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NEW YORK, SATURDAY, SEPTEMBER 3, 1910.

TABLE OF CONTENTS.

Western Attendance at the Convention.....	349
Opening of the Pennsylvania Station in New York.....	349
Keeping Cars Clean.....	350
Drawing up Specifications.....	350
The American Tourist Abroad.....	350
A New Class of Litigation.....	351
The Union Issue in Columbus.....	352
Report of the Illinois Traction System.....	353
Power Contracts for Electric Railways.....	353
Southern Cambria 1200-volt D. C. Railway.....	354
Breakage of Railway Motor Pinions.....	357
Instruction of Student Conductors in Brooklyn.....	360
Treatment of Depreciation in Glasgow.....	362
Ordering and Standardization of Supplies on the London County Council Tramways.....	363
Meetings of Car House and Shop Employees in Boston.....	364
New Crossing Signs on the Louisville & Indianapolis.....	365
New Subways for Berlin.....	366
Effects of Injury by Electricity.....	366
Addition to Decatur Shops, Illinois Traction System.....	368
Bonding with Oxy-Acetylene Torch in Minneapolis.....	369
Some Notes on Rail Corrugation.....	370
C. S. Mellen Discusses Proposed Public Utility Legislation in Connecticut.....	371
Valuations of the Detroit United Railway.....	372
Special Convention Train from Chicago.....	373
Opening of the New York Station of the Pennsylvania and Long Island Railroads.....	373
Valuation of Chicago Consolidated Traction Company.....	374
Recorder of Steam and Water Consumption.....	374
Preventing Accidents from Opening Gates.....	375
Minor Shop Economies.....	375
The Columbus Strike.....	375
London Letter.....	376
News of Electric Railways.....	377
Financial and Corporate.....	378
Traffic and Transportation.....	380
Personal Mention.....	382
Construction News.....	383
Manufactures and Supplies.....	385
Table of Traction Earnings.....	386

Western Attendance at the Convention

The time-table of the convention train from St. Louis was published last week, and the arrangements made for the special train from Chicago are printed in this week's issue, both in ample time for those who are planning to travel on these trains to engage their reservations. It will be a great convenience to the transportation committees if this is done soon, so that the accommodations required will be known. There is no doubt that the attendance at the convention this year from the East and the Central States will be larger than ever before, and it is hoped that the Far-Western members will be present in such numbers as will make a record for an Eastern convention. Last year, for the first time in its history, the association held a convention west of Kansas City, yet the attendance of the Eastern members was very large. It is due these gentlemen that the Far-Western members attend the Atlantic City convention in an equally representative way. Their contributions to the technical proceedings and discussions of the different associations last year were very valuable, and as equally important subjects are to be discussed this year their advice and suggestions are again greatly needed. We feel it our duty to make to them the same recommendations which we did to the Eastern companies last year, to secure their convention reservations early, so as to be sure and be on hand.

Opening of the Pennsylvania Station in New York

On Sept. 8, the new Pennsylvania terminal station in New York will be opened for regular traffic by electric trains of the Long Island Railroad. The engineering feats accomplished in driving the tunnels under Manhattan Island and the two rivers which flank it on either side and in rearing the monumental terminal station building have overshadowed in the public eye the electrical problems connected with the equipment of the tunnels for train operation. But if the art of heavy electric traction had not reached its present development the enterprise would be doomed to failure from the start. The electrical apparatus installed represents for the most part adherence to well-tried principles. A new and powerful type of side-rod locomotive is to be used for hauling through trains, but the power generation and distribution systems do not differ in their essential details from other standard direct-current third-rail installations. Nothing has been left undone to insure safety and reliability of operation, which are of paramount importance on a high-speed underground road. The electric locomotive tests on the West Jersey & Sea Shore Railroad and the construction of an experimental overhead line on Long Island may be mentioned as typical of the thoroughness and expense with which the preliminary work was carried on before any final decision was made. As an example of terminal and suburban electric operation the Pennsylvania and Long Island suburban systems rank first among the electric railway undertakings so far completed.

Keeping Cars Clean

Hercules' assignment to cleanse the Augean stables was a trifling task compared with that of keeping the ordinary street car in absolutely clean and sanitary condition. The vast difficulty of securing this result is not appreciated by the public, which seems to expect that every car should be accompanied by a scavenger as third member of the crew. A case in point is afforded by the experience of a company which recently answered some complaints about the cleanliness of its rolling stock. It showed that the cars are cleaned and disinfected every night at a daily cost of 22 cents to 30 cents per car. In other words, the equivalent of about five fares is required every day merely to free the cars from filth. It is a hard job to keep even an ordinary sitting-room free from dust and odd papers. How much harder would it be to do so if such a room were visited every hour by 50 to 100 people of all classes from bricklayers to bankers, while the room itself was being moved through a dusty or muddy street with doors and windows open. Yet these are exactly the conditions to which a city electric railway car is exposed. Here is a direction in which the public can assist. No matter what care the company exercises the sanitation of public conveyances would be greatly bettered if the riders did not use the seats for foot-rests, the window sills for whittling blocks and the floors for cuspidors and waste-paper receptacles. To our knowledge at least one company has been obliged to prohibit the carrying of fish because of the offensive odors which permeated the cars despite the liberal use of disinfectants. If the cars are to remain reasonably free from malicious microbes after they leave the depot in the morning, it is essential that the passengers themselves should be considerate and cleanly during their riding hours.

Drawing Up Specifications

The average specifications for material are such formidable documents at best that great care should be exercised to make them as free as possible from unnecessary clauses. Most operating engineers are not personally familiar with all the conditions met in the manufacture of the material used by them and consequently when they extend their requirements beyond those of the performance of the material to include methods and processes of manufacture they run some danger of not securing the results sought. This is particularly the case when the clauses used to describe the manufacturing processes desired follow some form, honored because of its antiquity. It often happens that a specification drawn in this way will not apply to existing conditions of manufacture or will prove too exacting for material sold at standard prices. To avoid this it might be well to follow the example of one company which desired to draw up a series of standard specifications for overhead material. Before doing so, its engineers made inspection trips to the shops of all the prominent manufacturers where they familiarized themselves with the difficulties and extra expense inherent to making odd sizes and unusual shapes of line material items. In consequence, the final specifications were free from all freak designs and unreasonable requirements. Of course, small railways cannot afford to send their representatives on trips of this kind but this should not deter them from seeking expert help in other ways so long as no standard association specifications are available for their conditions. Probably the most satisfactory method would be to consult some testing laboratory which could first assist in drawing up the

proper forms and later could undertake to see that all the terms of the specification were fulfilled. As a general rule, a specification ought to contain little about details of the manufacturing processes, but rather should be devoted to specifying clearly for what class of service the material will be used. Nothing is gained by inserting inspection and penalty clauses unless arrangements have been made to test the goods before shipment.

THE AMERICAN TOURIST ABROAD

The number of Americans who spend their summer holiday traveling on the continent of Europe is constantly on the increase and it seems impossible to build enough large and fast transatlantic steamers to carry them. Statistics show that those who have crossed the Atlantic this season, most of them, like John Gilpin, "on pleasure bent," are more numerous than ever before, and at this time of the year it is almost impossible to secure passage home unless it has been engaged several months in advance. The subject of transatlantic travel is pertinent in this place because many of the home-coming tourists, upon their return, will undoubtedly discourse on how much better things are done in Europe, and, among other directions, how superior in its appointments is the average city electric railway system there to that in their own city. Indeed, one article on this subject has already appeared in our esteemed contemporary, *Engineering News*.

We agree with the writer of this article that some of the electric railway methods on the continent of Europe are extremely commendable and might be introduced to advantage in this country. The most conspicuous of these is the distinct marking of stopping places for city cars. In America, the variety of the practices as regards stopping on the near and the far side of the crossing is confusing to strangers. Moreover, when cars stop at every cross street at which passengers wish to mount or dismount, as is practically the universal rule in this country, more frequent stops are made than are necessary. If stopping signs were used they could be so spaced that cars would have to stop only at every other corner on short blocks. This, in New York, would mean that the cars would still stop every 400 ft., whereas in Berlin the stopping signs are an average of 750 ft. apart, and last year the company petitioned to have them spaced 900 ft. apart. Of course, there is a question as to whether the American public could be educated to accepting this longer run between stops, but if this were possible it would increase materially the schedule speed of the cars without increasing the maximum speed. Another European practice which could be introduced in this country to advantage is the erection of artistic shelters at busy junctions for the use of waiting passengers.

There are still other features connected with electric railway operations abroad which impress the American tourist as being attractive and commendable, but which are not so susceptible of being transplanted. Among them are the military appearance and deportment of the employees, which is the result, not only of actual service of each man in the army from one to three years, but undoubtedly is an inherited trait, the effect of centuries of military discipline. This training and obedience to the law and regulations are shown not only in the conduct of the trainmen but of the passengers themselves who are liable to prompt arrest and fine or imprisonment if they violate such

regulations of the company and of the municipality as that of getting on or off a car while in motion. All of these customs, especially so far as they govern other people, appeal to the American who is not accustomed to have his life and actions minutely regulated by law. Each system of government has its advantages but we doubt whether most of the Americans to whom these rules appeal during a superficial acquaintance with them would be content to have their own actions regulated by these laws for any great length of time.

All of these points appeal to our countryman in Europe, and he is apt to confuse these and perhaps other real points of merit in foreign operating practice with others which are actually disadvantageous, and from which the foreign company would be glad to escape if it could. Among the latter is the short car and train of short cars. This is one point upon which the correspondent in our contemporary waxes very enthusiastic, partly because, as he says, such cars are very easy on the track compared with the heavy, huge cars now run in American cities, and partly because they permit the management readily to provide for variations in traffic by adding to or dropping off cars. But the facts are that the short narrow car is a practical necessity in many cities abroad on account of the narrowness of the streets and the sharp curves, and trains of short cars have to be used to secure rush-hour capacity, and sometimes a separation of class. But in the suburbs of large European cities and on certain routes where the width of the streets permits them, numerous long double-truck cars are operated, many of them as long as those on most American city systems.

Of course, there can be but little question as to the relative merits from an operating standpoint of the double-truck car of, say, 36 ft. over the corner posts, and a train of two single-truck cars, each of half that length, as used in many European cities. The slower acceleration and the far greater liability to accident of the latter would be sufficient to condemn it for city service if there was any alternative, as many companies here know. As for double-deck cars they are hardly ever seen in Europe outside of the United Kingdom. They seem to be popular there and fairly well suited to the climate, although even there there is a tendency to enclose the upper decks in winter. But they are slow in loading and unloading, are hard on the track and would be unsuited to the extreme variations in temperature and climate found in America.

The low fares charged on the zone system for short rides abroad as compared with the uniform fare in America are also likely to be a cause of invidious comment on the part of the returning traveler. The latter usually has had occasion to ride on European tramways for short distances only in going from his hotel to points of interest within the city, like the art galleries and cathedrals. For short trips of this kind the zone system of fare collection provides a very cheap method of traveling, because the passenger always pays the minimum fare. But we believe that the average charge per passenger mile in any of the large cities in America, if it could be determined, would not be much, if any, greater than the average fare per passenger mile on lines in cities of equal size in Europe, with the possible exceptions of Berlin and Hamburg where straight fares are in force. Thus an article in a recent issue of this paper showed that while the fare on the New York subway is slightly less than double the average fare on the Paris subway, the average length of ride per passenger was from 2 to 2½ times that in Paris.

A NEW CLASS OF LITIGATION

The pay-as-you-enter car, like any other radical change in an industry, is bound to create new questions of law as well as of engineering and operation. Of course, fare boxes themselves are very old devices, and the right of a railway company to compel passengers to deposit their fares in such a box instead of handing them to the conductor was established long ago—certainly in most States, but the inconvenience to which a passenger can be put in the enforcement of this rule has not been so clearly defined by the courts. Possibly as extreme a case as ever came before the Supreme Court of New York State was tried two or three months ago in the suit of Elder against the International Railway Company. Here the plaintiff transferred from one Buffalo car to another, and as the latter was a pay-as-you-enter car he handed his transfer to the conductor, according to the rules of the company, entered the car and took a seat. Shortly after he had done so the conductor entered the car and told him that the transfer could not be accepted for transportation because it had not been presented at the proper transfer point. Some argument followed, but the conductor adhered to his position and told the plaintiff he would have to pay a fare. The latter thereupon offered to do so, but the conductor stated to him that he would have to go back to the platform and deposit the nickel in the fare box because the rule of the company forbade conductors handling fares. The plaintiff became incensed at this, and while willing to pay an additional fare, refused to walk back and put it into the box. Whereupon the conductor, without unnecessary violence, put the plaintiff off the car.

Mr. Elder brought action in the City Court, alleging an unlawful assault, and secured a verdict of \$50 with costs, whereupon the company appealed to the Supreme Court. The latter considered the case very carefully and said that as a general rule the requirement that passengers should deposit the fares in the box on entering the car was a reasonable one. The court admitted that exceptional circumstances might arise which would make the strict enforcement of the rule vexatious, but hardly thought it incumbent on the company to provide for all the possible exceptions which would justify a departure from the rule. It said that the conductor should be given a reasonable time to examine a transfer and see if it was good for passage. The time taken in this case was not unreasonable. It then became the passenger's duty to pay his fare and to comply with the reasonable rule of the company as to its mode of payment. The court consequently decided in favor of the company and reversed the judgment of the lower court, but, in view of the extenuating circumstances, did not reverse the costs.

The decision of the court in regard to the legality of the ejection admits, of course, of no question but it is a little difficult to understand the reference to the extenuating circumstances. The passenger broke two rules of the company: he presented a defective transfer and he refused to deposit his fare in the fare box. Either one would warrant ejection if not remedied, but after his attention had been called to his illegal conduct he offered to comply with one of the rules but not the other, and as the rule with which he would not comply was legally a perfectly reasonable one the company was warranted in compelling him to leave the car. This phase of the decision, however, is a small one compared with the establishment in the clearest possible language by the court that a railway company has the right to eject both for the presenta-

tion of a transfer at a point which is not the transfer point and for the refusal of a passenger to place his fare in the fare box, and also that the conductor is allowed a reasonable time to examine a transfer on a pay-as-you-enter car even after the passenger takes his seat to see whether the passenger has the right to ride on the car.

THE UNION ISSUE IN COLUMBUS

One issue stands forth clearly as the principal stake in the strike at Columbus. From the beginning of the difficulties between the Columbus Railway & Light Company and its employees the chief underlying point at controversy has been the recognition of the union organized recently among the men. Allied with this point is the retention of men whose services are not desired by the company, but for whose continued employment the union struggles.

Since the question of whether or not a union shall exist, and its relative advantages or disadvantages to the employees and the company, is one that concerns the public in Columbus, as well as in other cities, the position of street railways on this topic should be considered to reveal in what vital respects, if any, it differs from that of other large employers of labor.

Such consideration shows that the most conspicuous aspect of the duties of street railway trainmen is, first, their responsibility to the company and also the public for lives of passengers and others, and, second, their responsibility to the company for the proper collection and return of the revenues from traffic. No other public utility, and certainly no class of private business, is so burdened with heavy responsibility and danger from these sources as the street railway. By careless operation of cars and wilful or inadvertent disobedience of orders, trainmen may destroy lives and property, inflicting irreparable harm upon both the public and the company. Apart from the direct effect of accident upon the public, which desires and is entitled to safety of operation, the financial effect upon the company is a matter for serious thought. A single accident, involving fearful casualties and resultant heavy suits for damages, has led many a company into bankruptcy. With the considerations that have to do with safety the public admits its concern. It does not appear, however, to be so greatly concerned with the protection of the revenues of the company. These will be safeguarded as the honesty of conductors is maintained.

Where companies are entirely dependent upon traffic revenues in order to pay not merely dividends and the coupons of bonds but all the expenses of operation, the necessity for the employment of trustworthy men, so far as they can be secured, is plain. The management is obliged to take all the steps that lie within its power to keep the ranks of employees filled with men who shall serve it wisely and well, protecting the lives and limbs of the public and returning to the company the revenue to which its service entitles it.

How best to accomplish these ends is admittedly a problem. Does the union contribute better than individual initiative toward these undoubtedly proper aims of the management, or does it use its influence in preventing the administration of just discipline and in protecting men who deserve nothing but elimination from the ranks? If its strength is manifested in the cultivation of greater efficiency, the development of greater loyalty and of more permanence of service, it can accomplish some satisfactory results.

As a fair proposition it may be admitted that organization among employees has protected men from imposition in some cases. But the instances where organization has been followed, whether with or without the sanction of the union need not be argued here, by unlawful attacks upon life and property if an employer failed to meet the conditions demanded, are measurably greater in number and in degree of violation of moral ethics and statutes. If the union is to meet the corporation on equal terms it should be financially responsible and its contracts should be enforceable, but if no financial responsibility is possible for the union, its pledge or the word of its responsible officers should be kept.

While these are general considerations they are pertinent because of the distinctness with which the union issue in Columbus stands forth. The general manager of the company against which the strike has been directed has been pilloried in the newspapers as a hater of unions, although the papers and not the men may be justly chargeable with this attempt to arouse the prejudices of sympathisers with organized labor against the company. The class feeling which this and kindred attacks have aroused has undoubtedly contributed to the spread of the disorder which has disgraced the city of Columbus.

Easily and rightly separable from the questions at issue between the company and its employees is the question of operation of the cars. If there are merits to the claims of the employees, the company should be free to accept or reject the terms on which the men will return to work, just as the men are free to accept or reject the terms on which they are offered employment. In the meanwhile the company should make every effort to operate its cars with safety, speed and regularity. Whatever scale of wages may be fixed by the company the men are free to decline. But if the company does not care to pay the wages asked by the men, it should be free to fill the rejected places with other men who are glad to have the opportunity for steady employment thus offered.

It is clearly in the interest of the company to retain men trained in the service. But it is likewise in its interest to have a force of men upon whom discipline may be visited if breaches of conduct occur that hamper the success of the property. Conditions of labor and likewise wages have improved steadily in the street railway industry during a period when all costs of materials have advanced and the unit of passenger revenue has gone down. The question of whether the union shall exist or shall be abandoned together with its necessary expenses of maintenance, is of less importance to the company and the employees than the successful development and protection of the property in order that fair conditions of employment may be created and the public be made to meet the reasonable cost.

From one point of view, the separate interests of the main body of employees, of the public, of the security-holders and of the management are far apart and as hostile in tone as are the conflicting interests in any other business transaction—where each interest strives to protect its own. But from the broad point of view of the real welfare of each one of the interests enumerated, the wisest policy, the most profitable in the ultimate results is a cooperation which abandons minor differences for the major gain that accrues to the majority from such continued operation of the property as renders service where service is desired and wages or other remuneration where they are earned. The strike is not a means to this end.

REPORT OF THE ILLINOIS TRACTION SYSTEM

By the publication in pamphlet form of the sixth annual report of the management to the board of directors of the Illinois Traction Company information which emphasizes the extent of the system and the diversity of its operations is made available.

A list of 26 principal component properties of the system is followed by a résumé of the public utility services rendered in various communities, which shows that, exclusive of the interurban transportation facilities by which the company is known most widely outside of the section of the country in which it operates, electric lighting and power are furnished in 12 communities, street railway services in 10, gas in 5 and heating in 5.

From the variety of business and the distribution of territory served which these few figures show, it will be appreciated that diversity of the sources of gross earnings is a marked characteristic of the report. It will be instructive to see the proportion of the total gross which was contributed by each of the various sources of revenue during the year 1909. The figures are as follows: Interurban, \$1,980,779, or 41.7 per cent; local street railway, \$1,371,119, or 28.8 per cent; gas, \$293,072, or 6.2 per cent; electric light and power, \$961,115, or 20.2 per cent; steam heating, \$138,486, or 2.9 per cent; miscellaneous, \$7,511, or 0.2 per cent; total, \$4,752,082, or 100 per cent. It is thus shown that interurban lines constitute the most important single source of earnings of the system and that the railway lines as a whole furnish over 70 per cent of the total gross revenue reported. In the previous year, 1908, the proportion was practically the same for the interurban lines, being \$1,847,381, or 41.8 per cent of the total, but some variations from the 1909 figures are shown in the other departments. The 1908 figures, in addition to those just stated for the interurban lines, were as follows: Local street railway, \$1,283,892, or 29.1 per cent; gas, \$277,085, or 6.3 per cent; electric light and power, \$872,394, or 19.8 per cent; steam heating, \$134,286, or 3 per cent. The 1908 total, including \$14 of miscellaneous revenue, was \$4,415,052. To carry the comparison back one year earlier the corresponding figures for 1907 may be given, as follows: Interurban, \$1,610,257, or 39.7 per cent of gross; local street railway, \$1,226,591, or 30.2 per cent; gas, \$259,572, or 6.4 per cent; electric light and power, \$819,427, or 20.2 per cent; steam heating, \$127,453, or 3.2 per cent; miscellaneous, \$13,282, or 0.3 per cent; total, \$4,056,582, or 100 per cent. By comparison of the figures for the railway operations in 1907 and 1909 the tendency of the interurban lines to develop more rapidly than the street railways is revealed. As a matter of fact, earnings of the interurban lines increased 23 per cent in the two years as compared with a gain of 12 per cent by the street railways in the same period.

A charge for depreciation, made in the report for 1909, indicates a recognition by the management of this large system of the importance of this element in the cost of operation. There was appropriated for depreciation the sum of \$200,000. This is equal to 4.2 per cent of the total gross earnings for the year. As, unfortunately, the general operating expense accounts are not published in the report, the ratio which this appropriation for the upkeep of the property bears to current expenditures for maintenance cannot be shown. The operating ratio as stated in the report is 57.85 per cent. In the computation of this ratio, however, taxes of \$120,876, and an item of \$43,150 for

"general and overhead expenses," were added to the amount of \$2,585,043 specified as "operating expenses." If the latter item alone is used in the computation the operating ratio is 54.4 per cent. It is interesting to show that the 4.2 per cent of gross allowed for depreciation, when added to the 57.85 per cent considered as the total operating ratio, makes an aggregate of 62.05 per cent as representing both elements of cost. The depreciation allowance, added to the 54.4 per cent which represents operating expense minus taxes and the other charge of \$43,150, makes a total of 58.6 per cent of gross. These ratios compare with 58.4 per cent, the average shown by 76 companies with gross earnings each of \$1,000,000 or over in reports for the 1907 census of street and electric railways. In the same census report 26 companies were shown as having made depreciation deductions aggregating \$2,397,250. Undoubtedly the next census will show notable additions both to the number of companies and the total deduction for depreciation.

It is to be hoped that the management of the Illinois Traction Company will continue to take the public into its confidence in the future as fully as it has done in this report through its presentation of financial results and its publication of the interesting review of the progress of the year, which is signed by H. E. Chubbuck, the general manager, and is published elsewhere in this issue.

POWER CONTRACTS FOR ELECTRIC RAILWAYS

The extension of high-tension power transmission systems into electric railway territory brings the question of power contracts into prominence when an investigation of the economics of any given case shows that it may be desirable to purchase current from the incoming organization. Co-operation between the legal and engineering departments is here most important. The technical problem is obviously based upon a reliable service of sufficient volume to meet the transportation requirements within a specified area. The power company usually has its own contract forms, but in the case of a large customer like an electric railway it is often necessary to draw up a special form of contract on account of the peculiar conditions to be met in the supply of electricity. This can be done without interfering with the application of standard rates by the power company if the contract points are carefully looked after, even though the agreement may represent a departure from the usual forms of expression.

To insure satisfactory relations and to avoid future disagreements a typical contract will take account of such questions as the maximum, minimum and average loads to be supplied; the hours of service; points of delivery; limits of responsibility for equipment; methods of metering and billing; the rates for a given service; provision for cutting down the demand or the securing of additional power; consequences of non-payment and non-supply; right to check apparatus for current measurement; responsibility for maintenance, accidents, division of labor expenses, ownership of machinery and arbitration in case of a dispute. The detailed provisions that will be applicable to different cases will, of course, vary widely. In some instances a much simpler form of contract may be successful; but it is well not to overlook the fact that the tendency is toward the supply of power on a large scale by great systems, which renders greater care in covering all contingencies more expedient than when the transaction is merely a local matter.

SOUTHERN CAMBRIA 1200-VOLT D. C. RAILWAY

The Southern Cambria Railway in Western Pennsylvania is another interesting example of the simplicity that can be secured by using a 1200-volt. d. c. trolley on an interurban road. The line is now completed and in operation between Johnstown and South Fork, situated 11 miles apart. The power house and

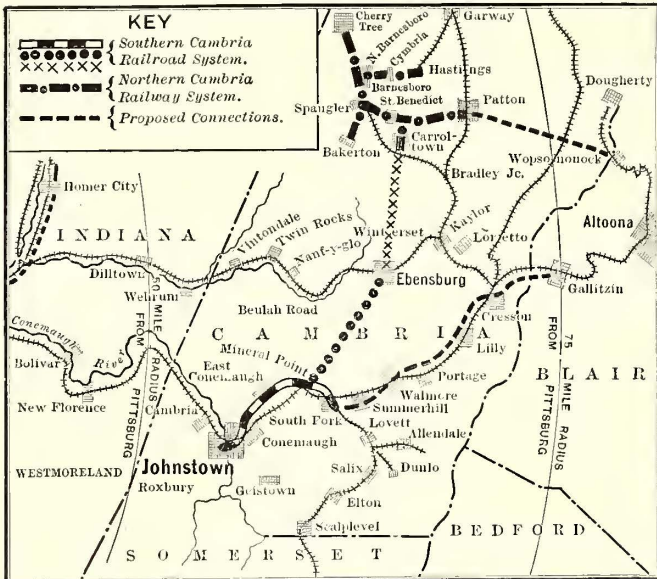
Ebensburg section. In all probability a transmission line will be built from Mineral Point to the present power house of the Northern Cambria system at St. Benedict. A substation will then be supplied with power from Mineral Point, as coal can be taken from the company's mines at the latter place for 45 cents per ton cheaper than it can be purchased at St. Benedict.

It is a point of general interest to record that a portion of the Southern Cambria Railway now in operation follows the course of the Conemaugh River from South Fork to Johnstown, as it was the breaking of the dam at South Fork that caused the terrible flood at Johnstown, 21 years ago. The road is built on the hillsides and follows their contour, winding in and out and assuming much the same form as the river which in some places is 200 ft. below the tracks. The route in summer time should be of more than ordinary beauty and should for this reason attract many pleasure seekers; at the same time it connects the busiest commercial centers in that portion of Pennsylvania.

ROLLING STOCK

At present the rolling stock consists of four cars, two straight passenger cars and two combination passenger and baggage cars. The electrical equipment of all four cars is identical and was manufactured and supplied by the General Electric Company. The car bodies were supplied by the Niles Car & Manufacturing Company. Each car is equipped with four motors of the GE-205 type, which are commutating pole units of 75 hp each, designed for full speed operation on both 600 volts and 1200 volts. For 1200-volt operation the standard practice of operating two motors in series is followed. In general design and construction these motors are similar to the maker's standard line of 600-volt railway motors except that they are insulated for 1200 volts.

The control is of the type M relay automatic design and is similar in general to that used on a standard 600-volt equipment. The control and power circuits are electrically separate. A commutating switch is provided in the power circuit for commutating the motors and rheostat connections when the car passes from a 600-volt to a 1200-volt section and vice-versa.

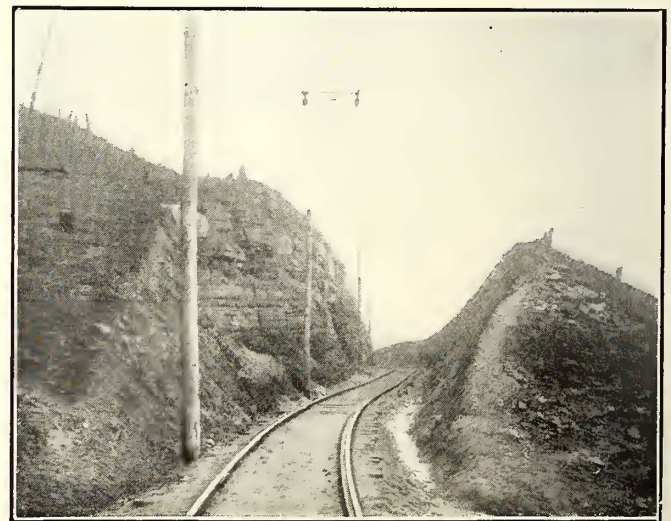


Southern Cambria Railway—Map

car barns are located near Mineral Point, which is 7.12 miles from Johnstown and 3.88 miles from South Fork. There are no substations, no transmission line, and no extra feeders aside from the double No. 0000 trolley, as the whole system is fed straight from the power house. It is anticipated that the road will soon be constructed and open for traffic between Mineral Point and Ebensburg, when another generating unit will be added to the power house. The distance



Southern Cambria Railway—Overhead Construction on City Streets



Southern Cambria Railway—Construction Through Cut on Right of Way

from Mineral Point to Ebensburg is 11.8 miles. A future extension of 9½ miles, connecting Carroltown and Ebensburg, is planned. This will connect the Northern and Southern Cambria systems, which are largely owned by the same interests. The accompanying map shows the district served.

The proposed method of supplying power for this future extension is of special interest. A 500-kw low-pressure Curtis turbine and condenser will be installed in the Mineral Point power house to use the exhaust steam from the present unit and that to be installed for operating the Mineral Point and

This switch can be operated either pneumatically or by hand, the master controller being mechanically interlocked with the air valve, which so operates the commutating switch that the controller must be in the "off" position before the switch can be thrown. A separate cut-out switch is provided to cut out a pair of motors, if necessary.

