a tremendous start; your systems have been worked out with exceeding care and precision. Various parts of the system have become standardized, and with the results of great experience at your disposal, it is natural to assume that you have acquired the very latest and the best methods. Not only does the practice seem to have been worked out with great precision, but the theory of the subject has been set forth with great skill. It would be foolish if English people refused to avail themselves of American experiments and experience.

There is, and probably always will be, more disposition to experiment with a view to effecting improvements than is generally the case in this country, and as Professor Ayrton pointed out a few days ago, "America is the laboratory of the world." In this country there must always be in electrical matters a limit to experimenting, for obviously a tramway company which is responsible to a body of shareholders would not be permitted to carry on extensive and costly trials, and the law of the country would absolutely prohibit any municipality embarking upon any scheme that had not been well tried and had become established practice. Having regard to these things, any one who approaches the subject in an unprejudiced spirit can not help the conclusion that it is to Americans we must look for much of the development of tramways.

There has been a disposition on the part of English engineers to criticise the details of American tramway practice. It is claimed that it is needless for us to go to America to buy engines. No one for a moment could and no one seeks to deny the splendid work carried out by English engine makers and they can rightfully boast of turning out an engine that has no superior in the world; but how many can claim to have made engines for tramway practice? It is said however that the conditions arising in electric traction do not differ materially from those which occur in lighting and mill work, but it seems to the writer that half an hour inside a tramway power house ought to convince one that the conditions are totally different from what is met with, for instance, in lighting work. The best known engine in this country for electric lighting, and it is in all respects a splendid piece of mechanism, was totally unable to meet with satisfaction the conditions arising in one of the most quoted

electric tramway power houses in this country and it became necessary to adopt the horizontal compound type of engine. Having regard to this experience, it is not surprising that the Tramway Company should send to the States for engines that had proved their worth for tramway purposes.

Quite recently, in a discussion on tramway matters, there was a tendency among the speakers to sneer at American engines and it was denied that a fly-wheel had the usefulness that seems to have become established by American experience. To an ordinary person who has some cognizance of the engineering ability and experience of American engineers, it seems somewhat absurd to think that on such an important matter as fly-wheels the Americans are hopelessly wrong. A further criticism on American methods is that there is too much tendency to change practice in tramway matters, but that is a most curious objection to bring forward, because the changes that have been made in lighting systems in this country are very remarkable and although the uniformity of English electric lighting stations is constantly dwelt upon, it would not be difficult to select several stations where three or four types of plant are in existence. There must of necessity be a process of evolution and it seems futile to object to American methods merely because their experience suggests occasional alterations of their practice.

It may be a matter of some interest to show the tramway undertakings that have been completed and are about to commence operations in this country for the purpose of showing how far American methods are being adopted.

Lines equipped, or to be equipped, by American contractors:

|                               |             |
|-------------------------------|-------------|
| Bristol.....                  | £ 27,249    |
| Central London Railway.....   | 3,244,000   |
| Coventry.....                 | 40,000      |
| Douglas Southern Tramway..... | 41,000      |
| Dublin.....                   | 120,000     |
| Glasgow.....                  | 20,000      |
| Dover.....                    | 27,000      |
| Middlesborough.....           | 143,000     |
| Plymouth.....                 | 3,683       |
|                               | <hr/>       |
|                               | £ 3,665,332 |

Lines equipped or to be equipped by English Contractors:

|                               |             |
|-------------------------------|-------------|
| Bessbrook & Newry.....        | £ 10,000    |
| Blackpool & Fleetwood.....    | 156,500     |
| Brighton & Rottingdean.....   | 20,000      |
| City & South London.....      | 958,149     |
| Giant's Causeway.....         | 45,087      |
| Guernsey.....                 | 22,686      |
| Hartlepool.....               | 12,000      |
| Isle of Man.....              | 188,462     |
| Kiddeminster & Stourport..... | 50,000      |
| Liverpool Overhead.....       | 707,829     |
| South Staffordshire.....      | 266,346     |
| Waterloo & City.....          | 80,079      |
| Leeds.....                    | 80,000      |
| Plymouth.....                 | 2,171       |
|                               | <hr/>       |
|                               | £ 2,580,309 |

The foregoing figures do not in every case show the value of the electrical equipment; for instance, in the Central London Railway, the figures represent the total amount of the contracts and the same applies to the Liverpool Overhead and the City & South London Railway; in all the other cases, however, the figures practically show the value of the electrical equipment.

London, Dec. 1, 1897.

## WHAT THE STARTER SAID.

The Bertillon Transfer — Baltimore Tired of Near Crossing Stops — Saengerfest in Columbus X-ray a Boomerang — A Cow Case.

"Let 'er go", sang out the starter, while at the same instant two bells were accompanied by the last day car gliding away into the gray fog. Then he filled his pipe, and the boys gathered around for the evening chat.

Did you notice that eastern paper I had here yesterday? Well, there was a story in it, hatched up by some reporter. Seems he got hold of one of those transfers as has the faces pictured out with beards and mustache and the old woman on, so as to punch the kind of passenger you give it to. Now he wasn't satisfied with marking a man by his Burnsides or bald head, but wants the repertoire extended to include whether the hair is red or black; and if his clothes is hand-me-downs or custom tailor; and a punch for the lady with store teeth, and so on. Guess he must have tried to ride on one as was punched fer the man with brains, and the con wouldn't take it.

\* \* \*

I hear the folks in Baltimore have got good and tired of stopping at the near crossing, and wading ashore in the mud. Now the women have raised a howl and the fellow who got the ordinance passed wishes he was at Klondike. It was just the same way in Brooklyn and Cleveland, and a lot more places. I told you it wouldn't last long. You can't run the nose of your car over the crosswalk, and so everybody has to land in the street. And the passengers tries to crowd out the front door and gets fouled in the baskets and kits of tools and things, and the dickens is to pay generally. Then they blames the motorman for wearing a storm coat and taking up so much room; and by the time you gets your bell there is a procession of teams headed across your track like an industrial parade, and you has to wait; and by the time a man has run a mile down town he's away off his schedule. No, sir; the old way at the far crossing is the correct thing.

\* \* \*

One of the Columbus boys was along here yesterday and he gave me a good one. Seems the superintendent, George Scranton is his name, rooms in a tony apartment house, and as he stays down until the last car is in for the night he likes to sleep late in the morning. Things went all right for a while, until some young ladies as came to town to study music, took the room next to his'n. About 7:30 a. m. they would begin at the piano and kept it up until they went to the school, at nine. The first few days he says nothing, but after a while it got tiresome. He sent in a polite report of his case, but the next morning they began earlier than ever, and when one was tired the other would spell her. Bang, thump, bang! scales and all kinds of musical pieces without any tunes. Then this Scranton gets weary and complains to the owners, and they tell him as how they was awful sorry, and the like of that, but it was a free country and they couldn't do nothing.

Scranton says, "Anybody got a right to play all they wanter round the premises?"

And the man says, "Yes, as long as it is in their own room."

Well, he didn't do a thing to 'em. He goes out to the company's park, and unpacks the biggest barrel organ you ever see. It was one as belongs to the merry-go-round. He gets some of the boys to fetch her down on the last car, and it took six of them to get her up the stairs. Then he rigs a motor from the light wire and was ready for 'em.

The next morning the musicians opened up the ball bright and early. Scranton was tired, 'cause he staid up late connecting things up, and when they woke him up he just turns over and sets the controller in the fourth notch. The machine got her headway quick, and "White Wings" and "Sweet Violets" could be heard six blocks. It roared and ripped, and you'd a thought the heartstrings of a cyclone was being torn out. Of course the girls made a miss, and when the music factory had run about 15 minutes he shut her off. Then he gets up and dresses, but the last thing when he leaves is to throw her on again. All day long it played and played, over and over again, until the neighbors was all out in the street, and all the tenants had served notice on the agent that they were going to move out.

The agent couldn't find Mr. Scranton until most dark. Said he was out testing the suburban line for leaks on the bond wires. The agent was crazy, but Scranton reminds him as how he said tenants had a right to music so as it was in their own room.

The fellow tumbled.

"How long do you intend to keep her there!" says the agent, sort of friendly like.

"Wall, as I am very found of music," says Scranton, says he, "I calculate I wouldn't open the park before June 1, and I might just as well have the good of the organ; and besides the folks as made it says as it is better for it not to stay idle out in the park. Might get rusty."

Well, the agent fixed the girls, and now nobody in the plant dares play so much as a jewsharp while Scranton is asleep.

\* \* \*

I've noticed where the companies has been exposing fraud hurts by putting the folks under the X-ray and showing as how the bones they claimed was cracked was as straight as a die. But did you see how a woman got \$10,000 on the Elgin City Railway the same way? She claims she was hurted, and, the company thought as how it wasn't so. But she up and has a X-ray picture made of the inside of her hip and there they was, just like her doctor said all the time. Still there is a good deal of doubt as who was to blame, the company or her, and the case has got to be tried all over. Seems to me, though, it would be a good scheme for the company to get these X-ray landscapes before it got into court, and maybe sometimes it would be cheaper to settle than law it.

\* \* \*

Some folks wants the hull earth. The other day the interurban which is building down to Peory, and runs through some farms, had a cow case. Seems some fellow left a gate open on the right of way, and a cow gets out, and into a orchard and eat so many apples she foundered. The farmer sends for the old man, who viewed the remains, and couldn't deny as how the cow was dead and as big around as a generator; so, rather than have any row, he pays the old hayseed \$35, and throws in the carcass. Now, they say every dried up old heifer in that hull section is being fed on dried apples and warm water, and driven on the right of



way to swell up and die and get damages. The old man had to hire boys to go out and pick all the apples off the ground for half a mile wide and four miles long, so they wouldn't have a case on him."

"Well, the owl's waiting, and I'll go home."

THE STARTER.

### PERSONALS.

E. D. Du Bois, superintendent of the Citizens' road, Muncie, Ind., was among the REVIEW callers.

Frank J. Jones, vice-president of the Citizens road, Memphis, visited Chicago for several days early this month.

C. D. Wyman, general manager of the New Orleans Traction Company, made the REVIEW a pleasant call on his recent trip north.

D. W. Pugh, whose name is synonymous with the Stephenson Car Company, New York, called on many of his western friends in Chicago, last week.

George W. Hommel, who was for some years general superintendent of the Milwaukee City Street Railway Company, has removed to New York.

Asa W. Field, cashier of the Union Street Railway Company, Saginaw, Mich., was presented with a gold-headed cane by the employes of the road.

A. L. Young, president of the Central Railway & Electric Company, New Britain, Conn., and the board of directors were re-elected at the annual meeting.

W. A. Smith, general manager of the Omaha Street Railway, spent several days in Chicago, during his December trip east, where he went to inspect several roads.

Captain Robert McCulloch, general manager the citizens road, St. Louis, and Richard McCulloch, electrical engineer, were REVIEW visitors when in Chicago early this month.

A. E. Lang, president of the American Street Railway Association, and president of the Toledo Traction Company, has been quite seriously ill, but is much improved and able to be out again.

S. F. Hazelrigg, superintendent of the Atlantic Coast Electric Railroad Company, has left Asbury Park, N. J., for a voyage to Rio Janeiro, Brazil, which will necessitate his absence for several months.

R. Semmes, general manager of the Mobile Street Railway, was one of the last victims of yellow fever, which he contracted late in November. After quite a hard siege he pulled through and is recovering.

H. C. Mackey, formerly assistant auditor of the Minneapolis Street Railway Company, has been appointed auditor of the Milwaukee Electric Railway & Light Company and will assume his new duties January 1.

