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Atlantic City for the 1910 Convention

General satisfaction, we believe, will be expressed at the selection by the executive committee of the American Street & Interurban Railway Association of Atlantic City for the 1910 convention. Its merits are well known and it is undeniably the best location in this country, all things considered, for an electric railway convention. Atlantic City has an exhibit hall of ample size, it has good hotel accommodations and it is fairly easy of access. Moreover, the climatic conditions at Atlantic City, during the regular time for holding the convention in October, can reasonably be expected to be good. The principal objection to Atlantic City is that the hotels are rather scattered, and being spread along the boardwalk, some necessarily have to be at a distance from the exhibit hall. We do not mean, by reciting these advantages, to express the belief that Atlantic City should be selected as a permanent meeting place or even that the association should meet there whenever the conventions of the association are held in the East. Any other city with equal accommodations in the way of hotels, exhibit hall and meeting places should receive equal consideration, and if any can show better facilities in any of these respects on any subsequent year when the convention has to be held in the East, its claims should receive careful attention by the executive committee. But at least the question is settled for this year, and if the plan is followed next year of meeting in some place other than in the East no other Eastern city will have to be seriously considered until 1912.

A Picayune Strike

Strikes for more wages or union recognition are no novelty, but petty jealousies among microcephalic labor leaders can cause a strike, even when the more common reasons mentioned above are absent. This statement is borne out by the recent strike of some carmen of the United Traction Company, Albany, N. Y. This company operates in the towns of Albany, Troy, Cohoes, Watervliet, Rensselaer and the territory between them. The system is divided into operating divisions which correspond to the normal traffic conditions, but, of course, extraordinary attractions require radical changes in routing. This was exactly the condition which the company had to meet when a circus came to Albany on May 27. Several days in advance, new timetables were prepared whereby cars of the Rensselaer division would not stop at the usual Albany terminus, but would proceed over the tracks of the Albany division to the circus grounds. This temporary change was solely for the public convenience, since it avoided the transfer of large numbers of women and children especially. Instead of loyally aiding the company to carry out this sensible program for circus day, the employees of the Albany division deserted the cars, stating that they would never countenance any such invasion of "their" territory. It did not take many hours for these men and their sympathizers in Troy to learn that the public

was disgusted at their folly and ere the day was over their picayune strike came to an inglorious end.

The Chicago Receivership

The appointment of protective receivers for the Chicago Railways Company appears to have been the only course that was open for those who are responsible for the property. It is an unfortunate development in that it returns the old cloud of receivership to the detriment of the Chicago traction situation, but it in no way indicates a change in the business situation or in the power of the company to meet the obligations that were recognized when the reorganization was perfected. The principal concern of the public in the receivership was in the possible effect upon the rehabilitation which is now in progress but anxiety on this account was dissipated by the prompt statement on the part of all in authority that this work should be expedited. Assurance has been given to the holders of bonds of the Chicago Railways Company that interest on those securities will be met during the receivership. Apart from these two questions, the point about which interest is aroused is as to the consolidation of the Chicago Railways Company and the Chicago Consolidated Traction Company. The statement of Judge Grosscup, of the United States Circuit Court, who appointed the receivers in the present case and in whose court the Consolidated Traction receivers were also appointed, gives assurance that the merger of the two companies is now probable. Without a merger of the two properties or other speedy readjustment of the claims of owners of the Consolidated Traction bonds who conducted the litigation, the alternative is a continuation of the court proceedings, which would be a tedious process of reaching a final legal determination of the rights at issue.

Rates of Wages

It is sometimes instructive to compare the relative financial returns secured in different industries in the way of salaries or wages paid. This opportunity is afforded, so far as the ministerial and electric railway professions are concerned, by some recent statistics published by the census department of the United States Government. According to these figures the average minister of the Gospel in 1906 received an annual salary of $663, whereas the average electric railway wage earner, not including those who are termed salaried employees, earned in the same year $659. There are no complete statistics available since 1907 of the wages paid in what we might call each kind of industry, so that an exact comparison of the present incomes of both classes of workers cannot be made. We believe, however, judging from isolated reports and printed appeals, that during the past three years railway companies have been more liberal in the way of increased pay than congregations, and that if the statistics for 1910 were at hand it would be found that the average motorman and conductor is earning practically as much, if not more, salary than not only the average clergyman, but the average teacher as well. It is true that the average salary in the ministerial profession, as shown by the census report, applies to the entire country and that if only the cities "of the first class," as they are termed in the census report, are considered the average salary would be somewhat more, or to be exact, $1,223. But the same is true of the electric railway statistics and when the difference in time required in preliminary training to qualify for the work involved in each case is concerned we doubt whether the difference in monetary returns received in the two cases would be material. Finally, we are convinced that if the comparison should be carried further so as to include the most closely allied consideration to salary, that is, permanency of employment, the electric railway industry, so far as the trainmen are concerned, would be found superior to the Church.

INCREASING FREIGHT TRAFFIC

Electric railways are successful in competition with steam lines because they offer more frequent service from more accessible points. These favorable features are shared by both the freight and passenger departments. Within their limits of territory the electric railways are better prepared to pick up freight traffic than are the steam roads. Their stations usually are more accessible and the train service can generally be made more frequent without interruption of the passenger schedules. As to the ability of electric roads to transport goods and deliver them at destination points, these services depend on connections and interchange arrangements. It is a pleasure to note that the hostile attitude toward electric roads exhibited by some of the steam lines is steadily lessening and that the freight-handling facilities of the former are being regarded in the more welcome light of feeders by the steam roads.

Interchange arrangements are essential to the success of some properties, and while an electrically operated railway will draw to its service traffic which never before existed, it scarcely could be expected that this unique feature alone will originate sufficient traffic for the sustenance of a property. Like any other business, an electric railway, and especially one which handles freight, must lay comprehensive plans for getting traffic and must spend money to induce new business. The three principal ways to encourage traffic are (1) good service, (2) active solicitation and (3) attractive advertising. The former and latter ways will not be discussed here, but we should like to emphasize the need and value of personal solicitation of traffic for those roads prepared to handle all classes of freight.

Two electric railway systems of central Iowa furnish excellent examples of the results that may be accomplished by intensive traffic solicitation. These are the Inter-Urban Railway, of Des Moines, and the Fort Dodge, Des Moines & Southern Railroad. The former was built primarily as an electric line in competition with steam roads and the latter is an electrified steam road. Each has its main terminus at Des Moines and neither is in competition with the other, but both have to meet steam competition. The plans for encouraging traffic followed by both roads are similar and have been successful or this comment would not be made.

All classes of traffic are solicited for shipment to any destination over connecting steam lines. Steam railroad methods are used by steam railroad men now interested in electric service, and though the fundamental plan of operation is not new, its application requires pioneer work. Because of the strong steam railroad competition the solicitors of the electric roads find it profitable to argue that on account of their interchange arrangements with several steam trunk lines the shipper has available more open markets by delivering his freight first to the electric road than by shipping on a steam road which would favor a final destination on its own system. The rates to a

shipper from a point of intersection of steam and electric lines are the same and business for the electric roads is only obtainable by more frequent service, better shipping accommodations and more aggressive solicitation.

The principal bulk of traffic in the central Iowa territory is coal, grain stock and clay products, but other revenue-producing business is not neglected and each of the electric roads has been successful in locating on its lines industries which are originators of regular shipments. While the amount of passenger business that can be had is limited it is held that there is no limit, comparatively speaking, to the freight development if the road can offer suitable locations for industrial concerns. One of the two roads mentioned has located 15 grain elevators on one of its divisions. The other road has been the means of encouraging two grain buyers and five elevator companies to establish headquarters on its interurban line since November of last year. On this same interurban division the traffic department has also succeeded in inducing local capital to build two new factories, and three other manufacturing plants have been encouraged to move to locations along the electric line. Other traffic producers which have been located along this electric line are a country club of 500 members, a State military encampment grounds and the winter home of a large circus. The latter sources of traffic, however, are largely of benefit to the passenger department.

Live stock is often considered not to constitute an ideal kind of traffic, but if a road wishes to succeed it must make every mile of its track produce some freight business, so both of the interurban lines operating out of Des Moines offer excellent facilities at all way stations for the collection and shipment of livestock. One of the traffic men of the interurban railway annually visits every farmer and stock raiser within 5 miles of the line. Thus he learns where the stock is, when it is going to move and has an opportunity personally to solicit the shipment for his road. These shipments average 15 carloads of stock per week, sent from some points on the Inter-Urban line to Chicago. Both of the electric roads serving Des Moines are interested in handling mail to the country towns, not alone from the revenue standpoint, but also, and principally, because it is a means toward improving the towns and making it possible for business along the route to be conducted more promptly.

Steam railroad methods have been applied wherever possible. The accounting methods of the traffic departments of both roads are founded on steam railroad principles and use the general types of blank forms. Both roads are interstate carriers and operate under the regulations of the American Railway Association and the Freight Claims Association. The steam railroad methods of investigating freight claims are followed, particular care being taken to give prompt attention to the settlement of claims. In this way the smaller electric roads have the advantage of the large steam railroad systems and they can frequently gain the dissatisfied customer of their competitor.

These two railroads do not have track or equipment which is better than that of many other roads similarly situated. They have, however, given the subject of traffic up-building a thorough study and only by aggressively applying their best efforts toward inducing new business have they succeeded in bringing about a continued growth in the community and of their own gross receipts.

ANNUAL REPORT OF THE PUBLIC SERVICE CORPORATION

Although the Public Service Corporation of New Jersey began its business operations in 1903, its first annual report was not issued until this year. The information presented in the report relates therefore to the results of operations in the last fiscal year and in the preceding years, when the property was undergoing preparation for the present standard of service and earnings.

Under the comprehensive plan of organization which has been developed, the corporation now operates directly only the electric lighting and power properties, while the railway system and the gas properties are operated respectively by the Public Service Railway Company and the Public Service Gas Company. The three classes of business are further subdivided into divisions and a detailed comparison of the gross revenue by divisions in 1908 and 1909 indicates the districts where the greatest development in each utility occurred.

The relative importance of the various classes of utilities operated is shown by the fact that in 1909 the railway system contributed 45.6 per cent of the total gross revenue, the gas company 29.6 per cent and the corporation 19.3 per cent from operation and 5.5 per cent from miscellaneous sources. The proportion secured by the railway has been getting smaller. During the seven months ended Dec. 31, 1903, the first fiscal period of operation, the railway furnished 47.3 per cent of the total gross.

Only one total for operating expenses and taxes is given in the report so that no analysis of the costs of operation can be made. Gross earnings and miscellaneous income aggregated $26,560,451, and operating expenses and taxes were 50.2 per cent of this sum or $13,331,228. It appears that the corporation and its controlled companies paid in taxes in 1909 a total of $1,225,583 and the deduction of this amount indicates net operating expenses of 45.6 per cent of the gross. The aggregate sum paid last year for bond interest and rentals of leased and controlled lines and for fixed charges of the Public Service Corporation was $11,800,775, equivalent to 44.4 per cent of the gross earnings and miscellaneous income.

In the development of the property large additions were made to the capital investment from June 1, 1903, to Dec. 31, 1909, divided as follows: Railway, $20,004,341; corporation, $7,073,247; gas company, $8,772,907; total, $35,850,495.

The president's report discusses many details of the company's operation, and among them none is perhaps of more interest than the experience recounted in regard to fire protection. The improvements introduced in this department have effected a material saving in insurance costs for the company. According to Mr. McCarter, the amount of insurance in force on July 1, 1903, was $9,455,000, with an annual premium of $122,400, while the total now carried is $20,273,000 at an annual premium of $122,909, that is to say, the amount of protection has been more than doubled with substantially the same premium. The investment for improvements which was a necessary antecedent of so notable a reduction in insurance rates as this change implies is given as approximately $200,000. At 5 per cent this indicates an addition to fixed charges of $10,000 annually. Mr. McCarter adds that he expects additional substantial economies will be obtained in the near future, either through the further lowering of rates by the insurance companies, or by the establishment of a self-insurance fund.

PROGRESS IN CATENARY CONSTRUCTION.

The paper on "Electric Railway Catenary Trolley Construction," contributed by W. N. Smith, before the American Institute of Electrical Engineers on May 27 is a valuable engineering summary of the principal types of this construction and their merits under certain conditions. Since the first catenary installation made in this country about six years ago, there has been such a remarkable development that sometimes it seems as if new designs were invented before the earlier ones are given a reasonable time to show their merits. We are inclined to believe that designers of catenary systems in their desire to make a novel construction absolutely perfect, have gone further than necessary to make the apparatus self-adjustable for all conditions. This applies particularly to hangers, which not only show a remarkable range from the simple to the complex in their make-up, but also vary greatly in the length and number specified for the same spans.

In comparing bow pantographs and wheels for current collection, Mr. Smith says that the drawback of the former is its sluggishness in responding to irregularities in the height of the trolley wire. This objection holds true where the bow is carried directly on the main frame in which event the neglect to respond immediately even to minor variations is likely to cause sparking and burning of the wire and collector; it does not apply, however, where the collector is mounted on a light auxiliary structure which takes care at once of any minor movements, while the main frame is raised to care for the larger changes in clearance, due to bridges, tunnels, etc. It is very interesting to note the author's experience that the staggering of the trolley wire is not necessarily inevitable where bow collectors are used. The fact is that the average interurban car does all the "staggering" necessary to prevent the sawing through of the collector at any one point. Even the more rigid conditions involved in steam operation would seem to indicate that staggering of the contact wire is quite needless. After all, the roller pantograph appears to be a good all-round solution of the current collection problem. It has certainly demonstrated its worth, both on the Valtellina line in Italy and the California interurban line mentioned by Mr. Smith.

The mooted question of regulating the tension of the overhead wires of catenary systems is made the subject of interesting comparisons between European and American practice, On such lines as that of the Heysham, Morecambe, Lancaster division of the Midland Railway in England, the contact wire is run in lengths of 2400 ft. to 3000 ft., anchored at one end, while the other is attached to poles carrying a weight of about 1200 lb. The train always enters at the fixed end of a section and leaves at the weighted end so that the collector bow tends to strengthen the wire. Mr. Smith believes that without the upwardly yielding hangers used on foreign lines it would be necessary to maintain a minimum tension of at least 2000 lb. and that the only excuse for maintaining a lower tension is the ability of the trolley wire to yield at the hangers. Such hangers are not employed in this country where it has been found that by using phono-electric, copper-clad or steel wire for the trolley, tensions up to 5000 lb. can be cared for without automatic devices. It might not be economically desirable to use a low conductivity wire on low voltage lines, but there appears to be no objection to its use on a high voltage line. Judging from the experience of the New Haven Railroad with steel contact wires, little trouble need be expected from arcing at the current collectors. Lack of space forbids consideration of other points brought up by Mr. Smith, but his paper leads the reader to the general conclusion that the main problems of catenary work are being effectively solved. It is worth noting, too, that despite the fact that so much catenary work is being done abroad, the American engineers are not slavishly following foreign designs, but have originated many features to reduce the complications and make the line automatic throughout.

SUBSTATION DESIGN AND OPERATION.

So long as direct-current motors are used on long electric railway lines, and that is likely to be for a considerable time, the question of substation design and operation is one of fundamental importance. In modern railway plants the rotary converter is generally the backbone of the system and on the successful and economical operation in substations with rotaries the economy of the power supply directly depends. The substation motor presents itself in two aspects. First, in the very large railway systems there are substations of great output coupled with relatively short transmission lines. Power is generated in polyphase machines and practically the whole working load of the system is passed out to the working conductors through the rotaries. In the second place, on the longer electric lines distribution is similarly accomplished, but with the difference that the transmission lines are relatively long, and the substations of moderate capacity usually suffer from too low load factor. We recently published a discussion of the conditions in some of these substations of the latter class and suggested the necessity of certain economies in their operation. Additional figures on cost of operation on the Boston & Worcester and Third Avenue railroads are presented in another column. As substations increase in output and improve in load factor the cost of operation per unit converted naturally grows less, but on the other hand, the fixed charges for real estate are apt to be greater because a large substation usually implies a large city and higher prices for ground. Hence a reduction in the cost of conversion is of importance to both the large and the small road. In seeking a way to better conditions it is practically necessary to do so outside of the efficiency of the rotaries themselves because that is usually so good that it cannot be materially improved save by increasing the load factor.

The most material improvement which has been made recently is in the development of some of specially compact types of high-output rotary converters, such as are beginning to find their way into the service of the larger railway systems. The labor costs of a substation do not vary greatly with its output. The same staff required for two or three small rotaries can equally well handle two or three big ones with a proportionate reduction in the operating charge against the output. Recently converters of 2,000 kw or 3,000 kw have become fairly common, machines costing less per unit of output and occupying far less space per unit than the small rotaries in more general use. By using such big machines it is quite within bounds to say that the operating expense per unit can be almost cut in halves. As to the fixed charges the situation, while less favorable, is encouraging. In city work for which alone these great substations are easily applicable the cost of real estate is a very serious matter. This cost can be very greatly reduced by the employment of larger converting units. There is no reason, indeed, why several units may not be

superimposed in successive stories if land chances to be exceedingly valuable, and it is altogether certain that the cost of space for the substation can thus be kept far below anything now usual. Furthermore, upon the whole the big units perform rather better at low loads than do the small ones at relatively low loads and for a given load factor yield somewhat more economical results. The main thing to be considered in such substation buildings is, of course, the value of the real estate, but the mere fact of low cost per kilowatt output gained by increase in the size of the machines is also a factor not to be neglected in the costs. It would be an extremely valuable exhibit from the standpoint of costs to collect data from some of the most recent substations, using the big rotaries, to which we have referred. Not only are the costs important to ascertain in themselves, but they also have a very important bearing on the development of alternating-current traction. If the transmission and transformation charges rise beyond a certain amount, the balance swings in favor of a.c. at the motors. Every reduction of cost in the transmission and transformation on the other hand increases the economic value of the system at present employed. The transformation balance sheet, therefor, is daily growing in importance and recent improvements in practice should be followed up with the closest attention.

PROFIT IN PARK OPERATION

During the last few years there has been some change in the general sentiment in regard to the profit to be derived from the transportation of passengers to street railway parks. We can hardly say that there has been a similar change in regard to the operation of the parks themselves, because few railway managers have ever been able to derive a profit directly from a park. They have been content if it paid its operating expenses. The decrease in enthusiasm as to the profits from riders to parks is not due to the fact that people have no desire for outdoor entertainment and will no longer patronize trolley parks. It is because of the increased cost of conducting transportation on most city systems which has reduced to almost nothing the profit on a long-haul 5-cent ride. Park traffic is chiefly one-way travel with heavy peaks, requiring more or less extra equipment and crews to be available during the summer months. The outbound cars in the afternoon and early evening return practically empty and usually make one or more round trips without taking in enough in fares to pay the cost of power. Under the most favorable conditions it is difficult to-day for some companies to make money on a 5-cent fare. They cannot afford to continue encouraging park traffic if it is carried at a loss.

There are some ideally located parks, of course, which are and will continue to be sources of profit to the railway companies owning them because a fare high enough to yield a reasonable return can be charged without affecting the patronage. Big Island Park, 20 miles out of Mineapolis, is an example of a successful summer resort to which people flock in large numbers despite a round-trip fare of 50 cents. Union Park, near Dubuque, Ia., is another resort near a small city which has been developed into a profitable venture. The situation of the park at the head of a gorge, about 5 miles from the center of the city, is such that it is accessible only by the street cars. A round-trip fare of 15 cents is charged by the company. In this instance also the transportation revenue is sufficient to show a balance on the right side of the ledger, but it is doubtful if any profit could be made with a straight 5-cent fare out and back. The temptation in promoting traffic too often is to get the business without counting the cost of handling it. The cost of handling park traffic should not be overshadowed by the prospects of the season's revenue from this source.

IMPROVING TELEPHONE DISCIPLINE

Better telephone discipline may be difficult of attainment, but surely it is worth striving for. Since the safety of train operation is entrusted to a railway telephone circuit the use of the instruments employed in this service should be restricted absolutely to those who, as a matter of duty, are interested in train movement. Safety is the most important object sought in successful train operation and should not be sacrificed for economy. When the use of telephone line is limited in the way mentioned, a certain respect is attached to the messages transmitted and the tendency for small talk and discussion which weaken discipline is counteracted. Some electric railways may justly be criticised for laxity in allowing trainmen to talk upon all sorts of subjects over the dispatching wire.

When the telephone was first proposed for use in handling steam railroad trains the fear was expressed that a train order transmitted by word of mouth would not command the respect necessary for good service. That criticism has largely been overthrown by two means: First, the heads of the transportation departments have enforced rules forbidding the use of the telephone except for necessary railway business, and, second, a type of telephone equipment with selectors has been installed and is so arranged that the dispatching office is the center of authority as to those who are permitted to use the telephone at any time. A railway has the best available means for transmitting its messages when it has separate lines for commercial and train-operating departments, and when the telephone stations are equipped with some type of selector or cut-out so that only those instruments which are in use are bridged across the wires at any one time. Not all roads can afford to remodel their telephone systems or install separate lines, but no road can afford not to instill into the users of its telephones the idea that small talk on an operating line is worse than a waste of time; it not only prevents someone else from getting in touch with the dispatcher, but it breaks down the wall of respect which should surround a dispatching office. A means for preventing the growth of the practice of indulging in idle conversation over dispatching wires can be provided by furnishing the manager or superintendent with a telephone instrument which is always connected with the operating wires. A rather complete system of branch-office telephones recently was installed in the general office of a new high-speed interurban railway. In addition to the regular office equipment the general manager had a switch placed close to his desk so that he could connect his telephone directly with the dispatching wire over a pair of leads which did not pass through the office switchboard. This permitted him at any time to learn what was said over the wire. We are not acquainted with the exact results accomplished in this instance, but such a means for frequently listening to the business carried on over the dispatcher's wire should assist in enforcing a better attitude on the part of those responsible for the safe movement of traffic.

ROLLING STOCK MAINTENANCE ORGANIZATION OF THE MASSACHUSETTS ELECTRIC COMPANIES

The system of the Massachusetts Electric Companies includes the lines of the Boston & Northern Street Railway and the Old Colony Street Railway, extending from Nashua, N. H., on the north to Newport, R. I., on the south, and comprising about 1000 miles of track. The executive offices of the combined systems are located at 84 State Street, Boston. As a result of the consolidation of numerous systems of varying size and strength and diversified administrative practice, the organization illustrates the benefits of centralized control for a wide operating area. These advantages have been realized by the public in improved service, reduced rates and greater financial stability.

In no department have the advantages of a single administration been more apparent than in the maintenance of equipment. Associated with this work has been the development of an organization for the care of rolling stock. With nearly 50 operating car houses scattered over the system and about 30 storage car houses on the company's list, the successful administration of equipment repairs and inspection requires a comprehensive division and location of responsibility. All rolling stock and shop maintenance on the lines north and south of Boston is handled by the equipment department, whose head, with the title of superintendent of equipment, maintains offices at the headquarters in Boston, reporting to the superintendent of motive power and machinery.

The diagram on the opposite page shows the general organization of the equipment department. At the Boston headquarters the superintendent of equipment has an office force consisting of a clerical staff headed by a chief clerk, an assistant engineer with a testing force, drafting force, and an inspector of equipment. The Boston & Northern lines are divided into two divisions with maintenance headquarters at Chelsea and Lowell, Mass., and the Old Colony lines are similarly sectionalized, with headquarters at Campello (Brockton) and Fall River, Mass. At Chelsea and at Campello quarters are provided for a superintendent of car repairs. One of these officers is scheduled for the lines north and the other for the lines south. Reporting directly to the superintendent of equipment, the incumbents of these two positions will be able, when the plans of the department are further advanced, to relieve the Boston office of much investigation and scrutiny of routine matters.

Immediately responsible for the maintenance and condition of the rolling stock and shops on the two systems are four general foremen, having quarters at Chelsea, Lowell, Campello and Fall River. Under these officials are clerical forces, inspecting staffs and foremen of individual car houses. The greater portion of all routine business centers upon the general foremen, who are in immediate control of the shop practice at their respective headquarters as well as of the management of the numerous car house maintenance and inspection forces scattered over the systems. Minor shops are directly under the general foremen, but the storage car houses are placed under the subordinate jurisdiction of the nearest car house foremen. In general, only summaries of routine matters are forwarded to Boston from the general foremen's offices, but the latter are in constant touch with the head of the department, and in many exceptional cases the most minute details concerning questions at issue are furnished the officer in charge of the entire work. All the operating centers of the systems are connected by a private telephone service, and in addition many important points are provided with the regular service of the New England Telephone & Telegraph Company.