The control circuits are taken care of on the 1200-volt sections by a dynamotor which provides 600-volt current for operating the control, lighting and air compressor circuits. A selector relay is used to transfer these circuits from the 600-volt

tap of the dynamotor to the trolley when the car passes to a 600-volt section, so in all cases these circuits are operated at 600 volts. The dynamotor is underneath the car. All the control apparatus, such as the contactors, switches, etc., is standard 600-volt apparatus, provided with extra insulation. The air brakes are also of the standard General Electric 600-volt design; they are of the straight air type with CP-22, 24-ft. compressors. All of the apparatus is carried under the car on steel supports made to templates so that installation is greatly simplified.

The straight passenger car illustrated is of handsome appearance and is exceptionally well lighted as shown by the interior view. All the cars are double-ended and equipped for train operation. The general dimensions, weight, etc., are given below:

Length over all	48 ft.	0 in.
Length over vestibules.....	46 ft.	8½ in.
Length over end plates.....	37 ft.	1½ in.
Width over all.....	8 ft.	10 in.
Height over body	9 ft.	5 in.
Seating capacity	50	
Weight of car body.....	27,000 lb.	
Total weight	64,500 lb.	

Trucks: (All are motor trucks)

Distance between centers.....	25 ft.	6 in.
Wheel base of trucks.....	6 ft.	6 in.
Diameter of wheels	34 in.	
Type of truck.....	Baldwin 28-25	
Weight of truck.....	8500 lb.	

It is interesting to note that designs for side entrance cars are being prepared for future rolling stock.

POWER

The power station and car house are situated near Mineral Point only a short distance from the Conemaugh River. Both buildings are constructed of Mahoning sandstone taken from the nearby hillsides. The power house is 94 ft. 6 in. long and 92 ft. wide. The engine room measures 92 ft. x 42 ft. and the boiler room 92 ft. x 52 ft. 6 in. The height below the roof girders of the power house is 16 ft. 6 in. and that of the boiler room 24 ft. 6 in. This building is laid out for three units, only one of which is now installed. The additions will be one unit similar to that already in use and a 500-kw, low-pressure Curtis

speed of the set is 120 r.p.m. The two electrical machines are connected in series to give 1200 volts.

The switchboard consists of but one generator, two feeder panels, with a negative equalizer panel besides a swinging bracket for the voltmeter. The generator and feeder panels are all of the same dimensions. There is only one generator panel



Southern Cambria Railway—Interior of Standard Car Showing Seating and Lighting

for the two machines, and both the circuit breakers and knife switches are provided with remote control. The ammeters have insulating covers.

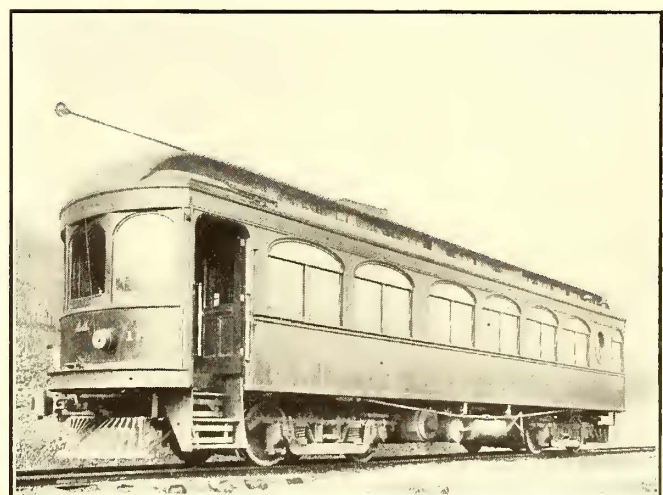
The equipment of the boiler house now consists of two B. & W. water tube boilers, each of 302 hp capacity. They are provided with Perfection shaking grates, but have no mechanical stokers or superheaters. The auxiliary apparatus consists of two feed pumps and a feed water heater. The pumps were



Southern Cambria Railway—Viaduct at Johnstown, Pa.

turbine and condenser. The latter unit is to use the exhaust steam from the two reciprocating engines.

The present steam-using equipment consists of one Filer & Stowell non-condensing, cross-compound, 900-hp, horizontal reciprocating steam engine with Corliss valve gear with centrifugal governors and cylinders 22 in. x 38 in. x 36 in. stroke. This engine is direct-connected to two General Electric eight-pole, 300-kw, d.c., commutating-pole, 600-volt railway generators. The

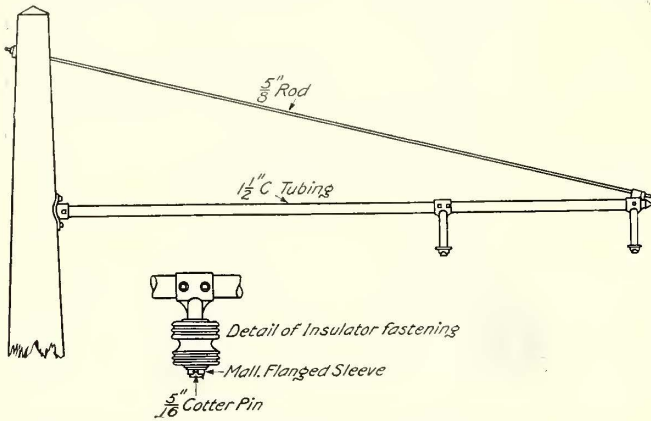


Southern Cambria Railway—Standard Interurban Car

made by the Scranton Feed Pump Company and are of the duplex type with cylinders 10 in. x 6 in. x 12 in. stroke and a capacity of 130 gal. per minute. The feed water heaters are of 1500 hp capacity and were manufactured by the Pittsburg Feed Water Heater Company. Coal is brought directly into the boiler room on an elevated track and dumped in front of the boilers. The coal is obtained from a mine adjacent to the power house.

OVERHEAD CONSTRUCTION

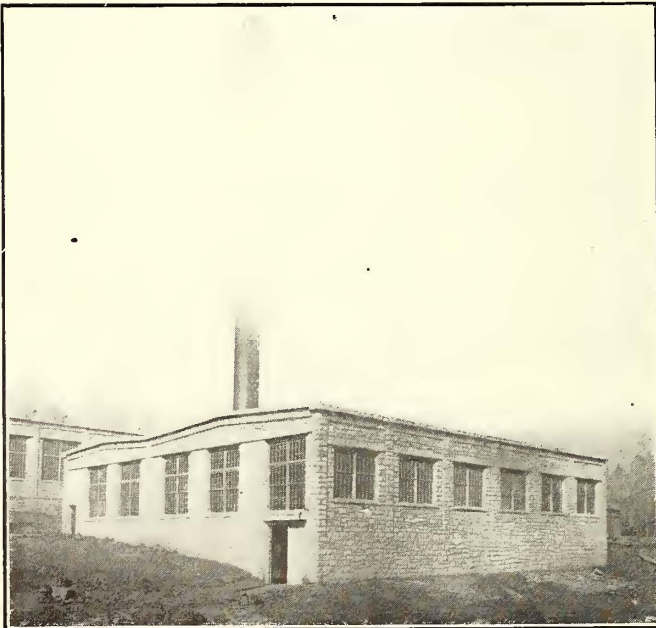
The overhead system is very simple as there are no transmission lines or extra feeders. It consists of two No. 0000 grooved trolley wires spaced 6 in. apart. Single bracket construction is used on private right of way and span construction in towns and cities. A general view of the bracket construction is presented and also drawings of the bracket, the insulators and the twin hangers employed. The distance between the in-



Southern Cambria Railway—Bracket for 1200-Volt Trolley and Detail of Insulator

insulator pins is not fixed in this design but can be altered as desired. The insulators are not cemented to the pins but are held by a washer and cotter which greatly facilitate their renewal when necessary. Another view shows the special bracket construction used on the long viaduct at Johnstown, Pa.

The pole spacing on private right-of-way is normally 90 ft., but as pull-offs, push-offs and guys have been avoided, the spacing varies at curves and where the conditions demand closer spacing to bring the trolley wires centrally over the track. The distance from trolley to track is 19 ft., while the total length of pole varies from 30 ft. to 35 ft. The longer poles are employed where there is a probability of transmission lines being



Southern Cambria Railway—Power Station

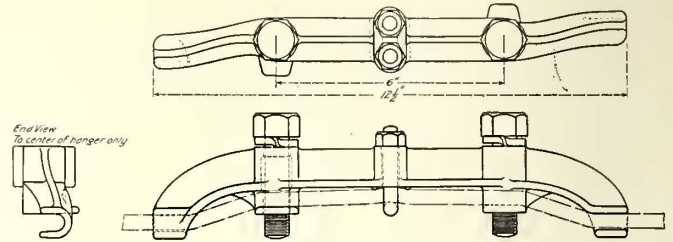
strung later. The poles are chestnut and are buried to a depth of 6 ft. in the ground.

For city work steel poles are used. The details of the pole strain porcelain insulators are shown in one of the accompanying cuts. The line strain insulators are built up of two 14-in. hickory wood insulators with malleable iron terminals, and with a double trolley hanger between. The span view construction

also shows the type of dead section used; in this particular instance a 600-volt city line crosses the 1200-volt line, and there are two dead sections with a 600-volt section between. A lead-covered cable is used as a jumper and a knife switch is provided in the jumper cable.

TRACK

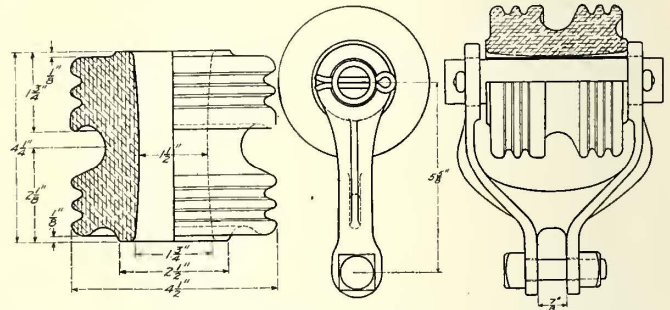
Owing to the nature of the country the grades and curves are very severe and numerous. The roadbed is well ballasted with granulated blast furnace slag and it is probable that a surface



Southern Cambria Railway—Twin Hanger

of stone will be added later, but even under the worst conditions—when the frost had just gone out of the ground—the roadbed was in remarkably good condition. The line is of single track throughout, with turn-outs at crossing points, but all bridges and viaducts are built with provision for future double tracking.

The rails used in Johnstown are 87 lb. girder section for



Southern Cambria Railway—1200-Volt Line and Pole Strain Insulators.

straight track and 127 lb. for curves; in Conemaugh, 73 lb. for straight track and 108 lb. and 127 lb. for curves. On the private right-of-way, forming the larger part of the road, T-rails of 70 lb. A. S., C. E. standard section are used. The rail joints are six-hole joints. Three kinds of bonds are used—compressed terminal bonds for concealed work on girder rails, 2 miles of twin terminal bonds and 8-in. brazed bonds of No. 0000 on the remainder of the road. The ties are of white oak and chestnut and are of standard dimensions.

Some of the civil engineering features of the road are of great interest, such as the long viaduct at Johnstown, which crosses the river, railroad tracks and city streets. This viaduct is of steel and is 525 ft. in length with sufficient breadth to accommodate a double-track road. There is also another steel bridge spanning the Conemaugh at the entrance to South Fork, of equal length.

It is interesting to add that this is the third railway to adopt 1200-volt d.c. apparatus, on the advice of James Bryan, as consulting engineer. The operation of the Indianapolis & Louisville and the Pittsburgh, Harmony, Butler & New Castle systems has fully justified his selection.

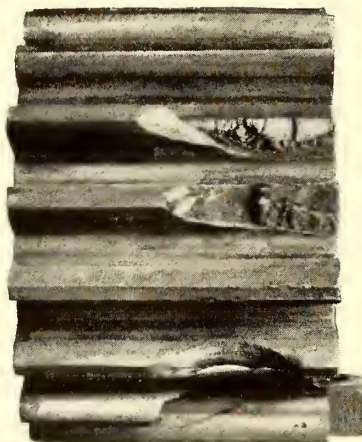
The Indiana Union Traction Company will begin at once to set all of its poles in cement. It is believed that poles set in this manner will last a great deal longer time than if set where moisture can get to them. After the cement is placed around the pole, the top of the cement will be covered with a pitch preparation to prevent moisture from entering the wood below the ground.

BREAKAGES OF RAILWAY MOTOR PINIONS

BY GEO. L. FOWLER

In a paper read before the American Society of Mechanical Engineers in December, 1908, Norman Litchfield, engineer car equipment, Interborough Rapid Transit Company, presented a statement of the character of service and record of breakages of motor gears and pinions of the New York subway cars and gave an analysis of the stresses to which they were subjected, basing the strength to resist fracture on the limit of elasticity of the metal rather than the ultimate strength. It appeared that the metal in the gears and pinions which had an elastic limit of 45,000 lb. per sq. in. had been subjected to stresses of 39,400 lb. per sq. in., and it was suggested that the elastic limit of the metal used in the gears should be raised to 90,000 lb. Another change suggested was to give the teeth a rounded contour longitudinally so as to bring the bearing at the center at all times regardless of the spring of the armature shaft or axle.

Shortly after this paper was read I was retained to investigate and report on a case of pinion breakage that, in general, appeared to be very similar to that described by Mr. Litchfield.



Pinion Failures—Fig. 1—Appearance of Tooth Fractures

As shown by the accompanying engraving, (Fig. 1) the teeth broke off on diagonal lines forming a V-shaped fracture beginning at the root of the teeth. At first glance it would seem that, as in the case of the subway, the metal was being overstrained, as the cracks which were formed corresponded with the line of maximum stress to which the teeth of the pinion are subjected. A further examination of the fractured surfaces showed that the breaks were, in no instance new and bright, but were invariably of a progressive character. The cracks started at the root of the tooth and worked gradually into the metal until the solid material remaining was insufficient to sustain the stress, when fracture occurred. This was shown by the smooth and worn condition of the surfaces. These surfaces differed, however, from the usual form of progressive fracture in homogeneous material in that they were filled with sharp ridges parallel to the line of fracture, and were not worn to that rolling smoothness that characterizes progressive breakage due to fatigue of the metal. With the experience of the Interborough Company in mind, the investigation was started with the expectation of finding that the metal had been overstrained. The first points to be settled were the actual strength and the chemical composition of the metal of the pinion. To determine this two tensile test pieces, each with 2 in. of length available for the test were cut from the pinion. One was cut from the body of a sound tooth and the other from the main body of the pinion immediately below the first test piece. The centers of the two test pieces were, therefore, about 5/8 in. apart, a condition that has an important bearing on the conclusions finally reached.

Owing to the limitation of the thickness of the metal in the tooth, it was necessary to reduce the diameter of the test piece

cut from it to 3/8 in. The test piece cut from the body of the pinion was turned to the same diameter for the sake of uniformity. The results of the tensile tests were as follows:

	Tooth	Body
Maximum load	144,413 lb.	133,680 lb.
Limit of elasticity	90,775 lb.	80,385 lb.
Elongation	16 per cent	16.5 per cent

From these tests it appears that, while the strength and quality of the metal were such as to sustain the load with an ample factor of safety, there was a marked difference in the quality of the metal in the two test pieces cut out of the pinion only about 5/8 in. apart. Except for a slight difference in the elongation the metal in the tooth was better than the metal in the body. This variation was checked elsewhere and has an important bearing on the results. The chemical analysis of the two test pieces were as follows:

	Tooth	Body
Silicon .....	.033 per cent	.024 per cent
Manganese .....	.73 " "	.57 " "
Sulphur .....	.033 " "	.036 " "
Phosphorus .....	.018 " "	.017 " "
Carbon .....	.768 " "	.671 " "

It will be noticed that there was 37.5 per cent more silicon in the metal of the tooth than in the body. Whether this excess had anything to do with the variation in the texture of the two parts as developed under the microscope I cannot say as I have no information as to the heat treatment to which the pinion was subjected, but it is well known that silicon has a decided effect in increasing the soundness of castings and so its presence in larger amount may have influenced the freedom of the teeth from the small blowholes that existed in the body of the pinion.

These pinions were of 2 1/2 diametral pitch and were cut with 14 1/2° involute teeth. Taking the Lewis formula and assuming the most unfavorable conditions of load and acceleration that obtained in service, the maximum fiber stress of the material was but 19,895 lb. per sq. in. or 24.74 per cent of the elastic limit of the material, at its weakest place, giving a factor of safety of more than four. This stress might have been increased by springing of the armature shaft, but even were this to occur to an exaggerated degree, it is safe to assert that the working stress on the tooth was not enough to break it under normal working conditions and sound material.

As there was nothing the matter apparently with the material physically or chemically, the next step was to examine it structurally.

Visual inspection showed no defects; the metal was seemingly perfectly sound throughout. For a better inspection, the teeth at the inside ends of several pinions were polished and the whole periphery examined with a microscope magnifying to 18 and 34 diameters.

In the case of one pinion this careful search revealed two fine hair cracks, one of which, magnified 34 diameters, is shown in Fig. 2. Even on a polished surface these fine cracks were quite invisible to the naked eye, nor were they brought out by a hand glass that magnified about 6 diameters. It was only after polishing the surface and examining it in detail under the microscope that they were detected. It would have been quite impossible to have found them with any degree of magnification, with the surface bearing the tool marks as received from the makers.

When these cracks were found the metal was cut away back of them and worked down until the two pieces dropped apart without strain.

The cracks were so fine and the metal had been held so tightly together that no oil had worked in, so that, when opened, the

surfaces were clean. They showed unmistakable heat effects. The surfaces were covered with that peculiar blue and straw-colored oxide that can only be produced by heat. They were not detail or progressive cracks, as they ended abruptly and showed no signs of the rubbing that always characterizes the progressive fracture. The surfaces, moreover, had the same peculiar markings at right angles to the outer surface that existed where a piece had actually broken out. These markings are characteristic of heat cracks, but they could not be identified positively in the developed fractures because of wear and the presence of oil that had entered. The presence of these fine cracks could explain a portion of the breakages as the cracks which developed at the root of the tooth by some heat treatment to which the pinion had been subjected, would eventually have caused a fracture.

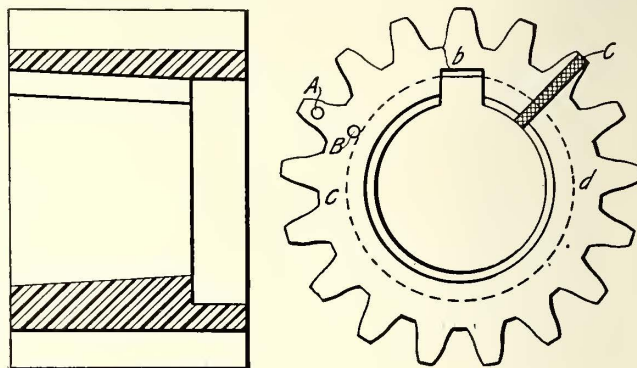
Aside from these cracks there were other defective features of the structure. In the search for the fine cracks an interesting condition of the metal was revealed by polishing the ends of the pinions.

The tooth itself could be polished to a state of great brilliancy, but there was an annular space immediately below the root that was filled with minute blow holes. These holes were so numerous as to mar the whole surface and were plainly visible with the eye. Farther down towards the bore the metal was sound again. At the point of the tooth, the metal was clean and homogeneous. The blowholes increased in size and number, until at a depth of 1 1/8 in. below the point of the tooth, the major portion of the surface was filled by them. They, then, rapidly decreased towards the bore, until at a depth of 1 3/4 in. from the point of the tooth they had largely disappeared.

Where the visible cracks occurred the transition was usually very marked from the solid to the defective metal. The whole surface of the tooth on one side of a crack would present clean, homogeneous metal and on the other a cluster of blowholes. This structure is brought out very clearly in the engravings, Figs. 3 and 4. These cracks started at the edge along the line separating the sound from the defective metal, and, in some instances worked along this line until fracture occurred. The blowholes, however, did not extend all of the way through the metal but were deep enough to cause concentration of stresses and the development of a crack.

This investigation had just been completed when another type of pinion began to fail in an entirely different way. This was of the same size as the first ones examined having a 2 1/2

ing stresses put upon it and a fracture occurred. The final portion of the fracture was of the usual granular character whereas the progressive portion was worn smooth and showed no evidence of having been caused by any heat treatment to which the pinion might have been subjected. In the accompanying engraving (Fig. 7) the form of a typical fracture is shown. The double hatched lines indicate the bright granular or final fracture, while the dotted section indicates the progres-



Section of Keyway

Pinion Failures—Fig. 5—Location of Crack in Keyway

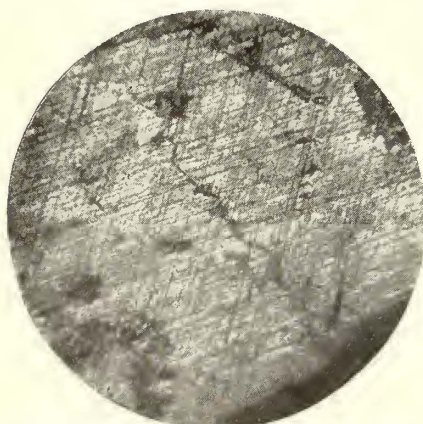
sive fracture. It will be seen that the crack undoubtedly started at the point a, on the outside between the teeth and worked in until the whole area represented by the dotted portion was a crack.

A careful examination was made of broken and sound pinions of the same type without detecting any incipient cracking whatever. Moreover, the fact that the breakages invariably occurred in the same place, indicated some other cause than heat treatment or cracks.

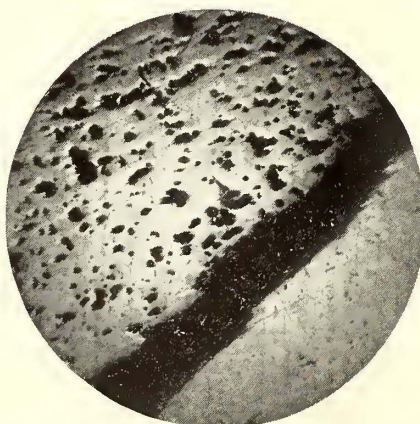
Physical tests of the material gave the following results:

	Tooth	Body
Maximum load	140,342 lb.	126,043 lb.
Limit of elasticity	91,279 lb.	70,244 lb.
Elongation	12.5 per cent	13 per cent
Reduction of area	28.16 " "	31.51 " "

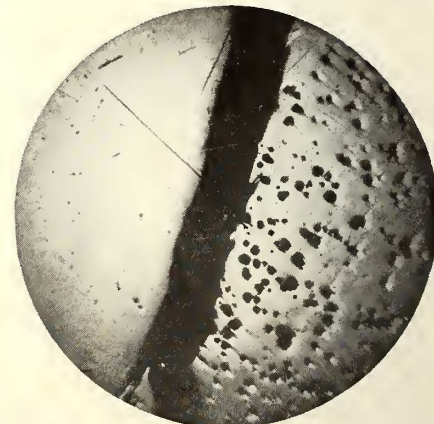
It will be noted that there was a marked difference between the physical properties of the tooth and the body. This can be explained readily by the method of heat treatment. The



Pinion Failures—Fig. 2—Hair Cracks on Polished Surface. Magnified 34 Diameters



Pinion Failures—Fig. 3—Division Between Sound and Honeycombed Metal. Magnified 34 Diameters



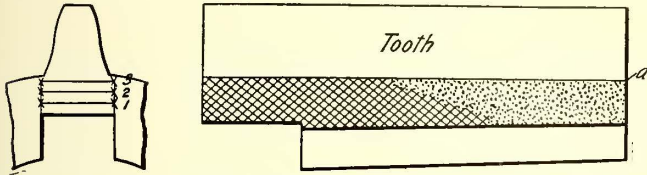
Pinion Failures—Fig. 4—Crack Dividing Sound and Honeycombed Metal. Magnified 34 Diameters

diametral pitch, and 17 teeth. The fractures occurred through the center of the key way out to the space between the teeth, or to the root of the teeth as shown in Fig. 5. The puzzling feature of these breakages was the fact that the cracks started from the center of the keyway and not from the corner. An examination of the fractures showed that, in every case, they were progressive. They started at the armature end and worked down, in and across the pinions until the metal remaining had not sufficient strength to sustain the work-

ing stresses put upon it and a fracture occurred. The final portion of the fracture was of the usual granular character whereas the progressive portion was worn smooth and showed no evidence of having been caused by any heat treatment to which the pinion might have been subjected.

In the chemical analyses the metal was very uniform throughout with a carbon content of about 0.70 per cent. The microscope also showed a high degree of homogeneity so that it was demonstrated that the metal was of an exceedingly high grade, and that some other cause than defective material must be sought to account for these breakages. The next step was

to make an examination of the condition of the metal when the pinion had been keyed on the armature shaft. In order to determine this the armature end of a pinion was polished in three places, over the keyway and at the ends of a diameter drawn at right angles to a radius drawn through the keyway. These points are shown at *b*, *c* and *d* of the end elevation. (Fig. 5) Markings were made on the two latter surfaces, and on the polished surface above the keyway three lines were drawn approximately parallel and about 1/8-in. apart as shown in Fig. 6. These lines were intersected by lines drawn from the edges of the keyway and the distances between the



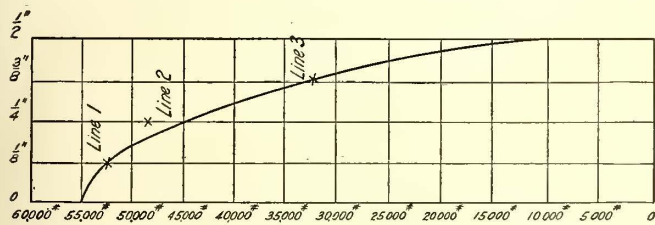
Pinion Failures—Figs. 6 and 7—Marked Tooth and Granular Fracture

points of these intersections, as indicated by the crosses, were accurately measured with a microscope and micrometer.

A stub end of an armature shaft was then cut from the main shaft so that later measurements could be made, and then the pinion was mounted on this stub in exactly the same manner as for a pinion to be used in service.

The method of doing this is that commonly used by most railways. The key was put in place and the pinion slipped on and first driven down with a hand hammer and then struck three heavy blows with a 12-lb. sledge, after which the nut on the shaft was tightened. It was then struck three medium blows with the sledge.

When the pinion had been set on the mandrel the latter projected from the back 0.445 in. After the pinion had been driven on the projection was 0.365 in. As the taper of the mandrel was 1 in 10, the increase in the diameter of the hole (the mandrel remaining uncompressed), would be, for the distance driven on, 0.008 in. Measurements taken between the points *b* and *c*, showed that the increase in diameter was 0.0032 in. on points midway between the bore and the root of the teeth. Such an increase in diameter would call for an actual increase of circumference of 0.012021 in. Measurements taken of the stretch observed on line No. 1, showed a strain of 0.0021 in. which multiplied by the modulus of elasticity of the metal, which had been found to be about 28,000,000, gave an initial



Pinion Failures—Fig. 8—Diagram of Stress in Metal Surrounding Keyway when Pinion is Driven On

stress in the metal of 58,000 lb. per sq. in. As the limit of elasticity of the metal in this part of the pinion was 70,000 lb., it is quite possible that that limit might have been exceeded when the working load of 19,000 lb. was added to this initial stress.

It was suggested that driving on the pinion with a sledge was severe treatment for a high grade pinion and that heating in hot water and shrinking on would be more reliable in giving uniform results.

The pinion, therefore, was placed in boiling water where it was allowed to remain for two hours until it was, presumably, evenly heated throughout to a temperature of 212° Fahr. It was then removed, placed on the mandrel and driven gently down with a hand hammer until it was seated. When it was cool, and was measured, it was found that line No. 1 had increased in length by 0.00085 of its original length; No. 2 by

0.0009 and No. 3 by 0.001. Assuming that the modulus of elasticity of the metal was the same as that of the pinion from which the test piece was cut, we have a stress on the metal, due to stretching, of 27,093 lb. at line No. 1; 28,142 lb. at line No. 2, and 31,076 lb. at line No. 3. In other words, the stress was practically uniform throughout the metal above the keyway.

The mandrel was then put on an anvil and the pinion struck with a sledge until it was driven on 1/16 in. further. Measurements of the three lines were again made and it was found that the stresses in the metal had been greatly increased. Taking the original measurements as a base, it was found that they had been stretched so that line No. 1 indicated a stress of 52,678 lb.; line No. 2, 48,465 lb. and line No. 3, 32,630 lb. These results were afterwards checked by pressing the pinion on to the same position on the mandrel. The stresses developed were somewhat less.

These investigations showed that when a pinion is put on the armature shaft by careful shrinking, all parts of the metal contract together and the result is a uniform stress throughout. When driven on with a sledge the metal in contact with the shaft is distorted and stretched more than the metal which lies beyond, and, while the average may not be high, there may be zones that are subjected to an excessive stress. This stress decreases rapidly as the distance from the bore is increased.

As line No. 1 was 1/8 in. from the edge of the keyway, it is fair to assume that the stress at the edge was much greater. To show this graphically, a parabolic curve (Fig. 8) has been plotted through the two outer points, as indicated by the crosses; carrying out this curve to the edge of the keyway gives a stress at that point of 55,000 lb. per square inch. It must be borne in mind, also, that the limit of elasticity at that point is about 70,000 lb. Almost identical results were obtained with another pinion having a shallower keyway. The stress was less, but the section of the metal strained was more.