L. S. Wright, general manager of the Schuylkill Electric Railway Company, has resigned on account of failing health. The employes at Pottsville, Pa., presented him with a gold-headed cane as a token of their esteem.

At the recent meeting of the board of directors of the Leavenworth Electric Railroad Company, E. E. Coombs, auditor and cashier, was selected to fill the position of general manager left vacant by the resignation of L. M. Erb.

On December 2, M. B. Dunham, of Warren, Pa., president of the Titusville Traction Company was badly hurt by the explosion of the boiler of a dinkey locomotive used on the line. Three of the men were also injured, two of them fatally.

Ira Bishop, who has been superintendent of the Piedmont division of the Alameda, Oakland & Piedmont (Cal.) Electric Railroad, has been appointed general superintendent, succeeding B. H. Fisher. The change is due to a change in the ownership of the road.

E. H. Mather, superintendent of the New Haven (Conn.) Street Railway, entered upon his duties as superintendent of the Central Railway & Electric Company of New Britain on November 22. At the annual meeting of the latter company he was elected treasurer also.

M. K. Bowen, general manager, and W. B. Walker representing one of the largest stockholders of the Chicago City Railway, were elected directors to fill resignations of E. M. Phelps and James C. King. Other changes in the board are announced for the annual meeting, January 15.

George R. Folds, of the Twin City Rapid Transit Company, was the recipient of a very flattering offer by the Nassau road, Brooklyn, to become its claim agent. The Twin City, however, made it an object for Mr. Folds to remain and continue the service in which he has done such excellent and satisfactory work.

Thomas H. McLean, president and general manager of the street railway system in the City of Mexico, is taking a few weeks' rest and visiting his railway friends in the States. He is in excellent health, and has won a high place in the esteem of the people and officials of Mexico City, and has revolutionized the service. He expects to commence on the work of changing to electricity during the coming year.

Richard E. Danforth has been appointed superintendent of the Buffalo Railway Company and the Crosstown Railroad Company, succeeding P. C. Deming, who has resigned. Mr. Danforth has been connected with the Buffalo street railways for several years and leaves the position of superintendent of the Buffalo, Bellevue & Lancaster; this position is now filled by F. D. Jackson recently with the Niagara Power Company.

On October 1, E. G. Johnson, who has been superintendent of the Brigantine Transportation Company of Brigantine Beach, N. J., was appointed superintendent of the Philadelphia & Brigantine Railroad and will henceforth manage both roads. Mr. Johnson has succeeded where others failed, and the new appointment indicates that his work is appreciated. It is understood that the Brigantine Transportation Company will make extensive improvements in the spring.

### OBITUARY.

Dwight S. Smith, one of the builders and owners of the Jackson (Mich.) Street Railway Company, died at his home on the morning of November 24, after a short illness.

John Savage, superintendent of the Detroit & Oakwoods suburban, was instantly killed in a wreck on his road, December 4. Mr. Savage had been in railway work in Detroit constantly for the past 16 years, and was highly thought of by officials, the men, and the public.

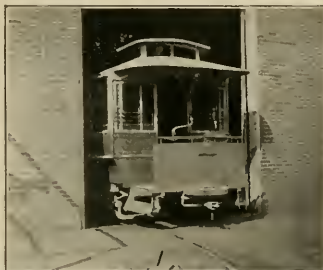
We regret to note the death of Ross Mackenzie, which was announced a few weeks ago in a dispatch from Nelson, B. C. Mr. Mackenzie was born in New York, but removed at an early age to Toronto. For years he has been engaged in railroad and street railway work. Shortly after the completion of the Niagara Falls Park & River Railway, he was offered the management, which he held until a year ago, when he resigned to accept a position with the Crow's Nest Pass Railway.

An electric car on the Oregon City line was held up by two robbers and \$90 was secured from the 35 passengers aboard. When the car was stopped the conductor thoughtfully turned out the lights and enabled the passengers to hide some of their valuables and money. As soon as the car arrived in Portland the police were notified and detectives were sent in pursuit of the robbers.

## A CHEAP AND PRACTICAL VESTIBULE.

Each year adds to the number of states which by statute have made it compulsory to equip street cars with vestibules and managers in those states who have for the first time to comply with such a law can not fail to be interested in the device here illustrated. This cheap and practical vestibule was designed by S. P. Baird, superintendent of the Portsmouth Street Railroad & Light Company, Portsmouth, O., to whom we are indebted for the illustrations and data. This description is offered in the hope that it may prove of advantage to some road which finds it difficult to make both ends meet.

The line drawing shows a horizontal cross-section of the vestibule in place on the car and makes clear the details of construction of the top and bottom portions of the frame. The supports of the vestibule are two rods of  $\frac{7}{8}$ -in. round iron extending from the platform floor to the hood. The front sash are from old horse cars that were condemned.



THE PORTSMOUTH VESTIBULE.

The side sash are transom sash; in these the glass is in three pieces, so that in event of accidental breakage the cost of replacing the glass will be less.

The four photographs reproduced were taken at intervals of four minutes and make evident how quickly the vestibule may be put on the car. The first is car No. 17 ready to

years, being removed in the spring and replaced in the fall. They were built in the company's shops at a cost of \$8 per car, including, of course, two vestibules.

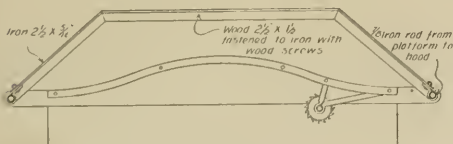
## STORAGE BATTERY FOR THE BUFFALO RAILWAY.

General Manager H. H. Littell advises us that the Buffalo Railway Company is about to install a storage battery plant in connection with the Niagara street power house. The size of this plant will make it a special object of interest to railway engineers and its success, which is confidently predicted, will mark advancement in power station practice. The contract for the battery has already been awarded and when it is completed and installed, which will be some time in March next, it will be operated in connection with the steam and converter plant now used by the company. The battery will be charged from the converters. Should there be a sur-

plus of power from the Niagara transmission at any time, or if the steam plant is not worked to its capacity during the day, the battery will store the surplus current until such time as it is needed. The current thus accumulated will be available whenever the demand is more than ordinarily heavy, or possibly, when some part of the present plant is out of repair temporarily. The greatest demand for power is at 6 p. m. and this is supplied by starting up an extra engine and dynamo but the charged battery is to furnish the current at such times.

The battery will have a capacity of 1,200 h. p.-hours and will have 290 cells, each weighing 1,200 lbs. The iron tanks will occupy a floor space of 2,800 sq. ft. A new fire proof building, with a frontage of 10 ft. and 70 ft. deep, will be erected for the battery adjoining the Niagara street power station. Work on it will commence at once.

This move has been made only after careful investigation, and the railway company has such faith in its success that the tanks, in which the cells are placed, will be made much larger than necessary to meet present requirements. At any time desired more plates can be added, without enlarging



PLAN OF BOTTOM.

receive the vestibule; No. 2 shows the vestibule on the sidewalk ready to be placed in position; No. 3 shows the men at work; No. 4 is the car ready to run; time, 12 minutes.

Vestibules of this pattern have been in use for three

the tanks, so as to increase the capacity of the battery two-thirds.

The Niagara Falls Power Company supplies the Cataract Power & Conduit Company with a 24-hour service. As the street railway lines are not operated all night, there will be much surplus power for charging the battery which will be discharged during the times of heavy loads, morning and evening. The adoption of the storage battery for this work is quite in keeping with the progressive spirit of the company.

### BAD COLLISION AT BALTIMORE.

During the heavy fog which prevailed on the morning of November 21, two cars on the suburban road of Baltimore, the Baltimore Northern Electric, met head on, the accident resulting in the death of both motormen and the very serious injury of some of the passengers. The accident occurred on a curve at the foot of a grade, down which one car was coming rapidly, and to mount which the other car had turned on full current. One motorman was instantly killed, nearly every bone in his body being broken. The other lost a leg, was terribly crushed and died in a few minutes after removal from the wreck. One conductor was cut in the face by broken glass until he was scarcely recognizable and lost the entire lower part of one side of his face. Both motormen leave families; one of them a pair of twins only three days old; the other a child of three weeks, making the case an unusually pathetic one.

The cars were demolished, one telescoping the other past the middle. The coroner's jury found that one car crew disobeyed orders, by not taking a switch and waiting for the other car to pass.

### CHIEF ENGINEER FOR ALLEY L.

A. L. Hadin has been appointed chief engineer of the power plant of the South Side Elevated, Chicago, and is now engaged in superintending the erection of the machinery. The selection of Mr. Hadin is an excellent one as he has had a very extensive experience in the management of steam and electrical machinery. For the last six years he has been chief engineer of the Aurora (Ill.) Street Railway, and during this time remodeled the power plant, and by his careful management and the design and construction of many labor and money saving devices brought it to a high state of efficiency. Prior to taking this position Mr. Hadin was for seven years in charge of the plant of the Hutchinson (Kan.) Water, Light & Power Company.

### EMPLOYEES' EXAMINATION IN ST. LOUIS.

Superintendent George W. Baumhoff, of the Lindell Railway, St. Louis, invited all the motormen and conductors on his road who could be spared from duty to report at the general offices on Saturday night, November 27, and had there a little surprise in the shape of a list of 50 questions chosen with a view to testing the competency of the men for the positions which they hold. The time allowed was 70 minutes, and nearly all succeeded in completing their papers in less than that time. Prizes of \$25, \$15 and \$10 were awarded for the three best papers.

### A MUNICIPAL LIGHTING PLANT IN CALIFORNIA.

The "Argus" of Alameda, Cal., says: "This city spent more than \$42,000 on its light plant last year, \$22,000 the year before, \$27,000 the year before that and is likely to spend more than \$20,000 this year. The municipality could buy all the light it uses for \$10,000 a year at the outside. The light it sells is undoubtedly sold at a loss. As a business venture Alameda's experiment is a rank and wretched failure."

### A NEW WAY OF FIGHTING.

The North Hudson County Electric Railway in extending its lines to Jersey City was opposed by one of the property owners along the line, Mrs. Christiana Parrott, who sought to prevent the company from setting a pole in front of her lot by the novel method of getting into the hole herself. She held the enemy at bay for a time but growing tired of standing placed a board across the hole and sat with her feet in it. The men finally decided to put the pole in anyhow and when it came to the point the woman gave way fearing injury.

### NEW PUBLICATIONS.

The University of Wisconsin has published as one of the Bulletins the thesis of George Henry Trautmann on "A Comparative Test of Steam Injectors." Nine injectors of different makes were tested according to a definite system so that they can be accurately compared in all particulars.

The Electrical Review, London, with its issue of November 12, 1897, celebrated its twenty-fifth birthday, and took advantage of the occasion to give a general review of the progress in all the several lines of electrical work during the past quarter of a century. The special articles were contributed by men high in their respective branches of the electrical industry, and constitute a most valuable and interesting history. Advertisers also availed themselves of the special features and large edition to occupy a generous amount of space; and both the editorial and business departments of this excellent weekly are deserving of much credit for their good work in this number.

"Russell's Convention Dates" published at Newark, N. J., is a paper which can not fail to prove of great value to street railway managers who wish to know in advance of trolley parties and sight-seeing trips to be taken by conventions scheduled to meet in their own or neighboring towns. The paper is a weekly now completing its first year and its success shows that there was a field for it. It is a list tabulated alphabetically according to states and towns of the places of meeting, giving the name of the organization, the date of meeting, name and address of the secretary, and the class of the meeting, whether district, state, or national. It covers Canada and British America as well as the United States. All announcements are kept standing until after the date of the meeting.