MONTHLY STATEMENT OF CRIPPLED CARS FOR JULY, 1909

	Car-miles per car pulled in—				
	1909.	1908.	1907.	1906.	Principal troubles.
Essex	23,745	5,675	3,003	2,530	Scattered
Maplewood	21,252	3,497	2,469	6,212	Scattered
Nashua	19,908	4,997	6,616	1,300	
Myrtle St.	19,281	6,303	13,485	4,060	Scattered
Byfield	16,196	8,232	4,383	....	Scattered
Gloucester	10,209	3,064	2,171	4,560	Scattered
New Port.	8,180	1,567	12,805	1,180	Armatures
Campello	8,069	3,699	3,887	3,700	Brakes, controllers, armatures
Quincy	7,721	5,919	7,608	3,040	Controllers, brakes and rigging
Westwood	6,801	4,592	5,184	2,415	Scattered
Reading	6,405	1,354	1,410	2,820	Scattered
Hyde Park	5,543	5,803	35,195	2,360	Armatures
Fall River	5,424	4,119	2,211	1,690	Armatures, brush-holders
Danvers	4,968	8,011	3,761	1,850	Armatures, brakes
N. Abington	4,585	2,394	1,570	1,150	Brakes and rigging
Lakeville	4,566	3,559	3,359	1,660	Air brakes, leads
Taunton	4,091	2,731	803	1,180	Brakes, air brakes, armatures
Haverhill	3,763	2,112	1,733	1,210	Armatures, brakes, trolleys
Washing'n Av	3,580	3,306	3,524	4,850	Armatures
Melrose	3,427	3,645	2,050	2,010	Miscellaneous, motors and controllers
Wyoma	3,404	5,484	2,018	1,150	Fields
E. Weymouth	3,363	2,208	2,738	1,685	Controllers, brakes and rig., trolley
Webb St.	3,210	2,327	3,463	1,250	Armatures, brush-holders
Wakefield	2,973	1,783	1,308	2,080	Armatures
Woburn	2,859	2,705	3,093	1,820	Controllers, armatures
Broadway	2,597	2,189	4,475	1,570	Armatures, leads, brush holders
Lawrence	2,489	3,113	2,021	1,780	Brakes and rigging
Lowell	2,310	2,527	2,426	2,540	Controllers, armatures, brakes
W. Lynn	1,506	3,274	2,036	3,330	Armatures, fields, brush-holders
Div. 1, O. C.	5,974	3,672	3,766	2,480	Brakes, armatures, controllers
Div. 2, O. C.	5,108	2,660	1,532	1,440	Armatures, air brakes
Div. 1, B. & N.	3,178	2,741	2,510	2,190	Armatures, fields, brush-holders
Div. 2, B. & N.	2,864	2,724	2,369	1,840	Brakes, armatures, controllers

Old Colony Street Railway Company, Division No. 1:
109 defective cars. Average mileage, 5,974 (July, 1908—3,672).
Previous months—5,863, 4,857, 7,208.

Old Colony Street Railway Company, Division No. 2:
83 defective cars. Average mileage, 5,108 (July, 1908—2,660).
Previous months—5,162, 3,959, 3,973.

Boston & Northern Street Railway Company, Division No. 1:
334 defective cars. Average mileage, 3,178 (July, 1908—2,741).
Previous months—2,436, 1,994, 1,713.

Boston & Northern Street Railway Company, Division No. 2:
238 defective cars. Average mileage, 2,864 (July, 1908—2,724).
Previous months—2,616, 2,556, 2,538.

On each system one afternoon per month is devoted to a meeting of car house foremen, their superiors and the superintendent of equipment, in which a general subject of interest is discussed, followed by an analysis of experiences. These meetings have been productive of great good, and aside from the information and instruction offered, have improved the friendly relations existing between the subordinate employees of each system.

Form C 83. 2-10-1m. A. T. H.

STREET RAILWAY COMPANY

REPORT OF DEFECTIVE CARS REMOVED FROM LINES FOR ..... ENDING .....

	Car Body									Trucks							Motors & Controllers									Trolley & Wiring				Total	
Car House	SEATS	STEPS AND RUNNING BOARDS	REGISTERS	WINDOWS	CURTAINS	GRAB HANDLES	FENDERS	SAND BOXES	HEATERS	MISCELLANEOUS	BRAKES AND RIGGING	AIR BRAKE EQUIPMENT	HOT JOURNALS	FRAMES AND SPRINGS	WHEEL DEFECTS	AXLES	MISCELLANEOUS	CONTROLLERS	ARMATURES	FIELDS	BRUSH HOLDERS	GEARING AND CASES	OVERHEAD SWITCHES OR CIRCUIT BREAKERS	BEARINGS	LIGHTNING	MISCELLANEOUS	TROLLEYS	LEADS AND CABLES	LAMPS AND WIRING	RESISTANCE	MISCELLANEOUS	FALSE	OPERATING AND INSPECTION	

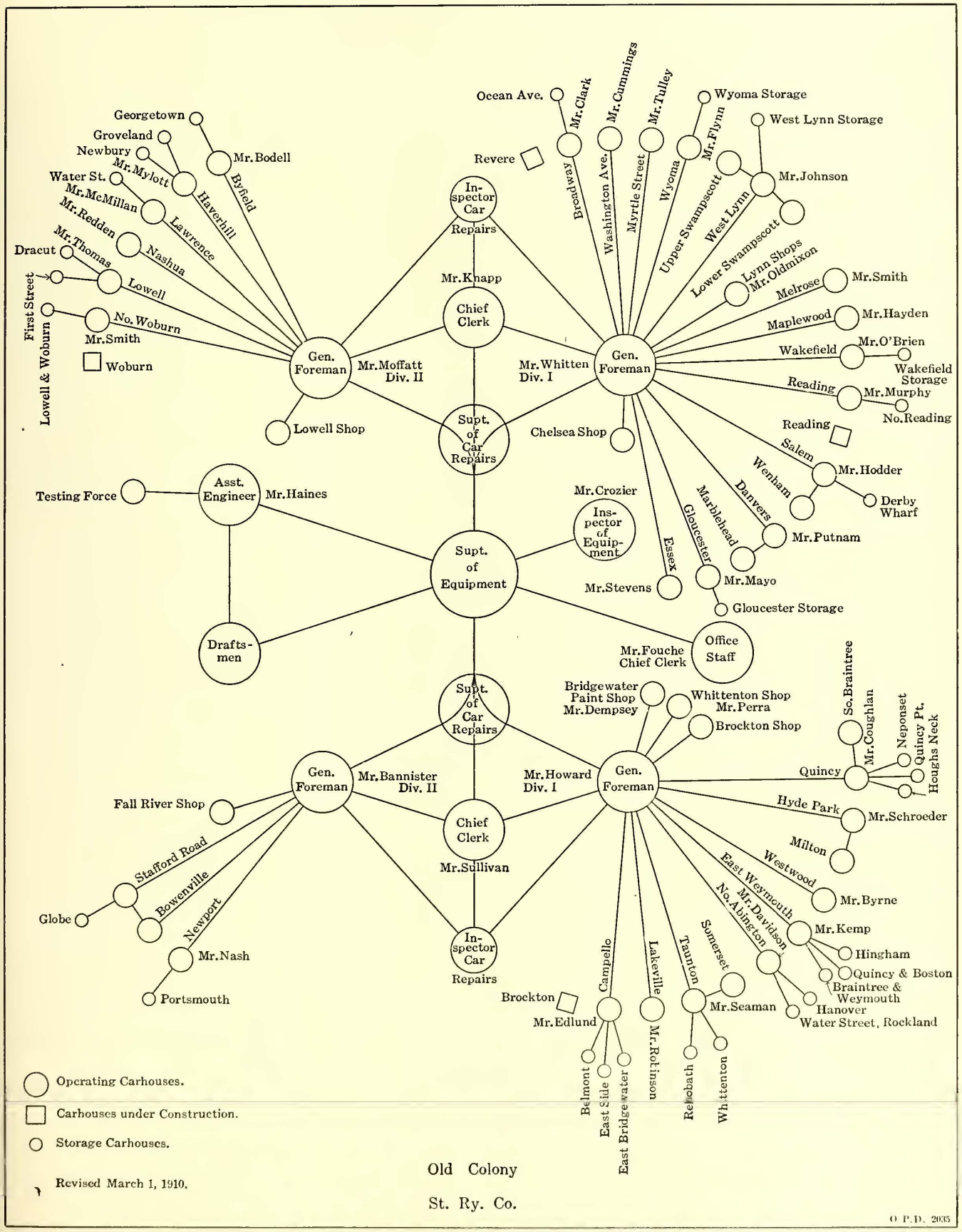
Massachusetts Electric Companies—Report of Defective Cars Removed from Service

STANDARDIZATION OF FORMS

In order to avoid confusion in an organization of such scope it is necessary to make use of a number of printed forms relating to internal business. The forms have been standardized with the object of avoiding complications and providing the necessary detailed information with a minimum expenditure of time and thought. The forms in use, some of which are illustrated herewith, are those pertaining to the work of the car

house, the shop and general foremen's offices and the records of the Boston office.

At all car houses a daily log book is kept with duplicate sheets. This shows details relating to the leaving times and numbers of cars operating on the different routes, armature and wheel changes, bearing and field changes (the latter being shown under coil numbers top or bottom), cars put up for the night or otherwise at foreign stations and the reverse, cars inspected as to body, trucks, brake rigging, motors, controllers, wiring, etc., and cars out of service on account of defects. Any accident or occurrence which causes a car to be withdrawn from its regular duties is noted, whether caused by employees, outsiders, or by circumstances beyond control of the company. The original log sheet is forwarded to the office of the superin-



Massachusetts Electric Companies—General Organization Chart of Equipment Department.

tendent of car repairs daily, and a duplicate is kept at the car house for the information of the car house foreman.

In addition to the notation made on the car house log book, a form is sent daily by the car house foreman to the general foreman, in case of a defect or failure in service, to show the car number, route, direction of transit, trouble, amount of delay, pole number, action taken in regard to withdrawing the car from service, time of withdrawal if any and motorman's number. If the trouble causing the delay is due to an accident the fact is shown, as well as any trouble due to an inherent failure of the equipment. The general foreman notes this information and then forwards the form as filled out to the office at Boston, so that the head of the department is informed regarding withdrawals from service, their cause and results.

OLD COLONY STREET RAILWAY CO.

DEPARTMENT OF MOTIVE POWER AND MACHINERY.

TEST RECORD OF REGISTERS

DIVISION ..... STATION. DATE. TIME

TEST INSPECTION MADE BY MR.

Car No.	Register No.	Make of Register	Cash or Trans.	Reading at Start	Nos. Rung Up	Reading When Finished	Difference if Any	Does Register Need Overhauling	General Condition

Massachusetts Electric Companies—Test Record of Registers

From these forms the Boston office prepares a monthly tabulation of defects occurring at all the car houses on each division. This tabulation, shown on page 970, provides for over 30 subdivisions of defects classified under car body, trucks, motors and controllers, trolley and wiring troubles. The number of cars damaged in service is indicated, and the report also shows the average mileage at each car house per shift-over or pull-in for a defect, the same figure for the corresponding month of a year back and for the three preceding months. Thus, in the report for July, 1909, the Campello car house had a total mileage of 217,863 car-miles. One car was damaged in service. One miscellaneous, six brake and rigging, seven air brake, four controller, three armature, one field, two brush holder, two lightning, two lead and cables and one miscellaneous defects occurred, or a total of 27 for the car house. The average mileage per defect was 8069, compared with 3699 the year before in the same month. The mileages per defect in the three preceding months were 9478, 4560 and 5098.

Form N 629

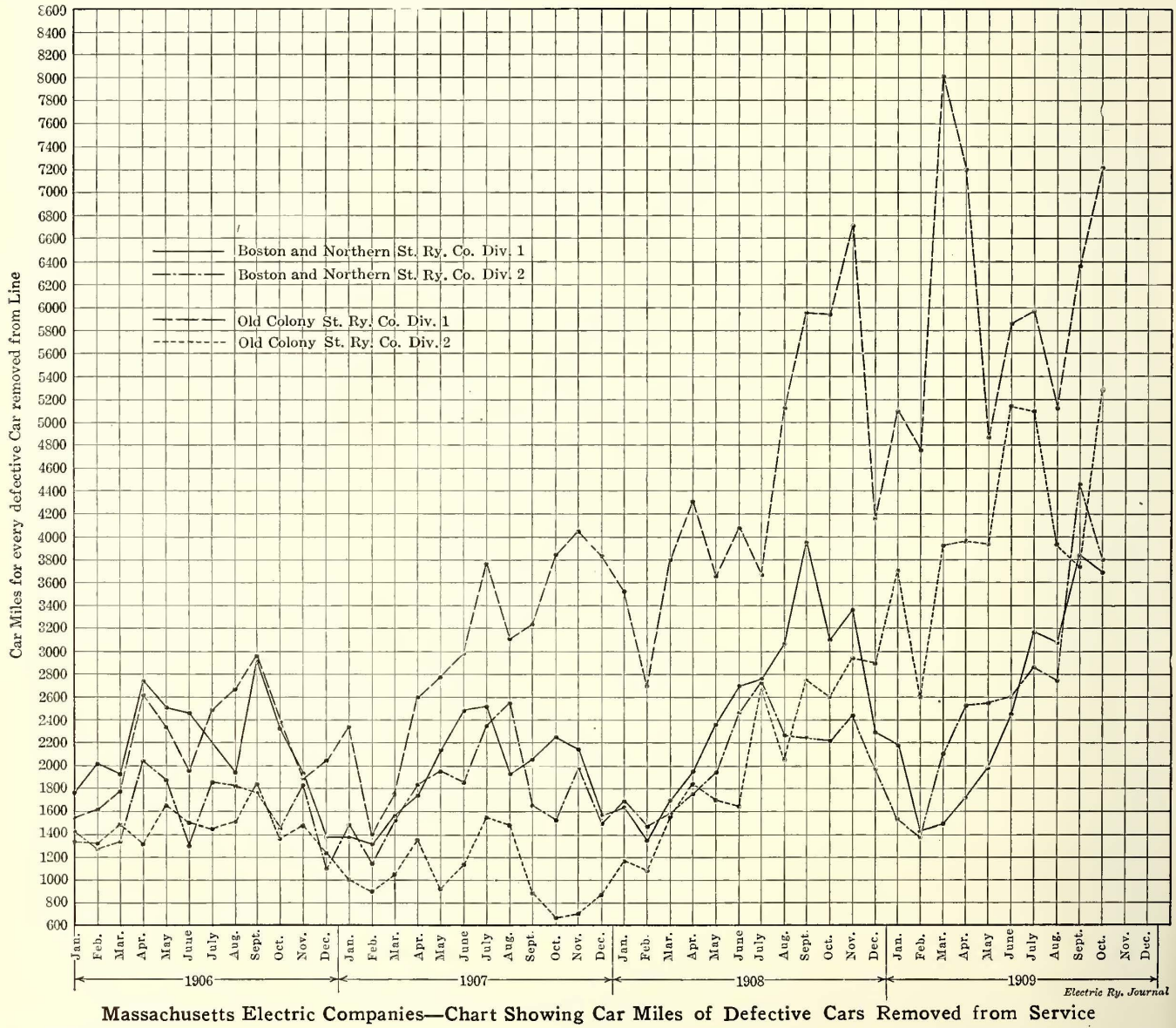
MONTHLY REPORT.

ARMATURE AND FIELD CHANGES

MONTH ENDING ..... 19 ..... ST. RY. CO.

STATIONS	TOTAL ARMATURES SENT IN	TO REWIND	TO REPAIR	NEW COMMUTATORS	REMOVED FOR RUBBING	TOTAL AIR ARM. SENT IN	TO REWIND	TO REPAIR	REMOVED FOR RUBBING	TOTAL NO. FIELDS USED	NEW	RETAPED	REPAIRED	TOTAL AIR FIELDS

Massachusetts Electric Companies—Monthly Report of Miscellaneous Car Service Expense



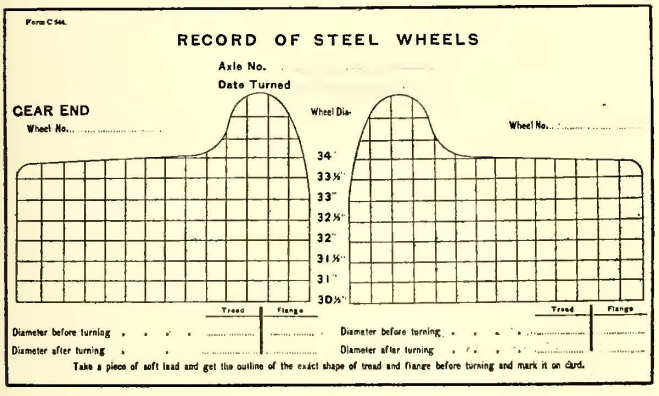
Massachusetts Electric Companies—Chart Showing Car Miles of Defective Cars Removed from Service

CAR-MILES RUN PER DEFECT

Each month a table is prepared of the troubles at the individual car houses. The summary for July, 1909, is shown on page 970. The table illustrates how the number of car-miles run per defect causing a pull-in has increased in the past four years. About two to three times more mileage is now obtained per pull-in than in 1906, when the system of recording defects was inaugurated. In 1906 the Campello car house, for instance, was getting only 3700 car-miles per defect, whereas in the month shown 8069 miles was the record. In a few instances four times as much mileage is now obtained. A chart showing the results since January, 1906, is given on page 972. Scientific analysis of the causes of equipment failures and steps taken to prevent the occurrence of troubles have accomplished these results.

At all car houses a weekly statement of changes in equipment and cars equipped is made out in triplicate. Changes in equipment, such as motors, controllers, trucks and air compressors, are recorded by kind and numbers. Two of the sheets are forwarded to the office of the superintendent of car repairs for each system, one copy remaining at the car house. Another car house record is a change of location sheet, also in triplicate. This covers the transfer of all vehicles, either sent away or received, and also includes registers changed from one car or place of storage to another. Two sheets are sent to the office of the superintendent of car repairs, and of these one is sent to Boston, to facilitate posting the card catalog record maintained there of each piece of rolling stock on the two systems. One copy remains at the car house.

Thorough reports are made in regard to the car equipment in cases of accident. At each car house is provided an accident report book with triplicate record. This report covers the nature of the accident in detail giving the particulars as to time, location, condition of car, date and extent of last inspection and name of inspector of the car as a whole and the part involved in the accident, type of motor, gearing details, type of controller, kind of truck and brake details, as well as the style of resistance. The name of the man who makes reports is required. The original sheet is given to the car house foreman and filed in an accident report folder, the duplicates being forwarded to the office of the superintendent of car repairs. This form has been found of great value in connection with the work of the claim department.


Form C 544.

RECORD OF STEEL WHEELS

Axle No.

Date Turned

GEAR END

Wheel No.

Wheel Dia.

Wheel No.

34" 33½" 33" 32½" 32" 31½" 31" 30½"

Tread Flange

Diameter before turning

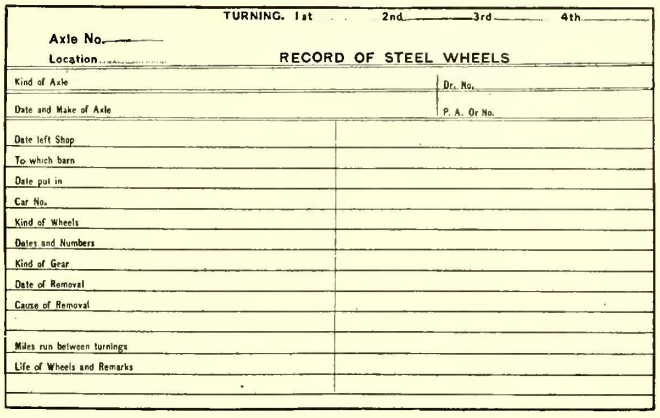
Diameter after turning

Tread Flange

Diameter before turning

Diameter after turning

Take a piece of soft lead and get the outline of the exact shape of tread and flange before turning and mark it on card.


TURNING. 1st 2nd 3rd 4th

Axle No.

Location

RECORD OF STEEL WHEELS

Kind of Axle — Dr. No.

Date and Make of Axle — P. A. Or No.

Date left Shop

To which barn

Date put in

Car No.

Kind of Wheels

Dates and Numbers

Kind of Gear

Date of Removal

Cause of Removal

Miles run between turnings

Life of Wheels and Remarks

Massachusetts Electric Companies—Obverse and Reverse Side of Steel Wheel Record Card

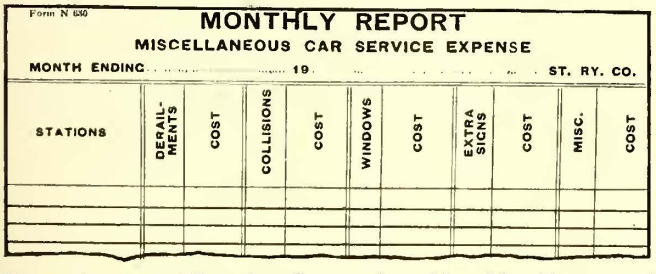
ACCIDENT REPORTS

On the morning following any car accident the division foreman or superintendent of the operating department makes out a request to the foreman of car repairs regarding the car accident reports wanted. The accident report request asks the foreman to inspect and furnish a complete report on specified car accidents, stating the dates and car numbers, the location of the accident, brief description and time of request. The operating foreman is expected in addition to notify the foreman of car repairs verbally immediately after an accident, so that inspections can be made in due time. The accident report request book is made up with the sheets consecutively numbered and is so kept on file by the foreman of car repairs. Responsibility for prompt inspections after accidents is fixed by this form.

The forms for defective material, material used, daily record and time cards, time books and requisitions are designed in conformity with the usual practice. The car inspection card is in the form of an original record, signed by the man who does the work, and this is classified under car bodies, fenders, motors, controllers, car wiring, trucks, brakes, air brakes and heaters. In this signed record the claim department finds evidence of proper care of the equipment.

Special care is taken in testing car registers to maintain an accurate record as to the numbers rung up, the place and date of test. These tests are usually made quarterly and each form gives the car number, register number, make, readings before and after tests, need of overhauling and action taken. The management does not favor testing registers by removing them from the cars and sending them around the system in a more or less haphazard manner. The original of the test record is sent to the cashier at the division headquarters, one copy is sent to the general foreman and superintendent of equipment and the third remains in the test book.

A special report is used at car houses in connection with work done on rolling stock that has been crippled on account


Form N 650

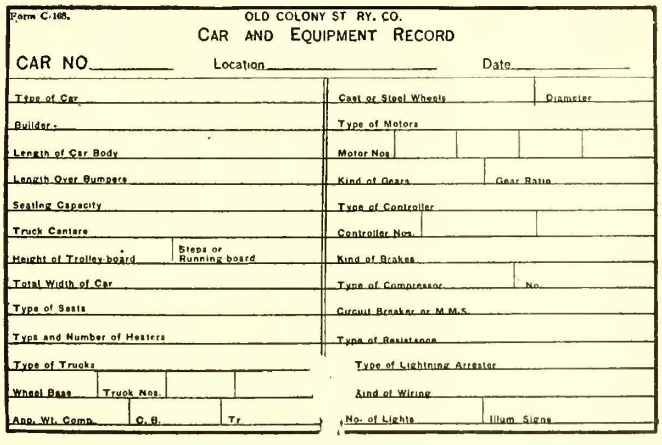
MONTHLY REPORT

MISCELLANEOUS CAR SERVICE EXPENSE

MONTH ENDING ..... 19... ST. RY. CO.

STATIONS	DERAILMENTS	COST	COLLISIONS	COST	WINDOWS	COST	EXTRA SIGNS	COST	MISC.	COST

Massachusetts Electric Companies—Monthly Report of Armature and Field Changes


Form C-165.

OLD COLONY ST RY. CO.