If this work served no other purpose it at least demonstrated that the driving on of a pinion with a sledge is an unscientific method of making the adjustment and one that is apt to set up unequal progressive strains in the metal that may run dangerously close to the limit of elasticity. It also shows that the shrinkage by the hot water treatment will put the pinion on the shaft sufficiently tight to meet all requirements of service. Finally it illustrates how impossible it is to arrive at a correct conclusion as to the cause of a breakage of this sort without making a thorough examination into all of the conditions under which the metal is worked.

In both cases the metal of the pinion was all that could be asked for as far as the ordinary methods of inspection and testing could determine and yet it was found that in the one case the breakages were due solely to microscopic defects that no inspector could detect and which, nevertheless, put the responsibility on the maker. In the other case it was due to unfair treatment and the user accepted the responsibility.

ECHOES OF THE PHILADELPHIA SYMPATHETIC STRIKE

The *Annals* of the American Academy of Political and Social Science for September are devoted to the "Settlement of Labor Disputes." Among the articles is one by C. O. Pratt on the sympathetic or general strike in Philadelphia. He writes:

"The general strike was positive evidence before the world of the justice of the carmen's cause, and there was no other way by which this fact could be established. The truth of the actual conditions became generally known and understood. . . . Our forefathers acted in sympathy when they threw off the yoke of tyranny and fought for the establishment of a government of the people, by the people and for the people. Our own fathers, many of them, from '61 to '65, did not stop to ask if they had contracts with their employers when they went to the front to fight for the preservation of the union and eventually the freeing of the chattel slave. Nor did they stop to question whether such an action would injure a friendly employer. There was a paramount issue involved which surmounted all other questions that were insignificant in comparison. So it was in this strike."

INSTRUCTION OF STUDENT CONDUCTORS IN BROOKLYN

The Brooklyn Rapid Transit System has drawn up and printed in pamphlet form a guide for the instruction of student conductors. The rules are reproduced practically verbatim in the following paragraphs, but attention may be directed to the logical order in which the instructions are printed, beginning with the exit from the depot in the morning to the return in the evening:

AT THE DEPOT—PULLING OUT

1. Daily Assignment of Students.

Each instructing conductor will consult this sheet every evening to see if a student is assigned to him for the following day. If so, find out if he is there as soon as you report in the morning.

2. Student's Assignment Sheet.

Get this from the student, as it covers your authority for breaking him in. See if he is assigned to the line you are working on that day. If not, take him at once to the despatcher. If he is assigned to your line, take him to the time-table.

3. Time Table.

Show him how to copy your run, running time and time points.

4. Bulletins.

Instruct him where to find bulletins and explain to him the importance of watching the bulletin board every day.

5. Day Card.

See that he is provided with a day card, and at the end of each half trip have him make all the necessary entries, filling in actual time of leaving the terminals; not the table time unless this agrees with the actual. This day card you will turn in to the depot, together with student's assignment sheet at the end of the day. Your day card will be made out as usual.

6. Time Card.

See that he is provided with a time card and show him about entering the name of the motorman, with additional entry if the motorman is changed during the day.

7. Inspection of Car.

This inspection will be made to cover condition as to bell and register cords, steps and running boards, doors, ventilators, gates, trolley ropes and poles; inspect for cleanliness, wet paint and projections or defects liable to injure passengers or damage their clothing. Report to starter any defects needing immediate attention.

Compare readings on registers with entries on register card, and if any difference exists, report it for correction to the register taker or starter.

INSTRUCTIONS ON THE ROAD

NOTE.—If starting with a student on a rush-hour trip and a heavy load, do not attempt to let him collect fares unless you think he is capable of doing it properly, nor take up your time in instructing on the subjects which follow. Station him on the back platform, instruct him briefly on signals and use him for that purpose until the end of the half trip. On the return trip you will have few passengers and can devote your attention to his instruction in detail.

1. Position of Conductor.

When not busy, to remain always on the rear platform between the step and controller, and facing the front end of the car in order to see everything which occurs.

2. Trolley Pole.

When approaching special work, crossings or rounding curves, the trolley ropes are to be taken in the left hand and held until they have been passed. This leaves the right hand free for any emergency or to protect passengers if necessary.

3. Bell Signals.

See that the student understands all bell signals, not only those which he is required to give, but those given to him by the motorman.

4. Transfer Points.

Have the student make a list, which he will keep in his rule book, of all transfer points on the line, arranging them in the

order of reaching them. Show under each transfer point the line or lines to which transfer may there be made. Question him to see if he remembers, and instruct him to call out transfer points and lines to which transfer is made so passengers will not be carried by.

5. Time Points.

The conductor is jointly responsible with the motorman that his car is run on schedule time, for which reason a knowledge of the time points is important. These he will have copied from the time table before pulling out. Have him watch the time to see that the car is being operated on schedule and instruct him that when the car is on stand at terminal, he must be on board to give the starting signal at the proper time.

6. Registers Out of Order.

Instruct the student that when a register gets out of order on the line, he will mark a piece of paper "Out of Order," and, by wetting, paste it over the dial. He will then keep account of fares or transfers collected and not rung up, and will notify the depot master or the starter as to the number, when reaching the terminal. Register out of order should be reported to the first inspector found on the line after the trouble develops.

7. Backing Cars.

Instruct the student that when backing a car he must face to the rear of the car, with trolley rope in his right hand and bell cord in left, sounding foot gong. Then give three bells to the motorman, and be sure to give the stop signal in plenty of time to enable the motorman to shut off power and stop the car within the required distance. This latter is of special importance when a wagon or other obstruction is on the track in rear of car. Cars are not to be backed around curves, over special work, and only 50 ft. on a straight rail.

8. Transferring without Transfers.

See that the student understands what to do if passengers are for any reason transferred from another car to his car without transfers. In such cases he will count the number of passengers, ring up on his cash register the proper number and then have his day card "O.K.'d" for this amount by the inspector or official directing the transfer.

9. Conversation.

It is very important that students should realize that they must not hold any conversation, except to answer questions asked by passengers. A conductor's business is to keep his eyes on everything that happens, and this he cannot do if he fails to observe this rule.

10. Disabled Car Being Pushed.

See that the student thoroughly understands how signals are passed in pushing a disabled car. The conductor on the rear car gives the two-bell signal on his car. This is repeated by the conductor on the front car. If everything is clear, the motorman on the front car rings overhead bell twice, which is the authority for the motorman on the rear car to apply the power.

11. Head Lights, Tail Lights and Flagging.

During heavy fog, headlights must be kept lighted on the rear of the car during the day. At night the headlight on the front part of car must always be kept lighted.

Tail lights on the cars of suburban lines must be frequently inspected at night to be sure that they are burning.

Whenever a car is stalled on a curve or a straight rail under conditions when it cannot be seen by the motorman of a following car or train, the conductor of the stalled car must immediately go back 500 ft. and be prepared to flag any approaching car. This paragraph is of great importance, for accidents happening through failure to comply with it in every detail are always serious.

TRANSFERS

1. Punching and Issuing.

Be sure that the student is supplied with "Notice to Conductors," and see that he thoroughly understands all of the requirements in regard to punching and issuing transfers.

2. Receiving.

The student should be shown how to inspect the list of trans-

ferring lines printed on the face of all transfers at the top. If he is in doubt about accepting a transfer, he can readily satisfy himself. This is of interest to him, for transfers improperly accepted are charged against the conductor accepting them and collection made from him at the rate of five cents for each transfer.

3. Where Carried.

Yellow (first) and green (second) transfers will be carried by the conductor in the outside breast pocket. In rainy weather or on open cars they may be carried on the inside pocket to prevent damage or loss. Explain to the student about placing the pads back to back and holding with a rubber band; about punching his transfers for the half trip and how to prepare them so as to remove a single transfer at a time without taking out the whole package.

PROTECTION OF PASSENGERS

Under the following headings will be found items requiring special attention, and the student should be instructed thoroughly in regard to them.

1. Passengers Boarding.

The conductor must guard against injury to his passengers when boarding the car, being careful not to give starting signal until the passenger is safely on the platform. If the car is coming to a stop and passengers attempt to board while the car is still in motion, caution them to wait until the car stops. If a passenger attempts to board a swiftly moving car between blocks and persists in his attempts, it is better to signal the motorman to stop than to run the risk of an accident.

2. Passengers Alighting.

The student should understand that like attention is necessary when passengers are leaving the car, which should not be started until passengers clear it and let go of the grab handles. If conductor sees passengers attempting to alight while car is still in motion, he will call out loud enough to be heard by the other passengers, "Wait until the car stops, please!" Should the passenger persist in leaving and start to fall, the conductor will give the motorman three bells for a sudden stop and do what is possible to prevent injury to the passenger.

3. Giving Signals from Inside the Car.

Should it be necessary to give starting signal from inside the car, the conductor being busy collecting fares, he will make certain that no one is in the act of boarding or alighting. This he may do by looking through the windows on the right side of the car to the rear step, or should the car be crowded, making this impossible, he will call out, "All right back there, Please?" and will not give the starting signal until satisfied that everything is O.K.

4. Passing Obstructions.

When passing proceed signal in answer to the motorman's three bells, warning of an obstruction he is approaching, the conductor will caution passengers, especially on open cars. Should any be standing on the running board, he will call out, "Step inside off the running board, please," and will take every precaution to see that passengers are not injured.

5. Children on End Seat.

The student should be instructed that when operating an open car, children should be kept off the end seats as far as possible to avoid the danger of their falling, due to the motion of the car or when rounding curves.

6. Bumpers, Running Board and Steps.

Instruct the student to prohibit passengers from riding on the bumpers. They should also never be allowed to ride on the running board or steps provided there is room on the platform or inside the car. Children 16 years of age or under should never be allowed on running board.

7. Old or Infirm Passengers.

Assistance should be rendered passengers of this class when boarding or alighting, to prevent injury from falling.

8. Passengers Injured.

In case of an accident where a passenger or passengers are injured, attention must first be given to the injured and ascertain if they wish an ambulance, and if they do, call police headquarters over telephone, telling them who you are, the loca-

tion of accident, asking them to send an ambulance. As soon as this is done, secure all the witnesses you can, both on the car and on the street.

9. Fatal Accident.

In case of fatal accident where the body is blocking the car, call 2991 Main (company headquarters) over telephone and ask for the depot you are assigned to, telling them of the accident and the location of same.

10. Fire on Car.

In case the car is on fire from hot resistance or any short circuit, warn all passengers to wait until the car stops. Put sand on the burning parts to put the fire out, and if this does not put it out, secure water. If water is used, have car towed to the depot.

11. Peddlers Boarding Car.

Boys or any one selling papers, candy, fruit or any other article should not be allowed to board car to sell such articles. In case they should board car while it is in motion, do not eject them until the car has been brought to a stop.

12. Stop and Fly Bells.

At all stop points the conductor should see that motorman brings the car to a full stop, proceed signals not being passed until this has been done. This is very important to avoid collisions and accidents caused by the motorman not having car under full control at points along the line when such things are most liable to occur; also to give passengers ample time to alight from or board car safely.

13. Trolley Pole Off Wire at Terminals.

Instruct the student that when reaching a terminal or turning back point, at night, when the car is reversed, he must never remove the pole from the wire until all passengers are off the car, as otherwise they are liable to fall in attempting to alight with the car in darkness.

14. Politeness.

The student should clearly understand that politeness to passengers will be insisted upon. He will answer courteously all questions asked him, without engaging in any unnecessary conversation. In no instance must he engage in an altercation with a passenger about rules which he, the conductor, is required to enforce. Should a passenger object to these rules, the conductor should politely inform him that he has no alternative in the matter.

15. Ejectments.

See that the student clearly understands that he has a right and is expected to eject passengers who are so intoxicated as to be offensive to other passengers; also those who refuse to pay their fare or who attempt to ride on a transfer which is not valid. Passengers carrying large bundles or those of such a nature as are liable to dirty up the car or soil the clothing of other passengers, will not be allowed to board the car. Passengers of this latter class who board the platforms while the conductor is busy inside the car should be told that it is against the rules of the company to permit them to ride under such circumstances. Should they refuse to get off, they may also be ejected. In putting passengers off the car, the assistance of the motorman should be called if necessary, but no force or violence must be used other than that required to remove the unruly passenger.

16. Front Platform—Closed Cars.

The following persons only are permitted to ride on front platforms:

1. Policemen and firemen in full uniform.
2. Uniformed inspectors and instructors of the company.
3. Officials and employes of the company in citizen's clothing. Those of the third class must have a permit properly signed.

17. Rear Platform—Closed Cars.

Uniformed employees of the company are forbidden to ride on the rear platform if there is room inside. The student should be instructed that it is desirable to keep the rear platform as clear as possible of passengers. Not only does a crowded platform cause delay when passengers are boarding and alighting, but those on the platform run the risk

of being thrown from the car in rounding the curves, with the location of which they are not familiar.

18. Passengers Carried Free.

The following passengers only are carried free:

When in Full Uniform.

Policemen, firemen, members of salvage corps, members of Society for Prevention of Cruelty to Animals, U. S. mail carriers and special delivery messengers of the Postal Department (last two only when carrying mail pouches), uniformed employees of the Brooklyn Rapid Transit System.

Ununiformed.

Certain ununiformed employees of the authorized advertising companies and of the Brooklyn Rapid Transit System are allowed to ride free when wearing badge properly displayed on uniform type of head gear.

19. Ventilation, Heat and Light.

Instruct the student that a conductor is responsible for the proper ventilation and heating of his car. With reference to the first, see that he understands the rules governing the opening and closing of doors and ventilators in the car. Also that he understands turning heat and light switches and where to look for signs covering heat points to be used.

COLLECTION OF FARES.

I.

The best way to teach a student is to let him do the work himself. Go with him through the car and correct his mistakes as he makes them. Remember that he is new at the business and the things that are easy for you seem difficult at first to him. As he becomes more familiar with the work, let him collect all the time, until finally he will be able to handle any load. He should be carefully instructed on the following points:

2. Where to Commence.

The conductor should begin at the front of the car, working back to the rear door. In this way he is able to see readily the signals of passengers wishing to alight and also has a view of the rear platform, which is essential in the prevention of accidents.

3. Order of Collection.

1. Collect the fare.
 2. Register it.
 3. Return change (if any).
 4. Issue transfer (if requested).
- See special bulletins for exceptions to this order.

4. Identification of New Passengers.

The student should be taught the importance of not only counting passengers who board, a number at a time, but of trying to remember something peculiar about each, such as the size, color of dress or hat. This, together with watching to which part of the car the new passengers go, will help him to pick them out when he goes for their fares. In working through the car, the conductor should repeat the words, "Fares, please," watching carefully the motion of the hands or arms of passengers as they sometimes offer their fares and, if not seen, pay no more attention to the conductor's request. If the conductor believes a passenger has not paid his fare, he should touch him lightly on the arm and repeat his request for the fare. Experienced conductors can give students a great many points about this feature of the business and they should make this a part of the instruction.

AFTER PULLING IN AT NIGHT.

1. Laying Up the Car.

Take the student with you and instruct him on the following points:

1. Turn registers to zero and lock.
2. Turn off light and heat switches.
3. Close ventilators and doors.
4. On open cars, hook up steps.
5. Swing trolley pole to proper end.
6. Inspect for defects for which conductor is responsible.

2. Turning in Student's Papers.

Make the necessary entries on student's assignment sheet and turn it in together with student's day card, to the despatcher. In filling out student's papers, remember that you should enter

only the actual time he is with you on the car. If you sign a student up for more time than this, you make a false statement, besides you do him an injustice, for then he will not get the benefit of the full instruction period and is liable to get into trouble on account of the mistakes he will make when he starts out for himself.

On the student's assignment sheet, in the column headed "Remarks," enter your conscientious opinion of his work while with you. Do not make use of the sign "O. K.," but state in a few words your opinion of the man.

In handling students you should always remember that it is very easy to discourage a new man. Instead of doing this, you should encourage him all you can, taking up the details of the work one by one and seeing that he understands each before going on to the next. This is better than telling him about a lot of things at one time for that only confuses him and makes it hard for him to get a clear understanding of his work. If the student repeats his mistakes, don't lose your temper, but go over the explanation again until he is able to do his work properly.

TREATMENT OF DEPRECIATION IN GLASGOW

In presenting the report of the Glasgow Corporation Tramways for the year ended May 31, 1910, Bailie W. F. Russell, of the tramways committee, discussed the treatment of depreciation in the accounts. He said that the committee had always heard a great deal about the excessive amount it was writing off for depreciation, but he had always been of the opinion that it was writing off no more than it should do; in fact, he would like to have seen a still more liberal provision made. The rates of depreciation in operation at the present moment would give an average of something between 5 per cent and 6 per cent on their gross capital. This matter had just been under consideration of the management, which, he was glad to say, was averse to any reduction being made in the rates of depreciation now in operation.

It was pointed out that sooner or later in renewing their track the method of street paving would require to be improved, and that this, while enormously increasing the cost, could not possibly be regarded as capital expenditure. In fact, they were still waiting for some satisfactory form of smooth paving, which could be adopted in all the busiest streets of the city on the tramway routes. Again, from a practical point of view it was admitted that in setting £440 per mile on street track for renewal they were doing nothing more than what was absolutely necessary, and this figure, he understood, was recognized as a fair rate by the different tramway undertakings throughout the country. Then they had the electric equipment, which had cost to date £708,652, which in the opinion of practical men they ought to continue writing down as at present for some years, as if a change of the system were coming about the whole equipment could only be worth scrap value.

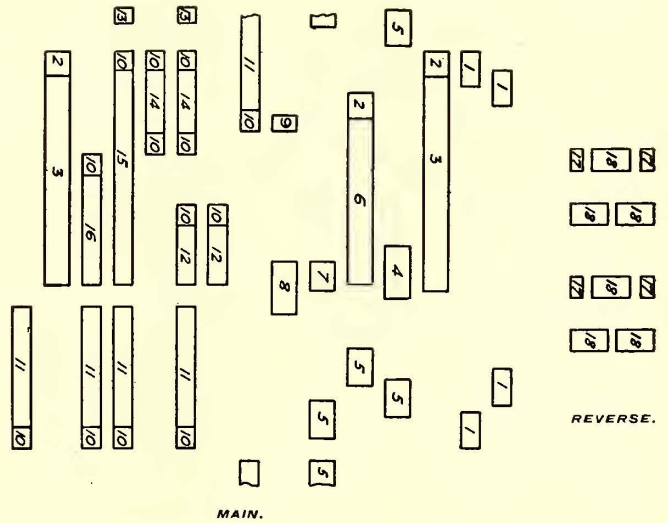
Then as regarded the depreciation on the buildings, that had been written off at the rate of 2½ per cent, notwithstanding that many of the buildings were still standing on the books at a higher figure than they could be erected for to-day. Regarding their power station plant at Pinkston and six substations, although Pinkston was perhaps as efficient as any other power station in the country, it was a fact that the plant there could be installed at less than half its original cost. Therefore, to quote the words of the manager, the object of the committee should be first of all to write down the original capital expenditure as soon as possible to the present value of the plant, and when that figure had been reached the question of depreciation could be again considered. Another item was the cars, and if they included the partly completed cars at present in the workshops the work had cost practically £500,000. The present rate of depreciation should, he thought, still be continued here, as if a more suitable car for their requirements was devised they ought to be in a position to take advantage of it, even if the present cars should be scrapped.

ORDERING AND STANDARDIZATION OF SUPPLIES ON THE LONDON COUNTY COUNCIL TRAMWAYS

It is far from easy to list the thousands of detail parts used on a large electric railway system in such a logical manner that there can be no misunderstanding of requisitions in the storerooms. It is a fact that men employed even on the same properties but in different shops do not use exactly the same terms in calling for supplies. In making up lists of separate parts for convenience in ordering, some companies go no further than to bind together a collection of manufacturers' catalogs or to mimeograph lists for general distribution, but a great many more trust to the description forwarded by the signer of the requisition. To overcome the disadvantages of these uncertain methods of describing supplies, A. L. C. Fell, chief officer of the London County Council Tramways, had printed some time ago a series of several illustrated catalogs, listing by definite numbers every kind of railway and structural material employed on the system. These supply lists were not prepared from similar corresponding publications issued by

Where material is stocked, it is indicated by a catalog number and description and also by a reference to stock levels where provision is made for the latter. The quantities refer to finished articles and apply only to the central storeroom. The auxiliary storerooms keep on hand only such articles as are required for general maintenance and merely in sufficient amounts to meet their weekly requirements. If the material needed

—Class O4 Tramway Controller



Listing of Controller Segments in Catalog

Section III—Class O4 Tramway Controller

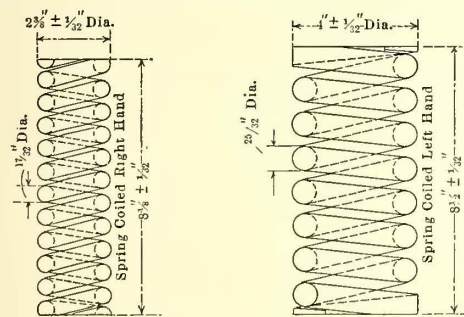
Catalog No.	Description	Illustrated on page	Drawing No.	Sketch Pattern	Stock level		Central Store Bin No.	Sub-storeroom Bin No.
					Max.	Min.		
2401	CONTROLLER complete (without operating handles)							O 394
FRAME and COVERS.								
2402	Frame, C.I. machined, etc. complete		92			35	6	O 387
2402Z	... (toasting)					250'	75'	O 750
2404	Piece, fibre clamping, for cable loose					288	72	O 751
427e	Screws, esk 1/2" x No. 2 B.A.					See Section I		O 824
2405	Plate, top, C.B.					24	6	O 691
2405Z	... (toasting)					288	36	N1614
482B	Screws, set, brass, raised hd, 1 1/2" x 3/8"					144	36	O 4
2538	Pin, pivot, for main drum ratchet pawl, 2" x 1/2", curved 1/2"					144	36	O 4
2539	Pin, pivot, for reverse drum ratchet pawl, 1 1/2" x 1/2", screwed 1/2"					144	36	O 43

Section of London Supply Part Catalog

manufacturers, but were based upon a direct examination of everything actually used by the tramways. A thorough overhauling and inventory of the supply department showed that there had been unnecessary duplication of parts owing to the varying names given by different men for the same article and, furthermore, the investigation clearly revealed the necessity of standardizing many details which could be adapted for use on different classes of equipment.

The catalog, which is supplied to all storekeepers, foremen and other interested employees, is divided into 28 sections, among which are the following relating to car maintenance: I—Bolts, nuts, washers, screws, studs, plugs, nails, tacks, rivets,

is not kept on hand, the nearest stock article must be used, unless it is practically or economically unsuitable. All articles are listed in order according to their numbers and only these numbers must be used in ordering supplies. Compounds of numbers and letters are used in certain cases, as follows: Where length, width or diameter is the varying factor, letters are employed for fractions and multiples of an inch; where the articles are unfinished, as in the case of castings and stampings, the letter "Z" is placed after the order. An example of the first case is this: Catalog "No. 556—D" means screw, set, hexagon head, 1 3/4 in. x 3/4 in., while "No. 556—E" refers to the same type of screw, except that the dimensions are 2 in. x

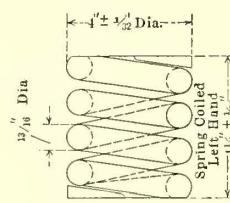


Specification	Test	
	Load	Deflection
A	12 1/2" 840 Lb.	1/2" ± 1/16"
B	6 1/2" 1080 "	1" ± 1/16"
C	3/16" 2520 "	1 1/2" ± 1/16"

108

Specification	Test	
	Load	Deflection
A	8 3/4" 1008 Lb.	3/4" ± 1/16"
B	6 1/2" 2016 "	1" ± 1/16"
C	3/16" 3024 "	1 1/2" ± 1/16"

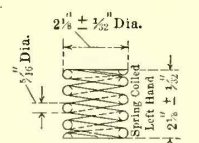
109



Specification	Test	
	Load	Deflection
A	4 3/4" 1400 Lb.	1/2" ± 1/16"
B	3 3/4" 2800 "	3/4" ± 1/16"
C	1 3/8" 4200 "	3/4" ± 1/16"

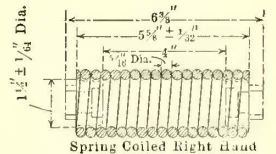
112

One Set is Sufficient for One Pair of Trucks			
Reference Number	Name of Part	Material	No. Off per Set
108	Internal Bolster Spring		8
109	External Bolster Spring		8
110	Brake Release Spring		8
111	Bolster Buffer Spring		4
112	Axle Box Spring		12



Specification	Test	
	Load	Deflection
A	5" 190 Lb.	1/4" ± 1/16"
B	1 3/4" 380 "	3/4" ± 1/16"
C	3/8" 4200 "	3" ± 1/16"

111



Specification	Test	
	Load	Extensior
A	18" 160 Lb.	1" ± 1/16"
B	3" 320 "	2" ± 1/16"
C	3/8" 480 "	3" ± 1/16"

110

Drawings and Specifications Covering Standard Truck Springs

cotter pins, etc.; I-A—Tools; II—Different classes of motors; III—Different classes of controllers; IV—Circuit-breakers, canopy switches, plug connections, and similar fittings; V—Current-collecting apparatus, (i) plows, (ii) trolleys; VI—Magnetic brakes and mechanical track brakes; VII—Trucks; VIII—Car bodies and fittings. The remaining sections relate to the power, line and way departments.

Each catalog is accompanied by a direction page in part I explaining the scheme used in listing and ordering supplies.

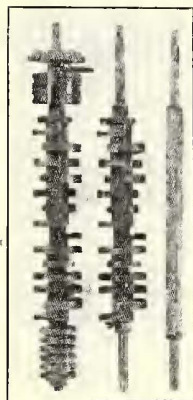
3/4 in. Special abbreviations are used to indicate the different metals, wires, etc., and a car plan outline is presented to define left-hand and right-hand sides. The illustrations in these catalogs are original but the numbers which are given them are not used in ordering, as the cuts are presented only to give the user of the catalog a general idea of the appearance of the parts listed elsewhere. The idea of the catalog arrangement as applied to controller parts can be obtained from the accompanying reproductions. It will be noted that the controller

segments are listed by their position on the cylinder, and not by length alone.

MOTOR AND CONTROLLER FEATURES

The London County Council Tramways use only two-motor equipments made up of the following combinations: Dick-Kerr No. 25-a 25-hp motors with Dick-Kerr DBI Form D controllers, Dick-Kerr No. 3-a 35-hp with Dick-Kerr DBI Form D controllers; Westinghouse No. 200, 30-hp motors with No. 90-M controllers; Westinghouse No. 220, 42-hp motors with No. T-2-A controllers. The last-named equipment represents the company's latest practice. The T-2-A controllers are provided with an insulated return for the magnetic brake circuit to keep the latter entirely separate from the power circuit. This means that when the controller handle is turned from the running to the braking positions the power circuit is opened; otherwise, with a high ground potential, a slight defect in the magnetic brake would be dangerous. In the T-2-A controller the reverser is carried on the main cylinder.

The tramways are also making a number of improvements covering all of their controllers. Thus the wooden finger boards are being superseded by micanized steel bars, to which the fingers will be clamped in such a manner as to permit of easy replacement. This change will greatly improve the resistance to fire, as no wood will be left in the controller except that used in the brake cylinder. One of the illustrations shows the new square type main cylinder spindle to which the segments are clamped in halves, thus making it possible to exchange old or new segments without dismantling the controller.



Controller Parts

for the assemblies and the smaller size serving for the individual details.

A large part of the tramways' metal supplies is bought on specification. Particular attention is given to spring specifications, and separate drawings have been prepared to cover the requirements for each of the trucks now in service. The drawing on page 363 and specifications below show the Council's standards for its center-bearing, swing-bolster, maximum traction trucks.

GENERAL SPECIFICATION

Springs to be made of spring steel, and are to be carefully hardened, tempered and black japanned; ends to be ground flat. The conditions and dimensions given on the drawing may be varied, to obtain the requisite tests, but approval of any proposed modification must first be obtained from the chief officer of tramways.

SPECIFICATION FOR OPEN COIL SPRING

Number of coils (end to end) "A" Closed length not more than "B." Makers must guarantee springs not to take a permanent set more than "C" after 12 months' continuous service, and that springs when tested after a like period are to be within 5 per cent of specified test. Spring to close repeatedly under power hammer without taking any permanent set.

SPECIFICATION FOR CLOSED COIL SPRING

Number of coils (end to end) "A." Extension without taking permanent set (with bushes in position) not less than "B."

Makers must guarantee springs not to take a permanent stretch of more than "C" after 12 months' continuous service, and that springs when tested after a like period are to be within 5 per cent of specified test.

MEETINGS OF CAR HOUSE AND SHOP EMPLOYEES AT BOSTON

For several years the Boston Elevated Railway Company has devoted considerable attention to securing the benefits of co-operation among its employees. The management has long appreciated that much is to be gained by the periodical meetings of employees more or less intimately concerned with the maintenance of service and equipment. The conditions under which operation takes place on any large urban street railway system are constantly changing. In applying the best modern practice over wide areas with varying traffic requirements there is always opportunity for improvement, whether it take the form of the institution and trial of new methods, or the correction of old policies and habits in handling the company's property and business. This is especially true in Boston, where the forms of service rendered the public illustrate such a wide range of operation, where the density of traffic varies through such extremes, where the types of car routes illustrate such diverse conditions and where the subdivision of the mechanical plant surrounds repair and manufacturing operations with such differences in circumstances bearing upon the cost of maintenance.