The "Power Catechism" has just been issued from the press by the Power Publishing Company, 146 World building, New York. Cloth, \$2.00. It comprises, including the index and tables, 226 pages, and consists of correct answers to direct questions covering the main principles of steam engineering and the transmission of power, and in accordance with our latest knowledge, compiled from the regular issues of Power, after revision and extension. This work is to be highly recommended to those who are seeking specific information on the subjects treated as the answers given are direct and as complete as they could well be made in a book of this kind, glittering generalities being carefully avoided. The index and the table of contents have been carefully prepared and enable one to find the subject sought very readily. The catechism was prepared under the direction of F. R. Low, editor of Power.



COMPRESSED AIR IN NEW YORK.

On August 3, 1896, three cars equipped with the Hardie system of compressed air motors went into regular service on the 125th street line, New York. The cars were run in between other cars and had their own schedule. The demonstration was continued until August 2, 1897, when the air cars were withdrawn. The daily press throughout the country lent its columns and influence to the experiment and few features of street railway work have ever been better cared for in this respect. The cars maintained good running time and the service was generally satisfactory to the public; notwithstanding the favorable conditions, the year's demonstration had closed without a contract for a continuation of the compressed air car service, or its adoption by any other road in this country.

On August 17th last a test was made on the Manhattan Elevated, a specially constructed locomotive having been built for the purpose. The air power people labored under some disadvantage on account of the overweight of their engines, which on arrival had to be reduced from 46,150 lbs. to 44,730 lbs. This necessitated the removal of five bottles reducing the air storage from 193 cu. ft. to 163 cu. ft. The tests were made with trains of three, five and four cars; one trip on each of three nights. The pressure with the four-car train fell from 2,360 lbs. at the start to 180 lbs. at the finish. The train made the usual station stops and carried passengers. Henry C. Cooke, general manager of the American Air Power Company, in his report to the president, says of this performance: "The motor hauled all the various loads and performed all the tasks it was set to do, never having failed in hauling any load, but lost eight minutes time over the schedule when the first trial with five cars (each loaded with 14,000 lbs. of dead weight, and speed around curves limited to six miles an hour) was made. This was due to various causes, principally to inexperience in handling the engine, unfamiliarity with the road, restricting speed on curves to six miles per hour, and tardiness in starting from stations, due to smallness of starting pipes and valves, all of which can be corrected, and this trial must not be considered conclusive."

Theoretically compressed air undoubtedly possesses desirable features although we have yet to be convinced that a "self contained" car of whatever system, can ever be as economically operated on a line of any magnitude, as the car which is always in connection with the central source of power, where that power can be made at lowest cost and drawn on for much or little as the demand requires. The question is still an open one, almost as much so as it was in August 3, 1896.

At that time, we stated, that in our judgment, no two or three cars would ever solve the problem, but that the operation of a much larger number, say 20 cars on a line for a full year, would give some data of consequence. It by no means follows that a 20-car line will show the same cost per car per year as is shown by one car on a two or three car line. The trouble with the air system is that so much of vital importance is still an open question and General Manager Cooke in his report admits this when he says, "The records show that the 125th street cars use 100 to 450 cu. ft. of free air per mile traveled, which the Ingersoll Sergeant Drill Company estimates can be furnished at a cost of 2.8 cents per 1,000 cu. ft. of free air, compressed to 2,000 lbs.

which, including re-heating, is equal to 1.33 cents per car-mile."

The actual cost for any considerable service apparently is still contingent on the correctness of the estimate of a concern having air compressing machinery to sell. The year has not been without progress for the American Air Power Company, as it has effected the sale of the English patents to a strong English syndicate composed of well-known and influential men. These gentlemen have incorporated a company with \$750,000 capital for the purpose of promoting the business; first in the city of London and later throughout Great Britain. Interest has also been aroused and important contracts are stated to be pending for Germany and other foreign countries.

McLEAN'S GOOD WORK IN MEXICO.

When Thos. H. McLean assumed the presidency and management of the street railway lines in the city of Mexico, he found abundant opportunity for the introduction of modern American methods of operation. The owners and the public and the government considered they had a finely managed road, and would have been satisfied with simply a continuation of the former methods. The needed improvement, however, which at once became apparent to Mr. McLean, was something which he discerned would have to be worked out gradually.

The accounts for the first complete year under his management have just been made up, and the showing is as pleasing to the stockholders as it is to Mr. McLean's friends. The earnings have been increased nearly \$95,000, and the entire increase carried into the net earnings. After paying a 6 per cent dividend of \$482,000, a surplus of \$37,000 remains towards an extra dividend in 1898. Following is the statement:

|              | EARNINGS.   | EXPENSES.   | NET.      |
|--------------|-------------|-------------|-----------|
| 1897.....    | \$1,614,575 | \$1,004,680 | \$510,804 |
| 1896.....    | 1,519,519   | 1,095,012   | 424,507   |
| Increase.... | \$ 94,056   | (decrease)  | \$ 95,387 |

The winter months of December, January and February are those of poorest earnings. The gain in the net is further emphasized by the fact that all kinds of fodder during 1897 have been unusually high in cost, and with much lower prices in sight for the coming year, even better gains are confidently expected. The motive power is mules, which, of course, does not admit of the created travel possible in an electric or cable system.

INDIANAPOLIS 3-CENT FARE CASE.

On November 20 the motion to dismiss the Indianapolis 3-cent fare case was argued in the United States Circuit Court of Appeals. December to the decision of the court was handed down by Judge Woods, the appeal being dismissed on the ground of want of jurisdiction. The court says: "There is a distinct assertion that there is a contract right which has been impaired, and unless the contrary is clear it makes a case of which this court cannot take jurisdiction. There is too much foundation for the contention to admit of the inference that it is made in bad faith, and that being so, the question is one for the supreme court and not for this court."



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

The Akron Street Railway & Illuminating Company has purchased for \$400,000 the line of the Akron & Cuyahoga Falls Rapid Transit Company, extending a distance of 20 miles between Kent and Barberton, O.

The Portsmouth Street Railway Advertising Company has been incorporated at Portsmouth, Va. The capital stock is \$5,000, and the officers are W. H. Triol of Philadelphia, president; and William E. Stoakes of Philadelphia secretary and treasurer.

The Williams & Moore Railway Jack Company of Chicago made an assignment November 18 to Lucian M. Williams. The assets are estimated at \$5,700 and the liabilities at \$13,000. The company will be reorganized and the business, which has been good, continued as before.

W. A. Shirley, secretary of the Wheeling (W. Va.) Railway Company, writes us his company has applied for a charter for a park for pleasure resort purposes at the north end of Wheeling Island, and intends to have a first class track for horse and bicycle racing, base ball and other amusements.

The Union Electric Construction Company has been incorporated at Des Moines, Ia., to build and equip electric railways and manufacture street railway appliances. The capital stock is \$5,000,000, and the incorporators are William B. Purvis, Halsey J. Tibbals, B. F. Taylor and John S. Carter.

The Skinner Electric Brake Company has been incorporated at New York, commencing with \$5,000 capital stock. The incorporators are James D. Ganner, Brookline, Mass.; Frank L. Pashaw, Canton, Mass.; E. S. Shepherd, Attleboro, Mass.; Benjamin Pope, Boston, and A. F. Copeland, Newton, Mass.

November 22 the following named gentlemen were re-elected directors of the West End, Boston: G. T. W. Braman, T. Jefferson Coolidge, William Hooper, Albert C. Houghton, Samuel Little, Joseph B. Russell, Richard M. Saltonstall, Samuel Spencer, Walter S. Swan, Stephen M. Weld, Moses Williams and Alfred Winsor.

The receiver of the Newark & Granville Electric Street Railway Company, Newark, O., has been authorized by the court to issue fare tickets, to be styled labor tickets, and sold at the rate of 10 for 25 cents, to be good when presented by laborers before 7 a. m. and between 5 and 7 p. m.; also tickets for school children at the rate of eight for 25 cents.

At a meeting of the board of directors of the Market Street Railway Company, San Francisco, W. J. Adams who has long had a place on the board resigned and was succeeded by I. W. Hellman, president of the Nevada Bank, who recently acquired a large block of the stock. Will H. Crocker also retired and Henry T. Scott was elected in his place. The board as now constituted is as follows: H. E.

Huntington, F. S. Douty, Charles Holbrook, C. G. Lathrop, N. T. Smith, Alvinza Heyward, J. L. Willcutt, I. W. Hellman and Henry T. Scott.

The last competitor of the Union Traction Company, of Philadelphia, the Hestonville, Mantau & Fairmount Passenger Railway has passed into the control of the larger company through the purchase of a majority of the stock by individuals interested in the Union Traction. The Hestonville Company operated 24 miles of track and 150 cars.

The Cleveland 3-cent fare ordinance has been temporarily defeated. It was lost on the first ballot and the motion to reconsider was lost on a tie vote. Councilman Hopkins, father of the defeated measure, states that another one, having the same purpose, will be introduced at the next meeting. It is directed especially against the Woodlawn avenue line of the Cleveland City Railway Company.

A recent circular of the General Electric Company of Berlin gives the electric roads for which apparatus was furnished by that company as follows: In operation, 28 roads with an aggregate length of 476.4 kilometers of single track, 841 motor cars and 566 trail cars. In construction, 21 roads with an aggregate length of 288.7 kilometers of single track, 425 motor cars and 156 trail cars. And in addition the company is preparing plans for 17 new roads or extensions to old ones.

The girls employed by the Western Electric Company formed the Occident Club for literary and social purposes about two years ago. It is self-supporting and managed entirely by the employees. The company has now provided two large rooms and furnished one as a library and reading room which may also be used for entertainments and has a seating capacity of 500; the other room is fitted up with a kitchen and lunch counters. The entertainments have been meritorious and well attended.

The report of President Nagle of the Chicago City Railway Employees' Mutual Aid Association for the year ending September 30, shows the association to be in a prosperous condition. The membership increased during the year from 1,884 to 2,021 and the insurance in force from \$942,000 to \$1,010,500. There were 12 deaths; the losses were paid by six assessments of 50 cents each, making the average cost per death 25 cents to each member; in 1896 the average cost per death was 34 cents; in 1895, 50 cents.

C. D. Wyman, general manager of the New Orleans Traction Company, writes us under date of December 1, that business through the South and especially in the city is very rapidly picking up, and that there is no more talk of the fever which has been exterminated. "You may tell all your friends that they are absolutely safe in visiting our city. If there has been any good worked by the scourge, it has been the general cleaning up of everything so we have on our best clothes now, and we were never in finer array to welcome our friends from all parts of the country. Just say for me in the next issue of the REVIEW, that they can all come; we will greet them warmly, treat them nicely, and send them away at the end of their visit, sound in body, refreshed in mind, and with a calm and equable conscience."

At the 24th annual meeting of the directors of the Melbourne Tramway & Omnibus Company, F. B. Clapp, managing director, presented a report which made a very favorable showing for the past year. The traffic receipts amounted to \$1,794,575 and the operating expenses were \$1,023,720. The total assets of the company are \$4,129,960 and the paid up capital stock is \$2,400,000. There is a reserve account for tramway renewal which amounts to \$1,000,000. During the past year there has been a very satisfactory increase in traffic and the prospects for the coming year are unusually bright. A dividend of 2 per cent was paid in January and one of 3 per cent was proposed in the annual report.

### BIRMINGHAM STREET RAILWAYS.

If the city of Birmingham does not soon follow up the report of its tramway committee by adopting electric traction it will lose its vaunted reputation of the most progressive city in England. Although it has a population greater than Boston and suburbs, its traction facilities would not be



TRAIN ON THE BIRMINGHAM TRAMWAY.

considered up to date in a country town in Massachusetts. The people of Birmingham have to ride behind noisy, dirty, puffing steam locomotives going to and from their homes. The illustration represents the locomotive, which is entirely encased, and a double deck trailer on one of the principal streets of Birmingham.