CAR AND EQUIPMENT RECORD

CAR NO. Location Date

Type of Car — Cast or Steel Wheels — Diameter

Builder — Type of Motors

Length of Car Body — Motor Nos.

Length Over Bumpers — Kind of Gears — Gear Ratio

Seating Capacity — Type of Controller

Truck Centers — Controller Nos.

Height of Trolley-board — Steps or Running board — Kind of Brakes

Total Width of Car — Type of Compressor — No.

Type of Seats — Circuit Breaker or M.M.S.

Type and Number of Heaters — Type of Resistance

Type of Trucks — Type of Lightning Arrester

Wheel Base — Truck Nos. — Kind of Wiring

App. Wt. Comp. — C. G. — Tr. — No. of Lights — Illum. Signs

Massachusetts Electric Companies—Car and Equipment Record

of such accidents as collisions, derailments, split switches, etc. This is a simple form covering labor and material, but it is advantageous in enabling the equipment department to charge unusually heavy repairs to accidents, when they are the cause of extra expenses. Where such a form is not used, it is often difficult to separate the cost of ordinary maintenance from that due to accidents, and the showing of a group of shops or car houses for a given period may be seriously handicapped if the influence of troubles beyond the control of the maintenance organization is not determined.

Among the shop forms in use the record of steel wheels is interesting. This is an index card, 5 in. x 8 in. in dimensions, both sides being used. One side carries a developed wheel tread and flange, with cross lines ¼ in. apart. The wheel outline is taken with a piece of soft lead and the card is then marked with the calipered dimensions, giving the wear of the wheel between inspections. The reverse side of the card gives data as to the turning of wheels, life of wheels, gear and axle fits, etc. This record is kept in the general foreman's office. A summary of material used at given car houses is useful. This is made up from the daily reports of material used sent by car house foremen to the general foreman. This record shows the precise amount of material used on each day of the month for trucks, motors, controllers, trolleys and miscellaneous, over 60 items being covered. A summary for all car houses on the lines north or south is made monthly by the office of the general foreman and sent to the headquarters at Boston.

Among the card records maintained at the general foreman's office are pattern card, wheel and axle record, made up from a postal card report of changing wheels, which is sent from car houses to the office of the superintendent of car repairs, a car and equipment record card made up from measurements and data taken in the shops, an accident and defective card, records of fields and armatures received at the shops, report of cars repaired and returned to service during each day, construction time sheet used in making up new car equipments, according to the classification of the Interstate Commerce Commission, employment slips and foreman's daily time slip used between internal parts of the system to avoid recording labor in two time books.

Whenever a car passes through Boston from one system to the other a report of the transfer is made to the superintendent of equipment on a special form. The use of this form records the condition of the car on passing between the systems.

At all car houses a large inspection record is posted near the pits, with space showing the character of inspection performed on each car on the different days of the month, special symbols being used for motors, controllers, trucks and general inspection. The use of this form has been found to increase materially the facility with which the foremen follow the work and keep the inspection up to a high standard.

RECORDS AT BOSTON OFFICE

Among the records kept at the Boston office are monthly reports of wheel changes, armature and field changes, miscellaneous car service expense and a car and equipment record. The latter gives the details of the fittings of each car on the lines north and south of Boston, one card per car being allowed. A form has been worked out recently by the office of the superintendent of equipment to show the operating details of the different routes at the various car houses, including the schedule speeds of the routes, running time, character of car service, distance of round trips, ton-miles per car per day, etc. A column will ultimately be added to give the energy consumption in watt-hours per ton-mile for the different routes, and it is anticipated that valuable comparisons will be effected when this is done. Provision is made for a tabulation of regular and extra car mileage per day, and the mileage per employee.

Form C 32. 4-30 09-300 A.T.H

STATION ..... St. Ry. Co.

YEAR .....

CAR ROUTES AND MILEAGE.

NAME AND NUMBER OF ROUTE	REGULAR OR EXTRA	SINGLE OR DOUBLE TRUCK	NAME OF STATION CAR AT SCHEDULE TIME PUTS UP NIGHTS	TIME CAR LEAVES STATION	TIME CAR PUTS UP	SCHEDULE TIME ROUND TRIP hr. min.	NO. OF ROUND TRIPS PER DAY	MILES PER ROUND TRIP	MILES PER CAR PER DAY	MOTOR MILES PER CAR PER DAY	SCHEDULE SPEED M. P. H.	AVERAGE MILES PER DAY FOR EACH ROUTE	TON MILES PER CAR PER DAY	TOTAL TIME OUT	
															Regular Car Mileage per day
															Extra Car Mileage per day
															Total Car Mileage per day
															Motor Miles per Car per day
															No. of Regulars
															No. of Extras
															Total
															No. of Cars at Station
															No. of Motors " "
															No. of Men " "
															Regular Miles per Man
															Total " " "
															Motor " " "
															Ton " " "
															Motors per Man
															Cars per Man
															Average miles per Regular Car per day
															Track Miles Operated.
															CAR NOS. BY ROUTE

Massachusetts Electric Companies—Table of Car Routes and Mileage

All cars operated over 200 miles per day are given a daily inspection, and in general all rolling stock, except certain extra cars, is given an inspection at least once in three days.

The work of the equipment department is in charge of E. W. Holst, superintendent, who has extended many courtesies in connection with the preparation of this article.

A writer in a monthly magazine describes the successful use of cambric pinions. In making these pinions, the muslin is cut out in disks which are assembled and pressed between two steel washers, the whole then being securely fastened with rivets or tag bolts as in the manufacture of rawhide pinions. The blank is next turned to the proper diameter and the teeth cut in a gear cutter. The gear is finally soaked in machine oil. The oil thus absorbed keeps the pinion teeth lubricated indefinitely. Over 700 of these cambric pinions are in service.

TOLEDO MEETING OF CENTRAL ELECTRIC RAILWAY ASSOCIATION

The Central Electric Railway Association held its last meeting before the summer recess at Toledo, Ohio, on May 26 and 27. About 75 railway and supplymen attended the session. The convention was welcomed to Toledo by Mayor Brand Whitlock who, in speaking, classed the problem of municipal government as one of the greatest questions of the age. Electric railways, by bringing about closer contact between cities and the country, were helping in the solution of this problem. John F. Ohmer, president of the Ohmer Fare Register Company, replied in a pleasing speech.

DISCUSSION OF PRESIDENT'S SPEECH

The committee appointed to discuss suggestions made in the inaugural speech of President Whysall reported, in part, as follows:

"Paragraph 3. Lack of Mutual Confidence.—Your committee regrets that any necessity exists for the president to bring this matter to the attention of the association, and suggests that a special committee be appointed to consider the advisability of, and if advisable, suggest a plan for an association arbitration board, before which serious differences of opinion may be brought and adjusted. In addition, it suggests that each member constitute himself a committee of one, whose special duty is to try and smooth out insignificant differences that may exist between the various member companies, so that in a short time they all may work together for the common good.

"Paragraphs 4 and 5. Difficulty in Securing Information from Employees with Reference to Connections at Junction Points and the General Bearing of our Employees Toward the Traveling Public.—Your committee appreciates the good work done by the Traffic Association and heartily joins the president in his congratulations, but suggests that this work still be continued by the Traffic Association to the extent of publishing an official time-table covering the lines in the association district. This publication might possibly be made a source of income to the association. This time-table, with the necessary instructions as to its use, put in the hands of those dealing directly with our patrons, and in connection with stringent rules regarding their courtesy, politeness and encouragement of and attention to inquiries, would, we feel sure, in a very short time result in an increase in business due to the traveling public's appreciation of our very apparent efforts to serve them to the best of our ability.

"Paragraph 6. Dirty Stations and Cars.—Your committee regrets that these conditions exist, but feels that no concerted action can be taken by the association as this is a matter of the discipline employed by each individual company.

"Paragraph 10. Claim Index Bureau.—It has occurred to your committee that the reason quite a number of the roads have not sent in their reports is solely because they have been overlooked. Now that the president has given it the prominence it deserves the various managers will undoubtedly see that reports from their roads are sent in the future.

"Paragraphs 11 and 13. Lack of Interest in the Work of Special Committees and of the Secretaries of the Various Associations.—With many regrets your committee reports that a very large portion of us will have to plead guilty to the president's charge. We, however, ask for a suspension of sentence for a reasonable time so as to enable us to show how much help we can and will give the committees and the secretaries in the future. We all recognize the immense benefit of the work and we should, therefore, whenever we can, contribute all the information we have bearing on the subjects under investigation.

"Paragraph 12. Closer Affiliation of Our Association With the American Street & Interurban Railway Association.—In view of the fact that 65 per cent of the members of this association are members of the National Association your committee assumes that the sentiment of this association is in favor of a closer affiliation and, therefore, recommends the appointment of a committee to bring about such closer affiliation.

"Paragraphs 14, 15 and 16. The Relation of Cost of Handling United States Mail, Freight, Express and Package Business to the Income Derived Therefrom.—So far as the United States mail is concerned, your committee suggests that this be referred to the standing committee, which was appointed to cooperate with a similar committee of the American association for the purpose of securing more equitable rates for the handling of United States mail. As there seems to be a great difference of opinion among interurban managers as to the profits to be derived from the freight, express and package business, your committee would suggest that a special committee be appointed to investigate and report to the association its findings on the following questions: (1) Can interurban lines, in general, handle freight business at steam railroad rates at a profit? (2) How can the express and package business be made most profitable for interurban lines in general?

"Paragraph 17. Discussion of Papers and the Advisability of Having One or Two Two-Day Sessions Each Year.—Your committee respectfully recommends that the regular papers read before the association be printed and distributed so that the members can have the papers before them during the discussions. The committee suggests that the advisibility of having one or two two-day sessions each year be referred to the executive committee for decision.

"Respectfully submitted, Martin J. Insull, chairman, C. H. Warren, S. D. Hutchins."

The report was accepted, without discussion, and ordered placed on file.

PREVENTION OF ACCIDENTS

The paper on the "Prevention of Accidents," as presented by E. F. Schneider, general manager, Cleveland, Southwestern & Columbus, and read at the South Bend meeting, was next discussed. This paper appeared in the ELECTRIC RAILWAY JOURNAL April 2, 1910.

F. D. Carpenter, Western Ohio Railway, had found Mr. Schneider's paper worthy of very careful reading. He had a warm personal acquaintance with the author and so had read between the lines and could understand the true humanitarian spirit in which the paper had been written. He believed the paper to be one of the best ever presented before the association. Its keynote, sympathy, was a feature not frequently employed. During the past four years the standard of efficiency of employees had been raised, and the public attitude had changed so that operating conditions could not be settled as in years past. Thus it was more than doubly incumbent upon the representatives of the public service corporations that they should set an example for the people by handling their employees and properties rightly. He thought that if all men who administered the affairs of railway properties would carefully consider the plans outlined by Mr. Schneider, and would put them into effect, so far as could consistently be done, the number of accidents materially would be decreased.

In addition, Mr. Carpenter said that a railway company should put into use as many good mechanical devices as practicable to relieve the men from brain-tiring work.

C. L. Henry, Indianapolis & Cincinnati, had read the paper on "Prevention of Accidents" several times and felt that the author was recommending that operation be carried on by the sentiment of the heart rather than the judgment of the mind. Mr. Henry, in disciplining men, maintained a principle that it should always be his privilege to change his mind; therefore, he might be convinced later that, as Mr. Schneider had suggested, a road could be properly operated without inflicting punishment on the employees for disobedience. When he returned from the meeting at which the paper on accidents was read, Mr. Henry obtained copies of the paper, and gave one to every motorman and conductor on the Indianapolis & Cincinnati Traction line. Within 30 days thereafter it had been necessary for Mr. Henry to violate a life-time principle, and for the first time put into effect a suspension of employees for disregard of rules.

Mr. Henry felt that operating problems were so complicated that no definite rules for handling all manner of infractions of discipline could be laid down. The general suggestions made in the paper would be of great value in lessening accidents. The plans for educating the public to assist in avoiding accidents were most important, and the holding of meetings for school children and others should surely bring good results. Whenever the railways teach people to think at the right time then the troublesome accidents will disappear. Mr. Henry had an incontrollable impulse to hurry across the street in front of moving vehicles, and he was no more rash than the ordinary person. Now that the Railroad Commission of Indiana had recommended a peculiar and striking crossing sign he thought that it would be the cause of making people more attentive and thoughtful, and thus would lessen the number of accidents.

Referring again to Mr. Schneider's suggestions for the greatest possible elimination of discipline, Mr. Henry said that he thought this ideal condition would only come about when someone learned to combine a sympathetic heart with an iron hand that knew the right time to strike.

H. C. Warren, Toledo & Indiana Railway, thought that there could be no fixed rule regarding discipline, all cases could not be handled alike. The proper way was to apply the discipline that in the judgment of the management seemed best to meet the needs of each case.

Mr. Schneider said that the discussion of his paper had centered around what to do after an accident had occurred. In his opinion it was best to know what to do beforehand. Referring to his suggested method of handling employees and its reception by other railway men, Mr. Schneider said he knew that with the introduction of any new method there would follow many rebuffs. It was not possible to educate the men in a few days. Neither did he intend to convey the idea that it was best to do away with discipline immediately; rather the course would be that the men should be educated from the humanitarian and social standpoints and then when the men understood the need for greater care and better operation the need for discipline would disappear.

Mr. Schneider then presented some statements regarding the accident records of his road for the last one and a half years which to him showed that his plan was working rightly. During the past year not a single school child had been injured, and this clear record could be credited to the fact that more than 42,000 children had been addressed on the subject of taking particular care when about car lines. Formerly there had been some distressing accidents, and he had notified the school teachers to instruct their pupils how to take care of themselves. This method had not been successful and so he had resolved to make the talks himself. The cost of damage claims on the Cleveland, Southwestern & Columbus had decreased to 1.25 per cent of the receipts, and if the present ratio of decrease continued they would fall below 1 per cent for the coming year.

With a view to finding out what various men thought of his ideas as presented in the paper read at South Bend, Mr. Schneider had sent copies of that paper to James O. Fagan, and to Edgar J. Rich, general solicitor, Boston & Maine Railroad. Mr. Fagan, who had written many articles and books on the prevention of accidents and the relations between railroads and their employees, replied, in part, as follows: "I look upon your pamphlet as the most practical word on the subject from any quarter that I have yet come across. While your ideas on discipline are my own theoretically, and while it may be the only possible method in the management of the future, I have not yet persuaded myself that the interest of all concerned can safely be confided to your system yet awhile, until the personally responsible spirit among employees has had time to develop. Otherwise, I am heartily with you and your views in this pamphlet from beginning to end."

Edgar J. Rich had written Mr. Schneider in part as follows: "Your address on the prevention of accidents read before the Central Electric Railway Association is the best thing of the kind that I have ever read. It is sound, sympathetic and fearless. You have collected in it practically all the wisdom on the subject. When you say that the cause of accidents primarily is the failure properly to teach the human element its obligation, you put your finger on the sore spot in our railway organizations. What you say about your method of holding meetings is most interesting. I have believed that that is the only effective way to educate the men. Discipline counts for little; the men have got to be taught. I wish your address could be in the hands of every operating officer and every employee on the railroads in the United States."

Mr. Schneider had received these complimentary letters and many others gratefully, and considered that he had had good confirmation that he was on the right track. Careful education of the public and employees required a great amount of work on the part of a railway manager and for this reason he thought many managers had not been inclined to do as much educational work as was needed to show the great results possible by broader application of the principles laid down in the paper. He knew that to succeed in his plan of education he must first get close to the men. He had just finished a series of meetings which had been attended by all of the men of his road except the trainmen. At one of the sessions 120 laboring men listened attentively to his suggestions, and showed willingness to co-operate heartily toward stopping the great waste of life and property caused by accidents. When such a body responded so feelingly he said it made him think that his plan was sure to bring the desired results.

Mr. Henry restated that he had a high opinion of the paper and did not question the fact that Mr. Schneider was attacking the accident problem correctly. Mr. Henry did not mean to criticise Mr. Schneider's plan of education, but nevertheless he did feel that discipline must still be retained. There were certain offenses that needed strong punishment, and an appeal to moral sense of right would not always suffice. He was doubtful as to how to act toward men who had violated rules so that the next time a similar violation would not occur.

Mr. Schneider replied that he did not mean to imply that after an accident the men who had disobeyed should not be punished. He still did some disciplining on his road, but the need for it was gradually disappearing.

Referring to Mr. Henry's mention of strong punishment, Mr. Schneider stated that men had been disciplined severely in railway work for 50 years and still the need for discipline existed.

VALUATION OF OPERATING PROPERTIES

A paper on the "Valuation of Operating Properties" was next read by Edgar S. Nethercut, C.E., Chicago, Ill. This paper will be found in the Electric Railway Journal for May 28, on page 945.

Mr. Whysall called attention to the need for more general knowledge among railway men of the subject of valuations. It was well worth studying because within the next few years considerable such work would be done in the central territory. The railways especially should be prepared to handle the problem when it confronted them.

M. J. Riggs, of Riggs & Sherman, Toledo, Ohio, had taken part in the valuation of several large steam railway properties. While Mr. Nethercut's subject was a broad one Mr. Riggs did not think that he should have so lightly passed over the question of real estate valuation. Mr. Riggs had done considerable work of this kind for State railway commissions and was familiar with the valuations of railway real estate made in the States of Michigan, Wisconsin, Minnesota, Nebraska and New Jersey. In Michigan, the railway real estate had been valued and its purchase price had been found to have been from three to five times that for adjacent farm lands. The average farmer knew how to take good care of himself in a real estate deal with a railway company. As a result of the determinations made in Michigan a ratio of 3 to 1 had been determined as proper for the relative values of railway property and adjacent farm lands. The valuations made in Wisconsin had established the correctness of the ratio which applied in Michigan. In Minnesota a ratio of 4 to 1 had been accepted.

Mr. Riggs said that when it was the purpose of an appraisal

to determine the amount of property that a company had it manifestly would be unfair to neglect such ratios of real estate values. However, he did not think that such high ratios would apply to the real estate of a city property, because in an urban district a company's holdings were usually disconnected and the company need not purchase any particular parcel that might be held at an excessive value.

Speaking of unit prices, Mr. Riggs agreed fully with Mr. Nethercut that the basing price should be the present day price, and that an extremely high or low unit brought about, for example, by extraordinary market conditions, should not be accepted. Also he was afraid of the results that might come about when accounting for depreciation caused by age, unless the appraisal was made by careful, experienced men. In some work in which he had been interested in the South, stone buildings had been found to be in good condition so far as their desired use was concerned after 50 years had elapsed, and when, according to a determination of depreciation proportionate to age, they should have had no value.

When questioned, Mr. Riggs said that the Michigan appraisals in which he had taken part had been made for the legislature so that it could learn the value of the railroad property for purposes of taxation. This also was the reason for the Wisconsin valuations. In Minnesota the valuation had been made for use in the determination of rates.

Mr. Henry thought it interesting to know for what reason a valuation was being made. He had heard the following dialogue:

"How much is that brown mare of yours worth?"

"Why do you ask that? Are you the tax assessor or has the railroad killed her?"

For purposes of taxation Mr. Henry strongly favored basing the valuation on the earning power of a railroad, while if the value was being found for the purpose of determining rates it should include the entire cost for development, as well as all intangible values.

Mr. Nethercut, referring to Mr. Riggs' criticism that he had not devoted enough attention in his paper to the appraisal of real estate, said that the subject which he had tried to cover was so broad that he had been forced to pass over some of these details lightly even though they were of great importance. Appreciation of real estate values went a great way toward bringing the present value of a railway property up to its capitalization. Sometimes a valuation was useful in proving that the railway had little water in its capitalization. All costs for development should be included carefully and every bit of value should be claimed. These points were of interest to railway men because sooner or later they would all be directly interested in valuation work. A full and complete knowledge of the value of a property would enable its representatives to stand before municipal bodies and gain rights that otherwise might not be obtained. Satisfactory valuations only could be made after carefully planning the work for each property.

Regarding valuations for rate-making, Mr. Nethercut said that the Wisconsin Railroad Commission had allowed the traction companies to include the cost new of all pavement between tracks in their total capitalization. Now, the question arises, shall the traction companies be taxed on that value?

UNIVERSAL STOP SIGNS

A paper entitled "Universal Standard Car Stop Sign vs. Present Method of Indicating Car Stops" was read by R. M. Hemming, assistant superintendent, Ohio & Southern Traction Company, Columbus, Ohio. Mr. Hemming began by stating that there seemed no possible chance of solving the question of where to stop cars as was indicated by the article on "Near vs Far-Side Stopping in Chicago and Other Cities," published in the March 19 issue of the ELECTRIC RAILWAY JOURNAL. After quoting from this article a list of the various stop signs or marks used in different cities, Mr. Hemming took up the question of a standard sign. A great deal of confusion and many accidents would be prevented if some common stop-sign system were used throughout the country. Mr. Hemming presented four designs, of which two were reproduced on page 880 of the ELECTRIC RAILWAY JOURNAL of May 14. He said that these forms were offered merely as suggestions so that the association might use them as a starting point in any consideration of this subject. He thought that if any particular design were chosen it should be copyrighted by the association, but that the manufacturing rights should be given to anyone in order to minimize the cost. Such a design might be made of two metal sheets, the front sheet with punched or stenciled letters and painted white, the back sheet to be of the same type but solid and painted black so that the black background would show through the front sheet. Thus the repainting could be done by unskilled labor at a small cost compared to the expense that would be entailed by having signs relettered. The signs could be made removable for painting by mounting them on poles in flat sockets such as are used for tail-end signal lamps. Mr. Hemming also suggested the possibility of using a white metal or wood sign with black lettering to afford the most readable combination both night and day.

A general discussion followed the reading of this paper, and the inconsistency and incompleteness of many schemes for indicating the stopping points of cars were pointed out. As a result of the discussion, which emphasized the need for standard signs, the association instructed the president to appoint a committee to study and recommend signs which would be satisfactory for general adoption.

H. A. Nicholl, Indiana Union Traction, said that at the request of the Indiana State Board of Railroad Commissioners he desired to announce that the commission had on hand 10,000 red cross signs which it was anxious to have placed in the cars throughout the State. These signs in sufficient number could be obtained by any railroad at practically no cost. They were of correct size to fit in the city car sign racks or to place in a neat frame at the end of an interurban car.

Mr. Schneider said that his company had obtained from the Red Cross Society, at Washington, 500 cards, two of which had been placed in each car, and one in each depot and waiting station over the entire road. The cost of these signs was about 1 cent each.

On motion of F. D. Carpenter the association voted its approval of the generous use of the Red Cross signs and recommended that they be put in all cars and stations in the central territory.

REPORT OF THE STANDARDIZATION COMMITTEE

The report of the standardization committee was read by H. H. Buckman, chairman, who stated that at the final meeting of the committee, held on April 28, all members were in attendance and had agreed unanimously upon the following recommendations:

(1) The self-centering feature of couplers should be dispensed with.

(2) Couplers must be made to couple and uncouple automatically with M.C.B. and all other types of M.C.B. contour couplers, whether used by steam or traction roads.

(3) A device should be adopted for holding couplers on center when intercoupling with steam railroads.

(4) An open knuckle for shackle bar connection should be used.

(5) The draft rigging should meet M.C.B. requirements, and the draw-bar anchorages should be equivalent in strength to M.C.B. equipment and requirements.

(6) Couplers must not uncouple when cars are being pushed around a curve of 35-ft. center radius.

(7) There should be an arrangement to open and release the knuckle without requiring the operator to pass between cars.

(8) The face of the knuckle vertically should be 11 in. minimum and 15 in. maximum, a flexible drawbar carrier should be installed and there should be a locking device in the coupler head to keep the couplers from becoming uncoupled vertically.

(9) The height of drawbar center should be 31½ in. minimum and 34½ in. maximum above the head of the rail.

(10) The coupling center of the coupler should be at least 11 1/16 in. from the nearest point of the buffer face.

(11) The air hose angle fitting should be placed with its

coupling center 12 in. from the face of the angle air brake hose fitting, and all hose and hose couplings should be M.C.B. standard.

(12) Whenever possible the radii of the bumper should be 5 ft. to permit a uniformity in couplers and to maintain a uniform distance between bumper faces and the coupling centers of couplers.

(13) Adjustable continuous tie rods should be installed from coupler to coupler passing from the base, or extreme bottom of anchorage, of the coupler, thence over the bolster to the coupler on the other end of the car.