In following the plan of maintaining regular conferences between responsible employees in regard to problems confronting the maintenance forces of the company from time to time, there have been held for several years in the fall, winter and spring, monthly meetings of car-house foremen at which a great variety of topics bearing upon rolling stock repairs and service has been discussed. The scope and conduct of these meetings have been fully reviewed in the *ELECTRIC RAILWAY JOURNAL*. In brief, at each meeting, which is held in the annex of the mechanical drafting room of the principal shops in Boston, a review is made by the presiding officer of the defects occurring in rolling stock service during the preceding month. The presiding officer is usually the head of the department of rolling stock and shops, who discusses the service records of the different car houses, points out variations in the equipment defects for different parts of the system and reviews the failures of different types of motors, and defects occurring in car bodies, brake equipment, control apparatus, etc., in the month as compared with previous months and years. Graphic methods of illustration are liberally employed, and at the conclusion of the discussion of defects and their causes, which is participated in by those in attendance at the meeting, the rest of the time is usually devoted to the consideration of some particular topic of pertinent scope at the time of the meeting. Among the subjects which have been considered are "Fire Protection," "Preparing Open Cars for Service," "Causes of Motor Failures," "Snow Plow Maintenance," "Painting," "Car Cleaning," etc. The results of these meetings have included an increased interest in the problems arising in the car houses, a larger amount of team play between different houses, and a general appreciation of the importance of little things in the conduct of the company's affairs.

About two years ago several meetings were held for the benefit of inspectors and instructors of motormen. The object was to bring about an improvement in the handling of the cars, and so to reduce the strains imposed upon the apparatus and lessen the number of failures and consequently the cost of repairs. At these meetings the fundamental principles of controller handling and motor operation were discussed in the fullest detail; apparatus was shown in dismantled and assembled condition; drawings of the variation of current and speed with the handling of the controller were exhibited and explained, and finally, practical runs were made

on a car equipped with a recording ammeter, so that the current consumption with good and bad operation could be seen and measured. The bearing of energy consumption upon the cost of operation per car mile was discussed; the effect of various resistance combinations and setting considered, and the meaning of acceleration and retardation brought home to the men in attendance. These meetings leavened the handling of cars over the entire system, noticeable improvement following the more intimate grasping of electrical and mechanical phenomena by the inspectors and instructors.

Last fall the company decided to enlarge the value of the previous monthly meetings of car house foremen by extending their influence through the inauguration of additional weekly meetings to be attended by foremen and certain shop employees. The object of these meetings has been to give the attendants a deeper knowledge of fundamental principles bearing upon the equipment and its service. The meetings are usually addressed by an employee having an expert knowledge of the assigned subject. Beginning with a discussion of the principles of frictional electricity, magnetism, current electricity, and measurement, the subjects have passed through the field of inductive phenomena and considerations of design in railway motors, to the detailed study of each type of motor used on the system from the earliest to the latest forms of apparatus. In general an entire evening has been devoted to the consideration of any given type of motor and the progress in design from the early motors to the modern interpole form. The reasons controlling the adoption of different winding arrangements, changes for the better in the mechanical structure of the motor, etc., have also been discussed. Apparatus loaned by the Massachusetts Institute of Technology was used in illustrating fundamental principles at the earlier lectures. Among the subjects discussed were multiple unit control, four evenings taking up auxiliary wiring and apparatus; main control; details of apparatus, and locating faults; trolley equipment, one evening; brake rigging; air brakes with compressor and governor details; air brakes, automatic type, with functions of feed, brake and triple valves; truck maintenance; blue print reading; records and accounting.

POWER GENERATING COSTS IN LYNCHBURG AND ROANOKE, VA.

The Lynchburg (Va.) Traction & Light Company has been operating a mixed water and steam plant since 1905. The water power is derived from the James River and has proved very reliable. In 1909, for example, only 3 per cent of the total power output came from steam. However, owing to a drought during January and February of this year, 6 per cent to 7 per cent was generated from steam. The water power machinery is rated at 1500 hp, but can be operated at 50 per cent overload.

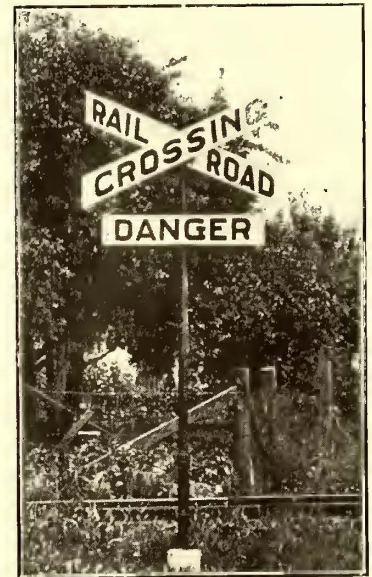
The steam equipment owned by the company includes a 500-kw Curtis turbine which has been in service for over four years. The turbine output is usually employed for the lighting service and the water power for the railway. The railway apparatus at the substation in the power plant consists of two 300-kw rotaries, one 500-kw rotary and two 225-kw engine-driven railway generators. The cost of power is 0.9 cent to 1.0 cent per kw-hour at the d.c. end of the switchboard, including depreciation and standby charges.

The Roanoke (Va.) Railway & Electric Company, which, like the Lynchburg Company, is under the management of R. D. Apperson, also operates a mixed steam and hydroelectric plant. The water power at Roanoke is less reliable than that near Lynchburg. Thus during November, 1909, only 30 per cent of the output was hydroelectric although the water-power output is 60 per cent to 70 per cent of the total energy requirements at other times. The power units consist of one 375-hp and three 750-hp hydroelectric sets; also one 1500-kw and two 500-kw Curtis turbines. The railway circuits are supplied by two 500-kw rotaries, one of which is a reserve unit. The approximate cost of power to the Roanoke company is 1 1/8 cents per kw-hour at the d.c. end of the switchboard.

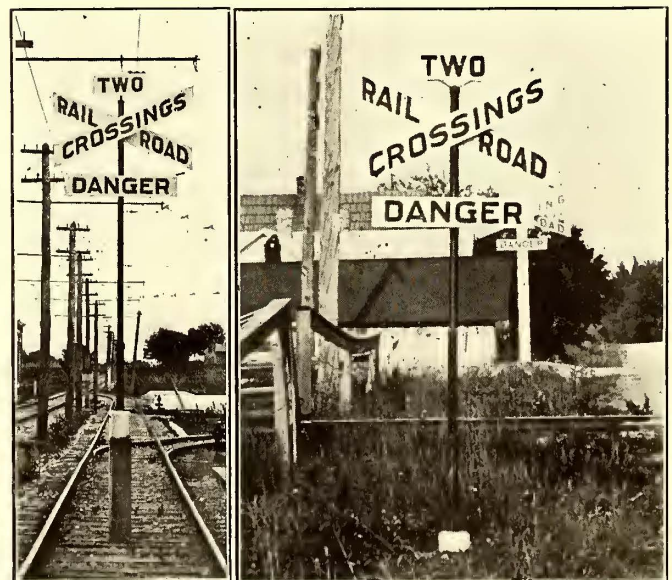
NEW CROSSING SIGNS ON THE LOUISVILLE & INDIANAPOLIS

In a recent issue an account was published of the standard crossing signs adopted by the Railroad Commission of Indiana for both steam and electric road crossings. Briefly the sign consists of a post 10 ft. high on which are placed two boards of 8-in. width, intersecting at the center at an angle of 50 deg. and lettered "Railroad Crossing." Underneath is a horizontal board lettered "Danger," and where there are two railroad crossings the commission recommends that the word "Two" be added to the sign.

The Indianapolis & Louisville Traction Company has recently installed new signs on its system which are in accordance with the recommendations of the Railroad Commission, but have also been improved. Instead of the usual wood post, the post is made of concrete 8 in. square and about 5 ft. long. The corners of this post are beveled. Imbedded in this concrete post is a piece of 2 1/2-in. pipe which extends 2 1/2 ft. above the concrete where it is reduced to 2 in. and extends 7 1/2 ft. farther, making the total height 10 ft. above ground. Metal clamps made of 3/16-in x 6-in. soft steel attach the regulation boards to the iron post which is topped with a round pipe cap. Where there are two crossings a hole is drilled in the cap and a bracket containing the word "Two" is attached to the top of the post. The line of the Louisville & Northern Railway & Lighting Company



Single Crossing



Views of Double Railroad Crossing

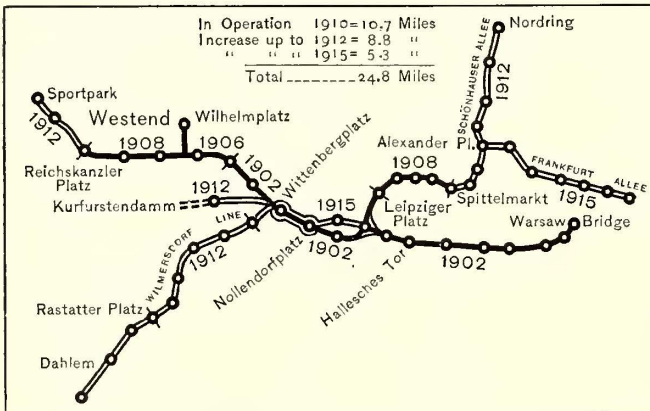
has also been equipped with this sign. The new post is the design of H. D. Murdock, Superintendent of the Indianapolis-Louisville line.

One of the accompanying views shows the entire post above ground. The position of the post in this view was selected for the convenience of the photographer and of course is not that which the sign would occupy. Another picture

shows a country crossing where a parallel track of a steam road is only a few feet away, and shows the use of the word "Two." The third picture shows the single crossing sign where but one track is to be crossed. The cost of the newly designed post is about \$7. Another little "kink" in the construction of the sign is that the top of the concrete post around the pipe is hollowed out. This cavity is filled with tar or asphalt so that the base of the iron post is made practically weather proof. The signs present a very attractive appearance.

NEW SUBWAYS FOR BERLIN

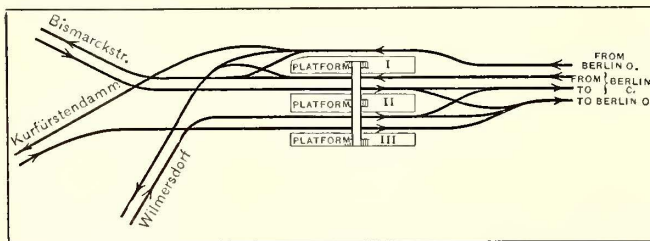
As noted in an article on "Present and Proposed Berlin Subways," published in the *ELECTRIC RAILWAY JOURNAL* of Jan. 15, 1910, a number of different plans for underground railways in Berlin have been presented by conflicting interests. The only system actually operating at present is the privately owned Berlin Elevated & Underground Railway, which runs from



Map Showing the Past and Approved Future Growth of the Berlin Subway System

east to west and embraces about 11 miles of route, including spurs.

The transportation conditions in the western section of Berlin are now to be greatly improved in accordance with a franchise just granted for the construction of one line from Dahlem through Wilmersdorf and one from the nearby Kurfürstendamm parkway, both ending at the Wittenbergplatz station of the present rapid transit company. The new routes are shown in the accompanying map, which also shows the past and author-



Approved Track Plan for Connection with the Wilmersdorf Subway at Wittenbergplatz

ized future growth of the unified rapid transit system. The Wilmersdorf-Dahlem line will run underground for 3.1 miles to Rastatterplatz and thence over open right-of-way for the remaining 1.6 miles. The greater part of this line will be constructed by the communities interested, but it will be operated by the rapid transit company. The second line will be less than a mile long at present, extending only to Uhland Strasse.

The accompanying track plan of the Wittenbergplatz station shows how the trains will be handled there eventually. Platform I will serve for trains from Berlin (O) to Kurfürstendamm and Wilmersdorf and also from Berlin (C) to Bismarckstrasse on the main line and to Wilmersdorf; platform II will serve for trains from Bismarckstrasse to Berlin (C) and from Wilmersdorf to Berlin (C and O); platform III will serve for

trains from Kurfürstendamm to Berlin (O). This arrangement will permit the majority of transferring passengers to get into other trains without going to another platform. The initial service on both lines will be given by shuttle trains to Wittenbergplatz without changing the present main line schedules. In about three years the tracks will be reconstructed for through operation as explained previously. It may be added that the Schöneberg municipality has almost completed its independent subway line, which will terminate underground near the elevated Nollendorfplatz station of the rapid transit company. It has been suggested that this municipality and the company should make arrangements for transferring passengers from one line to the other, but no agreement has yet been reached.

EFFECTS OF INJURY BY ELECTRICITY

An article by John J. Moorhead, M. D., in a recent issue of the *Journal of the American Medical Association* contains some interesting observations of the results of injury by electricity. Dr. Moorhead, as chief surgeon of the Metropolitan Street Railway Company and Interborough Rapid Transit Company, New York, and through his connection with three New York hospitals, had exceptionally good means for obtaining data on this subject. The author says that the physical effects of electricity are mainly determined by the following: Amount and duration of current; site, type and area of contact; the individual. High voltage (1000 volts and over), long duration (8 seconds and upward) and positive contact generally predicate coma, severe systemic shock, burns and oftentimes death. Medium intensity (400 volts to 600 volts) with medium duration (five to eight seconds) and partial contact generally cause burns of lesser degree, less profound coma and shock with more or less paresthesia, especially numbness and tingling. Low intensity (100 volts to 300 volts) with short duration (one to five seconds) and brushing contact generally cause burns of the first degree or none, slight coma, if any, and moderate paresthesia, mainly of the tingling type. Low intensity and brief duration and partial contact generally mean absence of burns or systemic symptoms, the only complaint being that of paresthesia of the formication (ant-creeping sensation) type. Site, type and area of contact are less important, pursuant to the physical law that electricity takes the shortest route between two electrodes. It has been found that the tissues transmit in proportion to the amount of their fluid constituents. Blood is the best conductor, mainly because of the saline serum. Muscle comes next, then nerve tissues and finally bone. Dry skin has a resistance according to one authority 150 times as great as the underlying tissues. The greater the area of contact, the greater the effect, especially if the current traverses the vital organs. The variation among individuals is striking, notably as to sex, age, physique, occupation and temperament. Those accustomed to electric energy are often less influenced than the novice. Those of rugged and muscular physique have a greater conductivity than those of the opposite type. Illness, sleep and alcoholism render persons less sensitive.

In a general way the physical effects are three in number, namely, death, burns and nervous symptoms. The most careful examination of all the tissues in post-mortem cases have as yet failed to give any adequately uniform causes of death. In general the findings are not unlike those following drowning or suffocation. The two principal theories to account for death by electrocution are that the heart muscle is paralyzed by a tetanic spasm and that there is a definite cellular destruction, especially of the vital centers. In connection with the second theory Dr. Moorhead states that the disintegration that seemingly takes place may generate poisonous materials, thus adding a chemical to the mechanical irritation. Death by low-tension current is by heart fibrillation; heart and respiration alike fail from lethal medium tensions, and respiratory failure is the cause of death, in high-tension accidents.

Burns from electricity differ only in origin from those due

to extremes of temperature. The existence of an electric burn indicates the high resistance of the tissue affected. The character of the burn is sometimes determined by the metal acting as a conductor, and burns by arcs and flashes or copper sometimes produce less severe burns than those from iron or steel. Deep electric burns in contrast with burns due to flame and contact with steam, hot solids or liquids, are apparently less painful produce less systemic shock and heal more quickly.

Dr. Moorhead describes several third rail burns and points out that electric destruction of tissues is as sudden and absolute as if done by electric cautery. Burns from partial or arcing contact often heal slowly and show a tendency to become gangrenous. Cases of this type sometimes give external signs disproportionate to the underlying damage. In one case, a laborer repairing a 550-volt contactor rail fell and the rail came in contact with his back at about the lower scapular (shoulder-blade) level while his feet were grounded on concrete. He remained in this position several minutes and when released was found to have a burn which practically escharred his back from the mid-scapular to the lower lumbar region, the burn even exposing the viscera. He suffered profoundly from shock and his recovery was protracted. Six years later there was still an unhealed area about 3 in. by 4 in. in the central portion of the scar but all except this place cicatrized without skin grafting in a remarkable way, considering the original extent and severity of the wound. The scar had contracted enough at first almost to draw the wings of his scapular together and spinal flexion was impossible; but by continued self-bending and manipulation of his back, he was able to resume manual labor although not completely healed.

Another severe case was that of an iron worker who, while repairing overhead wires on a suburban electrified steam railroad, came in contact with a 11,000-volt wire while assuming an upright position. He became temporarily unconscious but at the end of 10 days was able to be out of bed for a portion of each day. At the end of this period, he presented numerous sloughing and granulating burns of the left upper extremity and chest, and an extensive burn of the left lower back part of the head and soles of the feet. He had little, if any, systemic shock. There was no nervous involvement organically or functionally. The duration of contact in this case could not be ascertained, but it must have been short and imperfect. The contact was on the head and the left upper extremity and the man was grounded through his feet which were resting on a metal support so that the main part of his body was temporarily a part of the circuit. The victim wore no hat, his shoulders were bare except for a thin shirt and he had no tools in his hand. Theoretically, this man should have been unable to withstand electric shock of the volume mentioned but the burns showed that only a portion of the voltage was received. The author was told by Dr. F. B. Littlewood, consulting physician at the New Rochelle (N. Y.) Hospital, that this patient made an excellent recovery.

The nervous effects in the absence of direct destructive or inflammatory damage to nerve fiber are almost invariably those of the hystero-neurasthenic type. The author had never known an organic disease of the central nervous system to develop from the passage of electricity through the body nor does the available literature on the subject narrate more than one instance of this nature. Where direct injury to the nervous tissue is absent or minor in extent, the subsequent developments of neurasthenia and hysterical symptoms are generally psychic in origin or dependent on auto-suggestion or suggestion from others. The signs then presented usually are disproportionate to the actual physical damage sustained. Such cases rarely present objective evidence of electric contact and occur usually in those predisposed to them because of neurotic or actually hysterical temperaments. The flash or arc of charged metallic contact points occasionally induces such symptoms either with or without bodily contact. Cases of this and allied sorts are often designated by the term "electric shock" and less frequently as "electric neurosis," but the symptoms do not differ in any essential respect from the ordinary shock or

neurosis. Examination of such a patient develops a wealth of subjective symptoms and a poverty of objective symptoms. The following cases in point is quoted by Dr. Moorhead:

A woman was alighting during a rain from a suburban electric car operated by overhead trolley. While she had one foot on the car platform and the other on the metal step, with her hand on the dasher handle, she claimed to have received a shock which threw her face downward on the ground. She was stunned but not unconscious, did not vomit and when assisted to the sidewalk was able to discuss the occurrence with some show of agitation and not a little anger. She walked unaided to her home nearby and a few hours later saw her doctor, who gave her lotions for the bruises on the knee, elbow and hands. There were no burns or obvious electric effects but she had complained of a tingling and needle sensation in the hand that had touched the dasher handle and in the feet which contacted with the metal step. When the patient was seen by Dr. Moorhead some 14 days after the accident, she was in bed, somewhat pallid, had a characteristically tense and drawn expression and was markedly irritable. All of these characteristics were said to be foreign to her normal state. There was an obvious rapid tremor of the closed eyelids, about the angles of the mouth and the outstretched fingers and the protruded tongue. The external evidences of injury were lacking aside from a faded area of bluish discoloration just above the right knee, probably from her fall. No evidences of electric contact were apparent, no paralysis, and no areas of diminished sensation. In general, the physical condition was normal. Her gait was normal and her pulse rapid. The patient recovered perfectly in a short time.

Occasionally, cases are reported in which blindness, deafness and other especial sense defects have been attributed to electric contact or flashes. All instances of this sort are of the hysterical variety and fall into the class of so-called fright-neurosis.

Treatment for electric shock presents no special problems, inasmuch as it is for the relief of shock, burns or neurosis. In case of profound injury and even where death has apparently occurred, prolonged artificial respiration should be maintained as in drowning cases. Even digital compression of the heart itself has been proposed but never successfully practiced. Dr. G. W. Crile recommends rhythmic pressure over the heart area, the tongue being drawn out to combine circulatory and respiratory artificial stimulation. With the foregoing manual methods, the use of stimulants of the atropin, strychnin and adrenalin sort is also advisable. Burns are treated in accordance with the custom of the individual physician. Neuroses are best treated by isolation plus the mental or therapeutic means best liked by the individual practitioner.

In conclusion, Dr. Moorhead says there does not appear to be any sound basis for the claim that one electric shock renders the recipient more prone to similar experiences, but on the contrary, an acquired immunity seems to be created by repeated applications. There is no good reason for the view often expressed that the effects of electricity on the human economy are unusual or peculiar.

PLEASING THE PUBLIC

The Cleveland, Southwestern & Columbus Railway has placed on its cars and in its stations a card indicating that its motto is: "The Public Be Pleased." Many favorable comments con-

THE PUBLIC BE "PLEASED"

SOUTHWESTERN

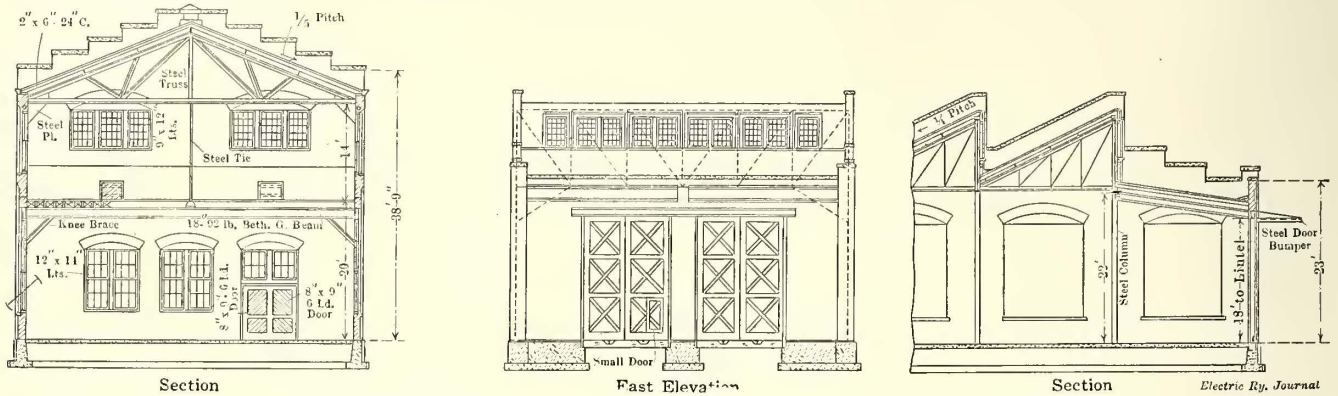
Advertisement of Cleveland, Southwestern & Columbus
Railway

cerning the action of the company and its endeavor to meet the public requirements for service have been received at the general offices.

ADDITION TO DECATUR SHOPS ILLINOIS TRACTION SYSTEM

A new carpenter and mill shop has just been completed as an independent section of the main repair shops of the Illinois Traction System at Decatur, Ill. Sections and elevations are shown. The building is 302 ft. long by 50 ft. wide and its interior is clear of columns. With the exception of a two-story portion, 30 ft. x 50 ft., the building is one-story high.

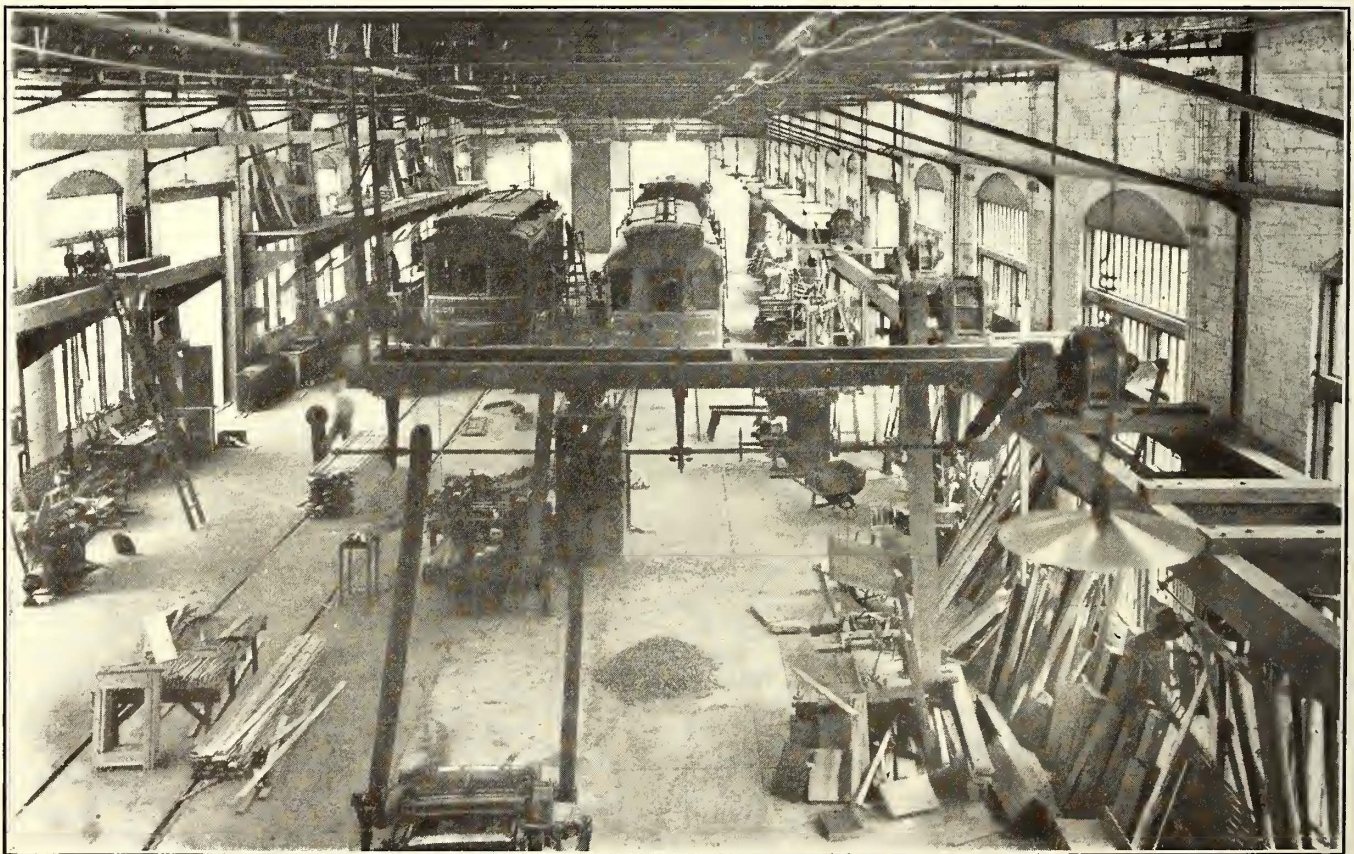
mortising machines, one horizontal and one vertical; band saw; saw sharpener; universal wood worker; Greenlee tenoning machine; drill press; 48-in. knife grinder; two swinging cut-off saws; four rip saws; surface planer; molding machine and a turning lathe and jig saw installed in the cabinet shop. Each of the wood-shop tools is independently driven by a three-phase induction motor with a General Electric starting compensator. Wherever shafting is necessary it is supported beneath galleries which carried on 4-ft. 6-in. steel brackets at



Sections and Elevations of Decatur Shops, Illinois Traction System

Over the two-story section the roof is supported on A-trusses and the larger part of the roof over the single-story section is of the saw-tooth type of construction, with cross trusses 11 ft. deep. This type of roof gives a clear head room of 22 ft. for

a height of 11 ft. 6 in. on either side of the main portion of the shop. These galleries also afford room for storage of lumber and materials for general repair purposes without interfering with the full use of the shop.



Interior of the New Wood Shop of the Illinois Traction System at Decatur

the full width of the building, which encloses two tracks. The main portion of the building is used for general repair work and at the rear of this section is the two-story portion subdivided into a cabinet shop on the first floor and pattern and upholstering rooms on the second floor. A freight elevator connects the two floors.

The equipment of tools in this shop has not been completely installed, but at present includes the following: Two Greenlee

At the same time the new woodworking shop was being erected a brick storehouse, brass foundry and blacksmith shop building were built nearby. The present equipment of the blacksmith shop includes a Bradley hammer; four oil furnaces; Lane steam hammer; combination punch and shear, and two Ajax forging machines. The new storehouse building carries the necessary supplies for the immediate use of the shop drawing them from the new storehouse of the Illinois Traction

System, which is located on the shop property. The Decatur shop of the interurban railway company is in charge of J. E. Johnson, general superintendent. The designs for the Decatur shop group were prepared under the supervision of J. M. Bosenbury, superintendent of motive power and equipment, Illinois Traction System.

BONDING WITH AN OXY-ACETYLENE TORCH IN MINNEAPOLIS

The Twin City Rapid Transit Company now uses an oxy-acetylene blow torch for applying copper rail bonds. This process is said to give excellent results at a cost for new work no greater than for placing compressed bonds in drilled holes, and at a less cost than for rebonding. A number of bonds have been installed to date and the process is the result of considerable preliminary work and experimentation.

The bonding outfit consists of a commercial oxy-acetylene blow torch supplied with gas from tanks carried on a small portable truck, the outfit complete weighing about 600 lb. The truck as arranged for work on the city streets has wheels without flanges and it may easily be moved along the pavement by two men. While the bonding work is in process the truck stands on the pavement about 6 ft. away from the track and thus does not interfere with street-car traffic.