### SMITH AND HIS LAMPS.

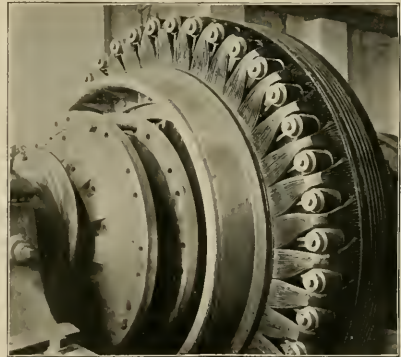
"Smith of New York," who is so well known no other address is really necessary to reach him, is reaping the results of several decades of well conducted business, augmented by the successful effort to always be in the lead, and to produce goods which will make the user want more of the same kind. While the concern manufactures all kinds of lighting apparatus, it is best known to our readers for its car lights, both interior and for the dash. Some time ago when the other headlight makers went into a combination, Smith persistently refused to join them, saying he intended to be free and independent in his position to make and sell his goods to the mutual advantage of the buyer and himself. Special pressure was brought to bear to bring him into the fold, and after friendly overtures failed, the effort was made

to force matters by bringing suit on some of his patents. All these failed, however, and Smith of New York won out beautifully, and the only result was more attention was directed to his goods. He is furnishing every kind of headlight desired; through the dash, in front of the dash or on top, according to order. His lights are standard on hundreds of roads.

### GENERATORS IN THE UNION LOOP STATION.

The illustration represents the armature and commutator of one of the Siemens & Halske 1,500-k. w. generators now being installed in the Union Loop power house in Chicago. The arrangement of the armature winding and the connections to the commutator are clearly shown. This construction has all the advantages of internal fields; great radiating surface and maximum magnetic effect are to be found. The commutator is on the armature spider, and its construction and insulation are for large current capacity and long life. The armature winding is such as to give good ventilation. The poles will be 16 in number.

The armature was entirely assembled at the company's works and had to be transported on a special car, on account of its great size and weight. For such service the com-



1,500-K. W. SIEMENS-HALSKE ARMATURE.

pany has designed and built two or three flat cars, with two out-board bearings, on either side of the car near the middle. The armature shaft rests on these bearings and part of the armature projects beneath the car floor, but far enough above the roadbed to prevent any damage from obstructions there. By this means armatures of very large diameter can be transported and come beneath the limit of height prescribed by the railroad companies. This armature had to be moved for some distance through the streets, from the tracks of the Chicago & Northern Pacific to the station. The trucks were removed from under the car body and it was let down on skids and pulled along on rollers by means of a capstan. The rest of the machine is so divided as to be easily handled.

This is the first of three machines to be installed in a short time, and the work on the station is being pushed as rapidly as possible.



## MR. WESSELS' WITHDRAWAL.

It is with keen regret that we announce the early withdrawal from the air brake business of Edward J. Wes- sels who has resigned his position as managing director of the Standard Air Brake Company to take effect on March 1. Mr. Wes- sels needs no introduction to our readers for he is known the world over as the "apostle of street railway air-braking." For the past three and a half years he has been an incessant toiler in this field. He was called



E. J. WESSELS.

upon to take hold of the old Jenett Air-Brake Company, which at that time had not made much headway and was in fact unknown. As soon as he took hold, the trade realized that the business had passed into competent hands. Realizing that the business could not be successfully worked at long range he sold the Chicago factory and transferred operations to the east. His sale of the factory on advantageous terms, in the teeth of bad times,

at once arrested attention. Before long he had evolved a successful axle compressor. He then went abroad and appointed agents. In a few months he sold hundreds of air brakes in England, Belgium and Germany. Then he developed business in far distant lands and before long shipped hundreds of brakes as far away as Australia. Meantime he and the company's engineer invented and patented the first independent motor compressor for braking cars and trains. Automatic current control next claimed attention and soon apparatus was patented which has relieved motormen from responsibility. They only need to use the interlocking controlling handle in order to have command of the car or train. Mr. Wes- sels was no less successful as a salesman. He had no one to assist him and depended largely on judicious advertising to make sales. Every "ad." was written by him and his invariable rule was never to let an advertisement appear a second time and always to use a full page. His example was followed by many. Printers Ink pronounced his "ads." the very best that had appeared. He also advocated the use of air brakes, in graceful and accurate style, and his articles in the technical press always commanded attention. Members of the American Street Railway Association will recall his admirable papers in Atlanta and Montreal. His motto was "This one thing I do" and into the development of the air brake he threw his great energy, versatility and ability. For these reasons we are sorry to record his early departure from the field. It is safe to state that no enterprise in which he sees fit to embark will ever suffer from dry rot and wherever he goes there will be scores of friends who will give him a welcome.

The Brooklyn Rapid Transit Company has recently issued 100,000 copies of a little book entitled "Where and How to Go" which is full of information regarding schedules, places of amusement, suburban towns, etc. It is illustrated with 55 half tone views and a large map of Brooklyn and vicinity. It is very artistic and indicates that General Passenger Agent Kennedy is up-to-date in every way. Presumably the advertising in the book pays for its publication.

## THE MOORE RAIL DRILL.

A new rail drill, herewith illustrated, was designed by M. M. Moore, 88 East Ohio street, Chicago. It was the purpose to build a drill that could be easily operated by hand, readily attached to the rail and quickly removed so as not to impede traffic. The drill frame is clamped to a bar, permitting a side movement of 2 1/2 in. and a vertical adjustment. At the end of the spindle there is a ball bearing which makes the drill operate very easily. The drill is self-feeding. The frame is less than 5 in. in

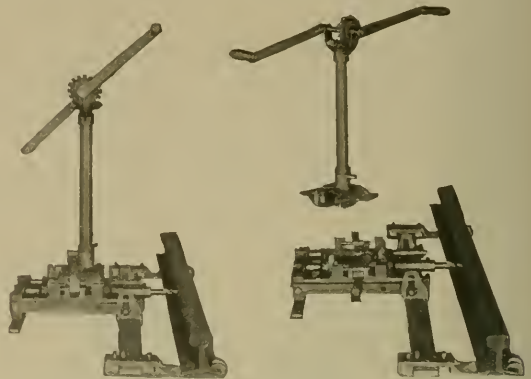


FIG. 1.

FIG. 2.

height so that it can be left in place while the cars are running over the track, and permits its use between the rails. The frame is substantially built and does not spring while in use. A 1 1/8-in. hole has been put through a 7/8-in. web by one man in 1 minute and 20 seconds without springing the frame. Fig. 1 shows the drill in position and Fig. 2 with the top removed which operation can be done in two seconds. To illustrate how easily and quickly the drill can be used, one man using one hand drilled a 7/8-in. hole through a 7/8-in web in 45 seconds.

## ADVERTISING AT COLUMBUS, O.

The Columbus Street Railway Company last summer distributed some handsomely illustrated folders; one is devoted to the attractions at Olentangy Park and another has an outline map of all the lines and gives directions for reaching every part of the city by means of the street cars. Secretary P. V. Burlington says that these folders have been distributed to nearly all the towns within a radius of 50 miles and are handed to the incoming strangers at the Union Station of the steam roads. By making these folders so attractive it is found that fully 95 per cent are preserved. Besides these, programs are issued whenever there are special musical and kinetoscope entertainments at the park. During the season there were a McKinley night, a labor day celebration, Franklin Centennial, a convention of stationary engineers and another of insurance men, all of which were commemorated in a fitting way by programs at the park.

As is usual during the winter season the street cars in Cheboygan, Mich., have been removed from the trucks and placed on runners and will be operated as sleighs.

**NEW WEST END POWER STATION,  
BOSTON.**

The West End Street Railway Company, of Boston, has recently completed the new power station needed to provide for its Cambridge traffic. It is known as the Harvard Power Station and was built for an ultimate capacity of 7,200 k. w.; work was begun May 10, 1897. The building is of selected hard burned brick with free-stone trimmings and in general appearance resembles the company's Dorchester station; it has a frontage of 126 ft. on Boylston street and is 172 ft. deep. The roofs of both engine and boiler rooms are iron trussed, tile arched and covered with composition.

The engine room lying next to the Cambridge Parkway has a capacity for four and contains at the present time three 1,800-h. p. horizontal, cross-compound, Allis engines with independent jet condensers, direct connected to three 1,200-k. w. multipolar General Electric generators, designed to run at 80 r. p. m. At one end is a blank wall to provide for further extension. The floor of the engine room is 12 ft. above that of the boiler room which is at the street level.

On the basement floor under the engine room, on the same level as the floor of the boiler room are the condensers, air pumps and feed pumps, the engine room floor being cut away so as to place the apparatus in full view of the engineer at all times. The feed pumps comprise one steam pump 14 in. and 8½ in. x 10 in. capable of supplying water for 6,000 h. p. of boilers, and three pumps driven by electric motors through a counter shaft, each with a capacity of 5,000 gallons of water per hour at a speed of 30 r. p. m.

In the boiler room are six 500-h. p. water tube boilers with extension furnaces designed to carry a working pressure of 180 lbs., and arranged in three batteries of two each.

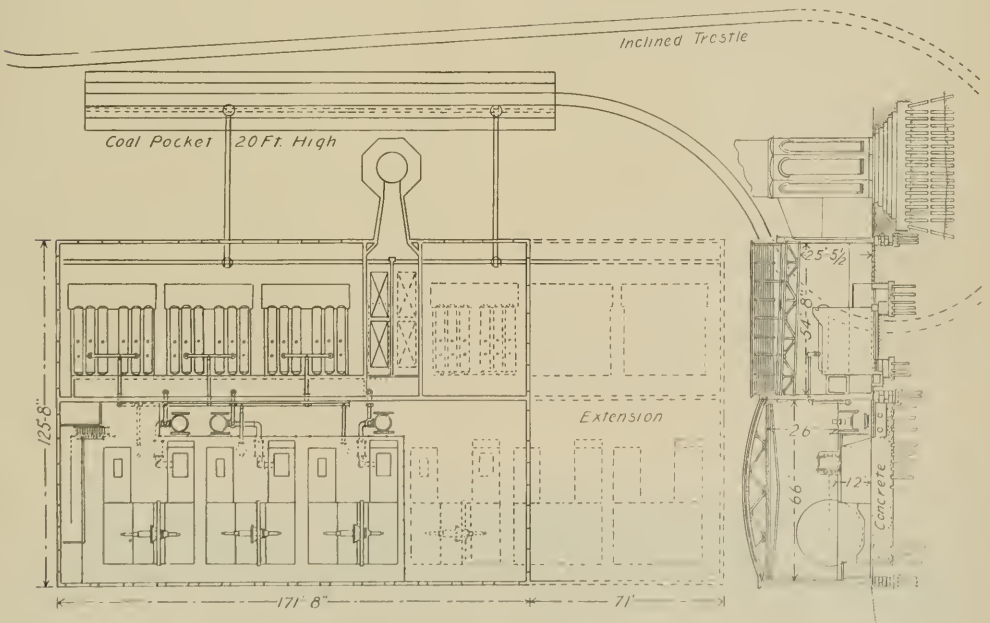
There are three feed water heaters of 800 h. p. each. The smoke flue is carried to and around the Green economizer, space being provided for another economizer of the same capacity. Under each section is a by-pass. On the roof above the economizer is a structure, shown in the illustration, to facilitate the removal of economizer tubes.