(14) Couplers should be placed on both ends of the cars.

(15) The association should purchase and have on file at the secretary's office the dictionary and the proceedings of the M. C. B. Association.

(16) The standards should be published after adoption.

President Whysall spoke of the importance of the standardization problem and suggested the advisability of having the report of the standardization committee distributed to each member company so that the recommendations might be considered before the next meeting at which the report should be discussed thoroughly.

Mr. Hemming, calling especial attention to the second recommendation, pointed out that while each of the so-called M.C.B. traction couplers might operate satisfactorily when coupled with a steam railroad car they would not automatically couple with other M.C.B. contour traction couplers, because the particular feature which had been added to make the couplers rigid when united, varied with different manufacturers. The committee had no device to suggest for holding couplers rigidly on centers when coupled to steam railroad cars. It felt that such an attachment was necessary, however, or an electric railway car equipped with a radial drawbar would not be accepted by a steam railroad.

C. F. Franklin, Toledo & Western, emphasized the need for careful standardization. Formerly he was connected with a steam railroad that had 47 different kinds of couplers which met the M.C.B. requirements and would intercouple. This variety had now been reduced to six. Mr. Franklin stated that the sharpest curve on the Toledo & Western was 13 deg. and that all of the freight equipment had M.C.B. couplers and attachments which operated satisfactorily.

After a general discussion of many of the details in the report the secretary was instructed to have it printed and forward a copy of it, together with the illustrations in blueprint form, to each member company.

STANDARD FILING METHODS

The following report suggesting standard methods for filing clippings from the electric railway papers and manufacturers' publications was submitted by the committee on this subject. The report was accepted and the recommendations were adopted.

"Your committee was instructed to consider carefully the subject of filing all printed matter, which ordinarily is received in a railway man's office. The need for a carefully thought-out system of filing was first presented to this association last fall in an able and comprehensive paper by R. N. Hemming, assistant superintendent, Ohio & Southern Traction Company, Columbus, Ohio. Mr. Hemming made a number of novel suggestions, which could be summarized in the statement that every railway office should be prepared properly to classify and file the valuable matter received in technical papers, and in the advertising catalogs, pamphlets and similar publications distributed by manufacturers.

"After the reading of Mr. Hemming's paper, a committee was appointed to consider his suggestions. This committee reported to you at the November meeting and among other things suggested that, as the publishers of the technical papers were vitally interested in ideas presented by Mr. Hemming, they should therefore be given opportunity to present their side of the case. Accordingly, at the South Bend meeting the report on the subject of 'Loose Leaf Filing of Matter Contained in Technical Publications,' was presented by L. E. Gould, Western Editor, Electric Railway Journal. In accepting this report the association instructed its president to appoint the present committee, which is composed of railway and manufacturers' representatives.

"Your committee has carefully reviewed the subject as presented by Mr. Hemming, and as discussed in the reports subsequently made. At a meeting held yesterday your committee agreed upon the following ideas, which are presented for consideration at this time:

"The committee recommends the adoption by railway companies of a vertical filing system to hold matter not larger than 9 in. x 12 in.

"This method of filing in vertical cases or drawers is now in general use, and has become so because of its flexibility, general utility and possibility of expansion. The vertical filing system should be found satisfactory for the use proposed because it may readily be adapted for filing catalogs, circulars and clippings of various sizes. Wiith a vertical file a railway man may effectively group published matter into sections and subdivisions, so that it will be possible at any time to pick out all the data received on any one subject that may be under consideration. The vertical filing system is also thought to be most satisfactory because at a small additional cost it may be expanded indefinitely. If a railway man wishes to file blueprints with his catalogs and printed matter he can best do so by the use of the vertical filing case.

"We recommend to the publishers of the technical papers that no periodical shall be larger than 9 in. x 12 in. in size.

"This size will not interfere with the filing of full unfolded pages from the electric railway papers.

"With regard to all classes of advertising matter circulated by manufacturers, it is recommended that no publication be larger than 9 in. x 12 in., as this matter will fit in the vertical filing system earlier recommended.

"It is suggested that the manufacturing companies should consider the subject of uniform sizes and establish standard sizes to which all companies could limit their publications. It is most desirable to have not more than three standard sizes for catalogs that might be published by different companies; none of these, however, should exceed 9 in. x 12 in. It is also suggested that when a manufacturer has established a catalog or pamphlet size he should use this as a standard for all other publications circulated among railway men.

"Thus, the general catalog of any one firm, the price lists and other pamphlet publications of this firm would be of uniform size and could conveniently be grouped by the railway man, who received them, into one section of his filing case, which might also contain clippings from the electric railway publications.

"Respectfully submitted, R. H. Bloss, chairman, S. D. Hutchins, H. C. Marsh, S. R. Dunbar, C. Burckmyer, T. D. Sheerin."

In discussing the report on the recommended standards for filing Messrs. Hutchins and Dunbar spoke of the need for bringing the recommendations to the attention of the American Street & Interurban Railway Association and the American Street & Interurban Railway Manufacturers' Association. Thus a considerable reduction in the number of sizes of electric railway association and advertising publications might be effected. This would considerably reduce the work of filing such publications for future reference.

L. E. Gould, Electric Railway Journal, suggested that the Central Electric Railway Association and other sectional bodies could greatly assist the American association by promptly furnishing the secretary of that association with copies of their standards and recommended practices.

SUBJECTS FOR CONSIDERATION

R. M. Hemming, assistant superintendent, Ohio & Southern, presented a list of topics and subjects of a mechanical nature for future discussion by the association or the standardization committee. Some of these were as follows:

Illumination of car signs, so that they can be read just as easily by day as by night.

Uniformity of tail-end signals, regardless of whether railroad

employs an electric tail-end signal system or uses oil lamps. If the electric system is used pockets should be provided on the cars to permit hanging standard tail-end lamps.

A standard trailer connection should be put on all cars so that plugs and receptacles will be interchangeable.

Look into the feasibility of conductor's control pipe for signal system, when operating two or more cars in train.

Adopt a uniform plug and receptacle and hanging devices for headlights.

Some insignia should be adopted to identify traction material that might be lost or stolen.

S. D. Hutchins related the circumstances surrounding the theft of a large amount of high-priced metal fittings, including triple valve parts, which had taken place near Buffalo some years before. The thieves were apprehended and the stolen goods were located, but when the case was presented at court it was lost because the railroads interested could not identify any particular piece of standard apparatus as belonging to one company; therefore, Mr. Hutchins pointed out the need for electric railway companies having some identifying mark on all material having a relatively high value.

E. C. Spring, past president, referring to the address of acceptance of President Whysall, complimented the association on not only having approved Mr. Whysall's suggestions as an organized body, but on having acted upon many of them as individual companies. Mr. Spring agreed with Mr. Whysall that there were many features of electric railway service which should be improved and he said that such improvements should be fostered by the association. The Central Electric Railway Association contained a considerable proportion of the interurban railway mileage of the country and therefore the unified action of its members has considerable weight. Mr. Spring called attention to the good work which the Iowa association had done at its last meeting and urged every member company to support the Central Electric Association willingly and to fulfill any assignments made by its officers during the summer recess.

ELECTRIC RAILWAY INSURANCE

The report of the insurance committee as published in this paper last week was read by Henry N. Staats, chairman, vice-president, American Railway Insurance Company. Mr. Staats announced that copies of his remarks would be distributed to each member company.

F. W. Coen, general manager, Lake Shore Electric Railway, recited the experience of that company in improving its insurance conditions. He did this with a view to urging that insurance matters be given more careful consideration. Two or three years ago the railway company had prepared plans and specifications for equipping its buildings with sprinklers. These were submitted to the Ohio inspection bureaus and later, after revision of the plans, the company purchased a sprinkler equipment. Before the installation of the sprinklers the insurance rate had been $1.68 and the premiums were between $10,000 and $11,000. The sprinkler equipment cost $18,000 and was the means of obtaining a 30-cent rate. Now the amount of insurance has been increased by $1,000,000 and the premiums were less than half. In addition the company had its property in full operating condition and under better protection than before.

When questioned Mr. Staats stated that the American Railway Insurance Company was not writing policies because, by reason of its improvement work, the old line companies had greatly reduced their rates. It was hoped that it would not be necessary to write policies, but the company was prepared to do so at any time. Mr. Staats had furnished plans and specifications to 50 railway companies which had improved their insurance conditions.

THE ACCOUNTING DEPARTMENT

A. F. Elkins, auditor, Columbus, Delaware & Marion Railway, read a paper on "The Relation Between the Accounting and Operating Departments," as presented on page 944 of last week's issue.

W. E. Rolston, Cleveland, Southwestern & Columbus, spoke a word against making frequent changes in the classification of accounts. He realized that the important changes in the general classifications made during the last two years had been desirable and necessary, but he urged the accounting officers to favor just as few changes in the future as they could and yet meet the requirements of the law. The operating department was at a disadvantage when frequent changes of account numbers were made because of the difficulty of making comparisons with the results from former years. Several officials expressed their satisfaction with the system of accounts as introduced in January, 1909.

A paper on "Track Bonding" had been prepared by T. W. Shelton, but because of his absence and a lack of time for consideration it was not presented.

The committee appointed to consider the advisability of amalgamating the Central Electric Accounting Conference with the Central Electric Railway Association was instructed to report at the next meeting. President Whysall announced that the convention committee favored holding the next meeting at Indianapolis on Sept. 23, but that that announcement was subject to the findings of the hotel committee.

EXHIBITS

The Toledo meeting was attended by about 50 manufacturers' representatives and exhibits of apparatus were made by the General Electric Company, the Automatic Ventilator Company, Chicago, and the National Electric Specialty Company, Toledo. The exhibit of the General Electric Company included the following: New design 15-ft. capacity, CP-27, motor-driven air compressor in operation. The top of the compressor case had been replaced with plate glass and the operation of the new method of oiling was clearly shown. This company also exhibited a K-34 controller with individual blow-out coils, Sheradized line material and samples of new brush-holder construction for electric railway motors. The Automatic Ventilator Company showed its system for ventilation of car bodies. The National Electric Specialty Company exhibited the VAC-M lightning arrester for telephone circuits and line fittings.

MEETING OF COMMITTEE ON EXPRESS AND FREIGHT, TRANSPORTATION AND TRAFFIC ASSOCIATION

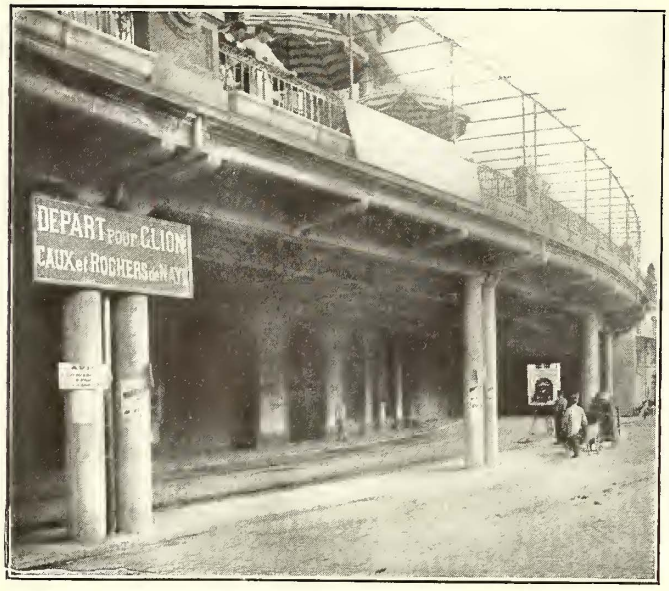
A meeting of the committee on freight and express traffic of the American Street & Interurban Railway Transportation & Traffic Association was held at Toledo, Ohio, on May 26. P. P. Crafts, chairman, general manager Iowa & Illinois Railway Company, Charles Floyd, general passenger and freight agent Grand Rapids, Holland & Chicago Railway, and M. H. Hyman, Electric Package Agency, Cleveland, Ohio, were in attendance. The committee met for the purpose of discussing the proposed data sheet which will be circulated prior to formulating the report. It is the idea of the committee to take special care in formulating the questions for the data sheet so that answers may easily be made. The intention is to determine as nearly as possible how each road is accounting for the earnings and expenses due to its freight traffic. A majority of the questions will have to do with the methods accounting and record keeping of the freight and express departments. Thus it is hoped to learn what each road has done during the past year toward working out various units of cost and expenses. With replies to the data sheet in hand the committee anticipates that it will be able to make a clear statement as to the relative value of freight and express and other traffic handled by electric railways.

Schemes have been sanctioned for the construction of underground electric railways at Buenos Ayres, the concessions having been secured by or with the co-operation of the Anglo-Argentine Tramway Company and the Compagnie Générale de Tramways de Buenos Ayres, of Brussels, Belgium.

It is stated that the Padua-Fusina Railway, Italy, proposes to electrify that section of its line between Malcontenta and Mestre.

THE MONTREUX-GLION ELECTRIC RACK RAILWAY

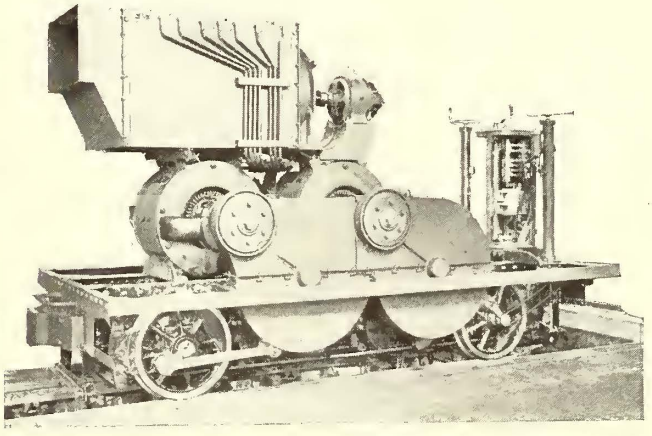
The practice of Switzerland of combining a rack railway with one of the ordinary type is exemplified in a striking way by an electric line in Switzerland built between Montreux and Glion by the Oerlikon Machine Works and put in operation about a year ago. Montreux is situated on Lake Geneva, the shores of which at this point rise precipitously so that the

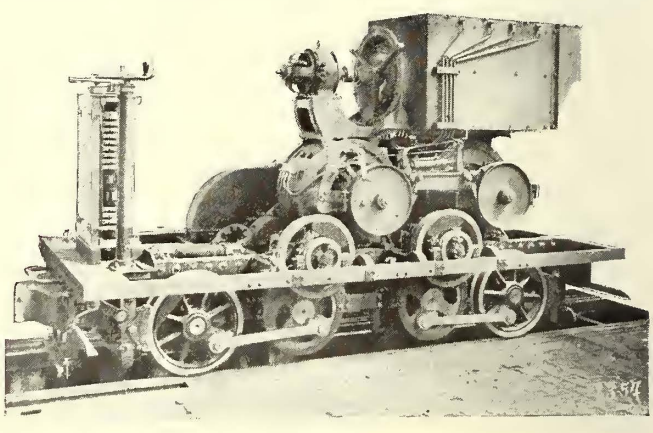


Station at Montreux

town of Glion which is but a little distance in a direct line from Montreux is much higher in altitude.

The line is only 1¾ miles in length and in this distance ascends a height of 964 ft. The track is laid with two gages so that the locomotives can haul as trailers the cars of either one of two steam railways which reach its terminals. On the line there are several tunnels, one of which is 1260 ft. in length and traverses three-quarters of a circle in the rock, 260





Side Views of Locomotive with Cab Removed

ft. in radius. The grade in this tunnel is 13 per cent so that one end of the tunnel is 160 ft. higher than the other. The average grade on the entire line is 10½ per cent and the maximum grade is 13 per cent.

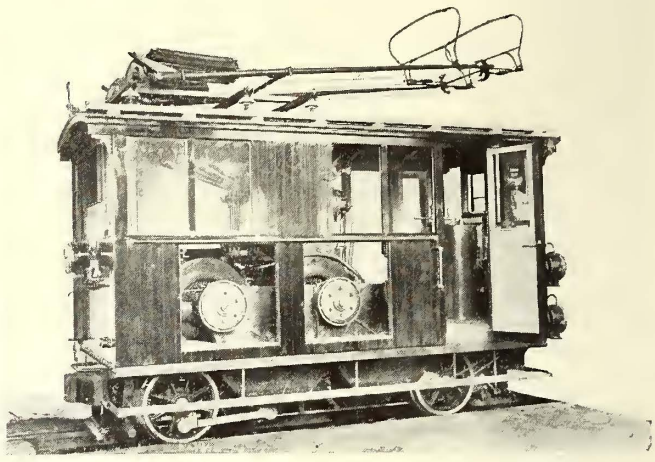
The rack which is not carried the entire distance of the line is of the Abt type. It differs from previous rack constructions in one particular. To provide for the easy entrance of the teeth of the locomotive gear, the usual plan has been to make the teeth in the rack at the beginning of a rack section, shorter than normal. In the Montreux-Glion line, the entrance teeth of the rack are of standard height but are reduced in thickness so that the gear on the locomotive slides into engagement with them easily.

OVERHEAD CONSTRUCTION

The line is operated by direct current at 800 volts with a double trolley wire, designed for use with a bow collector. Where the cars operate for a short distance over the steam railroad tracks at Glion, the trolley wire is of steel and is placed out of center so as to be out of the way of the fumes from the steam locomotives.

SUBSTATION

Three-phase power is purchased from an hydroelectric power plant. The rotary converter substation owned by the company is equipped with two sets of 110 kw converters which are arranged so that they can be connected in parallel with those in the substations of the Montreux-Bernese-Oberland Railway. In



Side View of Locomotive

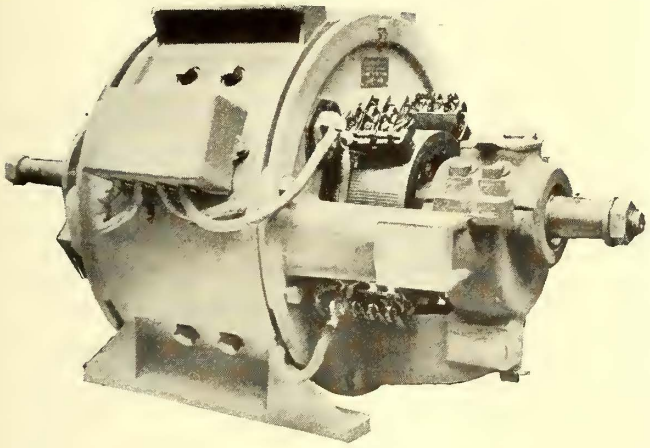
this way, the different substations can be used to supplement each other and the batteries in one substation even could be charged with current from the other.

The batteries, which are made by the Oerlikon Company have a new type of plate, designed especially for power station and substation auxiliary use. Instead of separating the plates by the usual glass tubes, their spacing is maintained by plates of wood which better prevent the buckling of the plates. While the interior resistance of the battery is increased by the employment of these plates, this increase is largely compensated by the ability to put the plates closer together.

LOCOMOTIVES

There are three locomotives, each equipped with two 110 hp motors. These motors are arranged to drive the gear meshing into the rack, or the ordinary wheels of the locomotive, or both together. Each motor is geared to an intermediate shaft and a friction coupling between the motor shaft and its pinion reduces any excessive strain at starting and also at stopping, so that there is no danger of the rack gear wheel of the locomotive climbing over the rack when the car is stopped. When the pressure exceeds 15,000 to 16,000 lb. the friction coupling slips.

By means of a set of helical gears the intermediate shaft transmits the energy which it receives to either the rack wheels which are mounted on a loose sleeve, or, by means of a clutch, to the shaft on which the rack wheel is carried. This shaft is connected by connecting rods to the driving wheels of the locomotive. The pitch circle of the rack wheel is of slightly less diameter than that of the driving wheels of the locomotive to compensate for the wear of the latter. This difference in diameters, however, it is thought, will occasion no trouble.

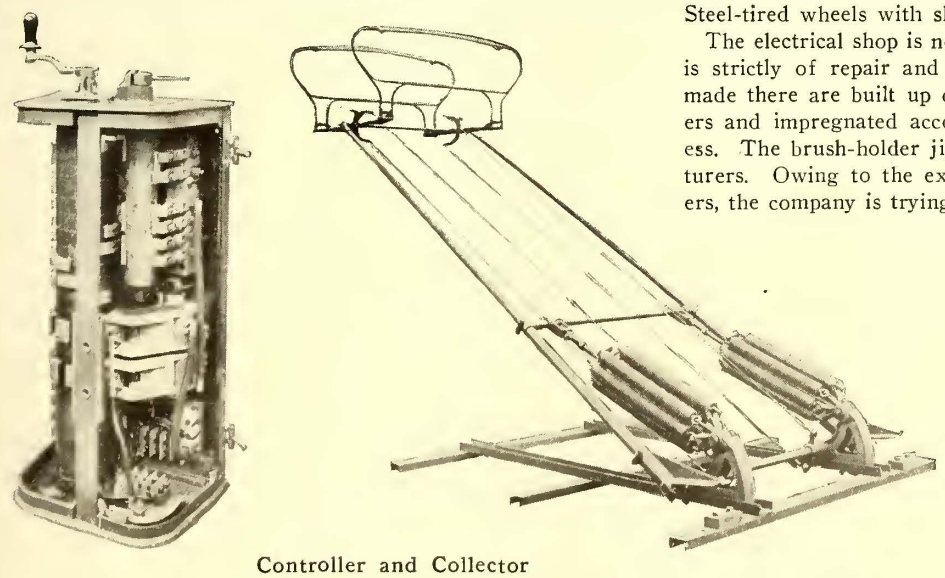


110-Hp Motor

An important feature of locomotives of the rack type, especially when they are of narrow gage, is that the four wheels should rest firmly on the rails so as to avoid derailing. To accomplish this in spite of the unavoidable inequalities of the track, the forward axle is supported on springs which produce the effect of a bolster, so that the locomotive body rests on three points only.

BRAKES

The locomotive is equipped with three brakes, one operating on the drum of the rack wheel and one on the ordinary wheels of the locomotive and also on the gear mounted on the driving



Controller and Collector

axle of the rack. The third brake works automatically on the motor shaft. This brake is thrown into action when the speed exceeds a certain amount. The motors are connected in series and their speed is controlled by a rheostat. The controller also allows the motors to be connected up as generators for braking purposes. The resistances are artificially cooled.

The current collector is of the double bow style operative in either direction.

The locomotive weighs 31,240 lb. of which 19,230 lb. is for the mechanical and 12,010 for the electrical equipment. Each locomotive has a capacity for hauling a train weighing 46 metric tons. The speed of descent is 12 m.p.h.

NOTES ON THE CAR EQUIPMENT AND SHOPS OF THE GROSSE BERLINER STRASSENBAHN

The Grosse Berliner Strassenbahn, which operates about 2650 motor cars and 900 trailers in Berlin and its suburbs, has its car maintenance problem greatly simplified by at least three important factors, namely: A highly efficient class of motormen, whose methods of running are under strict control; well-kept roadbeds, often semi-private, laid in clean, level streets, and contiguity to the principal electrical concerns, thereby eliminating the need for the home manufacture of many items. The motor and trail cars are overhauled and painted in rotation about every two years, when they go into the central shop for four or five weeks. Usually these shops take care of 18 motor cars and 8 to 10 trailers at one time, although 50 cars could be handled.

The company is not troubled by a great variety of cars and equipment. Its two main body types are single-truck cars, weighing about 18,700 lb., and double-truck cars, weighing about 28,600 lb. The latter cars are quite American in appearance, as they are furnished with individual car windows instead of three large sash of which only the center frame is adjustable. A number of the double-truck cars are mounted on St. Louis trucks. All cars carry two-motor equipments distributed among three chief types, as follows: GE-52 and GE-800 motors for single and double truck cars, with 67:14 gear ratio, and GE-67 motors for double-truck cars, with 67:18 gear ratio. The controllers are B-8, K-8, K-19 and B-3B. All motor cars except 800, which have air compressors, are furnished with the Sperry electric brake.