Two car air-brake reservoirs are used as storage tanks for the oxygen, which either is purchased in flasks under high pressure and discharged into the reservoirs carried on the trucks or is generated by the potassium-chlorate process in a plant at the storehouse of the Twin City Rapid Transit Company. The acetylene is carried on the truck in a pressed-steel flask similar to those used for automobile headlight service.

A bonding gang is made up of one man, who operates the torch, his helper and another man who cleans the rail head in advance of the bonders. These three men will apply bonds at an average rate of six per hour in continuous work day in and day out, although but four minutes are required to weld a bond after the rail has been made ready and the torch, with its gas supply car, has been wheeled into place.

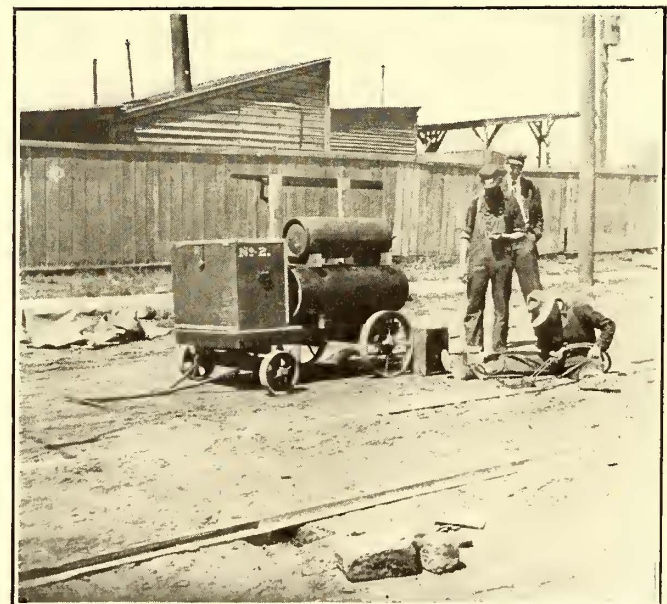
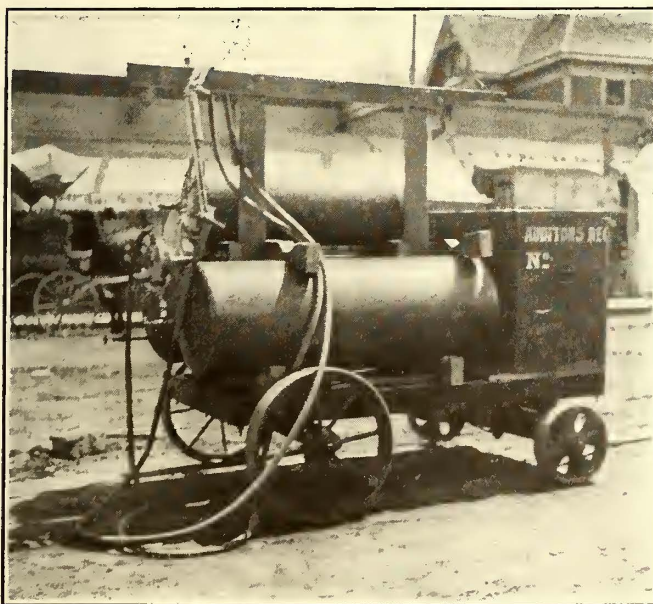
The process of applying the bond is as follows: One man

T-shaped terminals have been fused. The bond is held against the head of the rail either by a temporary clamp or a rod, and the flame of the blow torch applied. The steel and copper along the top side of the bond are first fused until the joint between the rail and the bond is secure. Then the clamp, if one has been used, is removed. This attaching process takes less than



Bonding with Oxy-Acetylene Torch

half a minute. Next, a piece of scrap trolley wire is held above the joint between the bond and the rail and enough melted copper is deposited on top of the bond and fused with the bond and the steel of the rail to build up a sloping upper surface about 1/2 in. higher than the original upper surface of the bond. This additional copper in a sloping form protects the bond from severe mechanical strain caused by vehicle wheels which may run close to the rail. Also, the additional copper assures a



View of Oxy-Acetylene Tanks and Their Application in Minneapolis

cleans the sides of the rails at the joints, using an emery grinder driven by a motor fed from the trolley. The surface of the steel is ground only enough to remove the scale. When rebonding old track it is not necessary to remove the joint plates.

The bonds used are similar in form to the soldered bond. These bonds are made up of two pieces of wire cable to which

fused connection between the rail and the steel about 3 in. long by 1 in. high.

About 100 cu. ft. of oxygen and 75 cu. ft. of acetylene at atmospheric pressures are used in applying 30 bonds to medium-weight rails. With heavier rails more gas is required because the larger body of metal absorbs the heat more rapidly. In

applying bonds the head of the rail is not heated to any degree of redness nor to a temperature sufficient to anneal the steel.

The principal features of this method of bonding are: (1) permanent mechanical and electrical contact obtained by fusing steel and copper; (2) economy due to rapidity of work, small gang and low cost of tools and supplies; (3) non-interference with traffic: a car may be allowed to pass any time during the bonding process; (4) portability of apparatus used in bonding.

SOME NOTES ON RAIL CORRUGATION

BY J. H. M. ANDREWS, ASSISTANT TO CHIEF ENGINEER, PHILADELPHIA RAPID TRANSIT COMPANY.

In the long procession of new conditions and problems with which the street railway engineer has had to deal there is probably no problem which has been so baffling as the curious phenomena known as corrugation. This problem is assuming greater importance every day, and in spite of widespread discussion and investigation, there is no generally accepted theory which will explain all of its varying manifestations. There are several theories which seek to explain the occurrence of corrugation under certain conditions, but there is not, nor does it seem logical that there ever can be, a theory which will cover the occurrence of corrugations under all conditions. In other words, there seem to be several causes which will produce the same effect. Some of the more prominent causes may be briefly outlined as follows:

1.—Chattering action of car trucks on which the two motors are hung outside the axles.

2.—Defects existing in rails when they are put in service, caused by the condition that when the head of the rail is rolled the metal has lost much of its initial heat and the advance of the metal lags materially behind the periphery of the rolls. This causes a series of characteristic marks which under traffic develop into well defined corrugation. ("Recent Report on Rail Corrugation in Europe," *ELECTRIC RAILWAY JOURNAL*, page 317, Aug. 28, 1909.)

3.—When a car is traveling with one side jammed close against the rail there is a tendency for the wheels on that side to ride on the flange fillet instead of on the tread of the wheel, thus increasing the rolling diameter on that side and causing a slipping or skidding action on the other side of the truck. This skidding action is explained by the fact that when the car wheel grinds against the rail on an increased periphery, the axle will be twisted until the torsion is sufficient to make the mate wheel skid on the rail. With clean rails this action is continuous. If, however, the track is dirty, the wheels will advance in a series of jerks at regular intervals. Therefore, the presence of sharp grit, sand, dust, etc., is a prime factor in the production of corrugation. Side pressure of the flanges on straight track is due to irregularities in gauge and surface, which makes the car lunge from side to side. (C. A. Carus-Wilson before the Tramways Congress of the Franco-British Exposition, July 10, 1908.)

4.—Sliding of the wheels on the rails due to rapid and intense braking.

5.—Tight track gage.

6.—Flat spots in wheels.

7.—Too rapid acceleration.

8.—When a wheel rolls on a rail it has a tendency to elongate the upper fibers of the metal and this increased length is pushed ahead of the wheel and compacted until the metal becomes so dense that the wheel cannot force it further. The wheel then rides over this little hump and begins the same process on the other side. (See remarks of C. B. Voynow before American Street & Interurban Railway Association, Atlantic City convention, 1907, *STREET RAILWAY JOURNAL*, page 789, Oct. 19, 1907.)

9.—Corrugation is due to vibration either of the rails or of the whole track structure. There may be lateral bending of the web of the rail under the passing car, the rails may be loose on the ties, the ties may be loose on their foundations or there

may be movement of the foundation immediately under the track structure.

There is probably some ground of support for all of the above theories, but as stated before, no one of them will explain all the phenomena of corrugation. Of the theories which will most nearly meet all conditions, the last two are perhaps deserving of more than passing notice. It is not the intention to enter into any extended discussion, nor to present any valuable new material, but merely to note a few points which have occurred to the writer in a more or less superficial examination of corrugation at odd moments. In connection with theory No. 8 it seems a fair assumption that if the metal of the rail is rolled ahead of the wheel there must be force enough applied to overcome the elastic limit of the metal, for otherwise there could be no flow of the metal or permanent set. Do we get such a force under the ordinary car? Unfortunately, there is little information obtainable on the action of metals under moving loads, so we must argue from their behavior under static loads.

The late Prof. Johnson made some experiments on the areas of contact between car wheels and rails and the pressures generated under various loadings. He found that under a maximum loading of 164,000 lb. per sq. in. no permanent set was produced in either wheels or rails and that the "apparent elastic limit" of the material had not been reached for this condition of contact. (*Trans. American Society Civil Engineers*, Page 270, Vol. 32.)

Some further experiments along this same line have been made by Geo. L. Fowler, and have been incorporated in "The Car Wheel" published by the Carnegie Steel Company. If we assume that the loading of an ordinary double truck eight-wheel car is, under maximum conditions, about 8000 lb. per wheel, we find from Mr. Fowler's experiments that the area of contact is about 0.10 sq. in. which gives an average pressure of 80,000 lb. per sq. in. or about one-half the loading under which Prof. Johnson failed to notice any flow of the metal. It is hard to say just what pressure is generated under such a condition of contact with a moving load. It seems natural to suppose that the pressure would be increased with the speed, but on the other hand the metal must have time to flow and the more the speed is increased the less chance there is for movement. Furthermore the occurrence of corrugations does not show the worst cases where the speed and loads are greatest. We might also argue that if this theory were true we would expect the rails showing a variation in hardness would develop corrugations and that the hard spots would be the crests of corrugation waves. Mr. Fowler in the *STREET RAILWAY JOURNAL*, for Oct. 5, 1907, has given the results of some experiments which tend to disprove this idea.

In connection with this theory it is interesting to note that the angle which the corrugation wave makes with the gage line is approximately the angle contact between the wheel tread and the rail head and that the crests of corrugation waves are apparently densest and highest at the bearing point of the wheel and rail and decrease gradually in the direction of traffic from the gage line toward the outer edge of the rail head.

It has been the privilege of the writer to examine many cases of corrugation under many and various conditions. A careful analysis of these cases has led to the opinion that in most instances the trouble is due to a lateral movement or vibration of the rail head caused by the buckling or bending action of the web, which allows the wheels to grind across the rail. In other words, the prime cause of corrugation is defective rail design as regards thickness of the web. When we consider that the webs of girder rails average from $\frac{3}{8}$ -in. to $\frac{1}{2}$ -in. in thickness and that wheel loads of 9,000 lb. and 10,000 lb. are carried on these thin plates stood on edge, we can readily understand how such buckling action can occur. Consider the action of the ordinary girder rail as that of a cantilever loaded at the end. It is evident that the bending moment increases from the head or point of loading to the base or point of support. If we assume that at the strongest point of the web, namely, at the end of the fillet under the head, $\frac{3}{8}$ -in.

is sufficient thickness, and develop with the cantilever formula, the thickness required for a beam of uniform strength, we find that the web should not be less than $\frac{1}{2}$ -in. or 9-16-in. to carry the ordinary wheel loads safely. We can also argue that the point where corrugation is most likely to occur is where the rail will have to withstand the greatest lateral stress or at the outside entering end of curves operated at high speeds with heavy loads. In the light of this deduction it is interesting to note the report of the Maintenance of Way Committee of the American Street and Interurban Railway Engineering Association presented at the Atlantic City convention of 1907. (STREET RAILWAY JOURNAL, page 729, Oct. 19, 1907.) An analysis of this report shows that in 60 per cent of the cases noted corrugations occurred in rails with a 13-32-in. web while the heaviest web on which they occurred was 7-16-in. thick. In 60 per cent of the cases also, corrugation was most frequent on the outer rail of long radius curves operated at high speeds with about 25-ton double truck cars.

To test the thin web theory more thoroughly the writer made a series of measurements in the following manner: A curve was selected where the grade was level and the speed high. The rail in this curve was Lorain section 104-353—a 9-in. guard rail which has a web $\frac{3}{8}$ -in. thick. A place was selected on the outside entering end of this curve, about the point where the outside leading wheel was reflected from the tangent by striking the gage line and where the radius was 410.19 ft. At this point was inserted an instrument for measuring the vertical movement of the rail head. This instrument which bolts securely to the base of the rail carries a short pin which is held in contact with the outer edge of the rail head, by a small spring. This pin moves freely and connects with a pointer which registers to an exaggerated scale a movement of 1-64-in. The instrument described is similar to that devised for this purpose by H. B. Nichols, chief engineer, Philadelphia Rapid Transit Company, and described and illustrated in the STREET RAILWAY JOURNAL of May 18, 1907.

The time of all cars passing over the section was taken with a stop watch and a measured distance of 100 ft. At some distance before entering the measured section the cars were boarded by an observer who counted the passengers and by this means arrived at an approximation of the loading. After the car had passed the reading on the instrument was taken by two observers. The results were as follows:

Eight double truck, eight wheel cars with an average load of 46,000 lb. at an average speed of 13.9 m.p.h., caused an average lateral deflection of 7-128-in. an inch.

Nine single truck, four wheel cars with an average load of 20,370 lb. at an average speed of 13.8 m.p.h., caused an average lateral deflection of 1-32-in.

The maximum deflection for the eight wheel cars was 23-128-in. with a load of 45,700 lb. at a speed of 20 m.p.h.

The maximum deflection for the four wheel cars was 13-128-in. with a load of 18,960 lb. at a speed of 17.8 m.p.h.

The rail on which these measurements was taken was badly corrugated. The corrugations were about 3-in. from crest to crest and about 1-16-in. deep, running diagonally across the rail from the gage line in the direction of traffic. The track was correct as regards gage and surface and was laid on ties on well packed gravel. There was no apparent vertical movement of the track under the cars and the whole roadbed seemed to be in first-class condition. From the foregoing observations and experiment, it seems safe to make the following deductions:

1. For average street railway conditions a 9-in. girder rail should have a web at least $\frac{1}{2}$ -in. thick.

2. With a web less than $\frac{1}{2}$ -in. thick there will be lateral deflection of the rail head and probably corrugations will be formed.

3. The amount of this deflection will be proportional to the speed and load.

The author does not claim that this article offers any new suggestions on this baffling subject. His efforts have been directed toward assembling and presenting the most important records which have been made on the study of the subject,

with the belief that in most cases the trouble can be traced to the lateral vibration mentioned above.

C. S. MELLEN DISCUSSES PROPOSED PUBLIC UTILITY LEGISLATION IN CONNECTICUT

A letter addressed by Charles S. Mellen, President of the New York, New Haven & Hartford Railroad, to Everett G. Hill and Arthur S. Barnes, officials of the Connecticut Editorial Association, dated Aug. 26, discusses the proposal to establish a public service commission in Connecticut. In order that there may be an intelligent discussion of remedies, Mr. Mellen asks for precise statements of the abuses in Connecticut which are found to need correction in order that there may be an intelligent discussion of the relief measures which should be applied. Mr. Mellen says in part:

"In the country at large, legislation upon this subject seems to be influenced to a considerable extent by a prejudice against corporations. But a corporation is in general only a financial arrangement adapted to permit many individuals—men, women and children—to use their separate savings in large business undertakings, under a management which they can trust.

"In the country at large there are also appearances indicating the influence of a particular prejudice against railroad companies. I wish very much that every man, before indulging in any vague prejudice of this sort, would stop to think what a railroad really is. In the first place, it is an enormous physical plant specially adapted to the performances of services of great general importance, which has been created by the money investors and the earning of that money. In the second place, it is an enormous and complicated human organization.

"I have a right to hope that the legislation regarding which you inquire will not be promoted or framed in response to any populistic clamor against railroads. Against what or whom would such a clamor be really directed? Against the investors? Over 20,000 stockholders of the New York, New Haven & Hartford Railroad hold less than 50 shares of its stock. None of the investors in the securities of this company receives more than a fair return on the money which has been paid for these securities.

"Is there to be a clamor against the operating organization? I presume that very many can suggest some particular trouble caused by some individual or individuals in this huge organization. Is it fair to hold all the rest of the organization responsible for this? Leaving myself again entirely out of the question, I can testify from personal knowledge that the officers and employees of this railroad company are hard-working duty-performing men.

"Is there to be a clamor against the directors of the corporation? They occupy a position of trust toward all the great interests involved in the general management of a railroad system. No tribunal could be created by law which would be more certain to respond promptly and efficiently to any appeal for the public good than the board of directors of this corporation.

"I think Connecticut people ought to realize that any political action which materially decreases the earning of its chief railroad company will injure the public even more quickly and more seriously than it will the investors in the securities of that company. Any action by the State which lessens the earnings of the corporation will naturally tend to diminish the power of the corporation to improve its railroad, and will result necessarily in less efficient service. Any political action which diminishes the earnings of this corporation will also necessarily tend to impair its ability to pay their fair wages to its employees, and to give those orders for the purchase of supplies upon which the prosperity of so many citizens of Connecticut depends.

"I frankly avow that I am not opposed to any legislation which, after consideration, may seem to be necessary for the correction of any real abuses, actual or threatened. I believe that any such legislation which is really necessary would benefit the railroad as much as the public."

COMMUNICATION

VALUATIONS OF THE DETROIT UNITED RAILWAY

Chicago, Aug. 23, 1910.

TO THE EDITORS:

On the 17th inst. I wrote you regarding an article which appeared in your issue of the 13th inst. entitled "Valuations of the Detroit United Railway," and called your attention to the fact that the clause in that article reading, "This valuation was made by Robert B. Rifenberick, assisted by Bion J. Arnold and Horatio A. Foster, consulting engineers," might be misleading and would place me in an embarrassing position if incorrectly understood, and as evidence of this possibility I enclose newspaper clippings quoting remarks made on the 22d inst. in the Chicago city council by certain aldermen, who, for reasons of their own, are opposing a traction franchise measure here.

In view of this misconstruction of your article, and in order that your readers may understand my exact connection with the Detroit valuation, I quote the following letter written by me on July 29, 1909.

"Chicago, July 29, 1909.

"J. C. Hutchins, Esq.,

"President, Detroit United Railway,

"12 Woodward Avenue, Detroit, Mich.

"Dear Sir:

"As I am leaving for the West, to be gone until about Aug. 15, I have thought best to write you what my understanding is of the recent conversation which we had regarding my connection with the valuation of your property.

"I understand that the values which will be submitted by your company, probably through Mr. Brooks, directly to Mr. Barcroft will be accompanied by a written statement to the effect that these figures have been compiled by your company, and that they are the company's figures and not mine. Furthermore, if there is any material difference between the figures submitted by your company and those compiled by Mr. Barcroft, such as to warrant a discussion of them, that I am to be called in to discuss this difference with Mr. Barcroft, and that only the figures which I finally decide upon are to be considered my figures.

"I hope that the figures submitted will be sufficiently close to Mr. Barcroft's idea of the proper valuation so as to make it unnecessary for this discussion, but if necessary I shall take pleasure in taking the matter up at such time as may seem to you advisable after Aug. 15.

"My understanding is also that Mr. Foster will be furnished with a complete list of everything delivered to Mr. Barcroft, so that he may go through them carefully prior to the time that I may be called upon to discuss the figures.

"I leave it to you to make it perfectly clear to the Committee of Fifty and Mr. Barcroft my position in this matter, and our understanding regarding the figures.

"Yours very truly,

(Signed) "BION J. ARNOLD."

On Aug. 2 Mr. Brooks of the Detroit United Railway Company wrote to Mr. Hutchins as follows:

"Detroit, Mich., Aug. 2, 1909.

"J. C. Hutchins, Esq., President,

"Building.

"Dear Sir:

"I have noted and herewith return Mr. Arnold's letter of the 29th ult.

"I have explained to Chairman Eddy of the Committee of Fifty, to Chairman Van Husan of the Sub-Committee of Appraisal, to Chairman Conant of the Sub-Committee of Statistics and Regulation, and to Mr. Barcroft, Director of Appraisal, that the inventory, prices and other data that we are furnishing them are being prepared by our own forces, and when the work is complete, under our arrangement with Mr. Arnold, he will review the work for us and also represent us before the committee should there be such differences between our ap-

praisal and the committee appraisal as to require discussion and revision.

"Yours truly,

(Signed) "F. W. BROOKS, Gen'l Manager."

On Nov. 5, 1909, Mr. Hutchins wrote Mr. Eddy as follows:

"Detroit, Mich., Nov. 5, 1909.

"Frank W. Eddy, Esq.,

"Chairman, Committee of Fifty,

"Detroit, Mich.

"My dear Sir:

"I do not know that I should be disturbed by some of the reports I read in the newspaper relative to some stated amounts at which the properties of this company are being appraised. It is stated in one newspaper that the values submitted to the committee amount to \$12,800,000, and in another at some \$10,500,000. Of course, these may be only guesses, and I presume are such, but it rather worries me that such figures are floating around, as they, of course, tend to mislead the public.

"We have been perfectly frank and entirely above board in supplying for the information of the committee all of the data at our command. Our local corps of engineers, headed by Mr. Robert B. Rifenberick, a very competent engineer, has, after a most thorough study of values, reported to us that the cost of reproducing the company's properties in Detroit would amount to \$24,708,375.40, exclusive of good will or franchise values.

"From time to time, as this work has been in progress, the same data which have been sent to your committee or its engineers have been sent for their consideration to Mr. Bion J. Arnold and Mr. H. A. Foster, who have been retained as consulting engineers for the company. These gentlemen have not as yet been brought into the situation, except as stated, but it has been our intention, relying upon what we have understood to be the policy of your committee, that after all data should have been collected, if differences should arise between our local corps of engineers, and the engineers of your committee, we would bring in Messrs. Arnold and Foster, engineers of high character and great experience, as our final representatives before your committee. I have no doubt it is the purpose of your committee that such a course shall be pursued. I do not know how far along the committee has proceeded in these matters as to valuations, but am pleased to say to you that we are ready to bring Messrs. Arnold and Foster here at any time that will suit your convenience for a review of the data you have collected respecting values.

"Awaiting advices from you, I am, with great respect,

"Yours very truly,

(Signed) "J. C. HUTCHINS, President."

Inasmuch as no opportunity has as yet been given me, and I understand this is through no fault of the railway company, to discuss with Mr. Barcroft, or any other engineer representing the Committee of Fifty, the differences between the railway company's figures and Mr. Barcroft's, it should not be assumed by any one that the figures published in your article are, or are not, my figures, because my judgment as to figures which I am to be held responsible for will be exercised at the time of the discussion referred to in the letters of Messrs. Brooks and Hutchins.

I am quoting the above letters with permission of Mr. Hutchins and I ask you to publish this letter in full in order that your readers may understand the matter.

BION J. ARNOLD.

A new mechanical device for registering the number of passengers as they pass into the McAdoo Hudson River tunnels is being installed for trial at the Hoboken, N. J., station. By interrupting a stream of compressed air, which holds an electric circuit open in an instrument across the passageway, each person completes the circuit and is registered. If this instrument continues to work successfully it may do away with the ticket chopper. It was invented by H. A. Reishel, who has patented it.

SPECIAL CONVENTION TRAIN FROM CHICAGO

The joint committee on transportation of the American Street & Interurban Railway Association and the Manufacturers' Association has arranged for a special train from Chicago to Atlantic City at the time of the convention next month. The following announcement signed by J. M. Roach, president, Chicago Railways Company and E. C. Faber, general manager, Aurora, Elgin & Chicago Railroad, has been sent to all railway companies in the vicinity of Chicago and in the Northwestern States.

"The train will be operated over the Pennsylvania lines as a second section of the 'Pennsylvania Special,' commonly known as the '18-hour train,' leaving Chicago at 3:00 p. m. Sunday, Oct. 9, and arriving at Atlantic City Monday morning about 10:00 a. m. This schedule will save a day and will not require those living east of the Missouri River to leave home before Saturday night, Oct. 8.

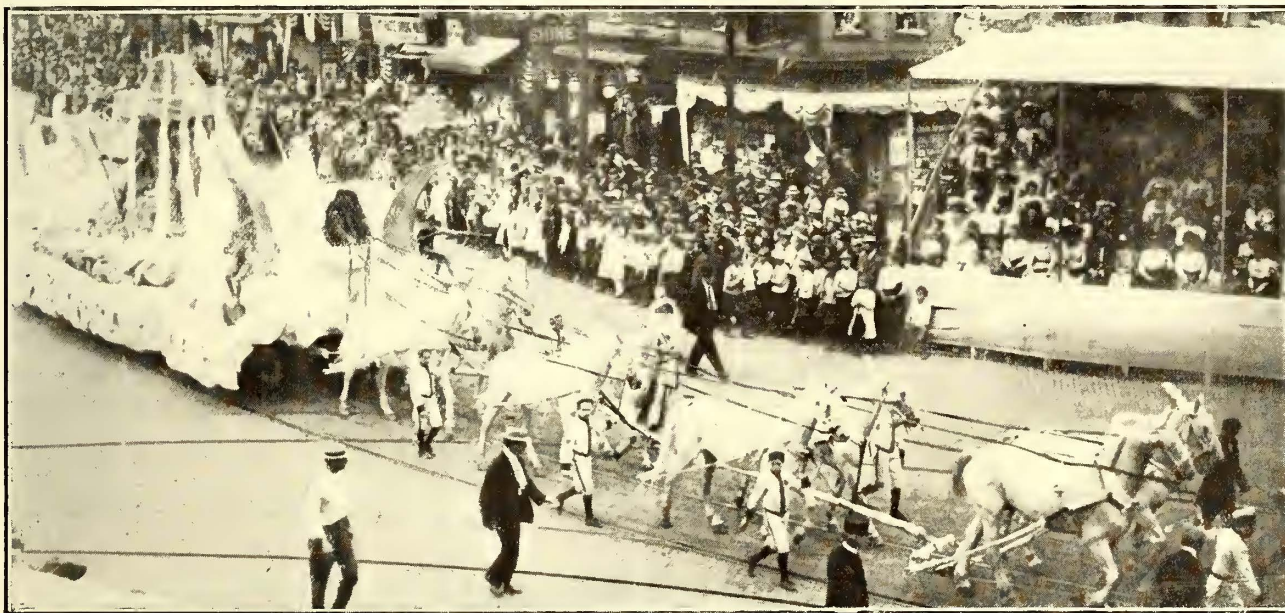
"A rate of one and one-half fare for the round trip has been obtained for the territory of the Central Passenger Association, which will make the round-trip fare from Chicago \$29.25. The one-way fare will be \$19.50. Tickets good going and returning via the same route only, may be purchased from Oct. 6 to 9, inclusive, and will be good for return, to reach original starting point not later than midnight of Oct. 18. No arrangements for a special train returning will be made. The com-

RAILWAY FURNISHES FLOAT FOR GRAND RAPIDS PAGEANT

The accompanying illustration shows a float of the Grand Rapids (Mich.) Railway Company which secured honorable mention in the big civic pageant held in connection with the Grand Rapids Sixtieth anniversary and homecoming celebration on Aug. 25. The float represented the story of Ramona, after whom the company's summer theater and pavilion at Reed's Lake were named. Papier mâché Indians supported a large fountain and a young woman dressed as an Indian also was on the float. The float was beautified with paper flowers in the "homecoming" colors which were pink, white and green. Another float for which the railway was responsible, in great measure, was that of the *Grand Rapids Herald*. A huge floral locomotive was built on one of the company's street sprinklers, the tank serving as the boiler. This float was decorated in white and blue and bore the words: "Herald Special."

OPENING OF THE NEW YORK STATION OF THE PENNSYLVANIA AND LONG ISLAND RAILROADS

Upon invitation of the Long Island Railroad, a large party of guests inspected the new terminal station in New York and the tunnels connecting it with New Jersey and Long Island on



Four-Team Float "Ramona," Furnished for Civic Pageant by the Grand Rapids Railway

mittee is endeavoring to get the return limit date extended, and in all probability will be successful.

"The Pullman berth fare from Chicago to Atlantic City will be \$5; compartment, \$14; drawing room, \$18.

"Applications for Pullman reservations on this train should be addressed to E. K. Bixby, district passenger agent, Pennsylvania lines, Chicago, Ill.

"The committee in charge is endeavoring to provide attractions and entertainment that will make this year's convention trip more enjoyable than any that has been undertaken heretofore. Full information on these points will be issued from time to time as arrangements are perfected.

"In order to help the committee in making its arrangements for entertainment and accommodation we are anxious to know how many are to be expected, and, therefore, your early reply will be very acceptable."

The members of the joint committee representing the Manufacturers' Association are: J. F. Porter, Electric Service Supplies Company, Chicago, Ill., L. E. Gould, *ELECTRIC RAILWAY JOURNAL*, Chicago, Ill., and Hiram Kenfield, *Electric Traction Weekly*, Chicago, Ill.

Aug. 30. Two special trains were run. A trip was first made to the New Jersey side of the river, after which the trains returned to the New York station, and proceeding under the East River, ran to Far Rockaway. Regular service via this route will be begun by the Long Island Railroad Sept. 8, and by the Pennsylvania Railroad early in November. During the rest of this week the company will entertain other parties, principally Long Island business associations.