The stack is of brick and 226 ft. high; the inside is lined with fire brick and is 11 ft. in diameter; the stack is of ample size to take care of the contemplated ultimate boiler power, 6,000 h. p. It rests on piles which are covered with concrete to a depth of 5 ft., with a capping of granite 8 ft. 6 in. thick made up in five courses.

As shown by the illustration, the engines and boilers are placed back to back with all the piping in the engine room beneath the floor so that there is no obstruction to the use of the traveling crane. The crane is of seven tons capacity and is worked by hand.

The switchboard is at the north end of the engine room on a platform 8 ft. above the floor, commanding a full view of the engines and generators; the switchboard has the usual complement of meters, circuit breakers and switches. Leading from this platform is the office of the chief engineer where are a recording voltmeter, a recording steam gage and a telephone. Under the office on the basement floor is the test room equipped with instruments for testing the underground cables. These cables are carried from the station in a conduit through which the wires also return.

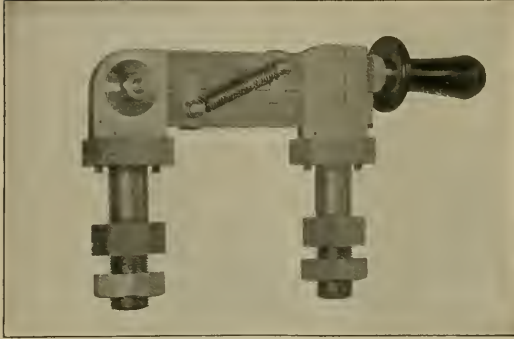
Coal will be handled at this station by a trestle and coal pocket adjacent to and in the rear of the building. From this pocket, through chutes leading from the bottom, it will be loaded into the coal or charging cars, which will run into the boiler room on a narrow gage track. Ashes will be removed over the same track.



HARVARD POWER STATION, WEST END STREET RAILWAY, BOSTON.

### QUICK-BREAK SWITCHES FOR RAILWAY WORK.

The General Electric Company has designed a line of quick-break, 500-volt switches which are especially adapted for street railway service. As may be seen in the illustration, the switch blade contact consists of two pieces connected to a common hinge and by a pair of helical springs, one on each side. In opening the switch the outer section of the blade, to which the insulated handle is attached, is withdrawn to an angle of  $30^\circ$  before the inner section



QUICK-BREAK SWITCH.

moves. The inner half of the blade is then forced from the clip by positive action and is drawn sharply to the outer half by the tension springs. This results in an extremely quick break and a wide gap, over which an arc cannot hold. Switches of this type are made for both single and double throw, with or without bases, and with either front or back connections.

### AN AUTOMATIC CAR FENDER.

The accompanying cut represents an automatic car fender designed by Obe. Cullison. It is attached to the wheel truck, is simple in construction, does not extend far in front of the car and is automatic in action. When striking an object the two coil springs are released and the fender shoots out about 3 ft., or this result may be effected by the motorman striking a foot lever attachment. A contact roller is at the front of the fender but there is little oscillation as the fender is attached to the truck. The fender can readily be changed from one end to the other of the car.



FENDER IN ACTION.

THE CULLISON AUTOMATIC CAR FENDER.

FENDER READY FOR ACTION.

### THE PROPER CONSTRUCTION AND USE OF ECONOMIZERS.

Henry G. Brinckerhoff, of Boston, presented a paper on this subject before the meeting of the New England Cotton Manufacturers Association held at Philadelphia in October and we give below a brief abstract.

The practice of heating the feed water in a separate vessel using the heat in the waste gases to do so and leaving the boiler to supply chiefly the heat necessary for the latent heat of the steam is one that has been extensively adopted by large steam users in all parts of the world. Such flue heaters are usually called economizers. A great many makers have constructed pipe heaters and with a few exceptions they have failed. These failures are to be attributed to three causes: 1. Not being of cast iron, the only practical metal to withstand the corrosive action of sulphurous gases. 2. Lack of capacity, it requiring time for the transmission of heat. 3. Lack of automatic cleaning of the pipes. The late Edward Green was the first to develop a flue heater embodying these essential features, whose absence in others was the cause of failure.

Important details of construction are: 1. The absence of all packed joints inside the brick work. 2. Easy accessibility to all parts of the internal surface. 3. The vertical pipes should be forced into the top and bottom headers by hydraulic pressure making metal to metal joints. 4. Each section should be tested to 350 lbs. per sq. in.

A well constructed economizer built under these specifications should last 20 years under ordinary care and attention. The care required consists in blowing off daily at the same time as the boilers. Every three months the soot should be cleaned out of the chamber below. Once a year the caps should be taken off and the interior of the pipes inspected; if the water is bad this should be done oftener.

### TROLLEY GETS STEAM ROAD PASSENGERS.

The traffic on the four-mile extension recently built by the Woonsocket (R. I.) Street Railway Company to Slatersville and Forestdale, is very gratifying to the company. The street railway is now a competitor of the New England Railroad for this business and the comparative conditions are as follows: The electric cars run at intervals of 30 minutes and carry passengers from any part of Woonsocket to Slaterville or Forestdale for 5 cents. The steam road runs from three to five trains per day, lands passengers at a point remote from the center of Slaterville and charges 10 cents, or 9 cents on 10-ride tickets. The result is that the electric line gets nearly all the passengers.



**THE SARGENT BRAKE SHOE TESTS.**

The Sargent Company, of Chicago, has since introducing its new "Diamond S" brake shoe made extensive service and laboratory tests and secured interesting data concerning this shoe. The "Diamond S" brake shoe consists of expanded steel and cast iron; a bundle of the expanded steel strips each of the same width and length as the brake shoe is placed in the mold and the cast iron poured about it, filling the open spaces in the steel core. Such a shoe is evidently strong and therefore safe against breakage, and uniformity can be secured by care in the manufacture. The service tests were made to determine the durability of the shoe and its effect on the tire.



"DIAMOND S" SHOE.

These tests were made on different railroads, the usual method being to equip one truck of the car with the "Diamond S" shoes and the other with the shoes to be compared with it; where two cars were always run together, one car would have shoes all of one kind. The service tests showed these shoes

to wear slightly longer than chilled iron, and about four times as long as the ordinary cast iron shoes. No cutting of tires was reported.

The laboratory tests to determine the frictional qualities of the shoe were made on the Master Car Builders' testing machine at the works of the Westinghouse Air-Brake Company, Wilmerding, Pa., by J. C. Whitridge, who worked with the machine under the direction of the M. C. B. Committee in 1896, and these tests are directly comparable with those made by the Committee.

Four shoes were tested: No. 2, soft "Diamond S"; No. 4, plain cast iron, cast at the same time and from the same metal as No. 2; No. 6, hard "Diamond S"; No. 7, plain cast iron cast at the same time as No. 6. Nos. 2 and 6 were tested at initial speeds of 65 and 40 miles per hour and at braking pressures of 10,733 lbs., 6,750 lbs. and 2,798 lbs., representing the pressures in heavy passenger service, medium passenger service and ordinary freight service, respectively. Three or more tests were made under each set of conditions.

Judging from the time required to grind the shoes to a bearing on the test wheel the "soft" shoes tested are thought to be approximately of the same hardness as the "hard" cast iron shoes tested by the M. C. B. Committee. A comparison of the results shows that the coefficients of friction of the "Diamond S" shoes are about the same or slightly higher than that for the hard cast iron of the M. C. B. tests, which is more nearly the hardness of cast iron shoes in general use than the "soft" cast iron taken as the standard by the Committee.

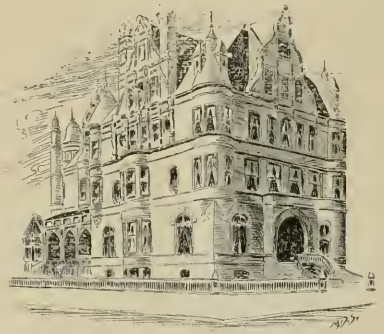
The experiments on steel-tired and chilled wheels show that practically the same coefficients of friction may be expected with the "Diamond S" shoe on the two wheels. The report concludes: "The steel appears to increase somewhat the frictional qualities of very hard cast iron brake shoes, but when soft cast iron is so used the addition of the

expanded steel does not materially affect the friction, the results not showing a uniform tendency either to raise or to lower the mean coefficient."

The coefficients of friction being considered the same, it is evident that the longer life of the "Diamond S" shoe gives it a marked advantage.

**WIDENER'S GIFT TO PHILADELPHIA.**

On November 25, P. A. B. Widener, who is so well known to our readers because of his extensive interests in electric railways in different parts of the country, and particularly as former president of the Union Traction Company, of Philadelphia, announced his intention of presenting



MR. WIDENER'S RESIDENCE.

his residence to the city for use as a branch of the free library. This is not the first instance of his munificence to the city, as a short time ago he promised his collection of paintings, estimated to be worth \$750,000, to the city in the event of the construction of a suitable building to accommodate them. The appropriation for this building was provided for in the recent loan bill passed by the popular vote.

**ILLINOIS STATE ASSOCIATION.**

The preliminary work of organizing an association among the Illinois street railways has been placed in charge of President Patterson, of the Bloomington City Railway, who has addressed the following letter to those concerned.

"It has been suggested by several street railway managers that a Street Railway Association be formed in this state, and I have been requested to write the different companies in this state to ascertain their views on the subject of forming such an Association, and I would suggest that a meeting of representatives of the different companies be held at the Great Northern Hotel, Chicago, on Thursday, January 5, 1898."

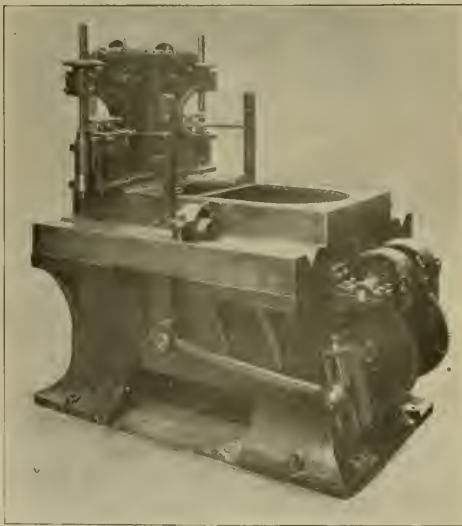
**RAE'S MOTOR CARRIAGE.**

Frank B. Rae, of Chicago, has designed a carriage to be operated from storage batteries. One motor is employed and this is geared to the rear wheels and is controlled so as to give four speeds. The carriage with passengers weighs nearly 2,000 lbs., and the battery capacity is sufficient to make a continuous run of 60 miles. Mr. Rae's long experience in electric railway and elevator work gives assurance of thoroughness and efficiency in the design of the electrical apparatus.

## KEYWAY CUTTER.

We illustrate herewith an ingenious and labor saving machine for cutting keyways on railway axles. This machine has two traveling beds for carrying axles, in each of which a deep "V" center is cut for holding the axle in place. By this means any sized axle from 1-in. to 6-in. in diameter, on being placed in the "V" receptacle, immediately assumes a proper position in the machine, that is, in an exact center line with the cutting device. This not only obviates the tedious necessity of lining up the axle with the machine, but renders it impossible to cut the keyway in any but a correct manner.