All gears are bolted. Experiments have been made with removable rim gears and rawhide gears and pinions, but they were not satisfactory. The Ambroin insulation hitherto used for the end pieces of resistance grids is being supplanted by glass and porcelain. During the summer of 1909 the company installed 50 nickel-steel motor axles of the following diameters: 90 mm (3.54 in.) for No. 67 motors; 78 mm (3.07 in.) for No. 52 motors; 75 mm (2.95 in.) for No. 800 motors. Worn down axles are afterwards placed under the trailers. Steel-tired wheels with shrunk-on rims are in common use.

The electrical shop is not very elaborate, as most of the work is strictly of repair and testing character. Such coils as are made there are built up on the manufacturers' standard formers and impregnated according to the Passberg vacuum process. The brush-holder jigs are also from the motor manufacturers. Owing to the expense from burned brass brush-holders, the company is trying a zinc composition which costs about one-half of the original article. The standard brush-holder tensions (two springs per holder) are as follows: 8 lb. for No. 800 motors; 4 lb. for No. 67 motors, and 3 lb. for No. 52 motors. The use of so low a tension as 3 lb. to 4 lb. is ample evidence of the satisfactory track conditions in Berlin. No mileage records are kept of individual armatures, but from calculating the mileage between repair dates it has been found that the armatures of the No. 52 motors give the best service, running as high as 53,320 miles.

The motor and truck assembly shop contains a tank which is used for the rapid cleaning of large brass and steel parts, like bearings, gears, etc. The tank contains a solution of caustic soda, which is kept boiling by a live steam coil at the bottom. The objects put in to be cleaned are pulled out with tongs after an immersion of 30 to 45 minutes. An oxy-acetylene outfit is installed in an isolated building, for welding broken pieces of steel, gray iron and malleable iron. The attention given to protecting the workmen is shown in the provision of screens and rails around all pulleys and belting, caps for the circular

saws of woodworking tools, etc. The parts of the machines which must be protected are usually painted red. Luncheon, including the inevitable beer, is supplied to the employees at cost prices by the company.

POWER STATION ADDITIONS OF THE TWIN CITY RAPID TRANSIT COMPANY

The main generating station of the Twin City Rapid Transit Company originally was built to accommodate five marine type engines driving generators with a combined maximum capacity of 22,000 kw. This station has been described in these columns and as previously stated, in place of installing the fifth vertical engine, two 5000-kw Curtis turbines were installed. Now additions are under way and a 14,000-kw Curtis turbine is on order and will replace one of the present vertical units. The company plans ultimately to replace all four of the engine units with large turbines. These changes in generating units have required additions to the boiler plant and these changes are now being made. In addition, the two 5000-kw Curtis turbines are being equipped with forced ventilation which will raise their capacity to 8000 kw. each. Air will be taken from outside of the power house and circulated by a Sirocco blower driven by a Kerr turbine supplying 55,000 cu. ft. of fresh air per minute. Two circulating ducts are built around each generator frame and by means of these ducts cooling air is forced into the top and bottom openings in the sides of the frames. The heated air will escape through the series of openings around the middle of the frame. It is planned to furnish cooling air on the basis of 3 cu. ft. per minute per kilowatt. This change and the replacement of the engines by large turbines will give this station an electrical generating capacity of 58,000 kw in contrast with a maximum capacity of 22,000 kw for which the plant was originally designed.

In the boiler plant four new boilers with new feed pumps are being installed. All the boilers are being equipped with B. & W. chain grates and four steel stacks are being erected. The two old stacks were located at the center of the boiler house; the four new stacks will be located at the quarters of the building and supported on structural steel work spanning two boilers. Each new stack is to be 265 ft. high above the floor of the boiler-room and have an internal diameter of 14 ft. The supporting steel work has for its main members all four structural steel columns which are carried on foundations with a spread of 22 ft. x 30 ft. built upon solid rock. The two old stacks will be taken down and thus room will be afforded in the center of the boiler house for four more boilers. The present smoke flues which lead from the ends of the rows of the boilers to the old stacks in the center will be utilized, but the direction of flow of the gases will be reversed and the passage will be only half of its former length.

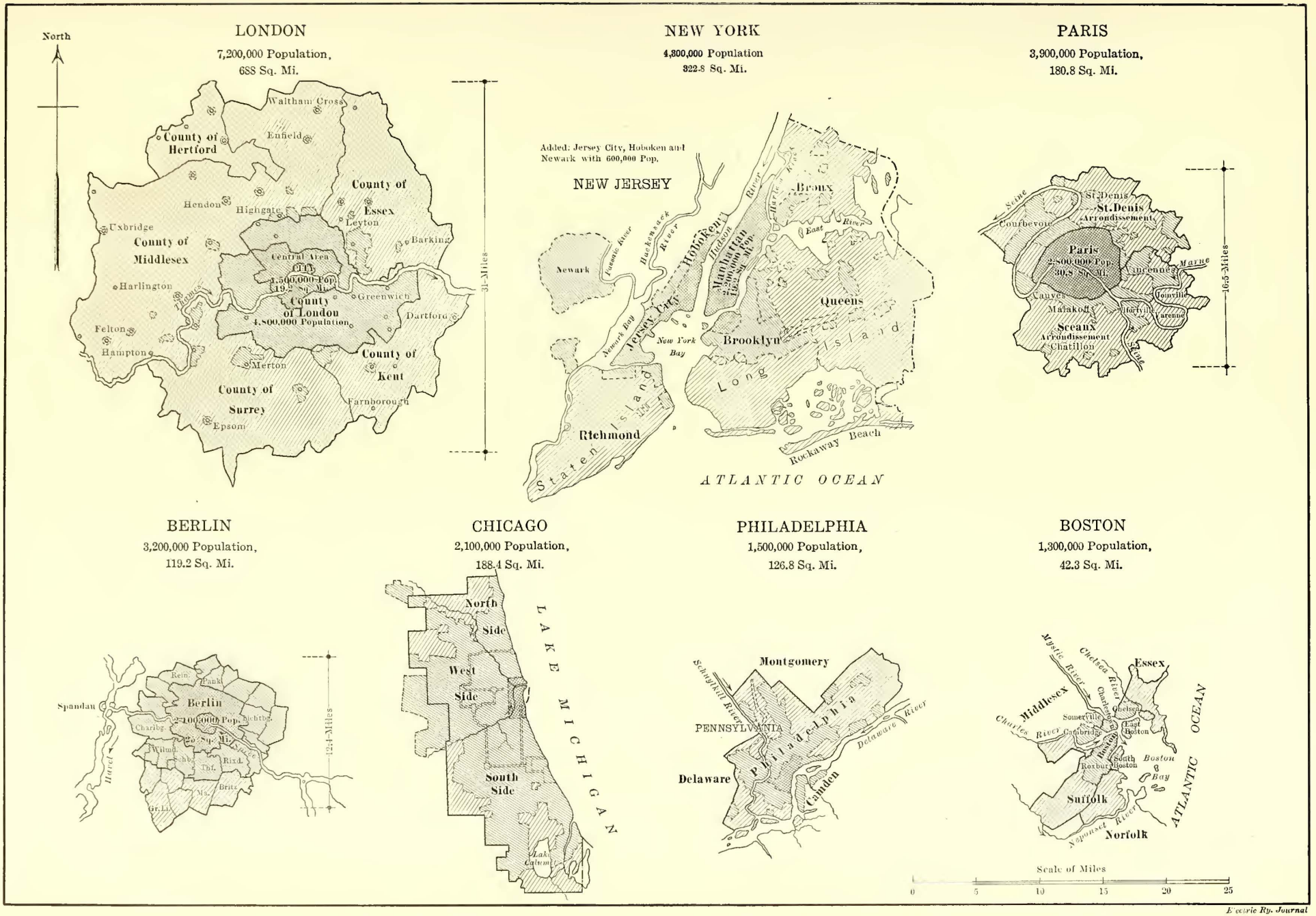
TRAFFIC IN METROPOLITAN CITIES

P. Wittig, director of the Berlin elevated-subway system and royal building councillor to the Prussian government has printed in book form an elaboration of a lecture given March 13, 1909, before the Berlin Architects' Society on transit conditions in London, Paris, Berlin, New York, Chicago, Philadelphia and Boston. Among the many interesting features of Mr. Wittig's thesis are two colored maps and a table showing the comparative areas, population, traffic density and traffic means of the different cities mentioned. As reproduced herewith, the first map shows the areas of each city and its dependent suburbs all drawn to the same scale for the purpose of comparison. The section lines (colors in the original), denote the boundaries of the heavy, medium and light traffic areas. The second map consists of sectored circles and of curves which show respectively the division of the total number of annual trips between the different means of transportation and the comparative ratios of city and suburban zone travel. The second map strikingly illustrates how large a proportion of the travel in large European cities is handled by omnibuses and cabs. A feature of the New York and Boston travel for the year of 1907 as illustrated was the large ferry traffic, which must have greatly decreased since then because of the opening of the Brooklyn subway extension and the Hudson River tunnels to New York and of the East Boston subway in Boston. In New York, the traffic carried by the elevated and subway lines is shown to approach very closely that handled by the surface cars. In Chicago the elevated traffic was less than one-tenth of the surface car traffic.

According to the figures given in the accompanying table, covering the year 1907, the average number of rides per inhabitant was greatest in Boston with the figure 494 and least in Paris with the figure 268. Mr. Wittig estimates that 365

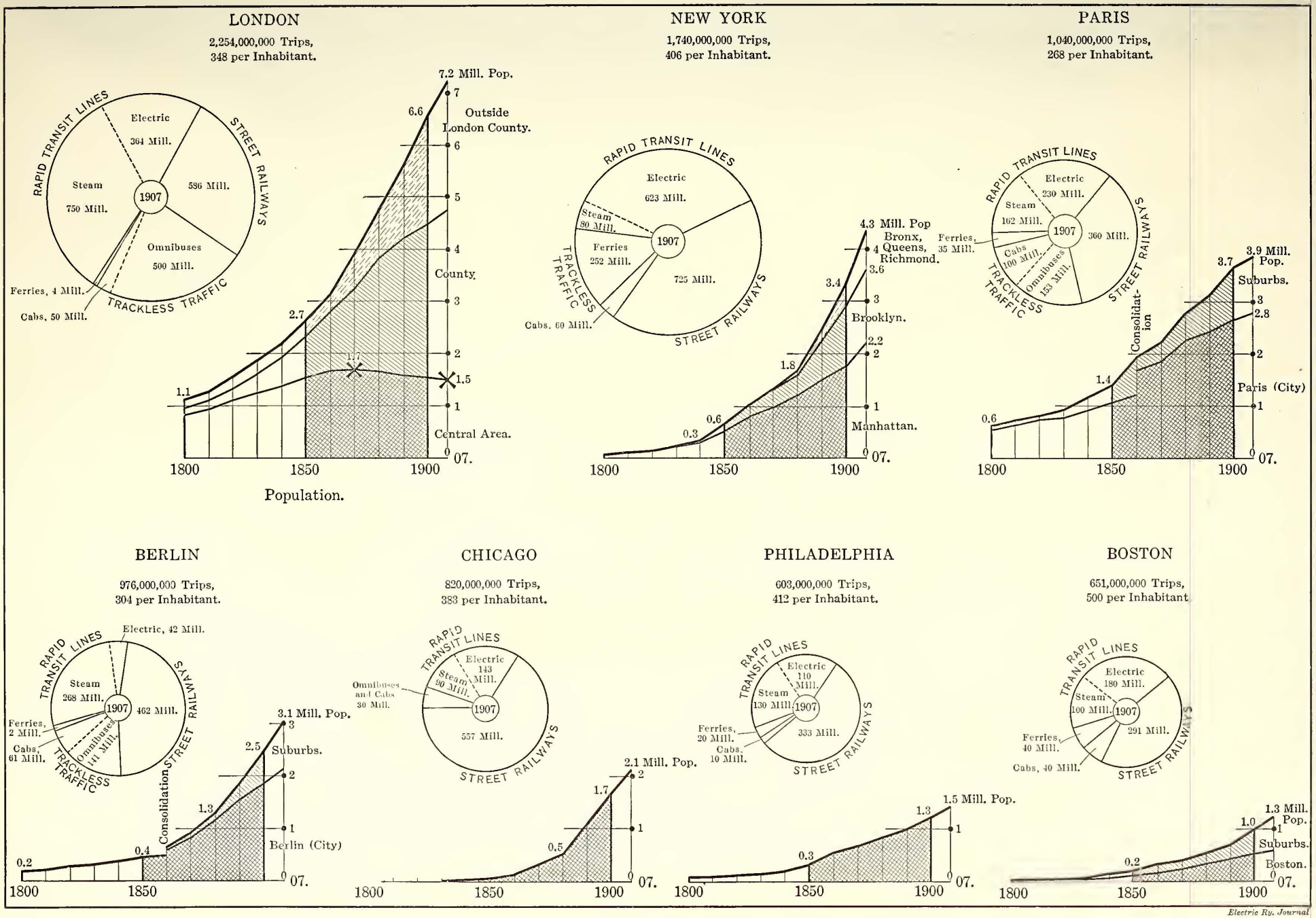
POPULATION, AREA AND PASSENGER TRAFFIC OF SEVEN EUROPEAN AND AMERICAN CITIES IN THE YEAR 1907

Cities.	Population	Area Sq. Miles	Population per Sq. Mile	Passengers in Millions					Annual Number of Trips per Inhabitant
				Total Traffic	Suburban and City Steam Railroads	Elevated and Subway Electric Railways	Street Railways	Omnibuses, Cabs, Ferries	
London (Metropolitan Police Limits):									
County { City	1,500,000	19.2	78,125	} (2254)	.....	.....	.....	.....	(474)
County { Elsewhere	3,260,000	98.0	33,265						
Outside of County	2,460,000	570.8	4,308						
Total	7,220,000	688.0	10,494	2254	750	364	586	554	312
New York (All Boroughs):									
Manhattan	2,220,000	19.2	115,729						
Brooklyn	1,400,000	48.0	29,166						
Queens, Bronx, Richmond	720,000	255.6	2,817						
Total	4,340,000	322.8	13,444	1740	80	623	725	312	403
Paris (Seine Department):									
Paris (City)	2,775,000	30.8	90,097	(1040)					(376)
Arrondissements St. Denis and Sceaux	1,110,000	150.0	7,400						
Total	3,885,000	180.8	21,488	1040	162	230	360	288	268
Berlin (Postal District):									
Berlin (13 wards)	2,130,000	25.0	85,200						
20 Suburbs	970,000	73.0	13,288						
6 Distant Southern Suburbs	110,000	21.2	5,188						
Total	3,210,000	119.2	26,930	976	268	42	462	204	312
Chicago	2,140,000	188.4	11,358	820	90	143	557	30	383
Philadelphia	1,470,000	126.8	11,593	603	130	110	333	30	412
Boston (Old Boston, South Boston, Roxbury, Charlestown, Chelsea)	1,320,000	42.3	31,205	651	100	180	291	80	494



Traffic in Metropolitan Cities—Comparative Density of Population in Three European and Four American Cities

Electric Ry. Journal



Traffic in Metropolitan Cities—Comparisons of Trips per Inhabitant, Modes of Transportation and Relative Growth

trips a year or one trip a day would fairly represent the average travel per inhabitant of the seven cities considered as one population. In discussing the subway question Mr. Wittig points out that while underground electric railways have been very successful from the engineering standpoint, their financial return has usually been small. Hence projects for future subway lines should be considered with extreme caution.

ABSTRACT OF PAPERS PRESENTED BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION

The following paragraphs are abstracts of papers of electric railway interest which were presented before the National Electric Light Association at its twenty-third convention, held at St. Louis, Mo., May 23 to May 27, inclusive:

PROBLEMS IN POWER TRANSMISSION

H. W. Buck's paper on "Some Problems in Power Transmission" discussed changes in construction and equipment standards. The rise in the price of wood and the reduction in the cost of structural steel has led to the frequent substitution of steel towers for wooden poles. Steel construction enables higher supports to be used and consequently permits longer spans. The question of depreciation in a steel tower, due to corrosion, even if galvanized, has not yet been determined. If the legs are concreted in the ground, the tower is greatly strengthened and corrosion is practically eliminated but the cost of such a tower may be twice as great as one with legs set directly in the ground. Unless the amount of power transmitted is very large the cost of steel towers is almost prohibitive.

The use of steel towers has permitted the lengthening of the span and thus reduced insulator troubles; on the other hand, the conductors must be drawn up to maximum tension in order to reduce the height of the towers. This has eliminated soft drawn metal for conductors in favor of hard-drawn copper and aluminum of very high elastic limit. The high working stress in the conductors affects the mechanical construction of the insulators and joint cross-arm designs. Another difficulty in the case of very long spans has resulted from vibration of the conductor and its crystallization and ultimate breakage at the point of attachment. In such cases it has been found necessary to make the attachment more or less flexible. The suspension type of insulator is specially favorable for this reason. The economical span length for steel construction under present conditions ranges from about 300 ft. as a minimum to 750 ft. maximum.

Up to about 60,000 volts the standard type of pin insulator construction gives very satisfactory results. Above this figure, however, mechanical difficulties are encountered due to the large size of pin insulator required. Probably the most important and radical improvement which has taken place in recent years in power transmission has been the so-called suspension insulator construction. It superseded the pin type almost immediately for the very high voltage lines and now is standard for voltages above about 80,000. The suspension insulator requires a higher tower than the equivalent pin insulator. This is a disadvantage but it is offset by the simplification of the cross-arm possible with the suspension insulator and the elimination of torsion on the arms and head of the tower. The suspension insulator is at a disadvantage in cost of construction. There are possibilities for improvement here as well as in the hardware used. Suspension insulators on the recent 100,000 volt lines have actually given less insulator trouble than the early 20,000-volt lines when they were first installed. Since the degree of insulation with suspension insulators can be increased to almost any desired extent without involving prohibitive difficulties, there seems to be no reason in the insulator itself why much higher voltages should not give satisfactory results. There are, however, other considerations which will probably limit line voltage to approximately 100,000 volts for some time to come. The insulation of the line itself is a much easier problem than that of transformers, lightning arresters and substation equipment.

While 60 cycles do not compare favorably with 25 cycles for line conditions alone, on account of its increased charging current and inductive drop the higher frequency is coming into more general use on the large transmission systems. This is due somewhat to the necessity of operating in conjunction with existing plants; but there is justification for it in the reduced cost and size of the transformers. One of the strong arguments formerly used in favor of 25 cycles for transmission is its desirability in rotary converter operation. On account of poor voltage regulation, however, it is no longer usual practice to install converters on long lines, since the independent voltage control of the motor-generator set is required. Furthermore, the general adoption of 25 cycles for single-phase railway operation does not look as probable as it did a few years ago.

Good progress has been made in lightning arresters through the development of the electrolytic type. Arresters are really more for protection from so-called surges than from lightning. Even these should be reduced as line voltages go up, since the reaction due to any sudden change in line current is proportional to the square of the line current. The higher the voltage, of course, the less the current for a given power, so that the tendency should be to lessen disturbances. The steel guard wire installed along the top of many recent transmission lines has given promising results, and the general opinion is that it is a benefit as a protection from lightning. It has an additional mechanical advantage in tying all the towers together and an added electrical use in connecting all the towers so that all must be at the same potential.

One of the most important elements in case of trouble is effective telephonic communications between the various parts of the transmission system. The practice lately has been to remove telephone wires entirely from transmission towers, so that they will not be subject to trouble from the high-tension conductors. This is especially necessary on the very high voltage lines because of static induction. The latter is more difficult to eliminate satisfactorily than magnetic induction, which can usually be overcome by transposition.

FAULTS IN UNDERGROUND HIGH-TENSION CABLES

William A. Durgin presented a paper on "Location of Faults in Underground High-Tension Power Cables." Prompt location by test requires that each terminus of high tension lines should be provided with a device for short-circuiting the phases of a faulted cable. For a three-phase line, three short lengths of flexible cable, joined at one end and provided at the other with spring clips adapted to clamping the phase terminals firmly, answer admirably. The addition of a longer cable from the common junction increases the usefulness of the device by making a convenient arrangement for grounding, which is further facilitated by installing a permanent ground wire with wing-nut connectors near each cable terminus. A 100 to 200 volt source of direct current should also be available at each terminus. With these devices available, fault location by test resolves itself into four main divisions: A. Analysis of original fault; B. Reduction of fault resistance; C. Approximate location by predictive tests. D. Final location by exploration tests.

Much time may be saved and many errors avoided in predicting locations by analyzing the original fault thoroughly. A sensitive voltmeter, a lead from one side of the d.c. source with a lamp socket in series, and some form of bridge for measuring resistances from 0.1 to 300 ohms, are all the apparatus necessary in addition to that noted above. The voltmeter is used to measure insulation resistance by the well-known series method and should preferably have a resistance of at least 500 ohms per volt, although satisfactory results can generally be obtained with instruments of 200 ohms per volt. The procedure is as follows:

(1) With both ends of all phases clear, measure the insulation of each phase by reading the deflection of the voltmeter when one terminal is connected to the phase conductor and the other to the ungrounded side of the d.c. source through a 32-cp lamp.

If E_2 = Voltmeter deflection.
E_1 = Pressure of direct-current source.
R = Voltmeter resistance.

$$\text{Insulation resistance} = \frac{E_1 - E_2}{E_2} R$$

(2) If a fault on either phase has low resistance, apply the lead from the lamp directly to this phase, and if the lamp glows measure the fault resistance with the bridge, reverse the battery and remeasure, taking the mean of the two bridge measurements as the true resistance.

(3) Test for crosses between such phases as show the same insulation by grounding one and remeasuring the insulation of the other, using first the voltmeter and then, if a low cross exists, the bridge.

(4) Have the short-circuiting device applied at the distant end of the line, caution being used to make firm low-resistance contacts on all phases.

(5) Measure the resistance of all uncrossed loops with the bridge, checking the result against the resistance computed from the known size and length of line.

(6) If either loop shows high resistance, determine the insulation on the far side of the "open" over a clear phase, and unless that is much lower than the insulation on the test side of the "open" proceed with No. 7.

(7) Measure the insulation of the test side of the open phase when the far side is grounded over a clear phase, thus getting a minimum limit for the resistance of the path across the "open." If in No. 6 the insulation resistance of the far side is low, No. 7 is practically covered by No. 6.

(8) If all the loops show "open," check continuity by having the short-circuiting device grounded at the distant end of the line and applying the voltmeter to each phase. If one phase is then shown continuous and has fair insulation apply No. 7 to the other two phases.

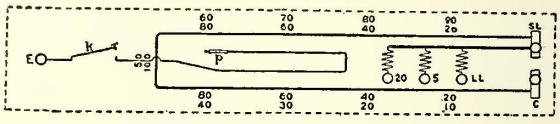
This procedure gives a clear picture of fault conditions. If the analysis shows all faults or crosses of more than 100 ohms resistance, the next step is to reduce one to this or preferably to a lower magnitude. The apparatus for "breaking down" faults depends largely on the size of the system concerned. In any system pressures from twice that of the normal transmission to a few volts and current of at least 5 amp will be required at the fault, while for long lines excess current capacity must be provided to supply charging current at the higher pressures. When special apparatus is to be provided for a moderate-sized system, the most satisfactory results will probably be obtained from a single-phase testing transformer of ample capacity supplied from the regular low tension system and controlled through a water rheostat. Provision should be made for following fault conditions with ammeter, voltmeter and wattmeter connected to the transformer, and for quickly checking the fault resistance at frequent intervals during the reduction process by series direct current voltmeter readings.

The procedure in this reduction process varies with the conditions at the fault. The object is always to carbonize a sufficient amount of paper to carry a current of 1 amp to 2 amp for several hours, as it is practically impossible to produce any form of metallic path from sheath to conductor in the presence of paper. If the paper at the fault is dry, a current of 1 amp continued for 5 to 10 minutes will generally produce a carbon path of less than 10 ohms resistance, which is stable for currents of a few amperes; but with damp paper a 3 amp to 5 amp current is required for about 10 minutes for drying, followed by a 1 amp current for 5 minutes for carbonizing. With a fault submerged in water, no manipulation will produce carbonization. These fault conditions can frequently be deduced from the behavior of the voltmeter and ammeter. Thus a submerged fault has a resistance to direct current of from 1000 ohms to 3000 ohms and requires 2000 volts for any alternating current from 1 amp to 5 amp. Furthermore, the frequent interruption of the arc at the fault by water gives both meters a peculiar kicking swing. A similar swing is also observed at first with a damp fault, but lessens perceptibly after 1 or 2 minutes; and when the arc is once established, the pressure required rapidly diminishes. With a dry fault very little swinging occurs, and if the current is held constant the pressure drops very rapidly to zero.