The station in New York is said to cover more territory than any other building constructed at one time, in the history of the world. The Vatican, the Tuileries, and the St. Petersburg Winter Palace are larger buildings but have taken centuries in their construction. The Pennsylvania station covers 8 acres of ground, and has been erected in less than six years. The station occupies the entire area bounded by Seventh and Eighth Avenues and Thirty-first and Thirty-third Streets. The depth of the property on both streets is 799 ft. 11¼ in., and the length of the building is 788 ft. 9 in., thus allowing for extra-wide sidewalks on both side streets and avenues. Views of the station were published in the *ELECTRIC RAILWAY JOURNAL* for April 9, 1910.

It contains a trackage of 16 miles and an aggregate passenger platform length of 21,500 ft. The total storage capacity of the station tracks is 386 cars and the proposed daily service is 1000 trains, of which 600 will be those of the Long Island Railroad and 400 of the Pennsylvania Railroad.

The station is connected with Long Island by four single track tunnels and New Jersey by two single track tunnels. The single track mileage in tunnels is about 18. The lines are fed by electric power from the power station of the Pennsylvania Tunnel & Terminal Railroad at Long Island City. This station has a capacity of 40,500 kw.

VALUATION OF CHICAGO CONSOLIDATED TRACTION COMPANY

Bion J. Arnold and George Weston, comprising the commission appointed to appraise the property of the Chicago Consolidated Traction Company within the city limits of Chicago, have reported to Alderman M. J. Foreman, chairman of the local transportation committee of the city council, the following valuation as of Nov. 1, 1909:

Track (approximately 128 miles); \$1,177,277; electric power distribution, \$728,156; rolling stock (344 cars), \$204,875; power plant equipment, \$438,781; tools, supplies and furniture, \$75,600; buildings, \$278,688; real estate, \$88,439; paving, \$459,088; total, \$3,450,904.

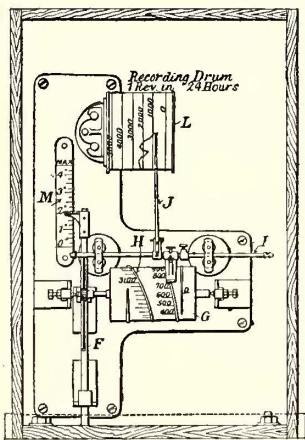
Percentages on above amount (5 per cent and 10 per cent)

purposes. In other words, we have fixed such a value for the physical property as, presumably, could be certified to by the board of supervising engineers, on the assumption that the Chicago Railways Company was purchasing the property of the Chicago Consolidated Traction Company, including the paving, under the terms of the pending ordinance recommended by your committee."

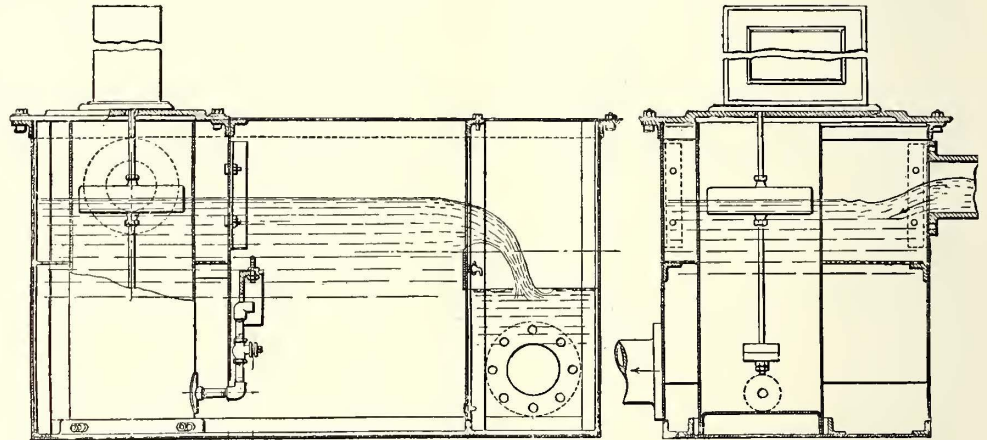
RECORDER OF STEAM AND WATER CONSUMPTION

A comparatively recent device which is being used extensively in British power stations for measuring steam consumption is the Lea recorder. This device actually measures the flow of water, but by applying it to the feed water or condensed steam as it is discharged from the air pump it can be used to test the steam consumption of groups of engines or of individual engines, either instantaneously or over definite periods of time.

The construction of the recorder is very simple. In the simplest form the water to be measured flows into an open tank and out through a V-shaped notch. Within the tank is a separate chamber in communication with still water so that the height of the water in the tank can be registered by a float. The vertical movements of this float are recorded on a clock-work-driven drum by means of a rectifying device so proportioned as to give the gallons or pounds of water passing through the V-shaped slot. Records of the performance of this



Recording Device



Longitudinal and Cross Section of Recorder, Showing Tank and Float

as allowed by the ordinance of Feb. 11, 1907, and pending ordinance, \$517,635; total \$3,968,539.

Messrs. Arnold and Weston state that this is their present appraisal of the property as it would be valued under the terms of the pending ordinance recommended for passage by the committee, subject to the deductions provided for in said ordinance. They continue: "Our previous valuations, based on the same principles as those followed in the traction valuations of 1906 and adopted by the ordinance of 1907, as stated in our letter to you of Aug. 10, 1910, were as follows: Value of physical property with paving, \$4,078,057; without paving, \$3,446,550; value of intangible property (franchises), with paving, \$751,326; without paving, \$751,326; total, with paving, \$4,829,383; without paving, \$4,197,876.

"We also deducted from each of these amounts the sum of \$94,341 on account of the isolation of certain tracks due to prior expiration of ordinances, and also on account of the provisions of certain franchise ordinances requiring the removal of the tracks thereunder from the streets at the expiration of their respective franchises, making a total valuation of \$4,735,042 including the paving, or \$4,103,535 if paving is entirely excluded.

"In the present valuations made as first hereinabove stated, all franchise values have been entirely excluded, and the physical property has been appraised at its value for rehabilitation

device in several of the power stations in Great Britain show an accuracy within a fraction of 1 per cent.

Another feature of the device is that when installed on an engine or engines it gives a continuous record of the steam consumption and so it becomes possible easily and quickly to detect any local cause for high steam consumption, such as defective turbine blades or improper cut-off adjustment. The device is manufactured by the Lea Recorder Company, Manchester, England.

DISTRIBUTION OF ASSOCIATION MEMBERS.

Secretary Donecker, of the American Street & Interurban Railway Association, has compiled the following statistics of the geographical distribution of the member companies of the association:

	1906	1907	1908	1909
North Atlantic.....	62	71	79	96
South ".....	20	25	26	35
South Central.....	25	26	32	35
North ".....	84	84	91	107
Western.....	18	19	24	38
Outside of U. S.....	5	3	10	14
Total.....	214	228	262	325

The percentage of member companies represented at the annual conventions from 1906 to 1909 inclusive was as follows: 79.0, 76.3, 78.2, 51.7.

LONDON LETTER

(From Our Regular Correspondent)

The Town Council of Weymouth is at present considering the advisability of providing some means of transportation in its district, and is at present weighing the relative advantages of tramways, motor omnibuses and railless traction methods. It is estimated that the capital cost of motor buses would be £10,000, railless traction £12,000, and electric tramways £27,000. The committee has about decided that the only practical solution is to provide electric tramways, and the matter will be decided at an early meeting.

A new departure has just been inaugurated on the Metropolitan Railway, one of the underground railways of London. One of the most important of this company's extensions is that which runs from Baker Street northwest through St. John's Wood, Hampstead, Kilburn and on to Harrow, Rickmansworth, Amersham, Aylesbury and Verney Junction. This has been for some considerable time entirely operated by electricity, and as the districts mentioned are all of a first-class residential nature it has occurred to the Metropolitan Railway to provide Pullman cars on this extension. The company has been running through trains on this line to the city, doing away with the necessity of the tedious change at Baker Street, and now that these Pullman cars have been put on, by arrangement with the Pullman Company, Ltd., a suitable increase is expected in the traffics and the steady building up of these beautiful suburbs as residential districts for London citizens.

J. H. Rider, who for the past nine years has been the electrical engineer for the London County Council Tramways, has resigned his position with the Council, having obtained an important appointment in South Africa as advisory consulting engineer to Messrs. Wernher, Beit & Company (Messrs. H. Eckstein & Company, Johannesburg). When Mr. Rider came to London to occupy the position which he has just resigned, the electrification of the tramways in London was just commencing, and it was under his careful management that the large central station for the Council's tramways was built on the river side at Greenwich. This station has attracted considerable attention, more, perhaps, than it otherwise would have done, as it is built exactly on the meridian, and it will be remembered that a few years ago considerable discussion arose from the fact that it was interfering with the delicate work of the Royal Observatory at Greenwich. At that time it was decided that the smokestacks would not even be completed, and they have never been built up to their full height. In this station at Greenwich, also, were installed, on Mr. Rider's advice, the first and only engines in Great Britain having two vertical and two horizontal cylinders. Even at the time they were installed they were becoming obsolete, turbines at that time developing very rapidly, and since the installation of these engines two very large Rateau turbo-generators have been installed. Mr. Rider has been a popular member of the electrical profession in this country, and his many friends will wish him the best of success in his new field.

The British and American Associations of Mechanical Engineers have had a highly successful meeting in Birmingham and London, which was particularly noteworthy because of the attention given to railway electrification. With the papers by Mr. Westinghouse, Mr. Potter and Mr. Pomeroy the readers of this paper are familiar. One of the most valuable of the British papers was that contributed by F. W. Carter, on "Electrification of Suburban Railways," giving some very valuable information regarding the working of all the electric railways in Great Britain. From his figures it would appear that there are 18 railways in Great Britain, operated wholly or in part electrically, working over an approximate length of 200 miles of route and 410 miles of track. These railways are worked by 87 locomotives and 821 motor coaches. Various figures were given of the City & South London Railway, which is the oldest of the London electrically operated lines; the Central London Railway, commonly called the "Twopenny Tube"; the Great Northern & City Railway, and the various underground electric railways of London which have been constructed in more recent years and which are well known.

Interesting figures were also given of the London, Brighton & South Coast electrification scheme, which is the first railway to use the single-phase system in this country and which has been frequently referred to in these columns during the past year. H. M. Hobart also presented some figures on the cost of electrically propelled suburban trains.

Valuable testimony as to the success of linking up tramways has recently been published in the annual report of the West Ham system. The West Ham Corporation has operated a system in its district for some years with marked success, but only recently was it possible to procure the advantage of through-running cars onto the London County Council's tramways at Bow Bridge. From the report it appears that the average receipts in West Ham have been about £250 a week more than those for the corresponding weeks of last year, a result made possible by the fact that passengers are now able to perform without a break the journey from Aldgate in London to the borders of Epping Forest on the outskirts of the West Ham system. Leyton, which is also linked up with the West Ham and the London County Council's systems, has also experienced a big rise in its receipts, these being £150 a week more than they were a year ago before through communication was available.

The Newcastle Corporation is at present considering the question of extending its tramways to the coast by way of Bonton. Representations have been made from time to time from outlying districts, but the tramways committee has not considered it advisable. Now, however, that Leeds and Bradford have both obtained Parliamentary powers for the installation of a trackless trolley system, the Newcastle tramways committee has conceived the idea that their city might also be beneficially linked by this means to outlying districts, and doubtless a Parliamentary bill will be introduced next session for powers for extensions, both by trackless trolley and by the ordinary tramlines.

The Cardiff tramways committee is looking for improved methods of running the electric car undertaking, and recently decided to purchase 130 meters at £35s. each, to attach to the cars as checks upon the current expended by the drivers. They will be paid for out of revenue in the course of two years. The firm which supplies the meters guaranteed that the cost would be covered out of energy saved in one year, and that if at least 6 per cent of energy were not saved in the first six months they would take the meters back free of cost.

Considerable interest is taken in the announcement that in order to cope with the growing tram-car competition the Great Central, Lancashire & Yorkshire, and London & North-Western Railway Companies are about to start elaborate services of motor trains on many of their lines radiating from Manchester for 10 to 12 miles, dozens of towns and suburbs being tapped in this manner.

Intimation has been received by the Bacup town clerk that the Board of Trade has confirmed the order of the Light Railway Commissioners for a new electric tramway from Bacup to Shawforth, which will be laid at once and will link up the system to Rochdale. The Rawtenstall Town Council has also received sanction to lay a new electric tramway from Waterfoot to Water. A. C. S.

Consul-General Robert P. Skinner, of Hamburg, reports that while there is always a market in Germany for electrical devices not already supplied by domestic manufacturers, or which possess the elements of novelty and practical utility, the condition of the electrical industries in that country is such that German manufacturers are not only able to satisfy nearly all domestic requirements but are also exporting in immense quantities to all parts of the world. For a very considerable period, and until within the last few months, when American manufacturers obtained the benefit of the lowest rates of duty in Germany, electrical supplies from the United States were subject to import duties greatly in excess of those applied to similar goods from other countries. Owing to this and other causes, German concerns, by arrangement, are manufacturing many articles of American invention, so that within the last few months, when the telephone system of Hamburg was reconstructed, with the exception of a limited number of articles imported from the United States everything was supplied by German houses.

News of Electric Railways

Program of Central Electric Railway Association

The following program has been announced for the meeting of the Central Electric Railway Association, which is to be held at the Claypool Hotel, Indianapolis, Ind., on Sept. 22, 1910:

SEPT. 22, MORNING SESSION, 10 A. M.

Business session and reports of special committees.

Talk on large station units, illustrated with lantern slides. Geo. J. Smith, Galena Signal Oil Company.

Paper, "Efficiency and Design of High-Tension Insulation," by A. C. Austin, electrical engineer of the Ohio Insulator Company.

Discussion.

SEPT. 22, AFTERNOON SESSION, 1 P. M.

Report of standardization committee.

Paper, "Track Work," by E. B. Entwistle, chief engineer of the Lorain Steel Company.

Discussion.

Paper, "Destinies of 500-Volt D.C. Motors, 1250-Volt D.C. Motors and 6600-Volt A.C. Motors," by W. E. Davis, vice-president of the Cleveland Construction Company.

Discussion.

Adjournment.

The executive committee of the association will meet in the office of the secretary in the Traction Terminal Building, Indianapolis, on the evening of Sept. 21, 1910, to transact routine business and consider any special matters that may be brought to its attention.

Transit Affairs in New York

Representatives of the Interborough Rapid Transit Company and the Public Service Commission, who have been in conference for more than a year over a \$6,000,000 claim by the Interborough Rapid Transit Company for extra work done on the subway, have come to an agreement. It is said that the company will get about 35 per cent., slightly over \$2,000,000. The claim covers the entire system from Atlantic Avenue to the termini at Van Cortlandt and Bronx Parks. Any expenditure the company thought represented permanent investment it charged to the city. This includes a heavy claim for construction of the East River Tunnel on which the Interborough Rapid Transit Company submitted a very low bid.

After a conference on forms of subway contracts held in the Mayor's office between Acting Mayor Mitchel, Deputy Comptroller Mathewson, LeRoy T. Harkness, of the counsel to the Public Service Commission, and some of the commission's engineers, Mr. Mitchel stated that the points of difference between the transit committee of the Board of Estimate and Apportionment on the forms of contract for the new subways had been reduced from 44 to four, and that these four points would probably be adjusted eventually, as they all relate to details of engineering. Mr. Mitchel declared himself still in favor of municipal construction, and said that there might be a lively discussion in the Board of Estimate and Apportionment after the advertising for bids should private construction bidders be recommended for awards of contracts. Mr. Mitchel admitted that according to the agreements thus far entered into between the Public Service Commission and the acting Mayor and the Comptroller the commission has reserved the right to permit open cuts in the new subways on Manhattan Island. Furthermore, the understanding between the acting Mayor, the Comptroller and the commission is that the contracts will provide that south of 130th Street tracks shall be under cover, except at all places shown in the detailed plans on file in the offices of the Public Service Commission. The commission also reserves the right to permit open cuts, if it sees fit, wherever they will not interfere with traffic or the public welfare.

Representatives of the Public Service Commission and the Interborough Rapid Transit Company have been in conference recently arranging a settlement of an arbitration rela-

tive to claims for extras on the subway operated by the Interborough Rapid Transit Company. It will be remembered that the Interborough Rapid Transit Company claimed something like \$6,000,000 for extra work done in the construction of the subway, and the matter went to a board of arbitrators. A compromise will probably be effected by which an amount somewhat in excess of \$2,000,000 will be paid. Whatever amount is awarded to the company will be used, according to an arrangement with the commission, for additions to the system.

W. G. McAdoo, president of the Hudson & Manhattan Railroad, has stated that the Thirty-third Street terminal station should be opened about Nov. 1, 1910. The extension to Forty-second Street and connection with the train levels of the Grand Central station should be completed within the three-year limit. Work is being pushed rapidly on the Jersey City-Newark extension, and the new line from the Pennsylvania Jersey City station to Jersey City's business district should be opened by Sept. 6, 1910. Within a year the connection with the Pennsylvania Railroad tracks to Newark should be made.

Action Postponed on Boston & Eastern Railroad Certificate

By a majority report the Massachusetts Railroad Commission has refused at present to issue a certificate of public convenience and necessity to the Boston & Eastern Electric Railroad, which has been before the board for about three years seeking the right to build a high-speed electric railway between Boston, Lynn, Salem and Beverly. Commissioners White and Bishop state that action on the company's petition should be postponed until the Legislature of 1911 has made known its attitude regarding the electrification of steam railroads at Boston, the building of a tunnel between the North and South Stations, and other improvements in the transportation service of the Boston metropolitan district which are to come before it. Chairman Walter Perley Hall has issued a dissenting opinion to the effect that a certificate could be issued to the company at present without prejudicing the solution of the above problems.

The company has filed the following request with the commission, asking that its petition be taken up again.

"The association for the formation of the Boston & Eastern Electric Railroad hereby requests that your honorable body grant to it a further hearing in the matter of its petition for a certificate of public convenience and necessity, and that you reconsider your finding as expressed by a memorandum filed Aug. 22, 1910, for the following reasons:

"First—That the majority of the board in their memorandum of a finding filed Aug. 22, 1910, made a manifest error in law and in the construction of Chapter 630 of the acts of 1910.

"Second—That the finding of the majority of the board in their memorandum filed Aug. 22, 1910, is based upon grounds and raises questions which the counsel for the petitioners have not had opportunity to argue before your honorable board and present their views.

"Third—That the majority of the board of railroad commissioners have ignored the rights of the petitioners under a decision of the board filed Nov. 17, 1908."

Association Meetings

Central Electric Accounting Conference.—Chicago, Ill., September.

Colorado Electric Light, Power & Railway Association.—Glenwood Springs, Col., Sept. 21, 22 and 23.

Central Electric Railway Association.—Indianapolis, Ind., Sept. 22.

Central Electric Traffic Association.—Winona Lake, Ind., Sept. 27.

Oklahoma Public Utilities Association.—Oklahoma City, Okla., Sept. 30 and Oct. 1.

American Street & Interurban Railway Association.—Atlantic City, N. J., Oct. 10, 11, 12, 13 and 14.

Electrification of Illinois Road Completed.—The work of equipping the Chicago, Aurora & DeKalb Railroad with electricity has been completed and the steam service has been supplanted by electric service.

Suit to Compel Street Repairs in Pittsburgh.—A suit in equity was filed in Common Pleas Court, No. 2, at Pittsburgh, on Aug. 23, 1910, by City Solicitor O'Brien, in behalf of the City of Pittsburgh, to compel the Pittsburgh Railways to repair many miles of streets.

N. E. L. A. to Study Workmen's Insurance.—The National Electric Light Association, in its desire to obtain the very latest information regarding the prevention of accidents and compensation to workmen, has commissioned Dr. Wm. H. Tolman, the director of the American Museum of Safety, to study the German governmental system of workmen's insurance in its threefold aspect, of accident, sickness and invalidity, including old age pensions.

Convention of the Colorado Electric Light, Power & Railway Association.—The eighth annual convention of the Colorado Electric Light, Power & Railway Association will be held at Glenwood Springs, Col., Sept. 21-23. The meetings will be held in Hotel Colorado. In addition to the papers listed below, committee reports on "Grounded Secondaries," "Insurance" and "Meters" will be presented. The subjects covered by papers follow: "Storage Batteries in Street Railway and Central-Station Work"; "Attitude Which Central Stations Should Maintain Toward Their Customers"; "Mazda Series Street Lighting"; "High and Low-Tension Pole Lines"; "High and Low-Pressure Turbines"; "The Place of Rotary Condensers and Induction Generators in Transmission Systems." W. T. Wallace, of the Colorado Light & Power Company, Canon City, is president of the association, and F. D. Morris, of the Colorado Springs Light, Heat & Power Company, is the acting secretary-treasurer.

Railway Electrical Engineers' Convention.—Preparations are under way in Chicago for the forthcoming annual convention of the Association of Railway Electrical Engineers, to be held at the Hotel La Salle, Chicago, Ill., on Sept. 27, 28, 29 and 30. A feature of the convention will be a large display of exhibits, and the roof garden, or 19th floor of the hotel, has been engaged for the exclusive use of the convention. The meetings will be held here, and the remaining space will be used for exhibits. A committee of the Railway Electric Supply Manufacturers' Association, an allied organization, is in charge of the local arrangements for the convention. George H. Porter, Western Electric Company, is chairman of this committee, and the other members have been assigned duties as follows: Exhibits, W. E. Ballentine, Willard Storage Battery Company; entertainment, W. H. Glatt, New York Leather Belting Company; finance, A. C. Moore, Safety Car Heating & Lighting Company; auditing, J. M. Lorenz, Central Electric Company; publicity, Edward Wray, *Railway Electrical Engineer*; membership, J. M. Schilling, Westinghouse Electric & Manufacturing Company.

Extension of Hudson & Manhattan Railroad Service.—Notices have been posted by the Hudson & Manhattan Railroad, New York, N. Y., that service in the Jersey City extension, which extends from Exchange Place to Henderson Street, Jersey City, will be started on Sept. 6, 1910. Through trains will run between Henderson Street and Twenty-third Street, New York, and the Terminal buildings, at Cortland Street, New York. Passengers to and from Hoboken will change at the platform at the station of the Erie Railroad, in Jersey City. Service from Twenty-third Street and the Terminal buildings, in New York, to Hoboken, will remain unchanged. Passengers from the Terminal buildings, Exchange Place, Jersey City, and the Pennsylvania station for Twenty-third Street will change at the Erie station, and passengers from uptown for the Pennsylvania Railroad station, Jersey City, and the Terminal buildings, will change at the Erie Railroad station. In other words, all trains leaving the Terminal buildings and Twenty-third Street will go to Hoboken, and alternate trains from Hoboken will go to the Terminal buildings and Twenty-third Street. At present alternate trains from either Manhattan terminal go to Hoboken and the other terminal.

Financial and Corporate

New York Stock and Money Market

August 30, 1910.

Trading in the stock market has been exceedingly light during the week and has been limited almost entirely to the professionals. While there has been no happening to influence market conditions adversely beyond the general apprehension over the anti-corporation propaganda now being carried on in the West, there has been a general sentiment of apathy. Prices have fluctuated only fractionally and have been little changed in net result.

The money market, too is unchanged. Call loans are remarkably cheap, and money for these is plentiful. Time money is not remarkably cheap.

Other Markets

Tractions in the Philadelphia market have been very little in evidence during the past week. Only small lots have been offered and price changes have been unimportant. Rapid Transit was a trifle lower to-day, but the net change during the week has been only fractional.

In the Chicago market there has been practically no trading in tractions. Series 2 Chicago Railways sold at 16 yesterday, but the transaction was only 25 shares. Sub-way has been selling at 4 7/8.

Both issues of Massachusetts Electric have again been fairly active in the Boston market during the past week. The close to-day was 18 for the common and 82 for preferred. This is a slight gain for the former and a fractional loss for the latter. Other tractions were dull.

In the Baltimore market stock of the United Railways Company has sold at former levels and the bonds have shown no important price changes.

Quotations of various traction securities as compared with last week follow:

	Aug. 23.	Aug. 30.
American Railways Company.....	344 1/2	344
Aurora, Elgin & Chicago Railroad (common).....	*50 1/4	*50 1/4
Aurora, Elgin & Chicago Railroad (preferred).....	90	90
Boston Elevated Railway.....	126	126 1/2
Boston & Suburban Electric Companies.....	*15	*15
Boston & Suburban Electric Companies (preferred).....	*74	*74
Boston & Worcester Electric Companies (common)....	110	110
Boston & Worcester Electric Companies (preferred)..	36	36
Brooklyn Rapid Transit Company.....	75 1/4	74 3/8
Brooklyn Rap. Transit Company, 1st pref. conv. 4s...	82 3/4	82 3/4
Capital Traction Company, Washington.....	113	113
Chicago City Railway.....	118 1/2	118 1/2
Chicago & Oak Park Elevated Railroad (common)....	*3 3/4	*3 3/4
Chicago & Oak Park Elevated Railroad (preferred)....	*7 1/4	*7 1/4
Chicago Railways, pteptg., ctf. 1.....	170 1/2	170 1/2
Chicago Railways, pteptg., ctf. 2.....	116	116 1/2
Chicago Railways, pteptg., 3.....	112	112
Chicago Railways, pteptg., ctf. 4.....	45 1/2	45 1/2
Cleveland Railways.....	*91 1/2	*91 1/2
Consolidated Traction of New Jersey.....	473	473
Consolidated Traction of N. J., 5 per cent bonds....	1103	1103
Detroit United Railways.....	45	45
General Electric Company.....	144	144 3/4
Georgia Railway & Electric Company (common)....	107 1/2	107 1/2
Georgia Railway & Electric Company (preferred)....	*86	*86
Interborough-Metropolitan Company (common)....	17 3/4	17 3/8
Interborough-Metropolitan Company (preferred)....	48	48 1/2
Interborough-Metropolitan Company (4 1/2s).....	79 3/8	79
Kansas City Railway & Light Company (common)....	225	230
Kansas City Railway & Light Company (preferred)....	278	268
Manhattan Railway.....	131	*131
Massachusetts Electric Companies (common).....	118	118
Massachusetts Electric Companies (preferred).....	283	282
Metropolitan West Side, Chicago (common).....	220	220
Metropolitan West Side, Chicago (preferred).....	265	262
Metropolitan Street Railway.....	*15	*15
Milwaukee Electric Railway & Light (preferred)....	*110	*110
North American Company.....	*69 1/2	68
Northwestern Elevated Railroad (common).....	220	218
Northwestern Elevated Railroad (preferred).....	260	*60
Philadelphia Company, Pittsburg (common).....	244	244
Philadelphia Company, Pittsburg (preferred).....	242	242
Philadelphia Rapid Transit Company.....	118 1/4	117 3/4
Philadelphia Traction Company.....	284	283 1/2
Public Service Corporation, 5 per cent col. notes....	295	295
Public Service Corporation, ctf. s.....	1100	1101
Seattle Electric Company (common).....	*109	*109
Seattle Electric Company (preferred).....	*98 1/2	*98 1/2
South Side Elevated Railroad (Chicago).....	260	262
Third Avenue Railroad, New York.....	*8 1/2	8 1/2
Toledo Railways & Light Company.....	*7	*7
Twin City Rapid Transit, Minneapolis (common)....	*106 1/2	*106 1/2
Union Traction Company, Philadelphia.....	243 1/4	243 1/4
United Rys. & Electric Company, Baltimore.....	215	215
United Rys. Inv. Co. (common).....	*31	*31
United Rys. Inv. Co. (preferred).....	56	54
Washington Ry. & Electric Company (common)....	233	232 3/8
Washington Ry. & Electric Company (preferred)....	290	289 1/2
West End Street Railway, Boston (common).....	288	288
West End Street Railway, Boston (preferred).....	*100	*100
Westinghouse Elec. & Mfg. Company.....	*60 1/2	*59
Westinghouse Elec. & Mfg. Company (1st pref.)....	*125	*125

a Asked. * Last Sale

Annual Report of Illinois Traction Company

The sixth annual report of the management of the Illinois Traction Company to the board of directors, covering the calendar year 1909, shows gross earnings of \$4,752,082, as compared with \$4,415,051 in 1908 and \$4,056,582 in 1907. The gain in 1909 over 1908 was 7.6 per cent. Operating expenses and taxes aggregated \$2,749,069 in 1909, as compared with \$2,522,779 in 1908. A comparative statement for three years follows:

	1909.	1908.	1907.
Gross earnings:			
Interurban	\$1,980,779	\$1,847,381	\$1,610,257
Local street railway.....	1,371,119	1,283,892	1,226,591
Gas	293,072	277,085	259,572
Electric light and power.....	961,115	872,394	819,427
Steam heating.....	138,486	134,285	127,453
Miscellaneous	7,511	14	13,282
Total gross earnings.....	\$4,752,082	\$4,415,051	\$4,056,582
Operating expenses.....	\$2,585,043	\$2,423,757	\$2,217,287
†General and overhead expenses.....	43,150	.....	.....
Taxes	120,876	99,021	78,952
Total operating expenses.....	\$2,749,069	\$2,522,778	\$2,296,239
Net earnings.....	\$2,003,013	\$1,892,273	\$1,760,343
Less net earnings of Des Moines prop- erty prior to purchase.....	75,749	147,776	106,643
Total net revenue of Illinois Traction Company	\$1,927,264	\$1,744,497	\$1,650,700
Percentage of operating expenses.....	57.85	57.14	56.61

†Amounts of general expense included in operating expense totals for years prior to 1909.

From the net revenue of \$1,927,264 for the year 1909 there was deducted for interest on bonds \$1,258,051, leaving available for dividends \$669,213. Dividends on the preferred stock aggregated \$259,146, leaving a surplus of \$410,067. From this amount there was deducted for depreciation \$200,000. The balance sheet surplus as of Dec. 31, 1909, was \$1,460,428.