These traveling beds are worked by an independent crank movement, and the feed stroke is easily adjusted to any length of keyway, from 1-in. to 12-in. Each bed is entirely independent of the other, and the machine will cut one or two axles at a time as may be desired. The cutters are end millers with a continuous feed, which is worked by a single ratchet with two dogs. When making any stroke, the dog not in use simply slips back into proper position for feeding the cutter when its time comes. This machine will cut



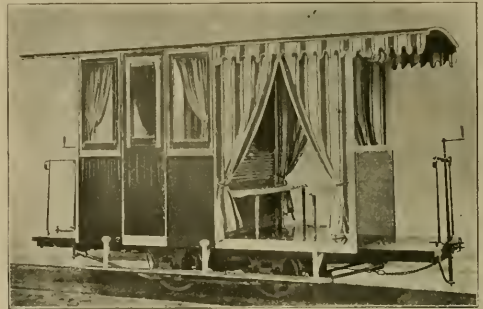
MCGUIRE KEYSEATING MACHINE.

keyways 12 in. long, 1 in. wide and  $\frac{1}{2}$  in. deep in from 35 to 40 axles per day, with accuracy and ease. It is used, among others by the Terre Haute Car & Manufacturing Company, Terre Haute, Ind.; Jones & Laughlin, Ltd., Pittsburgh, Pa.; McGuire Manufacturing Company, Chicago. It is designed, made, and sold by the latter company, to which all inquiries should be sent.

In a recent Texas case the power of a city to make a condition that the franchise of a street railway shall be forfeited unless the line be completed to a certain point without the city within a given time is denied, the legislature having given the right to use the streets of the city subject to the consent of the city.

## FOURTEEN-FOOT CAR FOR MEXICO.

Through the courtesy of the Jackson & Sharp Company we have received photographs and description of a novelty in tram cars just built by that company. The car was ordered through a New York broker and even the manufacturer knows nothing as to its owner or its use except that it was shipped to Mexico. It is painted a bright yel-



THE YELLOW KID.

low and in the shop went by the name of the "Yellow Kid."

The length of the body is 9 ft. 10 in.; the length over all, 14 ft. 6 in.; the width at the sills, 5 ft. and the gauge 600 millimeters ( $23\frac{5}{8}$  in.). The closed compartment measures 5 ft. 5 in. and has two facing seats that will hold three people each; the open end is 4 ft.  $2\frac{1}{2}$  in. long and has two seats for three each. The platforms measure 2 ft. each. The wheels are 20 in. in diameter.

## HOLD-UP IN KANSAS CITY.

The street car hold-up is not confined to Chicago, the latest one reported being from Kansas City, Mo. At 10:30 p. m. on November 20, while the grip car was being shifted at the terminus of the 18th street cable line, the conductor was attacked by a negro, and on refusing to surrender the money in his care was shot in the side. The bullet was deflected by his pass-book so that it inflicted only a flesh wound. The gripman came to the rescue with a coupling pin and received a bullet in the thigh. The negro escaped.

## ATTORNEY BLODGETT, OF THE GENERAL ELECTRIC, MURDERED.

George R. Blodgett of Schenectady, the well known patent attorney of the General Electric, was shot during the night in an encounter with a burglar who had broken into his residence. He died the following morning from the wound. He was a man of marked ability and highly thought of by friends and professional associates. The company immediately offered a reward of \$5,000 for the arrest of the murderer, who it is said was trying to secure certain valuable papers of record which Mr. Blodgett had taken home to work on during the evening.

The street railway at Janesville, Wis., did not pay and on November 30, operations ceased for the winter.



Force Bain, consulting engineer of Chicago, has been busy with expert patent work for some time.

The Corning Brake Shoe Company has opened an eastern office at 35 Nassau street, New York, for the sale of the Corning brake shoe.

F. T. Ley & Co., of Springfield, Mass., have received the contract to build the Palmer & Monson (Mass.) Electric Railway, a short line connecting the two towns.

The Ball Engine Company of Erie, Pa., has mailed to the trade an illustrated pamphlet descriptive of its new governor which was recently described in the REVIEW.

The General Electric Company during the months of June, July and August, received orders for 278 generators, aggregating nearly 1,000 k. w., for lighting purposes alone.

S. C. Strock, dealer in poles, piling, ties and timber, 11 Broadway, New York, reports a very good year considering the unsettled state of business, and that the outlook for 1898 is splendid.

The Missouri Car & Foundry Company of St. Louis has acquired the Madison Car Works at Madison, Ill., which have stood idle a year, and will operate the plant in connection with its own works.

The Cincinnati Manufacturing Company states that it has found that the sales of conductor's punches for use on street railways very satisfactory and growing steadily. The management looks forward to a much larger trade in punches during 1898.

The Fuel Economizer Company, Matteawan, N. Y., reports that the year's business has, on the whole, been satisfactory. The prospects are much brighter and the company looks forward to a large increase of business immediately after the new year.

The Rooke Register Company has been incorporated at Peoria, Ill., to manufacture street car fare registers. The capital stock is \$10,000; and the incorporators are George F. Rooke, C. A. Jamison, James Danley, L. H. Seltzer, Arthur Keithley and others.

The Cravath Manufacturing Company, 825 Monadnock building, has come into existence during the past year and has done much pioneer work in the way of showing railway managers the advantages of current recording instruments on each car. It expects to reap the benefits of these efforts the coming year.

The Joseph Dixon Crucible Company has within a few months placed on the market two products of great importance to metal workers, the anti-flux known as "brazing

graphite" for liquid brazing and a brazing crucible for use with this process. The latest crucible is of a form particularly adapted for bicycle manufacturers.

Meysenburg & Badt of Chicago are the representatives of the Weston Electrical Instrument Company, the Helios Electric Company, the Excelsior Electric Company and other concerns manufacturing electrical machinery and appliances. This firm also does a brokerage and contracting business for electrical construction, including power houses and railways.

Frank J. Sprague of New York has received the contract to equip 120 electric motor cars for the South Side Elevated Railroad, Chicago. As Mr. Sprague's system of train control is a new departure in electric railroading the directors hesitated to award the \$275,000 contract until a 17-days' practical test had demonstrated its efficiency and safety to their entire satisfaction.

The American Engine Company, Bound Brook, N. J., writes: We are glad to say that the year's business has been quite satisfactory to us, and we look forward hopefully to the coming year expecting business to steadily improve. We have completed our full line of direct connected generators and American Ball engines, and find a very satisfactory trade in these.

The Electric Railway Equipment Company writes: Our business for the year 1897 has been excellent. We have had a very heavy demand for our steel tubular poles; and during the year we have brought out several specialties which have met with marked success. We are now figuring on considerable work for construction in the early part of 1898 and anticipate a good year.

The Wells & French Company, Chicago, has the Price momentum brake on street cars in different parts of the country for trial and very favorable reports of their operation have been received. The Citizens' Street Railroad Company, of Memphis, has ordered momentum brakes for seven large double truck cars. Inquiries and orders in hand indicate a prosperous season in 1898.

The Morden Frog & Crossing Works, Chicago, writes: We are pleased to report a marked increase for this year in our street railway business, and from present indications, it will be better in 1898. During the present year we have added another engineer to our staff, assigning him specially to street railway work, and have also added to our machinery so as to insure prompt filling of orders.

The Taunton Locomotive Manufacturing Company, Taunton, Mass., writes: We think we have reason to look forward to a good business for our street railway department for the year 1898. We have sold 32 snow plows this season which is in excess of any previous result. There has been no change in the personnel of our firm. We have appointed J. M. Denniston, Chicago, as our western representative.

S. D. Merton, formerly secretary of the Heine Boiler Company, has organized the firm of S. D. Merton & Co., with headquarters at 317 Security building, St. Louis, and



is prepared to design and build heavy machinery foundations, boiler walls, etc., such work as any mason can do after a fashion, but very few are able to do properly and yet keep the cost within bounds. Mr. Merton's experience is a sufficient guarantee as to his ability.

The Forest City Electric Company advises us as follows: The outlook for the coming year is most encouraging, and we fully expect to do twice as much business in the coming twelve months as we have done in those just passed. The foreign trade is taking an impetus and continued inquiries regarding our roll drop, drop forged commutator bars and protected rail bonds, lead us to believe that there are prospects for a large field in that direction.

Eugene Munsell & Co., and the Mica Insulator Company, of 218 Water street, New York, and 117-119 Lake street, Chicago, carry a large stock of mica, Micanite and M. I. C. Compound, ready for prompt delivery. Orders are promptly filled by their local agents, the Cuyahoga Supply Company, Cleveland, O.; Arthur S. Partridge, St. Louis, Mo.; Sinclair Randall, Cincinnati, O.; and the Brooks-Follis Electric Company, San Francisco, Cal.

The New Haven Car Register Company reports that the field for its registers is constantly widening and the company has recently received a large number of letters from roads using them in which is expressed the great satisfaction given by them in service. In addition to the full line of fare registers the company is manufacturing a ballot box which has been adopted by Boston and a number of other cities in New England and which is attracting a great deal of attention.

"The Wainwright Steam Appliances" is the title of a new catalog issued by the Taunton Locomotive Manufacturing Company of Taunton, Mass., and illustrates and describes different types of water tube heaters. In these heaters the transmitting surface consists of corrugated copper tubes, and the increased tube surface reduces the volume necessary for a heater of given power, while the flexibility of the tubes prevents straining at the joints and the consequent leaking.

Mayer & Englund, Philadelphia, representing the International Register Company of Chicago, have secured the contract for supplying registers to the Capital Traction Company of Washington, D. C. Each car will be equipped with two single type machines, one to register the tickets and the other the cash fares. This contract was let only after a thorough investigation, and the result is considered strong testimony as to the excellence of the International "iron clad" register.

The New Process Raw Hide Company, Syracuse, N. Y., says of its business: We are about closing up a very satisfactory year's business and feel fully assured from the present outlook that our next year's trade will be greater than we have ever had. The improved condition of the street railway companies as a whole would seem to warrant this prediction. Our foreign trade increases year by year until it has become an important factor in our business, and the outlook in this direction is also very flattering. We hope we may be able to verify the above predictions at the end of 1898.

The Crane Company, Chicago, advises us as follows: Business during 1897, taken as a whole, has been quite satisfactory. We have been particularly successful in placing large quantities of our highest grade of steam piping material, valves, fittings, etc., in street railway plants throughout the country, besides closing contracts for the complete piping equipment of the London Central Underground Railway, London, England, and the Dublin United Tramways Company, of Dublin, Ireland.

The Sargent Company, Chicago, writes: We have had a gratifying increase in business during the past year over the previous one, and are looking forward to even a more favorable year in 1898. The output has been increased in both our crucible and open hearth steel departments, and we now have orders enough to keep us busy for some time to come. Our new "Diamond S" brake shoe for steam and street railways is making great strides into favor, and we expect a considerable increase in our business from this one source alone.

The Cambria Iron Company, Philadelphia, reports: We are continuing to furnish for street and electric use, our various sections of girder, guard and high T-rails, and also ordinary T-rails (the same as we furnish steam roads), of all of which we have a full line of sections. We are altering our mill to enable us to change rolls more rapidly, so that we can give better satisfaction to our customers in filling small orders promptly. We look for the general prosperity now obtaining in the whole country to cause a large street rail business next year.

The John Stephenson Company writes: The year which is rapidly drawing to its close has been a very satisfactory one, as compared to its immediate predecessor. While there has been no decided "boom" we have been kept fairly busy, and the general tone seems to promise better things for the future. Foreign countries, especially European, are being stirred up by the success of the leading cable and electric roads on this side of the Atlantic, and doubtless a great revolution along this line will transpire within the next few years, in which American skill and progress ought to bear an important part.

Gustave Fischer, in his official capacity as engineer of Government Tramways of New South Wales, tested the plastic alloy which is employed in the manufacture of the Edison-Brown plastic rail bond. One side of a polished steel plate was amalgamated, covered with the plastic alloy and immersed in dilute sulphuric acid for three months. A sample joint was made up of standard rails and angle plates with a pair of plastic bonds and left under the water in Sidney harbor for the same length of time. In both cases the unprotected steel was deeply corroded while the amalgamated spots were bright and shining.