The lower the resistance produced the easier it will be to make accurate locations, but, unless the reduction is carried below 100 ohms, a 1000-ohm fault is nearly as satisfactory as one of intermediate resistance. It is important to work always on a single-phase or loop, for if two or more phases are grounded, or more than one cross exists, a successful exploration test depends on reducing the resistance of one fault much below that of the others, and on the other hand, a successful predictive test depends on preserving the unfaulted phases intact for use as normal standards.

Resistance forms the basis of most predictive tests, for this quantity is easily measured to an accuracy of one-tenth of 1 per cent, and proportionality to length is approximately realized. Of the many resistance methods only two are generally applicable to power cables—the Murray and the Varley loop tests. Both these tests are special applications of the Wheatstone bridge principle, and in consequence a modified bridge is required. The essential features can be shown by describing the apparatus illustrated which although apparently crude has been found to answer all requirements.

This consists of a slide wire C-SL, mounted over a paper scale divided into 100 parts, numbered in two ways, the inner scale 0-100-0 and the outer 0-50-100. Between SL and the



Simplified Slide Wire Bridge

posts LL, 5 and 20 are mounted three coils, the first having a resistance exactly equal to the slide wire (about 0.75 ohms) and the second and third, 5 ohms and 20 ohms respectively. The key K serves to control the connection between the binding post E and the chisel blade P, which is used as contact on the slide wire. Connections to the cable under test are made through 6 ft. lengths of large flexible leads, equipped with clamps capable of gripping firmly any form of switch part which may serve as the cable terminal; the resistance of these leads in terms of equivalent lengths of the various-sized cable conductors is tabulated for use in correcting measurements. A portable galvanometer, having a resistance of about 30 ohms and a sensibility of 0.4 millivolt per division, and a box containing eight dry battery cells, complete the equipment.

The resistance to be measured is connected between posts 20 and C the galvanometer between posts SL and C and two or three cells of battery between posts 20 and E. The point of zero galvanometer deflection is found with P on the slide wire, when if S = reading on the outer scale the resistance = $\frac{S}{100 - S} \times 20$ ohms. If the resistance is less than 7 ohms the connections are transferred to post 5 from post 20 and the measurement repeated, 5 ohms being substituted for 20 in the formula. In practice the values of $\frac{20\,S}{100 - S}$ and $\frac{5\,S}{100 - S}$ are plotted against S in the form of curves, so that resistances are read off directly for any given value of S. For values between 0.1 and 200 ohms the apparatus gives sufficient accuracy to check the continuity of conductors or to provide the data for a Varley loop location. The loop tests are applicable only when the faulted conductor is continuous, that is, when its resistance from terminus to terminus is entirely unaffected by the fault, and when at least one unfaulted conductor is available in the same or a parallel cable. For either test, the phase which has the lowest resistance fault is

joined to a clear conductor at the distant terminus with the short-circuiting device described above, using every precaution to make the connection of negligible resistance to insulate it well from the ground.

In the Murray loop test the two ends of the cable loop thus formed are then connected to the ends of the slide wire at the posts SL and C, the galvanometer also being connected between these posts. When a "ground" is to be located, the lead from the grounded direct-current source used for insulation measurements with the 32-cp lamp still in series is connected to post E, and the point of balance is found with P. If the galvanometer is not sufficiently sensitive, a second 32-cp lamp may be connected in parallel with the first, care being taken to make and break contact at K rather than P.

If S = Slide wire reading on inner scale expressed as decimal part of 1.00,
L = Cable length,
= Equivalent length of single connecting lead from slide wire to cable terminus,

then S (L + 1) — 1 = distance of fault from testing end of cable. A check measurement is next made by reversing the connections to the cables when the point of balance is found on the opposite side of slide wire, and a second check by transferring connections from post SL to post LL. With this latter connection the slide wire is one-half of the measuring loop, and S is read on the outer scale with twice the precision of the former measurements. No check reversal can be made with this connection, as the faulted phase must be connected to C in order that the balance point may fall on the slide wire. The mean of the three measurements is taken as the Murray loop location.

The standard Varley loop test differs from the Murray loop merely in using a fixed ratio for the balance arms of the bridge, represented by the slide wire, and in inserting between one end of the balance arms and the faulted side of the cable loop a variable resistance which is adjusted until zero galvanometer deflection is obtained; that is, until the inserted resistance plus the resistance of the cable up to the fault bears the same ratio to the resistance of the remainder of the cable loop as one balance arm of the bridge bears to the other. The true Varley test cannot be made, with the slide wire bridge, but a modification which combines features of both loop tests can be performed by connecting the cable loop between posts five and C—the faulted side to five—with galvanometer between posts SL and C. This places the 5-ohm coil in series with the faulted side of loop and leads to a new point of balance on the slide wire.

Then, if,

S = Slide wire reading on outer scale expressed as decimal part of 1.00,
Lr = Resistance of one conductor of cable,
lr = Resistance of one connecting lead from slide wire to cable terminus,
2 Lr + 2 lr = Therefore, resistance measured by loop bridge
and X = Location of fault in per cent of cable length from testing end.

$$X = \frac{(2\,Lr + lr) - S\,(5.00 + 2\,Lr + 2\,lr)}{Lr}$$

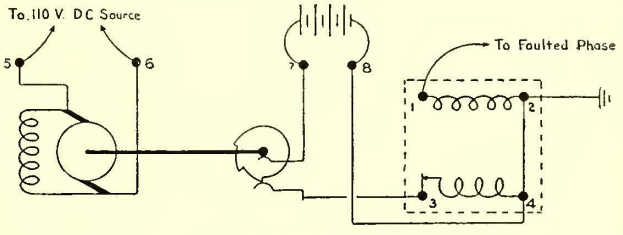
It has been assumed throughout that the faulted cable is made up of a single-sized conductor and that a clear phase in this cable is used to complete the loop. If, however, the line is composed of known lengths of different-sized conductors, or if a clear conductor of known length and size in a parallel cable is used, it is only necessary to remember that the percentage length obtained by either test is in reality a percentage of total resistance and to make the necessary computations to reduce this resistance measurement to percentage length.

The procedure has been outlined as applying to a "ground" fault, but the only change necessary to adapt it to the location of crosses is to treat one of the crossed conductors as "ground" connecting the d.c. source between it and the contact blade of bridge, the other conductor being considered the faulted phase.

The essential points in any satisfactory exploration test are to produce a large difference in some electrical condition on the near and far sides of the fault, and to provide a detector which shall only be affected by this condition. With sheaths bonded at frequent intervals to prevent electrolysis, the path of a signalling current from a ground to the sending station will divide first at the fault and further subdivide at each bonding point. A similar effect will result, even though the sheath is unbonded, if the duct line is damp or any other form of distributed earth connection exists. Hence, a continually diminishing portion of current will return over the sheath toward the sending station, while another continually diminishing portion will continue along the sheath to more distant bonds. Any detector, therefore, which responds equally well to current flowing in a conductor or in the sheath, will continue to indicate beyond the fault until the point is passed, where the last trace of signalling current leaves the sheath. Furthermore, any detector which responds at all to sheath currents will give most confusing signals due to railway and other stray currents.

These considerations lead to the development of a longitudinal exploring coil to be used with a telephone receiver. When the magnetic circuit of the coil is parallel to the axis of the sheath, and the winding, therefore, at right angles thereto, no effect is produced by sheath currents alone, but with conductors spiraled as in all high-tension cables a loud signal is produced by current flowing over the loop circuit formed by the conductor up to the fault and the sheath back toward the sending station.

When the fault resistance can be reduced to a few ohms, so that curents of 8 amp and 10 amp can be produced with a 115-



Vibrating Interrupter

volt d. c. source, very satisfactory signals may be obtained by using such a current sharply interrupted from 50 to 100 times a minute. Any form of "flasher" is adapted to the purpose, which gives a quick break and is capable of operating with certainty for a sufficient period to permit the exploration of the entire length of the longest line should location by the explorer method alone be necessary. In many cases, however, it is extremely difficult to reduce the fault resistance below 50 ohms or 100 ohms, and in some instances even when so reduced the ground quickly burns off under currents of more than 2 amp or 3 amp.

Such conditions are well met by an interrupting vibrator. This, as indicated, consists of a small 110-volt shunt-wound motor, which, through reduction gearing, drives a three-point cam-switch controlling the battery connection to the primary of an induction coil. The vibrating spring of the coil breaks contact about 200 times a second, and as the cam-switch makes irregularly spaced interruptions of the vibration increase the words "Hur-ry—up," repeated once a second, result. These irregularly spaced interruptions of the vibration increase the life of the vibrator contacts and battery and give a distinctive signal. With eight cells of dry battery connected to the primary, currents from 0.4 amp to 0.2 amp can be forced through resistances from 0 ohm to 100 ohms. Direct currents of this magnitude interrupted at low frequencies produce no sensible sound in the detecting apparatus, but the exploring coil and receiver are so much more sensitive to high-frequency currents that the signal from the 0.2-amp current of the vibrating interrupter is quite as loud as that

which would be obtained from a 15-amp "flasher" current.

The sensitiveness of the explorer and receiver are such that with high-frequency currents the displacement of the conductor due to spiraling is sufficient to cause a signal when the explorer is parallel to the sheath axis, even though the sheath carries no return current. For complete silence, the explorer must be absolutely parallel to the conductor axis, and, when used on a cable, to the sheath axis as well. This condition may be attained by connecting the vibrator between ground and all cable conductors in parallel. Charging current then flows out over all conductors, but as these are disposed symmetrically about the cable axis the combined effect is strictly equivalent to that of charging current flowing along a single straight conductor at the centre, the sheath also being equivalent to such a central conductor. The signal from charging current then is entirely eliminated by adjusting the explorer accurately along the cable axis, if the charging currents are approximately equal for all phases. Such approximate equality will exist unless the resistance of the faulted phase up to the fault is a considerable per cent. of the fault resistance, that is, in general power work, unless the fault resistance is less than about 10 ohms. As no interference from charging current is experienced with the single-conductor connection on very low resistance faults, the entire range from 0 ohms to 100 ohms is covered by using the multiple-conductor connection from 100 ohms to 10 ohms, and the single-conductor connection below 10 ohms.

D. C. TURBO-GENERATORS.

W. L. Waters, who presented a paper on d. c. turbo-generators, said that they have been built in Europe for the past fifteen years, but their design and operation have not until recently been sufficiently satisfactory to recommend them for use under American conditions. Lately, several European manufacturers have been turning out direct-current turbo-generators in sizes up to 1250 kw. In some instances these turbo-generators, which were originally built to operate with metallic brushes have been modified after installation to operate with carbon brushes. American manufacturers realized early that the d. c. turbo-generator would never be satisfactory until it could be built with carbon brushes, but it is only within the last five years that it has been found possible to construct d. c. generators to operate satisfactorily with carbon brushes at speeds materially higher than those of standard belt-driver generators. Such turbo-generators have now been developed in sizes from 10 kw to 300 kw at 125 volts and from 50 kw to 500 kw at 250 volts. Although 600-volt generators do not seem to be in great demand for this type of unit several have been in satisfactory operation for some time, notably a 1000 kw unit (consisting of two 500-kw generators coupled to one steam turbine) operating at 1500 r.p.m. in use by the North Shore Railway Company, California, in 1907. The two factors which limit the design of d. c. turbo-generators are the commutation and the collection of large currents at high speeds. The commutating difficulties can be satisfactorily met if a properly designed interpole construction is used. For generators of larger ratings than 500 kw a complete system of distributed compensating winding in the pole faces should be used. Good operation with carbon brushes requires a commutator which runs absolutely true under all conditions and at all times. The peripheral commutation speed usually adopted at the present time in America is from 4500 ft. to 6000 ft. per minute, although peripheral speeds 40 per cent higher than this have been used by European manufacturers with a special grade of brush.

At present the d. c. turbo-generator can hardly be considered commercial above 500 kw at 250 volts, and the probability is that in larger sizes it will be necessary to use an a. c. turbo-generator and rotary converter as a substitute. This substitute may, however, be only temporary in the 750-kw and possibly the 1,000-kw sizes. Considerably larger sizes are at present in use in Europe, but it should be remembered that operating conditions there are by no means as severe as in the United States.

GAS ENGINES.

The report of the committee on gas engines contained a list of 171 public service and private gas engine installations, including the following electric railway properties: Boston (Mass.) Elevated Railway Company; Charlotte (N. C.) Consolidated Construction Company; Milwaukee (Wis.) Northern Railway Company; Parsons (Kan.) Railway & Lighting Company; Missouri & Kansas Interurban Railway, Lenexa, Kan.; Philadelphia (Pa.) Rapid Transit Company; Western New York & Pennsylvania Traction Company, Olean, N. Y.; Warren (Pa.) & Jamestown (N. Y.) Street Railway Company. The correspondence of the committee brought out the fact that there are many more gas engines run by illuminating or natural gas supplying power to line shafting or direct to power-consuming apparatus than of gas engines driving electric generators. The list of installations given in the report includes the names of the manufacturers, names and addresses of users, horse-power in units and total, duty, kind of gas and kind of producer fuel.

The engine manufacturers informed the gas engine committee that they were steadily making improvements tending to increased reliability, better efficiency and lower weight. The report also mentions the fact that the lignite coals of the southwestern and northwestern states which are not suitable for steam generation are being successfully used in gas producers. In conclusion, reference is made to the Gary (Ind.) plant of the United States Steel Corporation, where there are installed 42,500 kw in gas-electric sets and 64,000 indicated-hp in blowing engines. Since starting the electric plant, some modifications have been made in the piston rings, piston rod packings and the circulation of cooling water, but apparently there has been no serious error in design or construction.

TIMBER PRESERVATION

A lengthy report was presented by the committee on preservative treatment of poles and cross-arms. The average life of an untreated, unseasoned pole throughout the country was given as follows: Cedar, 13½ years; chestnut, 12 years; cypress, 9 years; pine, 6½ years; juniper, 8½ years. Limitation of pole supply could be effected only to a very small extent by using metal and concrete structures or by placing wires underground. The only remaining method was to use preservatives which promised relief in two ways—first, by decreasing the drain on the present supply, and second by increasing the number of species available for pole construction. During 1907, 12.4 per cent and in 1908, 14.7 per cent of poles purchased by electric light and railway companies were treated with some preservative.

Answers to the committee's question box elicited the information that most of the reporting companies were favorably impressed with the use of creosotes or carbolineums for poles. Practically all the companies paint or preserve their cross-arms at an average cost of 14½ cents per arm. Quite a number of companies dip their pins in oil or other preservatives before setting.

The report also includes much data from the Forest Bureau's reports, and a paper on the history of German telegraph poles, which are chiefly of fir. It appears that up to the close of 1903, 2,560,412 standing poles equal to 89.9 per cent of the total, were treated with copper sulphate.

The economic value for different treatments is given as follows:

Kind of treatment.	Average life (years).	Manufacture. Mark.	Pf.	Cost per cu. m for freight and erection. Mark.	Pf.	Total. Mark.	Pf.	Cost per cu. m per year. Mark.	Pf.
Copper sulphate....	11.7	28	96	20	..	48	96	4	19
Zinc chloride.....	11.9	28	12	20	..	48	12	4	5
Dead oil coal tar...	20.6	36	93	25	..	61	93	3	1
Corrosive sublimate.	13.7	32	89	20	..	52	89	3	86
Untreated	7.7	20	80	20	..	40	80	5	30

Note: Mark (100 pf.) equals 24.3 cents.

The average annual cost in the last column is evidently only an approximate value, because, while the estimated lives extend over a series of years, the estimated costs only relate to the last year of observation. In general, however, the or-

der of the treatments as regards their economical value is the same as the order of the average lives. Dead oil of coal-tar stands first. Corrosive sublimate stands second and its superiority over zinc chloride and copper sulphate treatments can no longer be doubted. The most unfavorable position is held by untreated poles, the annual cost of which is nearly twice as much as the best treated pole.

Another appendix of the report contains German costs of zinc chloride and creosoted ties, while another gives the standard specifications of the American Bell Telephone Company for treating poles by the full-cell straight creosote or Bethell process.

REPORT ON INSURANCE AT ST. LOUIS

The report of the insurance committee was presented by W. H. Blood, Jr., insurance expert of the association. He analyzed the ratio of premiums to losses in the electric light and power plants of the country and estimated that in 1907 there were in the United States a total of 2,642,403 kw capacity of such stations. Assuming the insurable property as $170 per kw, and that 75 per cent is insured, the companies in 1907 were paying premiums on $330,500,000. At an average rate of 1 per cent this would amount to $3,305,000. Mr. Blood said that it was commonly conceded that the Underwriters use 45 per cent of the premiums for expenses of management, commission, profit, etc., which would leave 55 per cent with which to pay losses. Fifty-five per cent of $3,305,000 was $1,817,750.

The records show that the worst year that the Underwriters ever had was 1909, when they paid out in losses on electric light and power plants some $619,000. Compared with the premium received, $1,817,500, the ratio is three to one. Even if the estimate is reduced by 33 1-3 per cent, the companies are paying fully twice as much as they should for the insurance of their electric light and power plants.

Mr. Blood then recommended the passage of the following resolutions:

"Whereas, in the thirty-third annual convention of the National Electric Association, convened in St. Louis, May 24, 1910, certain figures were presented by our insurance expert, which tend to show that the fire insurance premium rates paid by the electric lighting companies of the country at large are fully twice as high as the low ratio warrants.

"Be it resolved, that this convention makes notes of this fact and directs that the matter be called to the attention of the fire insurance companies throughout the country, and that a demand be made for an investigation by them of existing rates, and that a reduction be made commensurate with the premiums received and the risks involved.

"Be it further resolved, that copies of these resolutions be furnished every member company of this Association and that through them the insurance companies writing the various risks be informed of the action of this meeting, and that a positive demand be made for a material reduction in rates."

REPORT ON PUBLIC POLICY OF THE N. E. L. A.

The report of the committee on public policy of the National Electric Light Association, presented at the convention of that association at St. Louis last week, occupies, with the appendices, a book of 294 pages. The committee consisted of: W. W. Freeman, chairman; E. W. Burdett, Henry L. Doherty, Charles L. Edgar, George H. Harries, Samuel Insull, J. B. McCall, Samuel Scovil, Charles A. Stone and Arthur Williams.

In its report the committee referred to its three earlier annual reports and stated that some of the issues which appeared previously to have been threatening the industry were gradually settling themselves through a better understanding of facts and fundamental principles on the part of the public, and the resulting application of the underlying common sense of the American people. One of these was that of municipal ownership. While municipally owned and operated plants still exist in some places and might so continue, the practice is not being extended and the number of such plants may be expected to decrease steadily rather than increase.

LEGISLATION

The committee represented the association at the National Conference on Uniform State Legislation at Washington on Jan. 17 to 19. The subjects discussed there of interest to the association were particularly those relating to compensation for industrial accidents and conservation of national resources, including the regulation of water-powers. On the first subject the conference resolved to recommend to the several States that workingmen's compensation acts, fair to the employer and employee and just to the State, be uniformly substituted for the present system of employer's liability.

In connection with the regulation of water-powers the conference recommended uniformity of State laws as to the regulation of water-power on non-navigable streams, and the necessity of uniformity of State regulations as to water-power on navigable streams. While the committee said that it was entirely in sympathy with the idea of preventing unnecessary waste of national resources, it believed that there was danger of defeating the real interests in view if unwise restrictions were placed upon the development of certain resources when development was most essential to the prevention of economic waste.

In referring to the corporation tax law the committee recommended that all member companies file the report required within the date fixed by law to avoid the extreme penalties provided for failure to do so, but also to file a form of protest which will be sent to all member-companies in Class A to secure the recovery of the payment in case the tax was annulled.

In considering the employers' liability the committee gave a summary of the recommendations of Senator Wainwright, chairman of the legislative commission, of New York, on this subject, and stated that in its opinion member-companies should favor the amending of liability laws, so as to substitute for the present employers' liability a reasonable basis of employees' compensation for injuries.

WELFARE WORK

The committee mentioned the following methods of welfare work for employees which had been established by member-companies:

Educational courses for technical and business instruction.

Social clubs or organizations for better acquaintance and for recreation and entertainment.

Benefit or insurance associations for indemnity against loss of wages in the event of sickness, accident or death.

Pensions for retirement with partial compensation on account of age or disability.

Savings accounts, with principal or interest, or both, guaranteed by employers.

Sale of stock to employees upon favorable terms, usually involving installment payments.

Investment accounts or clubs which will enable employees to purchase stock by means of general fund.

Profit sharing, based upon success of company and contribution of labor by employees.

The practice of the Commonwealth Edison Company, Stone & Webster, the Cleveland Illuminating Company and the Boston Consolidated Gas Company in establishing savings funds for employees were then described. The committee also gave statistics of the old-age pensions in the principal European countries.

PUBLIC SERVICE COMMISSIONS

The committee gave a digest of the law establishing the Public Service Commissions in Vermont, Maryland and New Jersey and upon the modifications proposed in New York State. An abstract of the recent decision of the New York Court of Appeals in the case of the Delaware & Hudson Company versus the Public Service Commission of the Second District of New York defining the limits of the control of the commission over the issue of securities was then published.

REASONABLE RETURN

The committee stated that the question of what constitutes a reasonable return to a public-service corporation is one of increasing importance in view of rate cases that are constantly being decided. It then referred to the decision of the Supreme Court of the United States in the Consolidated Gas case, stating that rates which would permit the company to earn 6 per cent per annum on the fair value of its property would not be confiscatory, and, therefore, unlawful; and in that of a water case in 1903 that a reduction of rates to a point to yield 6 per cent per annum of the value of the property of the water company was not confiscatory; and to that in the Knoxville water case, where the court declined to determine, because unnecessary in that case, whether a demonstrated reduction of income to a point that would yield 6 per cent would or would not amount to confiscation.

The committee also referred to the decision of the Wisconsin commission in the Madison Gas & Electric Company's case where the commission held that it would be reasonable to allow for both interest and profit a return of not less than 7½ per cent on a fair valuation of the gas plant and not less than 8 per cent on a fair valuation of the electric plant, these percentages being arrived at upon the theory of 6 per cent interest, with 1½ to 2 per cent for profit in addition to interest, to enable the company to secure both the business capacity and capital required to maintain its business upon a permanently successful basis. The report also referred to the decision of the Public Service Commission of the First District of New York in the Coney Island fare case with the Brooklyn Rapid Transit Company. This decision was published in the Electric Railway Journal of March 12, 1910, page 456.

The committee concludes that from the opinions in the New York and Wisconsin cases that there is an inclination on the part of these commissions to consider that a return of approximately 8 per cent upon a fair valuation of the property is warranted as a reasonable return to investors without interference from rate-fixing authorities.

APPENDICES

The appendices include a digest of workmen's compensation acts in different countries; the plan of organization of the employees' savings and investment funds already mentioned, and the legal decisions in Delaware & Hudson Company, the Madison Gas & Electric Company and the Coney Island fare cases.

A. I. E. E. ANNUAL CONVENTION

The annual convention of the American Institute of Electrical Engineers will be held at Jefferson (White Mountains), N. H., June 27-30. Headquarters will be in the Waumbek, where the meetings will also be held. Among the papers of railway interest which will be presented are: "Electric Locomotive Design," by N. W. Storer and R. W. Eaton, Westinghouse Electric & Manufacturing Company; "A Method of Determining the Adequacy of an Electric Railway System," by R. W. Harris; "Third Rail Construction," by Jesse H. Davis, B. & O. Railroad, Baltimore; "Power Economy in Electric Railway Operation—Coasting Clock Tests on the Manhattan Elevated Railway," by H. S. Putnam, New York. At the San Francisco meeting, held May 5-7, a paper on "Transmission Line Crossings of Railroad Rights of Way" was presented by A. H. Babcock.

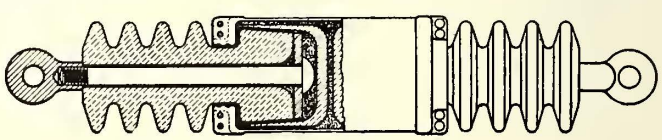
NEW OFFICERS OF THE N. E. L. A.