H. E. Chubbuck, general manager, says in part in his report to the president and board of directors:

"With the commencement of 1909 there was in progress the construction of the Mississippi River bridge at St. Louis, the lines of the St. Louis Electric Terminal Railway, the Decatur Belt, the Springfield Belt and later the Edwardsville and Granite City Belts. The question which had been pending for a year as to whether the lines from Peoria to Bloomington and from Mackinaw Junction to Springfield should be changed to direct current was also yet unsettled. These were the more important problems with which we had to deal at the beginning of the year.

"The importance of constructing the bridge of a type and strength commensurate with present steam railroad requirements has been kept constantly in view, and it is a pleasure to the management to be able to say that the bridge will be one that will be thoroughly adequate for handling the heavy modern equipment of steam railroads. The Eads bridge and the Merchants bridge, designed and erected years ago, are understood to be limited to a carrying capacity of 3,500 lb. per lineal ft. of track. Our bridge has been designed to provide a carrying capacity of 5,000 lb. per lineal ft. of track. The Illinois Traction bridge will, in fact, when completed, be the heaviest and strongest bridge of any kind across the Mississippi River at any point. When it is remembered that there are but two bridges across the Mississippi at St. Louis, that these are both heavily overtaxed already, that St. Louis is the fourth city in the United States, and that its trade is steadily and rapidly growing, the future value of such a bridge can hardly be overestimated. It is not unreasonable to assume that some of the steam roads which enter the metropolis will find it to their interest to operate over the bridge.

"Work has progressed rapidly on the trackage in Venice and on the approaches and tracks in St. Louis. One main span of the bridge had been completed when the work of the contractors was delayed, the false work erected by them in connection with the construction of the second main span being destroyed by the unprecedented high water and large quantities of floating ice. Construction work on the main river spans will unfortunately thus be stopped until after the maximum high water, usually taking place in June. It is now confidently expected that the two remaining main spans will be erected and the bridge completed for operation not later than December next.

"The uptown Broadway station, St. Louis, is well under

way and will provide for entrance of trains on the second floor. Negotiations for the purchase of the land required for the large downtown terminals are under way.

"The new power plant at Venice, to supply the additional electrical energy required for the increased traffic which will result from the completion of the bridge and the inauguration of service into the heart of St. Louis, was designed early in the year. Contracts have been awarded and construction has progressed rapidly. This power plant, located at the east approach of the bridge and with an initial installation of 4000 kw., commands a strategic position for the development and operation of the St. Louis terminals, and also for the sale of power. Contracts for power have been solicited by manufacturing plants for nearly half of the proposed electrical capacity, and we will probably be able to derive a large income from the sale of power.

"Applications for switching facilities in St. Louis by well-established manufacturing plants have been numerous, which gives promise of a very large measure of interstate traffic between Missouri and Illinois.

"A new line, known as the Danville & Southeastern, seven miles in length, has been established and will be opened early in 1910 to serve the Grape Creek coal mining district, which is tributary to Danville.

"Work has progressed upon the belts as fast as possible in view of the delay caused by the Railroad & Warehouse Commission of Illinois, which controls, under the State law, the placing of crossings with other railroads.

"For the better supervision and development of the interurban lines, the organization has been modified to some extent, the office of general superintendent of interurban lines having been created. Several of the interurban stations have been transferred from the traffic to the transportation department. In lieu of the former system of division superintendents, a chief trainmaster and assistant trainmasters have been substituted. The chief trainmaster reports directly to the general superintendent of interurban lines. This alteration has proved economical and satisfactory.

"The changing of the lines between Springfield, Peoria and Bloomington from alternating to direct-current operation was decided on and taken up actively. This makes it possible without change of cars or equipment to run through service from point to point upon the system, has proven of great advantage in operation.

"A tie renewal fund has been created. This is accumulated by the payment of a fixed sum from the interurban receipts each month which is charged to operation. Creosoted oak ties are now used for all construction and maintenance work.

"The freight equipment has been increased by adding 50 new 40-ton coal cars, 25 new 40-ton box cars, 8 passenger trailer cars.

"The requirements of the interstate commerce laws with reference to safety appliances have led to standardization as rapidly as possible of all rolling stock.

"Traffic agreements have been entered into with the Chicago, Rock Island & Pacific Railway and the Chicago & Eastern Illinois Railroad Company, which should prove an increasingly great factor in augmenting the traffic of the system. A freight claim department has been created.

"The construction of grain elevators along the lines has been encouraged, and several have already been erected, while others are in course of erection. When the belt lines shall have been completed the grain traffic should develop rapidly.

"The sleeper service which has been in operation from Springfield to East St. Louis for a long time has disclosed the desirability of its extension elsewhere. New cars have been ordered for a Peoria-St. Louis service.

"The Interstate Commerce Commission accounting system has been established as standard for interurban lines.

"The controversy with the City of Bloomington over the right of the Bloomington & Normal Railway & Light Company to occupy the streets of the municipality was concluded in June by the grant of a new ordinance for 20 years. This ordinance is considered exceedingly fair in its terms both to the city and company.

"The insurance of the entire system has been placed in charge of the land commissioner.

"A department of publicity has been organized and placed in charge of a trained newspaper man, and all advertising has been transferred to this department.

"The accident association has been enlarged and all of the companies of both the Illinois Traction System and of the Western Railways & Light Company participate therein under the name of the Western Illinois Accident Association. Its scope has been extended to include not only the interurban and street railway lines, but the electric lighting, gas and steam heating properties as well. The contract dated Jan. 1, 1909, has been entered into providing for payment of a fixed percentage of gross receipts to a fund, disbursements from which are made in payment of losses arising from accidents, subject to the conditions of the agreement. The percentage payable by the interurban and street railway lines is 2 per cent; by the electric and steam heating companies, $\frac{1}{2}$ of 1 per cent; and by gas companies, $\frac{1}{4}$ of 1 per cent. On Dec. 31, 1909, the fund accumulated amounted to \$65,351. Payments on account of accidents arising after Jan. 1, 1909, only have been assumed by the association.

"Of approximately 50,000,000 passengers handled during the year not one was killed in an accident.

"The relations between the system and its employees have been very satisfactory.

"The foregoing will afford a general view of the salient features of the year's operations. There has been no untoward occurrence of any kind; there has been efficient maintenance and development of the physical properties; continuous growth in passenger, express and freight traffic, and steady development and extension of railway, electric lighting, gas and heating properties, all of which have contributed to the good record of the year and forecast a bright future."

Aurora, Elgin & Chicago Railroad, Chicago, Ill.—The stockholders of the Aurora, Elgin & Chicago Railroad will vote at the annual meeting of the company on Oct. 18, 1910, on the question of purchasing the Chicago, Wheaton & Western Railway, and on changing and enlarging the objects for which the Aurora, Elgin & Chicago Railroad was organized.

Forty-second Street, Manhattanville & St. Nicholas Avenue Railroad, New York, N. Y.—The sale of the property of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railroad, under foreclosure, has been postponed from Sept. 26, 1910, to Oct. 18, 1910.

Lima & Honeoye Electric Light & Railroad Company, Lima, N. Y.—The Public Service Commission of the Second District of New York has given its consent that the Lima & Honeoye Electric Light & Railroad Company lease to the Lima-Honeoye Light Company its railroad system, electric light plant and other property located in Lima and Honeoye Falls. The Lima-Honeoye Light Company has been authorized to issue \$5000 in capital stock to improve and extend the electric distributing system of the company.

Northern Ohio Traction & Light Company, Akron, Ohio.—The Northern Ohio Traction & Light Company has declared a quarterly dividend of $\frac{3}{4}$ of 1 per cent on the \$9,000,000 of stock of the company, payable in September, 1910. This dividend compares with the dividend of $\frac{1}{2}$ of 1 per cent paid from June, 1909, to June, 1910.

Ocean Shore Railway, San Francisco, Cal.—A hearing was held before United States District Judge Van Fleet, at San Francisco, on Aug. 19, 1910, to determine the amount of liens against the company that should have priority over the bonds. The matter went over until Sept. 8, 1910. The sale of the property of the company under foreclosure has been postponed from Sept. 1, 1910, to a date which is to be fixed by the court.

St. Francois County Railway, Farmington, Mo.—The property of the St. Francois County Railway was sold under foreclosure recently at Farmington for \$25,000 to W. M. Harlan, president of the Bank of Farmington, who is said to represent a syndicate of local people who hold all but about \$30,000 of the second mortgage bonds of the company.

Traffic and Transportation

Electric Railway Employees to Assist in Suppressing Reckless Automobilists

The Secretary of State of Connecticut, through his chief clerk, has addressed the following letter to the superintendents of the electric railways operating in Connecticut, in the hope that by their co-operation reckless drivers of automobiles may be apprehended:

"Frequent complaints of a general nature have been received at this office of the violation on the part of motor vehicle operators with especial regard to the reduction of speed upon passing any street car that is stationary or about to stop, on the same side of the car on which passengers are ordinarily received or discharged. The law provides that an excess of 3 m.p.h. shall be prima facie evidence that the driver is operating the machine in a reckless manner and in violation of the law.

"No one is perhaps a more frequent observer of this than the conductor or motorman upon the street car, and it is also important for the interest of the persons whom the street railways serve as it is for the State in determining persons capable of and entitled to receive a license to operate such machines.

"With the co-operation of your service upon the street cars, this office could receive information of the habitual reckless driver, and upon investigating evidence thus given, withdraw the licenses, which such persons are unfit to hold. May we then ask for co-operation in the matter?"

The superintendents addressed have in general expressed their willingness to assist the State authorities in identifying the owners of automobiles who wantonly disregard the laws which govern the operation of motor vehicles.

Boston Elevated Railway Asks Permission to Carry Freight in Boston

The Boston (Mass.) Elevated Railway has petitioned the Mayor and City Council of Boston for permission to carry baggage, express matter and freight in Boston. The petition, which was sent to the Mayor by W. A. Bancroft, president of the company, follows:

"The Boston Elevated Railway respectfully represents that, as lessee of the West End Street Railway and the Old Colony Street Railway, it operates a street railway company in Boston and desires to become a common carrier of baggage, express matter and freight.

"Wherefore the Boston Elevated Railway respectfully petitions your honorable board to approve of its becoming a common carrier of newspapers, baggage, express matter and freight in Boston in, along and upon all streets and highways in Boston wherein is now located and maintained or may hereafter be located and maintained the street railway operated by it."

Car Tax in Reading.—Mayor Rick, of Reading, Pa., has signed the ordinance which imposes an annual license tax of \$10 on each street car operated in Reading.

Outing of Employees of Milwaukee Electric Railway & Light Company.—The fifth annual outing of the employees of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., was held at Waukesha Beach on Aug. 24, 1910.

Through Service Between Marion and Geneva, Ind.—The Marion, Bluffton & Eastern Traction Company, Bluffton, Ind., and the Bluffton, Geneva & Celina Traction Company, Bluffton, Ind., are arranging to operate through cars between Marion and Geneva.

Through Service Resumed Between Dallas and Denison.—The Denison & Sherman Railway, Denison, Tex., has resumed the operation of through cars between Denison and Dallas. Previously passengers riding between Dallas and Denison have been required to change cars at Sherman.

Campaign Against Transfer Abuse in St. Joseph.—The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., is conducting a vigorous campaign to prevent the abuse of transfer privileges by its patrons and to prevent newsboys and street urchins from trafficking in trans-

fers. One of the local papers at St. Joseph has joined issue with the company by refusing to sell papers to boys who are known to trade in transfers.

Preparing for Fair Traffic in Indiana.—The Indiana Union Traction Company, Anderson, Ind., is making special preparations for handling the traffic to the State fair at Indianapolis. The cars are all being overhauled and special schedules are being arranged to accommodate those who attend the fair. Some of the steam railroads are also planning to stop their way trains at crossings so as to pick up passengers, in competition with the electric railways.

Another Business Trip from Indianapolis.—The third trip by electric railway by members of the Indianapolis Trade Association was made recently with a view to still further increasing the influence of merchants in Indianapolis, Ind., with tradespeople and residents of the territory reached by the electric railways operating into Indianapolis. The party comprised more than 100 persons, and three special cars were used. The trip extended as far west as Paris, Ill. The night was spent by the members of the party in Terre Haute.

Suit to Test Jim Crow Law.—Suit has been brought against the Edwards Hotel & City Railroad, Jackson, Miss., to test the validity of the "Jim Crow" law of Mississippi. It is alleged that the company does not separate the races as prescribed by law, and that separate cars should be used, or if one car is used, then it should be partitioned so that the whites shall not be annoyed by coming into contact with the blacks or by having to endure other annoyances to which the petition says they are constantly subjected now on account of the uncleanness of the negroes.

Autos Supplement Electric Railway Service.—The Greenfield (Ind.) Auto-Traction Company has received two passenger automobiles, which are being operated on an hourly schedule between Greenfield and Maxwell, 9 miles distant, in connection with the Indianapolis, Newcastle & Toledo Electric Railway. The charge is 25 cents for the round trip. The purpose is to extend the service north to Hartsville, a distance of 13 miles, to connect with the lines of the Indiana Union Traction Company, and south to Fountain-town to connect with the lines of the Indianapolis & Cincinnati Traction Company.

Anti-Accident Notice.—The Kingston, Portsmouth & Catarauqui Electric Railway, Kingston, Ont., has carried the following sign in its cars for some time: "There's a Reason for Everything Except a Woman Getting off the Car Backwards; That's Foolishness." Hugh C. Nickle, superintendent of the company, says that this sign has done more good in the way of preventing the evil against which it is directed than all of the illustrated notices which the company has tried heretofore. Passengers have memorized it and visitors have spoken of the sign as being the best of the kind that they had seen to attract attention.

Proposal to Limit Car Capacity in Los Angeles.—The committee on legislation of the City Council of Los Angeles, Cal., has referred to the City Attorney the question of the advisability of the Council adopting a suggestion made by the Board of Public Utilities that the Council pass an ordinance limiting the number of persons that can stand on a street car to 25 per cent of the seating capacity. The proposal of the Board of Public Utilities would require street railways operating in Los Angeles to display a sign to that effect when the capacity of a car had been reached and would make it a misdemeanor for a passenger to board a car already carrying the limit of passengers prescribed in the ordinance.

Folder on the Berkshires.—The Berkshire Street Railway, Pittsfield, Mass., has issued a booklet giving a running story of the historical associations of various points along the route of the company. The folder contains views of Greylock, Stockbridge Bowl, "The House on the Stairs," Indian Monument at Stockbridge, and other Berkshire scenes. Authentic historical notes of interest are also given about important personages and incidents in the history of Berkshire County. The folder contains a map of the Berkshire region which shows the present and proposed lines of the company, including the Egremont line, the extension to the Connecticut line, the extension to Springfield

and the extension up Greylock Mountain, from which a particularly picturesque view is afforded of the surrounding country.

Wisconsin Commission Orders Stop on Interurban Line.—The Wisconsin Railroad Commission has ordered the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., to stop certain of its cars at the grounds of the Woodmont Country Club. The club had petitioned the commission for the concession, alleging that its members were compelled to walk nearly a mile from the station known as the county line to the club and that fully 5000 persons visited the club each season. The commission decided that, while it is not policy to order too many stops on interurban railways, this case was an exceptional one, and it was ordered that as soon as permission is secured of the Chicago & Northwestern Railway to cross its right of way and a suitable subway is constructed under its tracks cars of the interurban line of the company shall stop at the point where the line of the Milwaukee Electric Railway & Light Company crosses the property of the club.

Arbitration at Albany.—The board of arbitration which has been considering wages and terms for the service of the employees of the United Traction Company, Albany, N. Y., closed its hearings on Aug. 24, 1910, and has announced its decision. The present wages of the employees are 25 cents an hour, and time and a half for overtime. The men asked 30 cents an hour, with time and a half for overtime. The board has decided that a fair wage is 26 cents an hour, and time and a half for overtime, but has added a recommendation that the company shall petition the Legislature for authority to charge 1 cent additional for each transfer issued. If this should be granted the board recommends that the wages be increased to 27½ cents an hour, with time and a half for overtime. The arbitrators are Rev. Richard J. Nelson, Bishop of Albany; C. Gordon Reel, Kingston, who represented the company, and Joseph McLoughlin, Albany, who represented the employees.

Investigating Accident in Indiana.—The Railroad Commission of Indiana is investigating a collision which occurred on Aug. 14, 1910, between an Indianapolis-Warsaw flyer and a local car of the Indiana Union Traction Company, near Peru, Ind. Two passengers were seriously injured. The local car was running as an extra north toward Peru. Several passengers wanted to get off about 3 miles south of Peru. The trainmen ran past the stop and then backed to the place where the passengers wanted to get off. The Indianapolis-Warsaw flyer, which followed the local closely, was seen to be coming, and the motorman of the local started his car before the passengers alighted and threw them off. He hoped by starting his car promptly to give the motorman of the flyer time to control his train, but the flyer crashed into the rear end of the local before it could be brought to a stop and both cars were damaged. Had the motorman of the local not started his car when the flyer was discovered loss of life would probably have been caused by the collision which would undoubtedly have followed.

Hourly Limited Trains Very Successful in Massachusetts.—The Boston & Worcester Street Railway, South Framingham, Mass., is very well pleased with the results which have attended the operation by the company since June 1, 1910, of limited trains between Boston and Worcester once an hour. The company will continue the hourly limited as long as the traffic demands it and plans are being made to run more frequent limited trips between Boston and Worcester through the winter, making the trip from City Hall, Worcester, to Park Square, Boston, in 1 hour, 55 minutes. It is probable that four or six limited cars will leave either end of the line all through the winter. This summer is the first time that limited trips have been tried on an hourly basis. Up to this year the company operated cars on a 15-minute headway. Regular cars now run twice an hour and the limited cars once an hour. The limited cars stop only at Lake Junction, Lyman Street, Westboro; White's Corner, Framingham Center, Chestnut Hill, Brookline Village and Park Square, Boston. The schedule is so arranged that it does not interfere with the regular traffic of the company.

Personal Mention

Mr. J. H. Bliss has been elected president of the Chicago, Aurora & DeKalb Railroad, Aurora, Ill., to succeed Mr. J. C. Murphy.

Mr. Roy Clark has resigned as general foreman of the car shops of the Indianapolis, Crawfordsville & Western Traction Company, Indianapolis, Ind.

Mr. N. J. Hullin has been appointed general superintendent of the Sacramento Electric, Gas & Railway Company, Sacramento, Cal., to succeed Mr. G. W. Merrell, resigned.

Mr. Frank M. Lott has resigned as general foreman of the Ocean City (N. J.) Electric Railroad, to become general foreman of the repair shops of the West Penn Railways, Connellsville, Pa.

Mr. J. J. Haisch, who resigned recently as roadmaster of the Los Angeles-Pacific Company, Los Angeles, Cal., has been appointed superintendent of the Acton Rock Company, which is to operate a quarry at Acton, Cal.

Mr. John W. Andrews, a factory inspector in the employ of the New York State Labor Department, has been appointed an assistant inspector of electric railways by the Public Service Commission of the Second District of New York.

Mr. William Walker, assistant superintendent of the Milford, Attleboro & Woonsocket Street Railway, Interstate Consolidated Street Railway and the Attleboro Branch Railroad, Attleboro, Mass., has been appointed superintendent of these companies.

Mr. J. P. Alexander, whose resignation as purchasing agent of the Wheeling (W. Va.) Traction Company, after five years of continuous service, was mentioned in the *ELECTRIC RAILWAY JOURNAL* of Aug. 6, 1910, has accepted a position in the electrical engineering department of the General Electric Company at Pittsfield, Mass.

Mr. A. J. Winkle has been appointed auditor of the Sterling, Dixon & Eastern Electric Railway, and the Lee County Lighting Company, Sterling, Ill., to succeed Mr. Fred J. Maxwell, who has been appointed auditor of the Eastern Wisconsin Railway & Lighting Company, Fond du Lac, Wis., and the Wisconsin Electric Railway, Oshkosh, Wis.

Mr. H. J. Vance has been appointed general superintendent of the Chicago, Ottawa & Peoria Railway, La Salle, Ill., to succeed Mr. Joseph O'Hara, who has been appointed general manager of the Chicago, Aurora & DeKalb Railroad, Aurora, Ill. Mr. Vance was formerly connected with the operating and claim departments of the Illinois Traction Company, Peoria, Ill.

Mr. W. C. Wishart, formerly of the board of examiners of the Interstate Commerce Commission, has been appointed chief of the division of statistics and accounts of the New York Public Service Commission, Second District, to succeed Mr. William J. Meyers who, as announced elsewhere, has resigned to accept the appointment of statistician of the Interstate Commerce Commission.

Mr. Fred J. Maxwell, auditor of the Sterling, Dixon & Eastern Electric Railway and the Lee County Lighting Company, Sterling, Ill., has been appointed auditor of the Eastern Wisconsin Railway & Lighting Company, Fond du Lac, Wis., and of the Wisconsin Electric Railway, Oshkosh, Wis., the accounting departments of the companies having recently merged, the work to be taken care of at Fond du Lac. Mr. Maxwell has been connected with the Lee County Lighting Company for the last nine years, and for 2½ years he has held the position of auditor of the company.

Mr. M. S. Sloan has been appointed assistant to the president of the Birmingham Railway, Light & Power Company, Birmingham, Ala. Mr. Sloan became connected with the Birmingham Railway, Light & Power Company as chief engineer of the power station for the construction department of the General Electric Company, in July, 1906. In September, 1907, he was made superintendent of power of the Birmingham Railway, Light & Power Company, and in July, 1908, he was appointed superintendent of the business department of the company. On Dec. 22, 1909, Mr. Sloan was appointed superintendent of the lighting depart-

ment of the Birmingham Railway, Light & Power Company, and was recently advanced from this position to the office of assistant to the president of the company.

Mr. William J. Meyers, statistician of the New York Public Service Commission, Second District, has resigned to accept the position of statistician of the Interstate Commerce Commission, effective on Sept. 1, 1910. The bureau of statistics and accounts of the Interstate Commerce Commission is divided into two divisions, of which Mr. Meyers will be charged with the division of statistics. Mr. Meyers was appointed chief of the division of statistics and accounts of the New York commission upon its organization in 1907. Previous to that he had been for a long time chief assistant to the statistician of the Interstate Commerce Commission. He has taken a leading part in the compilation of uniform systems of accounts for public utility corporations, a work which has engaged the attention of accountants of companies and of United States and State commissions in conformity with recent laws.

Mr. Joseph O'Hara, general superintendent of the Chicago, Ottawa & Peoria Railway, La Salle, Ill., has been appointed general manager of the Chicago, Aurora & DeKalb Railroad, Aurora, Ill., the motive power of which has just been changed from steam to electricity, to succeed Mr. W. C. Cram, Jr., resigned. Mr. O'Hara served in various capacities with the Grand Rapids (Mich.) Railway for about five years, and was previously connected with the Pere Marquette Railway for two years, and as superintendent of the Eastern Ohio Traction Company, Cleveland, Ohio, for four years. Mr. O'Hara also was superintendent of transportation of the Aurora, Elgin & Chicago Railroad, Chicago, Ill., from August, 1903, to October, 1907, when he resigned to become superintendent of transportation of the Washington, Baltimore & Annapolis Electric Railway. Mr. O'Hara resigned from the Baltimore, Washington & Annapolis Electric Railway on June 1, 1908, and shortly thereafter became connected with the Illinois Valley Railway, which has been succeeded by the Chicago, Ottawa & Peoria Railway, La Salle, Ill.

Mr. H. Askin, who has been appointed general manager of the Bartlesville (Okla.) Interurban Railway, was educated in the public schools of Rahway, N. J., and in the high school at that place. He received his technical training in the laboratory of the United States Electric Company, Newark, N. J., supplementing his work with technical studies at night. When the United States Electric Company was absorbed by the Westinghouse Electric & Manufacturing Company, Mr. Askin became connected with the Westinghouse Electric & Manufacturing Company, and assisted in installing plants in different parts of the country. When the alternating current department of the Ft. Wayne Electric Company was organized, Mr. Askin entered the employ of that company, as an expert in installation work. Subsequently he became superintendent of the Reno Water, Land & Light Company, Reno, Nev., and continued in that capacity for eight years, when the property was sold. Mr. Askin then rebuilt the property of the Barnes Electric Light & Power Company, Maquoketa, Ia. After being connected with the Barnes Electric Light & Power Company for three years Mr. Askin changed the power system of the Atchison Railway, Light & Power Company, Atchison, Kan., from 133 cycles to 60 cycles for the General Electric Company. He was appointed superintendent of the Atchison Railway, Light & Power Company after completing this work. He resigned from the Atchison Railway, Light & Power Company to become general manager of the Bartlesville Interurban Railway.

OBITUARY

Charles T. Porter, one of the inventors of the Porter-Allen high-speed engine, died at his home in Montclair, N. J., on Aug. 29, 1910. Mr. Porter was born in 1825, and was graduated from Hamilton College in 1845. He began the practice of patent law but later abandoned the legal profession for that of mechanical engineer. In connection with Mr. John F. Allen he perfected the first high-speed steam engine, which revolutionized power-generating machinery. Mr. Porter received the John Fritz medal in 1909 for his work in advancing the knowledge of steam engineering and in improving steam engine construction.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

***Denver (Col.) Tramway Terminals Company**—Incorporated in Colorado in the interest of the Denver City Tramway to build a terminal for the Denver City Tramway. Two loop lines are being constructed. Capital stock, \$1,400,000.

***Millville, Tuckahoe & Ocean City Electric Transportation Company, Millville, N. J.**—Incorporated in New Jersey to build a freight and passenger electric railway between Millville and Ocean City. Capital stock, \$100,000.

***Tennessee Rapid Transit Company, Nashville, Tenn.**—Application for a charter has been made in Tennessee by this company to construct 110 miles of interurban electric railway to connect Nashville with Lewisburg, Springfield and Clarksville, Tenn., with an extension to Adairville, Ky. Capital stock, \$3,500,000. Incorporators: Robert L. Burch, Richard T. Wilson, Joe Frank, John M. Gray, and R. M. Wilson, all of Nashville, and J. Parks, Franklin.

***Cache County Amusement Company, Logan, Utah**—Incorporated in Utah to build an interurban railway through Cache County, Utah, to Preston, Idaho. Capital stock, \$100,000. Incorporators: Leo Nielson, Logan; F. J. Gustin, J. H. Garrett and Finlay Brooks, Salt Lake City.

FRANCHISES

Nettleton, Ark.—Preston Thatcher, of the Home Telephone Company, in the interests of a number of capitalists, has applied to the City Council for a franchise to build an electric railway in Nettleton. This is part of a plan to connect Nettleton and Jonesboro, a distance of 3 miles. [E. R. J., Aug. 27, '10.]

Oakland, Cal.—The Southern Pacific Company, San Francisco, has been granted a 50-year franchise by the City Council for an extension of the lines of the Central Pacific Company, a subsidiary corporation of the Southern Pacific, from their present Melrose terminus to Stanley Road, Elmhurst. This line forms part of the electric railway of the Southern Pacific Company in Oakland, Berkeley and the surrounding territory.

Quincy, Ill.—The St. Louis, Terre Haute & Quincy Interurban Railway has been granted an extension of its franchise for one year by the City Council to build a railway in Quincy. Edward Yates, Pittsfield, president. [E. R. J., May 23, '08.]

Fort Wayne, Ind.—The Fort Wayne & Toledo Electric Railway has applied to the commissioners for a new franchise to build an electric railway through Allen County. This proposed 42-mile railway will connect Fort Wayne and Maysville, Ind., and Hicksville, Bryan and Toledo, Ohio. R. T. Bastress, Harlan, general manager. [E. R. J., Sept. 23, '09.]

Cosmos, Minn.—The Electric Short Line Railroad, Minneapolis, has asked the Town Council for a franchise to build an electric railway in Cosmos. A similar franchise has been asked by this company to build a railway in Cedar Mills. Frank E. Reed, Glencoe, secretary. [E. R. J., Aug. 29, '08.]

Madison, N. J.—The Morris County Traction Company, Morristown, has asked the Common Council of Madison for a franchise to build a railway to connect Madison, N. J., with Pennsylvania across northern New Jersey via Chatham and Morristown. This company has been granted a franchise in Chatham.

Charlotte, N. C.—The Piedmont Traction Company, Gastonia, N. C., has asked the Board of Aldermen for a franchise to build a railway in Charlotte. This proposed 13-mile railway will connect Mount Holly, Charlotte and Gastonia. T. C. Lee is engineer in charge. [E. R. J., Jan. 29, '10.]

Charlotte, N. C.—The Charlotte Rapid Transit Company has asked the Board of Aldermen for a franchise to build a street railway in Charlotte. Cameron Morrison and Paul Chatham, Charlotte, are interested. [E. R. J., Aug. 27, '10.]

Stratford, Ont.—The Stratford Street Railway has been granted a 25-year franchise by the Council to build a railway in Stratford. Surveys have been made between Stratford and St. Mary's. [E. R. J., Aug. 6, '10.]

Welland, Ont.—C. J. Laughlin, Toronto, Ont., has been granted a franchise by the township of Crowland to build an electric railway from Welland to Welland Junction. [E. R. J., June 18, '10.]

Dallas, Tex.—George Works and associates have been granted a franchise by the Board of Municipal Commissioners to construct and operate a street railway on Ross Avenue and Henderson Avenue. This proposed line will connect at Garrett and Ross Avenues with the Dallas Consolidated Electric Street Railway and extend eastward 900 ft. over Ross Avenue to Henderson Avenue and north on Henderson Avenue 700 ft. to the city limits. [E. R. J., Aug. 13, '10.]