The Bates Machine Company, Joliet, Ill., says: We are pleased to advise you that we have noticed a decided increase in the last three weeks in both business secured and inquiries, and the outlook for trade in the near future is very flattering. Our works at the present time are running night and day, and among the orders booked in the last 15 days we note the following for engines: one 100-h. p., Portland, Me.; two 250-h. p., Philadelphia; one 150-h. p., Richmond,

Va.; one 125-h. p., Kansas City, Mo.; one 200-h. p. and one 1,000-h. p., Canal Dover, Ohio; one 150-h. p., Tacoma, Wash.; one 100-h. p., San Francisco.

The Western Electric Company has furnished a room 18 x 18 ft. in the rear of its store as a show room for fixtures. Numerous chandeliers and brackets have been placed in this room and these have been wired up with 2-point, 3-point, 4-point and combination switches in order to show the methods by which lights in private houses may be controlled. A large variety of beautiful shades is shown on the fixtures. Five of the Western Electric enclosed arc lamps are also exhibited. Another improvement is the introduction of a pneumatic carrier system connecting the sales department with the store rooms and order department.

The Strass Electrical Engineering Company, 29 Liberty street, New York, has this to say: We are experiencing a marked improvement, not alone in the quantity of work passing through our offices, since the end of June, '97, but what is more important, we find that the prices obtained both on competitive work, as well as on the regular work furnished our clientele, are far more satisfactory. We believe that the advent of a solid and settled condition of trade is casting its shadow before, and have no doubt but that "increasing business" and "better prices," will be reported from all quarters during the coming year.

The Ohio Brass Company has recently made a valuable acquisition to its engineering department in the shape of a special testing set from which graduated voltages as high as 10,000 can be obtained. This set will be used in testing insulating materials and will be put to a two-fold use; first, for experimental purposes, such as determining the quantity of insulation required in connection with any device of new design which may be composed of insulating material, either in whole or in part; second, in connection with the electrical tests to which every stock piece of insulating material which this company manufactures will be subjected before being shipped from the factory.

Our attention has been called to the "New Columbia" street car heater in use on the Chicago City and North Chicago roads. It is certainly interesting to street railway managers to see a very ornamental, self-feeding, coal stove in operation on a street car, which is entirely free from ashes or dirt of any kind, carrying its fuel for 18 hours without the use of a shovel or poker, and not a door to be opened nor any ashes to be removed throughout the whole day, and still capable of heating the largest street car. Such is the "New Columbia" and we congratulate the McGuire Manufacturing Company on its latest contribution to the comfort of street railway travel.

The International Register Company, Chicago, manufacturers of stationary and portable fare registers, writes: We can report a very great improvement in our business during the year. When we removed to our present location last February, we supposed that in doubling the space previously occupied by our factory, that sufficient provision had been made for increase in the business for sometime to come, but the volume of the business has increased so rapidly in the intervening months that further additions to the shop room have been recently made necessary. We have work for

several months ahead with our largely increased force, and the prospects for 1898 are such that an additional enlargement in the capacity of our plant will probably soon be required.

The Ball Engine Company, Erie, Pa., advises us of the receipt of the following letter from Julian Kennedy, the eminent steel works engineer of Pittsburg, which refers to a 400-h. p. vertical engine direct connected to a Siemens-Halske generator: "I am in receipt of a letter from H. S. Loud, general manager of the Nicopol-Maripol Mining & Metallurgical Company's works in South Russia, in which he says: 'The electrical plant is working beautifully. You would be doing an almost obligatory service in thanking both the Siemens-Halske and the Ball Engine people for me for the very great satisfaction which their machinery has given this company. The Ball Engine people were especially gracious in the prints, etc., sent, and their workmanship is magnificent.'"

H. F. J. Porter, general sales agent of the Bethlehem Iron Company with headquarters at 1433 Marquette building, Chicago, has during the past six months been located at the works in South Bethlehem, Pa., during the absence in Europe of R. W. Davenport, second vice-president. Mr. Porter is spending a few days at his office in Chicago and reports that there is a decided improvement in the steel forging business in the east, and that there are evidences that business will pick up rapidly in the west. He will return to the works and have his headquarters there during the winter. His western office will be in charge of his assistant Erwin Nelson, who will be glad to answer all correspondence and give information on matters relating to steel forgings of all descriptions.

The J. G. Brill Company says: The business for 1897 has been quite a satisfactory one for us. We have had the shops fairly well crowded from the beginning of February up to the present writing and have run during the entire time with our full force. We find many of the roads in this country are increasing their rolling stock equipment to meet the demands of increased travel, and consider this a very satisfactory and steady growth. Further, there have been projected quite a few new enterprises which have required rolling stock and we are glad to say in each particular case where we have been interested, the project has been on a sound basis. We consider the year's business, (1897) more satisfactory than 1896 and look forward to increased trade in 1898.

Among the highly prized compliments held in the files of the Central Electric Company, the following from W. E. Brice, president and general manager of the Mason City & Clear Lake Traction Company, is self-explanatory. The letter is dated July 9, 1897, and is as follows: "We have just completed 18 miles of electric railway using your material for the entire overhead construction. We have found everything to be first-class, and can recommend your materials for the purposes for which we used them. The shipments have all been made very promptly."

The attention which this road has attracted on account of its splendid success makes this voluntary testimonial to the high standard of the material furnished by the Central Electric, specially noteworthy.

The Q. & C. Company, Chicago, has issued to the trade an attractive pamphlet containing answers to questions often asked regarding Servis tie plates which puts the matter in a very accessible form. This company advises us of a marked improvement in general business and says: In the street railway line, the use of the Servis tie plates where cross ties are used, is becoming much more general, and we believe there will be a large demand for these. In our sawing machines for cutting rails, the regular sale of the small hand machines has now been added to by the demand made for power machines, with which frogs and switches and all other work can be made at a very small expense. Our present orders, together with inquiries, certainly warrant us in looking for a much larger business for 1898.

The Sampson Cordage Works, 115 Congress street, Boston, writes: We have been obliged to put in extra machinery for the special finish that we apply to our first quality trolley cord. The war between first quality cord and low priced cord is waged back and forth, sometimes with success for one and sometimes for the other, though so far the first quality goods have the advantage. We believe, ourselves, that it pays in the long run to use the first grade, but many buyers are attracted by the low prices of these lower grades. We are prepared to furnish either, and as we do a larger business in this particular line than any other manufacturer, are able to supply this cord to the best advantage. The prospects for improved business today are much brighter than for a year or two back, as there seems to be no limit to the increase in mileage of street railways all over the country.

The McGuire Manufacturing Company is closing the year full of business. For the month of December it expects to complete the order for 120 Alley "L" trucks, deliver 52 A1 suspension trucks to the Consolidated Traction Company, Pittsburg, and also a number of smaller truck orders. It also has for delivery orders for 27 of the combination snow plow and sweepers and the orders for "New Columbia" heaters to be delivered in this closing month, aggregate 470. The business of the entire year winds up very satisfactorily, but the last four months of the year are to be credited with this result, the first eight being anything but flattering. The company anticipates an immense business for 1898, indeed the orders in sight are enough for the present capacity until next June, and it has in contemplation an addition to the present works, a building 116 x 160 ft., three stories and basement.

The Westinghouse Electric & Manufacturing Company has some important contracts for electric apparatus to be installed by the large companies at Niagara Falls. Shipment has commenced on the five 5,000-h. p. generators for the Cataract Construction Company, and work is progressing on the exciters, aggregating 675 h. p., together with the switchboard appliances necessary for these machines. Six 300-volt, 750-h. p. generators are under way for the Niagara Falls Hydraulic Power & Manufacturing Company. The Niagara Electro-Chemical Company has contracted for a large increase in the transformer plant and 800 h. p. in air-cooled oil converters. Two 1,000-h. p. oil converters are building for the Acetylene Light & Power Company and the Mathieson Alkali Company has recently been furnished with 11 165-h. p. rotary transformers, several induction motors and 28 oil converters.

The Monarch Stove & Manufacturing Company, Mansfield, O., advises us: Having just begun the manufacture of the "Monarch" Track Cleaner, our year's business could not be summed up to make a very flattering showing. Suffice it to say, however, that such introduction as has already been made among the railway people of the "Monarch" cleaner has been attended with very flattering success. We have had a sufficient amount of business to justify us in feeling that we are on the right track. We have only to keep ourselves before the trade in the proper manner, and the business will be a very satisfactory one. The quality of our work will be such as to bring us additional business without question. Agencies have recently been established as follows: New England, C. N. Wood, 31 State street, Boston, and New York and New Jersey, J. Dolph & Co., 126 Liberty street, New York; the western business is handled from the factory at Mansfield.

The Standard Paint Company, 81 John street, New York, writes: The outlook for business in the street railway field in 1898 for us is exceedingly good. In fact, we may say that the boom has already struck us. The P. & B. compounds, tape and armature varnish, are in far greater demand this year than they have been for some years previous. As already noted in the columns of the REVIEW, we have found it necessary to establish a plant abroad to take care of our foreign business, this business having already assumed proportions which render it impossible for our American factory to manufacture P. & B. products sufficient to supply both continents. Our branch factory located in Hamburg, Germany, is now virtually ready to begin operations, and we hope and feel assured that when it is started up our works in this country will be sufficiently relieved of the pressure to enable them to turn out our products rapidly enough to supply the domestic demand.

D. W. Phelan, 280 Broadway, New York, dealer in ties and wooden poles, writes us as follows: I have had more large orders during the past two months than during any similar period within the past three years. I control several thousand acres of oak and chestnut timber and am cutting it up into ties and poles. I have recently delivered to one customer alone within five weeks from the receipt of the order over 3,000 chestnut poles, all of which were cut specially for this particular order and delivered without interfering in any way with regular orders which were very heavy. I also control the output of six southern mills making a specialty of octagonal yellow pine poles and trolley ties and carrying a general assortment of poles in stock, which enables me to ship promptly on receipt of orders. I have filled many of the largest octagonal pole orders that have been placed during the past year, so that I am more than satisfied with the year's business and the outlook for 1898 is full of encouragement. I expect to be strictly in it next year.

W. W. Wharton, secretary of the Electric Mutual Casualty Company, Philadelphia, advises us as follows: The Association has grown steadily during the past year and we are in every way satisfied with its progress. While the number of electric railway applicants for casualty insurance has been large, we have been compelled to reject many of them as not reaching the proper standard of excellence either in equipment, management or financial condition, as main-



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tained by our Association. However, we have accepted during the year, 18 new members, swelling our total to 51 and increasing the advance premium income of the Association to over \$65,000 annually. As a result of this care in the selection of our members, our losses have not increased in proportion to the growth of the organization, and consequently our surplus has grown very rapidly. With the success of our plan for casualty insurance on electric railways assured, the future prospects of the Association are very bright and our organization will continue to increase its membership gradually by the addition of only the most acceptable risks.

The Columbia Machine Works of Brooklyn, N. Y., a firm composed of John G. Buchler and Frank H. Platt, manufacturers of supplies pertaining to a street railway system, and specialties of various kinds is an example of "Young America." About four years ago it began business, occupying one floor in a moderate sized factory. Today it fills to overflowing, two large five story, and three two story factories besides two lots used for foundry purposes. The endeavor of the firm is to have nothing go out that is not first class in material and workmanship, believing an inferior article even at lower prices works an injury to all business enterprise. In the year now closing they have customers in nearly every state in the Union, also in Canada, England, France, Germany and Spain. For 1898 they are prepared for a banner year being especially equipped for armature winding, commutators, new, refilled or assembled segments, with their own drop forged pure copper commutator bars, drop forgings, brass, malleable iron or iron cast-

ings, sand boxes, adjustable brake and controller handles, also machine work in all its branches. They make it a feature to perfect new inventions, cheerfully estimating on anything that can be made.