The following were elected officers of the National Electric Light Association for the ensuing year at the convention last week at St. Louis: President, W. W. Freeman of Brooklyn; first vice-president, John F. Gilchrist of Chicago; second vice-president, Frank M. Tait, of Dayton. Executive Committee—Alex. Dow of Detroit, H. A. Wagner of Baltimore and W. C. L. Eglin of Philadelphia; treasurer, Gen. George H. Harries of Washington, D. C.; secretary, T. C. Martin, of New York.

THE APPLICATION OF PORCELAIN STRAIN INSULATORS*

By W. H. Kempton

As porcelain is strongest in compression, the preferable form of a strain insulator from the standpoint of mechanical strength would be one in which only compression strains existed, and in which sufficient stock was placed under the load to give a proper factor of safety. In practical design this condition is difficult to realize, and the load on most types of insulators gives a combination of compression and shearing stresses. The three types of porcelain strain insulators, suitable for high voltage railway, are the spool type, the loop type, and the compression or barrel type. The spool and the loop types are the simplest and oldest, but both are limited in mechanical strength owing to the fact that the load is applied between a cable and pin at right angles, and two cables at right angles, respectively. This throws a comparatively small volume of porcelain in direct compression, the larger part of the load producing bending stresses. The spool type insulator is further limited mechanically by the possible bending strength of the pin, and electrically, by the amount of surface insulation possible. If the pin fits the hole in the insulator snugly, and the hole is of uniform diameter, the least bending of the pin will throw a bending stress on the insulator and break it. If a metal sleeve be cemented in the pin hole to distribute the load along its length, the expansion of the metal with heat may burst the porcelain. Practical design has settled down to a form of pin hole smallest in diameter under the wire groove and enlarging



Compression Insulator.

toward each end. This allows the pin to bend without pressing on the ends of the pin hole. The problem then becomes one of designing a pin of such length as to allow the desired insulation, and of such diameter as to give the desired bending strength. Several forms of spool strain insulators have been designed, respectively for 1200-volt and 6600-volt service, and also for higher voltages. These forms of spool strain insulators have an ultimate strength of from 9000 lb. to 12,000 lb.

The ideal porcelain strain insulator would have the load-bearing portion of the porcelain made with two exactly parallel surfaces held between two exactly parallel and absolutely rigid plates. The accompanying cut shows a form of compression insulator which approaches this condition. It consists of a porcelain bushing with an undercut head portion, so that two approximately parallel bearing surfaces are obtained. The head of the bolt passing through the bushing rests on a steel washer bearing on its inner end, and the shoulder of the bushing rests against an inner end of a split cylindrical case, riveted or bolted together over the porcelain head. The irregularities incident to manufacturing porcelain are taken care of by placing a lead washer under the steel washer and embedding the portion of the insulator inside the case in neat Portland cement. The bolt head is insulated from the case by a porcelain cap cemented over the head of the bolt and the insulator. The chief requirement in the design of this insulator is to make the case ribbed and of such form as to prevent the end bearing surfaces from sagging. If these surfaces sag the load is thrown on the outer rim of the porcelain head, causing the sides to split off. One sample, with a 4-in. diameter head, stood a test of 34,000 lb., at which point the bolt broke. On tearing down the insulator a crack in the porcelain was discovered with difficulty. Insulators of about half the above size, with 2½-in. diameter heads, will stand mechanical tests of from 18,000 lb. to 20,000 lb.

For low-voltage work, what is known as the "goose egg"

*Abstract of a paper presented at the May 27th meeting of the American Institute of Electric Engineers, New York.

strain insulator has been used for several years. It consists merely of an oval mass of porcelain about 5 in. long by 3 in. thick, with wire grooves in opposite ends and at right angles to each other. Practically all of the porcelain helps carry the load directly or indirectly, so a very strong insulator results. The ultimate mechanical strength is from 12,000 lb. to 14,500 lb. A smaller size, 3½ in. long, stands from 9000 lb. to 12,000 lb. stress.

However, on account of the rough usage insulators are apt to receive in low-voltage work, the molded form has been more popular. The load is carried directly by metal parts with hard and tough insulation, usually sheet mica, interposed between and surrounded by tough molded protecting covering. This construction makes a very reliable insulator mechanically, and one that, on low-voltage work, is reliable electrically. All forms of molded strain insulators, whether for high or low-voltage work, tend to depreciate on exposure to the weather. Molded strain insulators are not so well suited for high-voltage work. To stand the higher electrical test the metal parts must be further apart, and on account of the resulting greater leverage the metal parts must be made much heavier to maintain the same mechanical strength. When large iron parts are embedded in the molded insulation, the expansion and contraction of the metal with heat is apt to crack the covering and admit moisture.

ELECTRIC RAILWAY CATENARY CONSTRUCTION

At the May 27 meeting of the American Institute of Electrical Engineers in New York, W. N. Smith presented a review of electric railway catenary trolley construction. Beginning with current collectors, Mr. Smith compared the sliding bow and trolley wheel. Although the advantages of the sliding bow seemed conclusive for high-tension trolley operation, it had the drawback of responding more sluggishly to irregularities in the trolley wire. The writer's observation led him to believe that the objections to the bow trolley had developed particularly where the catenary was defective. It was easy to allow enough slack to get into a catenary trolley to cause sufficient sag in the 10-ft. sections to make kinks at the hanger points. Under such circumstances high speed operation with a sliding bow was extremely unsatisfactory while with a wheel trolley, whose rate of vibration as about double that of the pantograph, such a condition was not prejudicial to smooth operation.

The author divided catenary construction into three types as follows: Plain single catenary with the trolley wire hung directly from the messenger; compound or three-wire single catenary in which the trolley wire was suspended by clips of uniform length from a tight secondary wire just above, this secondary wire being supported by hanger rods of varying lengths from a slack messenger wire; and double catenary construction, consisting of two messenger wires and one trolley, arranged to form an equilateral triangle as in the original New Haven construction. The three-wire single catenary was the one so extensively adopted abroad mainly because it enabled the maintenance of uniform tension on the trolley wire.

Taking up poles and bridges, the author recommended that where wooden poles were used they should invariably be treated by some one of the vacuum, open tank or brush methods. There were three important types of steel poles—the two or three-section tubular pole; the tripartite pole, built up of re-rolled Bessemer steel "U" sections with malleable iron collars and spreaders; and the diamond pole, which consists of two steel "V"-shaped troughs tapered and flanged over the edges, one being driven lengthwise within the other to form a box-shaped pole whose extra strength lies in the additional thickness of the overlapping flanges. The tubular type was the least economical in weight for a given strength while the diamond pole was superior to the tripartite in weight economy. The tripartite had a great advantage in being rustproof and accessible for painting throughout. The reinforced concrete poles which had recently come into use for electric railways could, under favorable conditions, compete with cedar or chestnut poles as to first cost. They were about twice as stiff as a cedar pole and had 30 per cent to 50 per cent greater ultimate strength besides being practically indestructible. Poles for catenary construction must be stronger and larger than those for the ordinary line work. On this point Mr. Smith gave some information on setting, rake and spacing on curves. He also described a number of bracket insulator pin fittings such as those used by the Denver & Interurban Railroad, the Connecticut Company and other roads.

In considering messenger and trolley wires, the author called attention to conditions which had arisen in using the plain type of catenary construction with no take-up devices. In warm weather, the 10-ft. sections between hanger points became slack enough to cause the sliding bows to pound kinks into the wire at hanger points. The only remedy for this situation aside from providing overlapping breaks was to pull the wire tight enough so that its strain at maximum temperature would not be less than 2,000 lb. for a No. 0000 wire. If the minimum tension at 100 deg. Fahr. was to be 2,000 lb., it would run up to about 5,000 lb. while the elastic limit of the wire would be reached at 5,817 lb. Since 5,000 lb. was so close to the elastic limit, it could be expected that a copper trolley wire pulled tight enough to be effective at maximum temperatures, would be likely to get pulled beyond its elastic limit in a season or two, particularly after the outer skin had been worn down somewhat by the passage of current collectors. These considerations might explain much of the trouble that had been experienced with plain catenary construction using hard-drawn copper wire. Usually, the only remedy was to pull out the slack as often as required. This warm weather slackness could be obviated where a wire could be pulled sufficiently tight to be at a minimum of 2,000 lb. at a high temperature and 5,000 lb. at a low temperature. This could be done with the phono-electric wire, steel or copper-clad steel wire.

The author recited the experience of the Denver & Interurban Railroad with phono-electric trolley wire and said that it had not been necessary to pull any slack out of this wire despite constant operation for two years over a 45-mile line. Tension devices for trolley wire, as thus far developed, chiefly in Europe, did not seem to contemplate tensions of more than 1,000 lb. to 1,500 lb. Furthermore, the clips by which the trolley wire was supported from the secondry wire directly over it were of a type that would yield vertically, so that the trolley could carry a wave along with it as it traveled underneath the wire. The writer believed that without the upwardly yielding hangers it would be necessary to maintain a minimum tension of at least 2,000 lb. and that the only excuse for maintaining a lower tension was the ability of the trolley wire to yield at the hangers. Such hangers had not been generally adopted for use in this country. Good results had been effected on the New Haven Railroad by a maximum tension of about 5,000 lb. on the trolley wire without using automatic tension devices.

In the latest New Haven construction, the clips by which the working conductor was attached to the lower or secondary messenger were fast to both the wires, and no vertical play was allowed other than that due to the yielding of the secondary wire. The European compound catenary, however, had its hanger clips designed to permit the trolley wire to yield vertically. The other principal feature of the compound catenary was the placing of tension devices at intervals to take up any expansion in the trolley wire. These contrivances consisted of weights operated by chains over pulleys and pulling against the free end of a 3000-ft. to 4000-ft. section. The consecutive sections were overlapped so that the contact bow would slide readily from one to the other. This arrangement naturally served for the installation of section insulators around each of which a jumper could be placed, if desired. Mr. Smith also referred to the equalizer catenary construction described in the ELECTRIC RAILWAY JOURNAL, of March 5, 1910.

The author next presented illustrations and descriptions of the catenary hangers used on the experimental line of the Connecticut Company as described in the ELECTRIC RAILWAY

JOURNAL of Feb. 26, 1910. He pointed out that in the hunt for the best imaginable solution, it should not be forgotten that some existing lines were operating very satisfactorily. It might be well, perhaps, to call a halt to ask ourselves whether all these catenary hanger adjustment features really were worth their cost. There was a tendency now toward increasing the distance between hanger points in catenary spans. The original spacing was about 10 ft. During the early development one company had advocated three-point suspension on tangents for spans as long as 150 ft. At present, however, the three-point suspension was recommended only for wheel trolley operation and 11-point suspension recommended for sliding bow operation. The spacings brought the hangers approximately 14 ft. apart. Another company recommended a construction having 12 points of suspension for 120-ft. spans and 11 points of suspension for 150-ft. spans.

The conclusions of the Power Distribution Committee of the American Street & Interurban Railway Engineering Association in its report on catenary construction in 1908 were rather in favor of 20-ft. to 30-ft. hanger spacing because the sag between hangers, though very slight, would still be enough to take up the expansion of a copper trolley wire in warm weather. The committee also favored making spans 300 ft. long, using light and flexible hangers and adopting a plow steel messenger cable strung to a small sag.

Much had been said from time to time about the necessity of staggering the trolley wire for sliding bow operation. The writer had noted enough successful operation without staggering to confirm his belief that it was not absolutely necessary in interurban service with average track and average motor cars, as the car generally was sure to sway enough fairly to equalize the wear on the sliding bow. Staggering might be seriously entertained on lines with very heavy locomotives and extremely solid roadbed. Although the latter conditions existed on the New Haven Railroad, it had not been found necessary to stagger the wires. Mr. Smith then described the new curved bent construction of the New Haven Railroad, as illustrated in the ELECTRIC RAILWAY JOURNAL of April 16, 1910.

In discussing steady strain insulators of various types, the author mentioned the one used on the Denver & Interurban Railroad and described in the article on this line printed in the Sept. 5, 1908, issue of the ELECTRIC RAILWAY JOURNAL. The author thought highly of the disc type of insulator. He did not believe in using wood for heavy strains where there was any possibility of full voltage being applied to opposite ends of the insulator. Deflectors were about the worst nuisance with which one has to contend in maintaining a catenary line, because it was very difficult to stretch the intermediate wires perfectly tight and to keep them so even if they were adjusted. Deflectors were heavy enough to require considerable care in installation and on account of their weight it was desirable to have them placed under a bracket or as near to one as possible. The use of frogs on catenary construction for a sliding bow had been found unnecessary. Wood section insulators were a necessity with wheel trolleys and ordinary trolley suspension, but by far the best form of section insulator for bow trolley operation was the overlapping break without wood or any other insulating under-run. Section insulators made good feeding-in points and should be fitted for a jumper, which would include a normally-closed knife switch. A hooked stick with a grounding chain attached above the handle could be used to pull this switch when it was desired to open a section of high voltage trolley. It was desirable to have such switch boxes located at railroad stations or signal towers and well out of the reach of all but employees.

At high voltages it was absolutely necessary to ground all the brackets and spans of a catenary line. This could be most effectively done by steel or iron bars about 5/16 in. or ⅜ in. by 1¼ in., having the top end bolted to the butt end of the bracket and the bottom end run over to the track through the ground from the butt of the pole. The best kind of a connection to make with the track was through a cross bond, as this was more flexible than to connect a rod directly to one of the rails. The ground rods, brackets and truss rods together formed a fair lightning protector for the trolley construction. To make this more effective, the Denver & Interurban Railroad had used a steel, grounded cable which was run along the tops of all the poles, connected to every bracket and grounded on the fifth pole through a rod attached to a cross bond and also to a pipe or ground plate set in moist earth.

Referring to current collection, Mr. Smith was disposed to believe that the roller type of trolley eventually would be developed to constitute a distinct improvement over the present sliding bow in the applications for the rough and ready service of trunk line work. In this connection he quoted an article from the ELECTRIC RAILWAY JOURNAL of Oct. 2, 1909, on the excellent results of the roller collectors of the San Francisco, Oakland & San José Railroad. The quoted life of 67,500 miles seemed incredible, but it was quite evident that the device was worthy of consideration. In conclusion, the writer mentioned double trolley construction. The Europeans had worked it out for three-phase railway equipment, but it was doubtful whether any American railroad man would ever become reconciled to employing two trolley wires of opposite polarity over any railroad track if he could possibly get along with one.

DISCUSSION

In discussing Mr. Smith's paper, C. J. Hixon, of the General Electric Company, laid great stress on the matters of flexibility of the trolley wire if good results are to be obtained in the operation of collectors at high speed.

R. D. Coombs, of the Pennsylvania Tunnel & Terminal Railroad Company, told of the tests made by that company in the Long Island test track. It was Mr. Coomb's opinion that the simple single catenary with flat-iron strap hangers looped over the messenger so as to allow of a vertical motion, offered a satisfactory form of overhead construction. He thought that the question of tension did not play such an important part in the operation of a successful system as to justify all the expense and trouble often devoted to it. With reference to tension in the trolley wire R. C. Thurston, of the Erie Railroad, said that when the tension is slack, a high wind has been known to deflect the trolley wire until the hangers touched the contact shoe.

The general problem of energy collection was clearly stated by Charles Rufus Harte, of the Connecticut Company. According to his statement the successful system for energy collection by a moving train involved the consideration of collector design as well as the type of overhead construction. The overhead structure should be uniform throughout its length, and a perfectly rigid conductor, which would approximate a third rail, should be equally as satisfactory as a perfectly flexible structure. The collector itself should be a compound mechanism; one part designed to take care of the large variations in height of the wire and another of small inertia to follow the minute and rapid variations. He suggested a type in which the angular displacement of the top member or flap would actuate air valves and operate the main or pantograph member, so as to keep the pressure against the wire about constant. A stop could be provided to force down the pantograph in case other air cylinders did not have time to act. Mr. Harte gave much interesting information regarding the results of the extensive tests being carried on by the Connecticut Company and promised to send in a written communication, which would give specific data.

Chairman William McClellan stated that the only way to get satisfactory results was with a flexible overhead system. He believed that the latest New Haven construction is a step in the right direction and yet it is not a satisfactory solution of the problem. In his opinion the overhead construction would finally come to straight poles on the sides and cables between them to carry the catenary as in the Erie yards.

MEETING OF THE COMMITTEE ON TRAINING OF EMPLOYEES

A meeting of the committee on training of employees of the Transportation and Traffic Association was held at the headquarters in New York on May 27. Those of the committee present were: G. O. Nagle, Wheeling; C. E. Learned, Boston, and L. C. Bradley, Pottsville. Henry C. Page, Worcester, was also in attendance during a great part of the meeting.

In drawing up a plan for the work for the ensuing year it was found that the committee for the two preceding years had considered the employee from the time at which he made his application for service up to the time at which he was accepted for employment. It was decided, therefore, to devote the greater part of the report this year to the period during which he served as a scholar or apprentice and until the time when he was accepted by the transportation department and placed on the extra list. The committee hopes during its investigation of this subject to establish a recommended form of examination for new employees.

During the meeting Mr. Learned gave a very interesting account of the method employed by the Boston Elevated Company in breaking-in new men. New men, after having been passed by the employment department, are assigned to one of the group of special instructors selected from among the regular men, who teach them the duties of motormen or conductors. These instructors receive 10 cents a day in addition to their regular wages whether they are engaged in instructing or not. This price is not considered unreasonable by the company because in addition to the work of teaching the new men each instructor necessarily has to give some extra time to the student before his run to show him how to begin his work and at the end of the day to teach him how to make up his card. The new men are paid $1 a day while breaking in. This policy seems justifiable by the management inasmuch as it is at least an amount sufficient to pay the man's board. A new man who is perhaps from the country with a little capital will often get discouraged during the first few days, and if he feels that his money is gradually being spent may leave the service and then the company may lose some good men. Another advantage of paying a student is that the man will take another day or two, or longer, in breaking in if he does not feel that he is quite competent for the work.

After a man has broken in in this way he goes on the extra list, and during this time the company guarantees that he shall receive at least $7 a week, provided, of course, that he reports for duty every day.

The company keeps its records of employees on individual cards and uses a cipher system for indicating all offences. For instance, the letter "A" may indicate insolence, "B" failure to hold the trolley rope while passing around a curve, etc. This system has two advantages. In the first place it very much abbreviates the work of keeping the records; in the second place, a glance at a card will show by the repetition of certain letters whether a man's failures have been of the same kind or not. The original records from which these reports are compiled are kept for only a short period of time, say, 6 to 8 months. Each inspector is instructed to report all offences on the car on which he is riding, as if he himself owned the car, and as if the car was in competition with every other car on the system. Each offence is considered to have three phases: First, the violation itself; second, the cause of the violation, and, third, the effect. For instance, the failure of a conductor to announce a street might be the violation reported. Talking, or general inattention, may be given as the cause, and the effect that a certain number of passengers had been carried past their destination.

All inspection reports are received in the transportation service, and after being noted, are sent direct to the division superintendent where the employee is in service. The attention of each man affected is called to the fact that he has broken a rule. The extent to which this system is carried is indicated by the statement that out of 6000 employees probably 2000 are spoken to a month in regard to various minor or greater infractions in the rules. When a rule is broken the man is requested to report the number of the rule broken and to quote its exact language. This impresses the matter upon his attention.

In the general discussion which followed this description of the method in Boston a great variety of practices was found in the methods of arranging runs. In Boston a man scheduled for a run, if unable to reach the station, is permitted to notify the starter by telephone or letter that he cannot take the run. If the notice is received 10 minutes or longer before the time scheduled for departure there is no penalty. If received within an hour after the time when the missed run begins the man goes to the bottom of the extra list for one day. If not received within that time he goes to the bottom of the extra list for three days.

Mr. Bradley said that in Pottsville if a man missed three times within a certain period he loses his rating and goes on the extra list. He also stated that in Pottsville it had been possible to divide runs into early and late runs and to divide the men into two sections, so that half of the men were assigned the early runs and the other half the late runs. The assignments for the sections are alternated every two weeks, and this plan has proved quite popular with the men. It allows a man, if he wishes to have some time off in the day time, to arrange to take that time off while he is working on a late run, and if he wishes an evening off, to arrange to take it while he is having a day run. Of course, once in two weeks each man has to work 18 hours out of 24 hours, but on the other hand every man has every other Sunday off.

Mr. Page stated that when he went to Springfield the practice there was to give the regular runs to the new men and give the extra runs to the old men. As a sliding scale of wages was used, the old men received higher wages than the new men. He had taken a concensus of the opinion of the men and had found this plan popular, so that it had not been changed.

The next meeting of the committee will be held during the early part of the summer, after the returns for the data sheets have been completed.

ASSOCIATION CIRCULARS ON TRANSFER INFORMATION AND CITY RULES

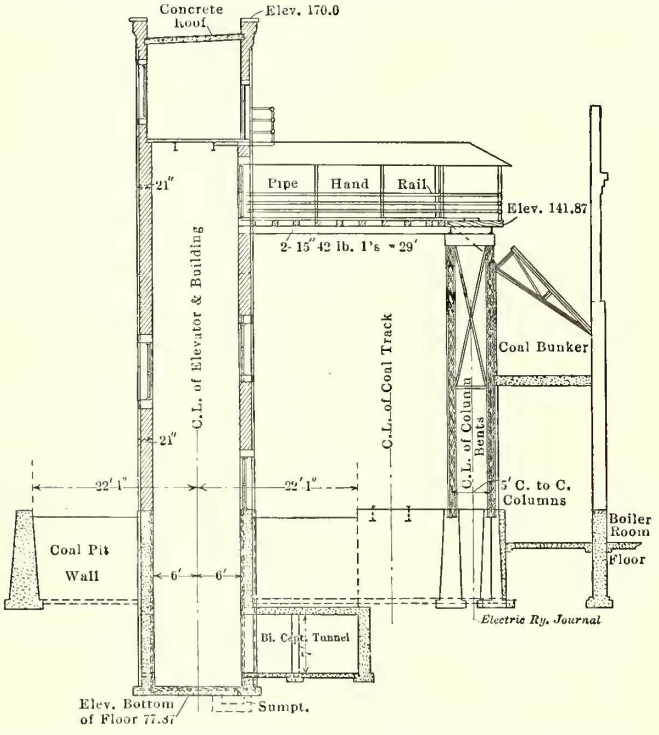
The committee on transfers and transfer information of the American Street & Interurban Railway Transportation & Traffic Association has sent out through Secretary H. C. Donecker data sheet No. 56 relative to this subject. Among the questions which the member companies are asked to answer are those relating to changes in transfers made necessary by the use of pre-payment cars; whether passengers who present lapsed or incorrect transfers should be ejected if they refuse to pay cash fare; whether transfers are registered; what percentage of passengers receive transfers; what percentage of total passengers ride on transfers, and whether automatic transfer issuing devices are employed.

The committee on city rules of the same association is sending out data sheet No. 55, on which member companies are asked to give their opinion of certain city rules, for which amendments were proposed at the Denver convention. The rules are as follows: No. 2, Responsibility; No. 21, Standing on Steps; No. 101, Position on Car; No. 116, Change; No. 213, Power Off Line, and a suggested additional paragraph to rule No. 10, relative to the conditions under which the motormen should proceed to the other end of the car when it is necessary to reverse the car for more than 10 ft. In the case of the other rules mentioned, the circular first gives the rule as submitted by the committee, then the amendment, and concludes with legal and other comments on the desirability of changing or retaining the original wording.

NEW COAL HANDLING PLANT FT. WAYNE & WABASH VALLEY SPY RUN STATION

The Spy Run generating station of the Ft. Wayne & Wabash Valley Traction Company was built in 1906. This plant has an ultimate capacity of 8500 kw with horizontal steam turbo-generator units. The generators are mounted on a floor carried above the boiler plant. The coal-handling plant of this station as first built included a gantry crane traveling over a coal-storage pit. The crane was equipped with a one-ton clam-shell bucket with the necessary hoisting and coal-crushing apparatus. The crane bridge, which was 60 ft. wide, was arranged for electrical propulsion over tracks 225 ft. long carried on the sides of the concrete coal-storage pit. Coal was received in cars and unloaded into the pit or directly into the power-station bunkers. The crane bucket elevated the coal and dumped it into a bunker of about 400 tons capacity. The crane served a storage yard of approximately 6000-ton capacity and is stated to have been satisfactory while in operation, except that the maintenance cost was high.