***Logan, Utah**—Leo Nielsen has asked the County Court for a franchise to build an electric railway to connect Wellsville, Hyrum, Paradise, Millville, Providence, Logan, Greenville, Hyde Park, Smithfield, Richmond and Lewiston.

Logan, Utah.—The Logan Rapid Transit Company has applied to the County Court for a franchise to build an electric railway in Logan City. This proposed railway will extend from the county boundary in Wellsville Canyon via Wellsville, Hyrum, Millville, Providence and River Heights to Logan, thence to Greenville, Hyde Park, Smithfield and Richmond to the state northern boundary. Ultimately this line will connect with the Ogden Rapid Transit Company into Ogden via Brigham City. David Eccles, president. [E. R. J., Feb. 5, '10.]

***Logan, Utah.**—The Cache County Amusement Company has been granted a 50-year franchise by the County Commissioners to build an electric railway through Cache County to Preston, Idaho. The terms of the franchise state that the company must begin construction before July 1, 1911, and that 10 miles of railway must be built during the first year.

Provo, Utah.—Abel J. Evans and associates have been granted a franchise by the County Commissioners to build an interurban railway through Utah County. The terms of the franchise state that the company shall elect within one year what streets and highways it will use and shall build 25 miles of road and have it in operation within three years. [E. R. J., Aug. 27, '10.]

Morgantown, W. Va.—The Morgantown & Dunkard Valley Railroad has accepted the franchise granted to it recently by the City Council to build an extension in Morgantown.

TRACK AND ROADWAY

Central California Traction Company, San Francisco, Cal.—This company, it is reported, will extend its tracks to make connections with the Oakland-Antioch Railway at Lodi and give through service to San Francisco Bay.

Athens Railway & Electric Company, Athens, Ga.—This company is building a new line around Lumpkin Street, Athens, to afford a ready means of access to the State College of Agriculture.

St. Louis & Eastern Traction Company, East St. Louis, Ill.—This company is securing right-of-way for its proposed railway from Granite City to Greenville via Collinsville, Troy, St. Jacob, Highland, Pierson and Pocahontas. A. W. Crawford, Hillsboro, is interested. [E. R. J., Aug. 13, '10.]

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.—This company is said to be considering plans to extend its Martinsville interurban line from Martinsville to Bloomington and ultimately to French Lick via Bedford, Mitchell, Orleans and Paoli.

Adel City Railway, Des Moines, Ia.—This company is said to have let the contracts for grading and bridge work to Railroad Contractor Kuhn, Omaha, Neb. This projected 20-mile interurban railway will connect Des Moines and Adel. F. F. Flynn is interested. [E. R. J., Nov. 27, '10.]

Red Oak & Northeastern Railway, Red Oak, Ia.—This company has secured most of the right-of-way for its proposed 110-mile interurban electric railway to connect Red Oak, Winterset, Greenfield and Des Moines. W. L. Sonntag, general manager. [E. R. J., July 16, '10.]

***Waterloo, Ia.**—H. R. Mosnat, Belle Plaine, Idaho, is promoting a double-track interurban railway from Waterloo to Keokuk, a distance of 175 miles, and two branches, one to connect Belle Plaine and Grinnell, and the other through Keystone, Vinton and Independence to Elkader.

Winnipeg (Man.) Electric Railway—This company expects to extend its railway in Winnipeg on Grey Street, Carter Street and Chalmer Street.

Metropolitan Street Railway, Kansas City, Mo.—Press reports state that this company is making preliminary plans for extending its Brooklyn Avenue, Indiana Avenue and Twenty-seventh Street lines in Kansas City. John M. Egan, president.

Springfield & Central Illinois Traction Company, St. Louis, Mo.—This company advises that as soon as the preliminary work is done it will begin construction on its proposed interurban railway to connect Springfield, Paronee, Morrisonville, Hillsboro, Coffern, Greenville, Carlyle, Centralia, Flora, Mt. Carmel, Edwardsville and East St. Louis. It will also furnish power for lighting headquarters, Security Building, St. Louis, Mo. Isaac A. Smith, Security Building, St. Louis, Mo., promoter. [E. R. J., July 30, '10.]

Corning & Painted Post Street Railway, Corning, N. Y.—This company, it is said, is considering plans for extending its line from its present terminus at the head of Bridge Street, Corning, to the new yards and shops of the New York Central & Hudson River Railroad at North Corning.

Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y.—This company has been authorized by the Public Service Commission of the Second District to exercise a franchise granted by the Common Council of Amsterdam permitting it to construct and operate a double track along East Main Street in Amsterdam and an extension of a single track line to the Eighth Ward.

Bennington & North Adams Street Railway, Hoosick Falls, N. Y.—This company states that the Fred T. Ley Company, Pittsfield, Mass., has just commenced the reconstruction of all the bridges on its lines. New abutments and piers will be put in to strengthen the bridges where necessary. Geo. E. Greene, superintendent.

Niagara Falls, Welland & Dunnville Electric Railway, St. Catharines, Ont.—F. E. Misener, Wainfleet, says that this company will have Roberts & Abbott, Cleveland, Ohio, make a report on the Niagara Falls, Welland & Dunnville Electric Railway, which is designed to provide service through the fruit belt of the Niagara peninsula.

Moose Jaw (Sask.) Electric Street Railway, Ltd.—This company advises that it has started construction on its proposed 7-mile railway in Moose Jaw. It has awarded the contract for rails to the Lorain Steel Company, Johnstown, Pa., and it is now placing orders for ties, rails, etc. The power house will contain 2 150-kw. d. c. generators, 500-600 volts, operated by Diesel oil engines. The car houses, repair shops and power house will be located on Manitoba Street near Fifth Avenue. It will operate 6 cars at the start. Capital stock authorized, \$400,000. Issued, \$200,000. Officers: A. A. Dion, 35 Spark Street, Ottawa, president; Newton J. Ker, vice-president; Douglas R. Street, secretary and treasurer; A. Hector Dion, P. O. Box 213, Moose Jaw, Sask., resident electrical engineer, and John B. McRae, Citizen Building, Ottawa, Ont., chief engineer. [E. R. J., Aug. 6, '10.]

Corpus Christi & Interurban Railway, Corpus Christi, Tex.—It is reported that this company is considering plans to extend its railway to the Epworth encampment grounds and south of Corpus Christi to the Alta Vista Hotel. V. S. Heinly, Corpus Christi, secretary.

***South Bend, Wash.**—J. B. Crary, Aberdeen, is reported to be promoting the construction of an electric railway to connect South Bend and Raymond.

Badger Railway & Light Company, Milwaukee, Wis.—This company, recently incorporated, advises that it is surveying and securing right of way for its proposed railway from Whitewater to Lake Geneva. Gustav Pickhardt is interested. [E. R. J., Aug. 13, '10.]

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—This company is considering plans for enlarging its waiting-room

at Sixth Street and Main Street, Los Angeles. The cost of the improvements is estimated to be about \$15,000.

Denver (Col.) Tramway Terminals Company.—This company has started the construction of a 2-story reinforced concrete car house, with street entrance to each floor and all tracks inclined to street level. An eight-story administration building, also of fireproof construction, adjoins the car house on the east and repair shops are immediately west. Mission style waiting rooms are also under way. William E. Fisher, architect.

Evansville & Southern Indiana Traction Company, Evansville, Ind.—Plans are being considered by the Murdock interests, which control the Evansville & Southern Indiana Traction Company, and other companies, to erect a terminal station at Lafayette, Ind., and to concentrate the offices of the several properties at that place.

Wahpeton-Breckenridge Street Railway, Breckenridge, Minn.—This company has completed the construction of its car houses in Breckenridge. F. L. Strum, Wahpeton, general manager. [E. R. J., March, '10.]

Nebraska Traction & Power Company, Omaha, Neb.—This company advises that during the next four weeks it will place contracts for constructing a new car house and repair shops. Arthur English, president.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company is said to have awarded the contract to P. Peterson, Council Bluffs, for the construction of its new car house, 100 ft. x 250 ft., to be located between Avenue B and Avenue C, on Twenty-eighth Street, in Omaha. The new building will replace the old structure and will be of reinforced concrete and steel construction. Estimated cost is \$18,000. [E. R. J., Aug. 27, '10.]

Rochester, Syracuse & Eastern Railroad, Syracuse, N. Y.—This company, it is said, has submitted plans for building a passenger station at Rochester, which will be practically fireproof. C. D. Beebe, Syracuse, general manager.

POWER HOUSES AND SUBSTATIONS

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.—This company has awarded the contract for building its new power house on Tenth Street and White River, Indianapolis, to the Bedford Stone & Construction Company. The structure will be in several sections, 160 ft. x 94 ft., 84 ft. x 193 ft. and 121 ft. x 77 ft., respectively. The smokestack will be 18 ft. in diameter and 278 ft. high. The plant will be equipped with automatic stokers. The estimated cost is \$280,000. [E. R. J., May 7, '10.]

Fort Dodge, Des Moines & Southern Railroad, Fort Dodge, Ia.—This company expects to build a substation, and it will purchase two substation outfits of 400-kw capacity from the Westinghouse Electric & Manufacturing Company. Frank Arnold, Boone, superintendent.

Mount Vernon Railway & Light Company, Mount Vernon, Ohio.—This company advises that it expects to place contracts during the next two weeks for motor generators, pumps, piping, heater, etc., for a new power house. The contract for turbines of 800-kw capacity has been let. A. J. Darrah, superintendent.

Nebraska Traction & Power Company, Omaha, Neb.—This company reports that it expects to place contracts during the next four weeks for building a new substation. Arthur English, president.

Grand Valley Railway, Brantford, Ont.—This company will place contracts during the next two weeks for building a substation at Paris, Ont., and for equipping an 8-mile, 40,000-volt, three-phase transmission line. It will also purchase two 300-kw generating sets. William P. Kellett, general manager.

Sarnia (Ont.) Street Railway.—This company states that it expects to purchase during the next few weeks a 350 to 500-kw generator. H. W. Mills, Sarnia, general manager.

Wilkes-Barre & Hazleton Railway, Hazleton, Pa.—This company reports that Kellogg & Company will build a brick chimney 9 ft. x 175 ft., for its power house. It has ordered Babcock & Willcox boilers, of 2000 hp., to be delivered in September. Thomas A. Wright, Wilkes-Barre, general manager.

Manufactures & Supplies

ROLLING STOCK

Lehigh Valley Transit Company, Allentown, Pa., has ordered four long-broom snow sweepers from the J. G. Brill Company.

Stockton Terminal & Eastern Railroad, Stockton, Cal., which is building a 28-mile line from Stockton to Jenny Lind, is planning to purchase 20 cars.

Wheeling, Cadiz & Tuscarawas Traction Company, Cadiz, Ohio, will purchase 10 cars for use on its line now being built from Uhrichsville, Ohio, to Wheeling, W. Va.

Birmingham Railway, Light & Power Company, Birmingham, Ala., has ordered, through Ford, Bacon & Davis, New York, N. Y., nine cars from the McGuire-Cummings Manufacturing Company.

Pittsburgh (Pa.) Railways has ordered 50 trucks of special design from the Standard Motor Truck Company, on which will be mounted the steel car bodies being built by the Standard Steel Car Company.

United Traction Company, Reading, Pa., noted in the ELECTRIC RAILWAY JOURNAL of Aug. 20, 1910, as being in the market for 10 cars, has placed an order with the J. G. Brill Company for 10 30-ft., 8-in., semi-convertible, pay-as-you-enter cars, mounted on Brill No. 39-E trucks.

Mahoning & Shenango Railway & Light Company, New Castle, Pa., reported in the ELECTRIC RAILWAY JOURNAL of Aug. 20, 1910, as having ordered six interurban cars from the Niles Car & Manufacturing Company, has specified the following details for these cars:

Seating capacity	56	Curtain material...	pantasote
Weight	26,000 lb.	Destination signs....	Hunter
Wheel base	6 ft. 4 in.	Fenders	pilots
Length of body...	39 ft. 5 1/4 in.	Gongs	pneumatic
Over vestibule...	49 ft. 5 1/4 in.	Hand brakes....	Lindstrom
Length over all...	50 ft. 9 1/4 in.	Heaters	Consol.
Width over all....	8 ft. 6 in.	Motors	West
Body	wood	Sanders	O. B.
Underframe	composite	Seats	H. & K.
Air brakes....	Westinghouse	Steps	Universal
Couplers	Tomlinson	Trucks	Stand. C-60

Forsyth No. 88

TRADE NOTES

David W. Pye has been elected president of the United States Light & Heating Company to succeed the late William H. Silverthorn.

Economy Oil Cup Company, Augusta, Ga., has appointed Thornton N. Motley & Company, 50 Church Street, New York City, as Eastern representative.

Indian Refining Company, Cincinnati, Ohio, announces that it has secured the services of Dalton Risley, who was formerly connected with the National Refining Company.

Railway Steel Spring Company, New York, N. Y., has elected W. H. Marshall, president of the American Locomotive Company, a director and a member of the executive committee.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., for the four months to Aug. 1, 1910, is said to have booked orders for between \$12,500,000 and \$13,000,000. The company has in its employ 19,000 persons, an increase of 2500 in the past three months.

Toledo-Massillon Bridge Company, Toledo, Ohio, announces that M. A. Beck, formerly chief engineer of the Pawling & Harnischfeger Company for a number of years, has allied himself with the Toledo-Massillon Bridge Company, in the capacity of consulting engineer and representative in the Milwaukee district.

Duncan McDonald and Thomas W. Casey, of the Pay-As-You-Enter Car Corporation, New York, N. Y., sailed for Europe on Aug. 31, 1910, on the *Maurtania*. While abroad they will attend the exposition at Brussels, where they plan to exhibit a pay-as-you-enter platform. Their European headquarters will be the Grand Hotel, Paris, France.

Wonham, Sanger & Bates, New York, N. Y., who are American agents for the H-B lifeguard, are constantly receiving evidence of the efficiency of this device from all parts of the world where it is in use. In a recent report, transmitted to the Bureau of Manufactures and printed in the daily consular and trade *Reports*, the American Consul at Belfast, Ireland, refers to the accident record of the Belfast Municipal Tramways for the past year as follows: "There have been two fatal accidents during the year. There would have been many others had it not been for the care and skill of the motormen, and the perfect way in which the Hudson & Bowring lifeguard acts. The ratio of fatalities to passengers was 1 in 23,173,795."

ADVERTISING LITERATURE

Chicago Bearing Metal Company, Chicago, Ill., has issued No. 3 of the *Graphose Age*, dated August, 1910. This publication is distributed semi-occasionally by the company to call attention to its products, among which are brass castings for steam and street railways and general machinery.

McGuire-Cummings Manufacturing Company, Chicago, Ill., has issued catalog No. 121 of snow plows and sweepers manufactured by it. Types of sweepers and plows as supplied to the Chicago & Milwaukee Electric Railroad, Peoria Railway Terminal Company, Gary & Interurban Railway and the Ft. Dodge, Des Moines & Southern Railroad are illustrated and described. The publication also contains a number of letters from users of McGuire-Cummings products.

The J. G. Brill Company, Philadelphia, Pa., in the *Brill Magazine* for August, publishes the twentieth in the series of articles describing the tramway system of some important city of the world with particular reference to the type of car which is used. Brussels, Belgium, is the city selected for the subject of the article in the current issue of the magazine. Among the other articles are: "Single-End Pay-As-You-Enter Cars for Wichita, Kan.," "Equipment for the Hawaiian Islands," "Cars for the Northern Ohio Traction & Light Company," "Prepayment Cars for Mexico," and "One-Man Pay-As-You-Enter Cars." The subject of the biographical sketch in the current issue is Preston S. Arkwright, president of the Georgia Railway & Electric Company, Atlanta. The cover contains a view taken at the Bourse, Brussels.

General Electric Company, Schenectady, N. Y., has recently issued Bulletins Nos. 4746, 4758, 4761, 4762 and 4764. In Bulletin No. 4746 is described a portable sub-station for the supply of intermittent power for electric roads, and to provide for a temporary supply of power in case of accidents at sub-stations equipped with only one rotary converter unit. Bulletin No. 4754 describes the company's continuous current and alternating current motors for use in steel mills, and similar places, in connection with cranes, hoists and other apparatus. In bulletin No. 4758, the mazda sign lamps are described. Bulletin No. 4761 on the type M control supersedes the company's previous bulletin on this subject. In Bulletin No. 4762, the Thomson polyphase watt-hour meters, made to measure energy in any two-phase, three-phase or monocyclic circuit, are described. In Bulletin No. 4764 a line of mazda compensator and low volt lamps is described.

MacGovern, Archer & Company, New York, N. Y., have issued their list of electrical and steam machinery, power house equipment, cars, etc., for September, 1910. They call attention particularly to 6 15-bench Jackson & Sharp cars, made by the American Car & Foundry Company, Wilmington, Del.; 15 10-bench Stephenson cars, 30 22-ft. body closed cars, 12 20-ft. body single truck closed cars with Diamond trucks, 10 18-ft. body single truck closed cars with Peckham trucks, and 20 semi-convertible interurban double truck cars made by the J. G. Brill Co. One of the 32-ft. closed cars is illustrated on the inside of the back cover. MacGovern, Archer Company also illustrate on the back cover a 750-kw. Stanley 60 cycle, 2400-volt, 90 r.p.m. (2 phase or 3 phase) generator, direct connected to 24-in. and 48-in. x 48-in. cross compound Corliss engine made by the Penn. Iron Works. There are also included in the list about 40 direct current 550 volt railway units for small roads.

TABLE OF MONTHLY EARNINGS.

Notice:—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. *Including taxes. †Deficit. ‡Includes dividend on preferred stock.

Company	Period	Gross In- come	Operat- ing Ex- penses	Gross Income Less Operat- ing Expenses	Deduc- tions From In- come	Net In- come	Company	Period	Gross In- come	Operat- ing Ex- penses	Gross Income Less Operat- ing Expenses	Deduc- tions From In- come	Net In- come
AKRON, O. Northern Ohio Tr. & Light Co.	1m., July '10	\$262,020	\$131,938	\$130,082	\$43,357	\$86,725	KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1m., June '10	\$617,264	\$373,655	\$243,609	\$185,432	\$58,176
	1 " " '09	227,012	115,650	111,361	43,391	67,970		1 " " '09	562,795	323,124	239,671	171,754	67,917
	7 " " '10	1,349,355	756,168	593,187	303,273	289,914		12 " " '10	7,178,441	4,153,250	3,025,191	1,911,535	1,113,656
	7 " " '09	1,200,954	669,016	531,938	306,711	225,227		12 " " '09	6,629,195	3,766,788	2,862,407	1,889,742	972,664
BANGOR, ME. Bangor Ry. & Elec. Co.	1m., June '10	45,707	21,990	23,717	13,071	10,646	LIMA, O. Western Ohio Ry.	1m., May '10	46,134	24,524	21,610	15,445	6,165
	1 " " '09	43,865	21,190	22,675	13,014	9,661		1 " " '09	40,011	21,510	18,501	15,394	3,107
	12 " " '10	555,937	243,968	311,969	157,279	154,690		11 " " '10	473,920	251,238	222,692	169,564	53,128
	12 " " '09	522,329	248,333	273,994	149,765	124,231		11 " " '09	419,699	231,464	188,235	167,947	20,288
BATON ROUGE, LA. Baton Rouge Elec. Co.	1m., June '10	8,942	5,824	3,118	1,945	1,173	MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1m., July '10	400,922	276,206	124,716	48,113	76,603
	1 " " '09	7,748	6,171	1,577	1,930	1,353		1 " " '09	361,915	229,692	132,223	42,339	86,884
	6 " " '10	52,083	33,823	18,260	.....	.....		7 " " '10	2,684,139	1,901,862	782,277	326,499	455,778
	6 " " '09	45,468	34,718	10,750	.....	.....		7 " " '09	2,400,421	1,586,947	813,473	326,689	486,784
BELLINGHAM, Wash. Whatcom Co. Ry. & Lt. Co.	1m., June '10	30,460	18,220	12,240	8,472	3,768	Milwaukee Lt., Ht. & Traction Co.	1m., July '10	171,332	66,647	104,685	55,775	48,910
	1 " " '09	30,605	18,039	12,566	8,085	4,481		7 " " '09	158,632	56,592	102,040	51,350	50,690
	6 " " '10	200,379	120,864	79,515	51,862	27,653		7 " " '10	913,825	362,919	550,906	387,929	162,977
	6 " " '09	189,029	111,192	77,837	50,096	27,741		7 " " '09	815,163	301,779	513,384	356,029	157,355
BINGHAMTON, N. Y. Binghamton St. Ry.	1m., June '10	31,869	16,692	15,177	9,784	5,393	MINNEAPOLIS, MINN. Twin City Rapid Transit Co.	1m., July '10	682,611	318,594	364,018	140,112	223,905
	1 " " '09	31,758	18,757	13,001	8,935	4,066		1 " " '09	640,094	277,571	362,523	140,251	222,273
	12 " " '10	348,786	200,253	148,533	108,428	40,105		7 " " '10	4,264,859	2,066,722	2,198,137	981,254	1,216,883
	12 " " '09	341,776	203,518	138,258	107,549	30,709		7 " " '09	3,980,160	1,900,053	1,990,107	968,009	1,022,009
CHICAGO, ILL. Aurora, Elgin & Chicago Railroad	1m., June '10	151,851	76,794	75,057	34,467	40,590	MONTREAL, CAN. Montreal St. Ry.	1m., July '10	3,898,847	215,224	183,623	69,250	114,372
	1 " " '09	142,568	71,332	71,236	28,981	42,225		1 " " '09	345,574	177,412	168,161	52,884	115,278
	12 " " '10	1,596,777	885,891	710,886	375,395	335,491		10 " " '10	3,490,646	2,021,516	1,469,130	446,854	1,022,277
	12 " " '09	1,458,998	796,127	662,871	337,776	325,095		10 " " '09	3,137,547	1,866,015	1,271,531	388,575	882,957
CLEVELAND, O. Cleveland, Paines- ville & Eastern R.R.	1m., July '10	41,880	*17,041	24,840	9,201	15,639	NASHVILLE, TENN. Nashville Ry. & Lt. Co.	1m., July '10	144,548	84,134	60,414	33,390	27,024
	1 " " '09	38,026	*16,249	21,777	8,324	13,453		1 " " '09	140,887	85,548	55,339	33,023	22,316
	7 " " '10	195,459	*96,156	99,303	61,999	37,304		7 " " '10	1,032,301	600,722	431,779	235,477	196,302
	7 " " '09	174,456	*88,004	86,452	58,492	27,959		7 " " '09	972,590	579,163	393,427	229,256	164,191
Lake Shore Electric Ry.	1m., July '10	132,032	*60,084	71,948	34,751	37,196	NEW ORLEANS, LA. New Orleans Ry. & Lt. Co.	1m., June '10	496,391	283,568	212,823	176,526	36,297
	1 " " '09	121,185	*55,650	65,534	33,786	31,748		1 " " '09	479,030	277,498	201,532	171,955	29,577
	7 " " '10	658,759	*358,782	299,978	243,362	56,616		6 " " '10	3,160,552	1,674,128	1,486,424	1,060,028	426,414
	7 " " '09	595,862	*334,027	261,835	240,436	21,399		6 " " '09	3,041,984	1,630,194	1,411,790	1,035,834	375,956
DALLAS, TEX. Dallas Electric Cor- poration.	1m., June '10	114,514	81,445	33,069	26,605	6,464	PHILADELPHIA, PA. American Railways Co.	1m., July '10	382,493	.....	.....	.....	.....
	1 " " '09	103,593	67,711	35,882	28,833	7,050		1 " " '09	348,491	.....	.....	.....	.....
	12 " " '10	1,394,814	906,477	488,337	323,780	164,557		.....	.....	.....	.....	.....	.....
	12 " " '09	1,245,732	786,143	459,589	342,819	116,771		.....	.....	.....	.....	.....	.....
DETROIT, MICH. Detroit United Ry.	1m., July '10	951,279	586,726	364,553	183,757	.....	PENSACOLA, FLA. Pensacola Electric Co.	1m., June '10	21,763	12,808	8,955	5,053	3,903
	1 " " '09	784,123	466,319	317,804	155,754	.....		12 " " '10	20,126	11,292	8,834	4,263	4,571
	7 " " '10	5,369,414	3,357,510	2,011,904	858,050	.....		12 " " '09	257,715	150,138	107,577	56,102	51,475
	7 " " '09	4,494,262	2,717,679	1,776,583	688,199	.....		.....	229,151	136,471	92,681	51,961	40,719
DULUTH, MINN. Duluth-Superior Trac. Co.	1m., July '10	103,532	52,994	50,538	119,934	30,595	PADUCAH, KY. Paducah Ry. & Lt. Co.	1m., June '10	19,740	11,685	8,055	6,989	1,065
	1 " " '09	91,658	47,536	44,122	118,417	25,705		12 " " '09	18,101	10,614	7,488	6,631	856
	7 " " '10	615,174	358,009	257,165	113,671	120,454		12 " " '10	238,066	143,301	94,766	82,012	12,753
	7 " " '09	544,149	327,285	216,864	112,917	87,947		12 " " '09	222,535	130,560	91,975	82,381	9,594
EAST ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., June '10	200,553	112,875	87,678	50,121	37,557	PLYMOUTH MASS. Brookton & Ply- mouth St. Ry. Co.	1m., June '10	10,418	7,485	2,934	1,760	1,174
	1 " " '09	164,887	93,604	71,283	49,522	21,761		1 " " '09	12,557	9,755	2,802	1,672	1,130
	6 " " '10	1,119,353	606,065	513,288	300,517	212,271		12 " " '10	125,089	91,010	34,078	21,007	13,071
	6 " " '09	957,216	547,356	409,860	297,371	112,489		12 " " '09	126,271	86,522	39,749	24,114	15,635
EL PASO, TEX. El Paso Elec. Co.	1m., June '10	45,224	27,409	17,815	8,195	9,620	PORTLAND, ORE. Portland Ry., Lt. & Power Co.	1m., July '10	490,724	205,731	284,993	148,154	136,839
	1 " " '09	47,075	27,701	19,375	7,943	11,432		1 " " '09	424,815	195,140	229,675	106,283	106,283
	12 " " '10	626,631	361,273	265,358	101,169	164,188		7 " " '10	3,136,336	1,335,498	1,800,838	944,927	855,911
	12 " " '09	557,317	372,033	185,284	91,267	94,017		7 " " '09	2,697,592	1,267,565	1,430,207	857,430	572,597
FAIRMONT, W. VA. Fairmont & Clarks- burg Trac. Co.	1m., July '10	57,488	19,042	38,446	12,610	25,836	ROCKFORD, ILL. Union Ry. Gas & Elec. Co.	1m., June '10	219,137	124,143	94,904	65,614	29,380
	1 " " '09	43,589	13,356	30,233	12,310	17,923		1 " " '09	205,894	106,519	99,375	64,154	35,221
	7 " " '10	327,264	119,909	207,355	87,905	119,450		6 " " '10	1,431,020	817,743	613,277	392,476	220,801
	7 " " '09	255,881	90,642	165,239	86,183	79,456		6 " " '09	1,347,801	684,822	662,979	338,426	279,550
FT. WAYNE, IND. Ft. Wayne & Wa- bash Valley Trac. Co.	1m., June '10	125,267	73,109	52,157	44,812	7,345	ST. JOSEPH, MO. St. Joseph Ry., Lt., Ht. & Power Co.	1m., July '10	90,928	46,689	44,239	22,874	21,365
	1 " " '09	115,981	70,688	45,293	43,110	2,183		1 " " '09	85,393	43,767	41,626	21,636	19,990
	6 " " '10	723,619	416,140	307,478	269,380	38,098		7 " " '10	584,942	320,590	264,352	157,417	106,935
	6 " " '09	648,655	390,835	257,820	249,046	8,773		7 " " '09	543,987	289,454	254,443	148,263	106,180
FORT WORTH, TEX. Northern Texas Elec. Co.	1m., June '10	120,964	64,701	56,263	20,162	36,101	SAN FRANCISCO, CAL. United Rail- roads.	1m., July '10	618,635	353,762	264,873	.....	.....
	1 " " '09	103,308	57,028	46,280	17,190	29,091		1 " " '09	621,753	356,225	265,528	.....	.....
	12 " " '10	1,350,515	729,163	621,352	215,216	406,136		7 " " '10	4,373,496	2,532,709	1,840,787	.....	.....
	12 " " '09	1,176,360	662,191	514,169	199,085	315,085		7 " " '09	4,190,658	2,441,558	1,749,100	.....	.....
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., June '10	109,083	67,027	42,056	17,729	24,327	SAVANNAH, GA. Savannah Elec. Co.	1m., June '10	53,610	35,596	18,014	18,008	7
	1 " " '09	105,803	57,806	47,997	21,418	26,578		1 " " '09	52,134	33,386	18,748	17,343	1,405
	12 " " '10	1,242,948	762,457	480,491	268,846	211,646		12 " " '10	611,836	398,959	212,877	212,444	433
	12 " " '09	1,155,391	664,337	491,054	251,832	239,223		12 " " '09	605,976	376,034	229,942	209,377	20,565
GRAND RAPIDS, MICH. Grand Rap- ids Ry. Co.	1m., June '10	99,952	47,677	52,275	19,745	32,520	SEATTLE, WASH. Seattle Electric Co.	1m., June '10	447,676	261,337	186,339	109,704	76,634
	1 " " '09	91,764	42,838	48,926	19,13								