The Joseph Dixon Crucible Company, Jersey City, N. J., attributes its prosperity to the probable cause and writes: There has been no change whatsoever in the personnel of the Dixon Company. There have been no additions to buildings during 1897 simply because we have not had time to formulate any plans or look after the erection of any buildings. We have a large plot of ground adjacent to our factory which we shall endeavor to cover with buildings sometime during 1898; at the present time every available corner of our factories has been utilized for business purposes. We are behind in filling our orders for the simple reason that orders have come to us in unheard of numbers. Although we have made no additions in any way during 1897 we have nevertheless by working over-time been enabled to put out more goods than we thought we had capacity for and still we are behind in filling our orders. It may be that this condition of things is due to the fact that the Dixon Company during the dull times did not withdraw or drop a single advertisement anywhere. All of our advertisements not only were run, but they were frequently changed and we whooped it up as lively as we could without ever thinking of dull times, and we are now probably receiving our reward.

The Weston Engine Company, Painted Post, N. Y., writes as follows: Our business for the year 1897 has exceeded by far our expectations as we have built and deliv-

ered more than double the number of engines built in any previous year, and the prospects for 1898 are exceedingly bright at the present time. We now have on hand orders for more than thirty engines of the "Imperial" type, and many more are in sight. We have been obliged within the last month to refuse two large orders owing to the fact that we could not make satisfactory delivery. We find our present plant although practically a new one, entirely inadequate to take care of our business, and now contemplate erecting another large shop immediately, or early in the spring. We have recently purchased a large amount of new machinery and are now making several changes in our plant, the most notable being the installation of one of our 12 x 12-in. Imperial engines direct connected to a 50-k. w. Westinghouse generator, for the furnishing of electric light and power for our plant, in place of the belted outfit which we are taking out. The contemplated addition will more than double our present capacity, and it is our opinion at the present time that even with this addition our plant will be inadequate to take care of the business.

The Swarts Metal Refining Company, Chicago, writes us as follows: The past year which we are about to end has been somewhat more satisfactory than the previous year; orders have been placed more freely, prices have advanced and the general feeling has been somewhat encouraging all through the year, with the exception of a considerable falling off of trade in the past two or three weeks. This we can attribute only to the fact that inventory begins very soon and the desire to reduce supplies on hand. We are, however, looking for a revival in trade, and we believe the prospect in store for the coming year is as bright, or brighter, than for some time past. In regard to our own business would say the only change is our removal to larger and more spacious quarters on May 1, last. Since removing to our new establishment our business has more than doubled. We have been very successful in keeping our plant running. While our trade with the electrical railways is but a small branch of our business, yet we find it a very profitable and desirable trade. We will use our best efforts in the future—as we have in the past, to supply the trade with our strictly high grade motor metal and other supplies, and shall also use our best efforts to keep up the standard of our goods in the future as we have in the past.

The H. W. Johns Manufacturing Company writes us that the electrical department has had a prosperous year, the aggregate sales exceeding those during any similar period. The company secured its share of the current contracts for trolley insulating material and greatly increased its foreign business. The toggle-clamp, self-fastening feed-wire insulator met with a wide sale and the year's experience adds its testimony to the value of moulded mica as a most reliable and desirable insulation. The season for electric heaters opened later than usual, but the business done has been gratifying. The Johns Company believes that for the best results in properly heating a car, the heaters must have large radiating surfaces properly distributed and not depend upon the heating and distribution of air, and states that it has found the public quick to notice the greater comfort afforded by the "H. W. J." heaters. The sales of "vulcabeston" repair parts, such as motor bushings, commutator rings, and controller parts have increased, while the orders from the

manufacturers of electrical apparatus, who have been among the largest consumers of this heat-proof material, have reflected the quiet condition of the trade in some lines compared with more active years. The Johns Company anticipates a good business during 1898 and expects to book its proportion.

Harold P. Brown, manager of the Edison-Brown Plastic Rail Bond Company, writes us that the past year has registered a series of triumphs for the plastic bond, and says: Many prominent roads have reported tests after two and three years' service, showing the bonds to be as good as new, while copper bonds installed at same time have dropped to 10 or 15 per cent their original conductivity. One of the Brooklyn roads after trying electric-welded rails, "cast-weld" joints, copper bonds welded to rails and all modern types of ordinary and flexible copper bonds, has found the plastic bonds unequalled not only for rails but for switch board contacts, where hot switches and shunt connections have been permanently cured by the treatment with the contact alloys. The principal roads constructed during the year in Europe, South America and Australia have used the plastic bond and the factory is still running on full time with foreign orders. Engineers are learning in all parts of the world that the rails cannot be bonded to full conductivity with any amount of copper, as proved by the following letter from the Western Electrical Instrument Company, Newark, to Mr. Brown: "We recently had occasion to adjust milli-voltmeters to rail sections as shunt for 1,500 amperes. In attempting to do this we found that the contact resistance between the current terminals and the rails could not be made of low enough resistance to allow sufficient current to pass through the rails from our low potential battery (4 volts). After we used your plastic alloy between the rails and the current terminals, we found that the contact resistance was reduced to almost nil, and we had no further difficulty in drawing sufficient current out of the batteries to make the required adjustment of the instruments. Thinking that this statement of facts may be of interest to you, we beg to remain, etc." For the spring trade a single road has contracted for over 45,000 plastic bonds and the outlook for the year's trade is excellent.

From the Cahal Sales Department, we have received the following letter: "We beg to state that in our line of business the year just closing shows a most remarkable advance in the volume of business over 1896, our business for 1897 being more than double that of the preceding year. The increase in volume of business during the last 90 days has been especially remarkable. Prior to 1897 the biggest year's business done by any one water tube boiler concern in the United States was 162,500 h. p. in 1892-3. From present indications we have every reason to believe that our business for the year 1897-8 will largely exceed this figure. On the 19th of November our orders received on the single day were for over 13,000 h. p., which is unprecedented in the water tube boiler business. Among those to whom we have furnished large quantities of boiler power during the year 1897 are, the Carnegie Steel Company, Pittsburg; the Illinois Steel Company, Chicago, and the Shenango Valley Steel Company, New Castle, Pa., all of them representative firms in their line. In the electrical field, we have built boilers for the Brooklyn Edison Company, the Brooklyn Heights Railroad Company, the Union Traction Company, Philadelphia, and the Capitol Traction Company, Washing-

ton, D. C., which are also representative concerns in the electrical field. Our aim is and always has been to secure the large orders wherever possible and in this we have succeeded to a most flattering degree, the Carnegie Steel Company and the Shenango Valley Steel Company having given us this year orders aggregating nearly 25,000 h. p. We are also building 6,000 h. p. of boilers for the new sugar refinery now building by the New York Sugar Refining Company. Our sales are generally distributed between the two principal types of boilers we manufacture in the following proportions: 60 per cent Cahall vertical water tube, 40 per cent Cahall-Babcock & Wilcox type. Our factories have at the present time ample facilities for turning out 300,000 h. p. a year and they are at this writing crowded with work, our business since October 1st being beyond the capacity of our factories. It is of course almost impossible to estimate on future condition of business, but from the reports that we receive from our various branch offices of projects contemplated for the ensuing year, we feel very safe in prophesying that our next year's business will be very much larger than the present one."

The Consolidated Car Fender Company writes as follows: Our business has been larger the past year than the total business of the two previous years. More than 4,000 cars have been equipped by this company, on 45 electric roads, in 56 cities and towns. We are at this time equipping cars for the Metropolitan Street Railway Company of New York, the Troy City Railway Company of Troy, N. Y., the Utica Belt Line Street Railway Company, Utica, N. Y., the Consolidated Traction Company, Jersey City, N. J., the Cleveland, Painesville & Eastern Railroad Company, Cleveland, O., and the Dover Electric Street Railway Company, Dover, England. More "Providence" car fenders have been attached to electric cars in the United States during the past year than all of the other projecting fenders combined. This statement is true, notwithstanding the fact that the "Providence" fender costs more than double that of any projecting car fender now made. So far as our experience will show electric roads pay their bills promptly, and not one poor account has been made by us, or a single dollar lost, since we began to deal with them three years ago. The few competitors we have complain "that we are ruining the fender business by asking and receiving high prices for our goods." We may be ruining the business for them, but are certainly not doing so for ourselves. The demand for our fenders the past few months has been so great that we have found it necessary to carry in stock not less than 500 full equipments of our regular pattern. From the present outlook we feel confident that we will equip during the next year not less than 5,000 cars. It has been demonstrated beyond a question that a car fender made of tempered spring steel, with the best quality of malleable iron fittings, is cheaper in the end for electric roads to buy than a fender made of gas pipe, angle iron and rope netting, with common gray iron attachments. Hence the demand for the "Providence" fender.

A cartridge on the tracks of the Kedzie avenue line of the West Chicago Street Railroad, exploded with great force and raised the front of a motor car off the rails. One lady was thrown into the street and severely bruised, but the other passengers were more scared than hurt. It is thought that some mischievous boys placed the cartridge on the rail.

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**CLODFELTER STILL IN THE RING.**

Receiver James L. Bradford sold the Indianapolis, Anderson & Marion Electric Railway, November 17, to Noah J. Clodfelter for \$5,000. Arrangements were made for the settlement of \$80,000 worth of claims by the issue of stock in the new company, which is capitalized at \$500,000. The property consists of franchises, right of way, grading, and 2.5 miles of track, with partial power plant equipment. From Marion, Ind., the line will run to Indianapolis by way of Gas City, Fairmount, Alexandria, Elwood, Noblesville and Broad Ripple. Interested with President Clodfelter in the new Indiana Traction Company are Major L. N. Downs, Battle Creek, Mich.; C. S. Cleaver, and R. A. Davidson, Chicago; W. R. Pierson, Fairmount, Ind.; Frank Maus and Judge Bartholomew, Indianapolis; Judge J. B. Tuttle and H. M. and E. F. Loud, Au Sable, Mich.

**TRUCKING BY TROLLEY.**

We learn from an exchange that the trolley-line between Bessbrook and Newry, two English market towns, makes a considerable addition to its receipts by hauling the truck



TRUCKING BY TROLLEY.

wagons of the neighboring farmers as trailers. In order that the wagons may keep the track a second pair of rails is laid inside the running rails and slightly above the latter. The advantages of such a scheme are the saving in horse-flesh and time.

**SPEED REGULATION IN DETROIT.**

On October 9 the Detroit city council passed, in great haste, an ordinance limiting the speed of street cars throughout the city to 10 miles per hour. So much opposition to this developed, the citizens of Detroit fully appreciating the advantages of a rapid service, that the council subsequently reconsidered its action and referred the ordinance to a committee which reported in favor of one limiting the speed to 10 miles within one-half mile of the city hall, 15 miles between the half-mile circle and the boulevard which surrounds the city at an average distance of three miles from the city hall, and 20 miles elsewhere, which ordinance was passed.

By the purchase of the stock and part of the bonds of the Sea Beach and of all the stock and bonds of the Sea View road the Brooklyn Rapid Transit Company secures a through connection to Coney Island both by way of the

Brooklyn Bridge and by boat from Bay Ridge. The cost of the securities is placed at about \$750,000. It is announced that both roads will be equipped with electricity.

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