On Aug. 28, 1909, the crane was blown over during a heavy windstorm. The crane operator had failed to lock the crane to the rails and the wind pressure against the framework of the bridge moved it along the runway at sufficient speed to break the bumping blocks when the end of the travel was reached. The crane then upset, falling into a water tower nearby. The force with which the crane struck the water tower served to destroy both crane and tank. After this accident the engineers of the Ft. Wayne & Wabash Valley Traction Company were confronted with the problem of replacing their coal-handling equipment. Several systems were considered and practically all except the new plant as here illustrated were not accepted on account of the high maintenance cost. The new installation was chosen, not for its low first cost, but because it promised to require little maintenance.



Coal-Handling Arrangement of the Fort Wayne & Wabash Valley Railway's Power Plant

The new system includes a coal tunnel under the storage pit, an elevator shaft and distributing tracks for handling coal in industrial railway cars. A tunnel was built under the coal-storage pit directly alongside of the tracks from which incoming coal cars are unloaded. Coal valves were fitted into the roof of the tunnel and thus the industrial railway cars in the tunnel are quickly loaded by gravity through the valves. Three 2-ton roller-bearing push dump cars were purchased from the C. W. Hunt Company for this use. One man can easily handle one of these 2-ton cars when loaded.

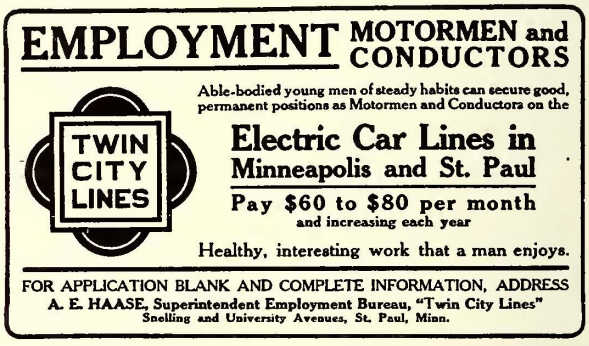
After a car has been filled in the tunnel it is pushed onto an Otis elevator and raised to a trestle just above the level of the coal bunker. The total lift from the floor of the tunnel to the elevated tracks is 60 ft. The car is then pushed out onto the trestle tracks and the coal is distributed to the bunkers. The engineers state that the total cost of this coal-handling plant was about $15,000. At present the coal consumption of the Spy Run station is approximately 150 tons per day. It is now said to cost about 3.63 cents per ton to unload, store, reclaim and deliver coal to the bunkers over the boilers. This figure includes only operating cost.

An accompanying engraving shows a vertical section across the coal pit and elevating machinery and through the elevator tower. Acknowledgment is made to M. J. Kehoe, superintendent of power, Ft. Wayne & Wabash Valley Traction Company, for information used in the preparation of this description.

TWIN CITY RAPID TRANSIT COMPANY'S METHOD OF ADVERTISING FOR TRAINMEN

The Twin City Rapid Transit Company is now advertising in a large number of daily papers throughout Minnesota and North Dakota, asking young men to apply for employment as motormen and conductors. The accompanying advertisement, bearing the monogram of the Twin City lines, ran for a month in each of 92 newspapers in country towns and brought good results in the form of applications from young men raised in the farming country.

A larger advertisement has been run as an advance announcement of the visits made to numerous towns by the assistant superintendent of employment, B. F. Jager. With a view to inspecting candidates for positions, Mr. Jager followed carefully laid out schedules, which took him to certain towns on definite dates. An advertisement of the itinerary was run in local daily papers a week previous to the arrival of the representative of the Twin City lines. Thus, at the published time of his visit, the candidates were on hand and he was in position to accept applications. It is stated that by means of this advertising campaign for employment the Twin City lines are obtaining applications from a satisfactory number of highly desirable men.



One of the Advertisements Printed in a Country Newspaper .

The Denver (Col.) City Tramways is entirely rearranging its lightning protection. General Electric electrolytic arresters are being installed in each car at a total expense of about $15,000, and other equipment, including line arresters, will add about $20,000 more. The points for special protection are determined from a "tack" map kept by the company for about a year, to show the points which have been suffering most by lightning strokes.

THE TECHNICAL SCHOOL AND ELECTRIC RAILWAY

The regular monthly meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of May 26, with President C. H. Hile in the chair. The speaker of the evening was Prof. A. S. Richey, of the Worcester Polytechnic Institute, who read a paper on "The Technical School and the Electric Railway." An abstract of Professor Richey's paper follows:

The notable point of contact between the engineering college and the railway company is the engineering graduate. He is the product of the college and the raw material which is to enter into the human organization underlying the transportation industry. The attitudes of both the college and the railway company toward the graduate are changing greatly. Engineering laboratories and new methods of instruction show that the colleges are active and alert in trying to meet the new needs. On the other hand, the railway companies do not so often repulse the efforts of the technical man to secure a position, nor do they expect the graduate to be a ready-made engineer. The railway companies are beginning to follow the example of the manufacturing companies in establishing apprentice courses in cadet engineering for the final training.

A representative course in a manufacturing plant was described by the author, who emphasized the fact that although the student may get long hours daily of work embodying little interest in the early part of his course, if he tries to master each task and study the reasons for details of design and construction he will soon be allowed to do more responsible work. During the time spent in the winding department he sees embodied in concrete form the principles of electricity which in the classroom were represented by formulas and diagrams. He learns that a mistake in making connections or carelessness in putting the coils into the slots is almost sure to result in injury to the installation, which causes a breakdown in the subsequent test. In the shop department the student has the benefit of the premium system, and the bonus offered for doing certain work within a specified time urges him to work as fast as he can. But the temptation to gain speed at any cost is lessened by the knowledge that his mistakes will surely be discovered, and as time lost in repairing defects very materially reduces his premium, the student soon learns that reliability is more important than speed. The natural bent of the student usually makes itself known in a short time after entering the shops. His future can be predicted with considerable accuracy from the report of the shop foremen after six or eight weeks. The managers also have full opportunity to take the measure of the apprentice. College graduates are able to take up the work of the different departments more quickly than are men without educational advantages. The character of the student counts for more than does the knowledge which he acquires at college.

Charles F. Scott, of the Westinghouse company, interviewed a number of his associates in different departments to ascertain the reasons for the deficiencies of the college graduate. No one mentioned lack of theoretical knowledge as a cause. Among the causes of failure mentioned were general mediocrity and lack of ability to do large things; lack of initiative and ability to carry through tasks independently; undeveloped faculty of attending to details; lack of diplomacy and tact; absence of real interest, and too great haste in passing from one line of work to another. Several referred to instances in which young men declined to take minor work, although their superiors had a succession of positions which were to follow successful performance. It was inexpedient to explain the plans to the young men, and their failure to undertake and do the little things proved that they were not made of the right kind of material.

While the college graduate is not a perfect employee any more than he is a complete engineer, he will average in a higher class and with no more of those faults which have been enumerated than the average non-technical employee. It simply means that in employing technical men as well as non-technical, the employer must "hire, try and fire" to weed out those with undesirable qualities. Even though objections as cited are found to technical graduates the fact that the manufacturing companies yearly send representatives to the technical schools in search of men proves that their services have some value. Competitive bidding for the services of apprentice engineers may of itself be bad for the young graduate, on account of the fostering of conceit to which it often gives rise.

Mention was made of the relations of the American Telephone & Telegraph Company to the technical schools, and the practice of the Denver Gas & Electric Company in seeking the services of new graduates was reviewed. The results have been most satisfactory. The Rochester Railway & Light Company, the Public Service Corporation of New Jersey, and the Metropolitan Street Railway Company of New York offer definite courses of instruction to technical graduates. R. M. Searle, of the Rochester company, writes: "It has been our practice every year to put on a number of cadet engineers at $50 or $60 a month, the idea being to give them a salary that would clothe and board them, and let them maintain sufficient self-respect to take up that which for two years is ordinarily a post-graduate course. About two men out of five stick or succeed along the channels we lay out. They are given everything to do from shovelling coal to actual executive work, and one of the chief things we teach them now is the necessity of having tact, not only with the men under them, but with the public. The fact that we are continually approached by outside companies for our cadets after training is a gratification to us, and indicates that the lines we are following approach good practice. We have found that at the outset the average college graduate is almost useless and hopeless in true commercial lines, leaning too much upon what he has learned at college and not using it to his advantage. It takes him at least two years to reach his equilibrium, and then if he has initiative left he manifests to his colleagues or competitors the superior benefits of technical education."

The details of the apprentice engineer's course as conducted by the Public Service Corporation of New Jersey were mention, as printed in the ELECTRIC RAILWAY JOURNAL of May 21, page 1008. The instance was cited of a young man who practically created such a course for himself in another company. The young man had just graduated from a technical school, and having a speaking acquaintance with the president of the electric railway company in his home city (in the Middle West), he requested the president to give him a letter of introduction to the head of any department, asking that he be put to work in that department as an inexperienced employee, with absolutely no unusual favors—to be discharged the moment he showed himself worth less than the man working alongside of him. He wished to remain in that department until he was satisfied that he had become familiar with the operating principles there, and then he wanted the privilege of resigning that job and being placed in a similar manner in some other department. He cared nothing for the order, but wanted a working knowledge of all departments. The president of the company listened to his plan and granted his permission, more as a personal favor to the son of a former acquaintance than as a practical scheme. The young man went to work. None of his superiors knew of his plan except the president, who kept track of his movements and progress in a half-interested sort of way. In the course of about two years he realized that the young man was "making good" and rapidly becoming a first-class railroad man. He is now in a regular position and in direct line for promotion to the headship of a department.

The constant need of first-class men as heads and sub-heads of departments in electric railway work is evident. That technical graduates are the best material as a class from which to fill these positions is being slowly realized by the companies is evidenced by the increasing number of technically trained men who are filling these positions year by year. Until recently these men have had to fight to secure a foothold, and most of those who have done so have done it in spite of every obstacle. The prejudice against college men has lasted here probably longer than in any other business. Too much has

been expected from the college man at the start. We must not expect him to be an engineer merely because he holds a diploma. He must start at the bottom like any man without college training. We must watch him, and in many cases take the conceit out of him, and shift him from one job to another, remembering if he is the kind we want he will "catch on" at different jobs quicker than the non-technical man.

The method used most generally by an electric railway in employing a technical graduate, if it may be called a method, is to put him at work somewhere in the electrical department, drafting, bond testing, pole checking or the like, and then letting him alone to watch him grow. He is four years older than other men of equal practical experience, or, in other words, four years younger than other men of his age. These four years have been spent away from actual business cares, which is in many cases to the disadvantage of the graduate. Sometimes he has a case of "swelled head," which could easily be reduced by proper treatment. Electric railway men do not realize these facts and act accordingly. We handle him precisely like other men, whom we do not expect to advance, and then damn technical education because he does not make a railroad man. And in spite of it some do make railroad men.

One result of this policy is that electric railways get only two kinds of graduates; those men who have their hearts set on railway work and have the idea so firmly fixed that all the advantages offered by the manufacturing, telephone and other companies do not shake their intentions, and the men who are not able to secure work with the companies offering better opportunities. The second class helps to fasten a bad name on the technical schools; those who succeed, in the first class, are called exceptions to the rule, and the rest are discouraged and turn back to the manufacturing and other companies, who welcome them.

Adopt a policy of systematically training the technical graduate; select your students as carefully as your conductors, and see how your opinion of the technical man changes for the better in three years. Then, when a valuable foreman or department head leaves you, see how much easier it is to fill his place and from men trained in your own methods and on your own property. Note the ease of thus officering a new division or department. One serious objection often raised to the apprentice system is that none but the largest roads can afford to adopt it. It ought to be possible for several small roads in close touch with an organization like the New England Railway Club to conduct a course between them. One road might set aside a subordinate job in the car shop; another in the transportation department; another in the power station, etc. A committee representing the roads could arrange the course and select men from the applicants, rotating them through the different jobs. There would be no trouble in getting applications, and the courses cost nothing, since the men can be discharged if they do not give services for their pay. Larger properties could well afford to conduct such a course in their own organizations, and after it was well started could not afford to drop it.

A STUDY OF TRANSIT CONDITIONS IN PHILADELPHIA

On May 27 the State Railroad Commission of Pennsylvania announced that Ford, Bacon & Davis, of New York, had been appointed expert engineers of the commission to make a thorough investigation of the transit conditions in the city of Philadelphia, particularly with reference to the service rendered by the Philadelphia Rapid Transit Company, and "to report thereon to the commission at the earliest possible moment." It was understood that the firm of consulting engineers mentioned will begin its work directly and will use a considerable amount of data which is already in the possession of the commission. Although the scope of the investigation has not been announced, it is supposed that it will be directed particularly in regard to the physical condition of the road and the method of operation and will not include financial matters connected with the company.

COMMUNICATION

SUBSTATION COSTS

Boston & Worcester Street Railway Company.
South Framingham, Mass., May 24, 1910.

To the Editors:

I read the editorial on substation economy in the May 21 number of your magazine with much interest, and thought it worth while to compare some of the estimates made with the actual figures resulting from operation in the case of the plant of the Boston & Worcester Street Railway Company. It occurred to me that you might be interested in these comparisons.

You assume that the ratio of the average output to the normal capacity of the substation might be 30 per cent. I find that last year this percentage for our four substations ran as follows: 34½, 28, 14½, 25. The largest figure is for a substation 1000-kw rating, located in the power house, and the figure of 25 per cent is for a 500-kw substation, or one of the same capacity you are considering.

You estimate an allowance for repairs of $780 and for supplies $400, or a total of $1,180 for these two items per annum. I think this is much too high. I have not readily accessible exactly the same figures for our plant, but supplies and repairs to all electrical machinery, including that in the power house, have averaged $1,336 per year for the past five years. This is for a total of 3800 kw of substation machinery and 3500 kw generators, together with the switchboard apparatus, transformers, etc., for the entire plant. This amounts to a little over 18 cents per year per kw, whereas your estimate amounts to $2.36 per year per kw.

You estimate the labor cost of running this substation at $8 per day for three men. The labor cost of running our three substations outside the power house the last five years has averaged $1,808, with a maximum of $1,976. This is an average of $1.65 per day per substation. Of course, this showing is only made possible by using substation men, who also have other duties, and charging up to the substation only that part of the time actually spent in substation work, but the labor cost to us from this method of operation has been very much less than you estimate, even after making allowance for such other use of the substation men.

It would seem to me that in a substation of this size, or even one of twice the capacity, it would be rather absurd to use more than two men per station, whether or not they had other duties. Of course, if only two men are used as substation attendants, there should be some other man available who can operate the substation in case of emergency, such as sickness or unaccountable absence of one of the regular attendants; but there ought to be no difficulty in providing some one who can do this, but whose whole time would ordinarily be charged up to something else.

The total cost of handling the substation service, according to your figures, which you estimate at .52 cent per kw-hour, is a very formidable item; and if it was the best that could be done in work of this kind, would go quite a ways toward an argument in favor of the use of several small power stations in place of one large station with high-tension transmission and substations.

Milan V. Ayres.
Electrical Engineer.

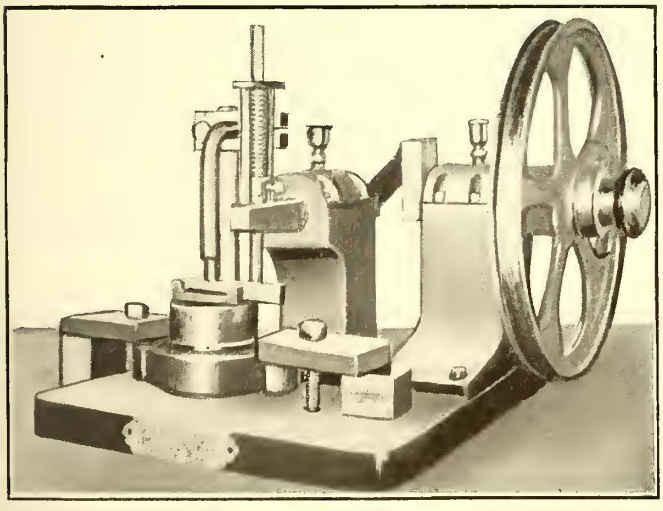
[Mr. Ayres' figures are interesting, and we are glad to learn that he has been able by good management to reduce the cost of operation below that quoted in the editorial. The figure of $44 per kilowatt for first cost of sub-station including land, given in the editorial, was based on the cost of a 500-kw substation in central Massachusetts. The fixed charges, which are not included in Mr. Ayres' figures, amount to 0.22 cent per kw-hour and account for 42 per cent of the total cost of substation operation given in the editorial. The labor charge of $8 per day was based on a 24-hour operation, and if three men are used, as assumed in the editorial, the amount quoted does not seem to be an unreasonable one, provided the men

have no other duties except those of looking after the sub-station machinery. Mr. Ayres was able to reduce this charge by using his sub-station men in other service, and the importance of doing this was mentioned in the latter part of the editorial. In regard to the final charge, that of repairs and supplies, it is undoubtedly true that with care these items can be kept low, as Mr. Ayres has succeeded in doing. During the first few years of sub-station operation practically the only charge for repairs and supplies should be for lubrication, cooling of transformers and brushes, but as the sub-station advances in age the repair expenses are apt to increase, and in a general estimate like that published it was thought advisable to make ample allowance for repairs. It would not take long to use up $1,100 a year in supplies and repairs if a sub-station suffered even only occasionally from armature or transformer burn-outs. We hope that the discussion by Mr. Ayres will elicit other records of sub-station maintenance which have not been so generally published as power station figures. Records of sub-station expenses from the Third Avenue Railroad of New York are published elsewhere in this issue through the courtesy of the engineering department of that company.—Eds.]

THE ACCURATE REGRINDING OF MOTORMAN'S BRAKE AND TRIPLE VALVES

BY C. S. BANGHART, GENERAL SUPERINTENDENT OF THE NEW YORK & QUEENS COUNTY RAILWAY COMPANY

In the past much trouble has been encountered in the operation of air-brake apparatus, attributable to leakage in imperfectly ground valve seats and valves in the motorman's brake and triple valves. These defects cause loss of air pressure, with resultant strains on the entire braking system and difficulty in effecting smooth, accurate stops. The sudden shocks and jerking of trains frequently observed are most invariably due to sticking valves caused by irregularities and imperfectly machined moving parts, valves and their seats. To say the least, the method of regrinding moving internal parts by hand, as employed heretofore, has never approached perfection, and



Grinder for Engineer's Air Brake as Applied to a Slide Valve

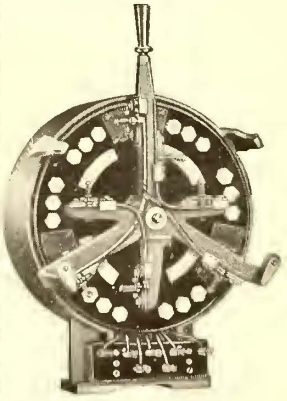
is unsatisfactory for the following reasons: (1) Only the most skillful mechanic can show any results in producing true surfaces, hence high cost of labor; (2) the minimum time required to regrind a valve or seat by this process is excessive, therefore added expense; (3) inequality in pressure between valve and seat during regrinding usually develops a slightly convex surface in the finished job, this condition creating leakage when the finished job is tested and necessitating a second regrinding, which adds a still greater cost.

These troubles have now been eliminated by the use of the Hartford-Blanchard valve-grinding machine, exhaustive tests of which were made some time ago by the mechanical department of the New York & Queens County Railway Company, at its Woodside shops. Furthermore, the mechanical method thus employed has the added advantage of increasing the efficiency and durability of the work produced. The results obtained by the use of this very simple and inexpensive machine have been far beyond my expectations. The simplicity of the device and its great usefulness would seem to warrant its universal adoption. It is quite singular that the device has not found its way into the railway supply market long ago, as the need for just such a tool has been recognized since the use of power brake equipment was inaugurated.

The machine will grind any type of engineer's valve in use. The face plate or chuck is counterbored to secure the various types of valves directly under the moving piston. The piston is fitted with a vertical spring plunger directly over the center of the valve. The lower part of the plunger engages in a small shoe, which is attached to the sliding part of the valve to give the required motion when the machine is in operation. By means of nuts on top of the plunger the pressure on the valve can be adjusted as desired. In using the machine for grinding a rotary valve, an extra arm is used with a stationary spring plunger for regulating the pressure on the valve. The valve is placed to one side and by means of a sliding shoe the reciprocating motion of the piston is converted into a rotary one for the valve. The plunger on the piston must be raised by the lock nuts and clamped there to avoid pressure on the valve. All the downward pressure for grinding this type of valve is supplied by the stationary plunger. The machine is compact in design, can be placed on a bench in the valve department and may be driven by using a small, round belt connected to the line shaft. Only a fraction of a horsepower is required for operation.

NEW A. C. CONTROLLERS

The flexibility and ease with which alternating current may be used for crane and similar motors have led to its use in a field formerly occupied exclusively by the series wound d. c. motor because the latter had the very desirable characteristic of high starting torque. In a. c. motors this feature is more nearly found in the slip ring motor than in the squirrel cage type. Speed and torque control of the former designs are obtained by inserting and varying resistance in the secondary winding of the motor. The Electric Controller & Manufacturing Company, Cleveland, Ohio, has developed a comprehensive line of manually operated controllers for such slip ring a. c. motors from 1 hp to 100 hp. These controllers follow as closely as possible in design and construction, the d.c. controllers which this company has been manufacturing for years. In fact, the wearing parts of the a.c. and d.c. controllers are interchangeable to a large extent.



A. C. Controller

These controllers are used with either two-phase or three-phase reversing slip ring motors. The resistance is entirely self-contained, it being necessary to connect only seven leads to the controller. Where heavy currents are to be handled, cast grid resistance is employed. Unusual precautions have been taken to insure permanently satisfactory insulation.

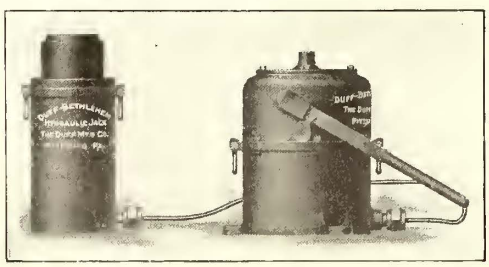
All contacts are mounted on a vertical slate face so that dust cannot settle between segments to cause short circuits. All contacts are of heavy copper and are reversible. Screws or bolts with special threads have been avoided, and so far as possible the wearing parts have been designed to permit their manufacture by the user. All of these controllers are oper-

ated by a lever motion which the manufacturers consider advantageous for crane and mill service. The company also makes controllers for squirrel-cage motors and a.c. commutating motors.

INDEPENDENT HYDRAULIC JACKS

The Duff Manufacturing Company, Pittsburgh, Pa., recently has put on the market the hydraulic lifting jack shown in the accompanying cut, in capacities ranging from 100 to 500 tons, with a raise from 6 in. to 12 in. It is for use in restricted areas where it is inconvenient to operate an ordinary jack. There are two main parts—the water reservoir with pump chambers and the ram or lifting mechanism. As illustrated, these parts are separate except for the flexible copper tubing which connects them. Consequently, the ram can be placed wherever there is room for it, while the pump can be set at any distance permitted by the length of the tube. The jack can be placed at any angle, and with small modifications in the frame construction can be put to many uses for which an hydraulic press is employed.

The pump is double-acting with a working stroke on both the upward and downward motion of the piston. There are two pump chambers, the upper having about five times the capacity of the lower. The valves in the pump chambers are so arranged that on light loads the larger volume of water in the upper chamber is forced under the bottom of the chamber, causing it to rise through larger spaces than on heavy loads or overloads when the smaller volume of water in the lower chamber is utilized. This speed variation is secured by an automatic by-pass valve in the diaphragm between the upper and lower reservoirs acting against a spring which can be adjusted so as to allow the water in the upper pump to escape at predetermined loads. The operating lever is reversed to trip the load so that the lug on the side projects upward to allow the lever to be pressed further down, thereby causing the trip sleeve and pump piston to bear directly on the suction and discharge valves respectively.



Parts of Hydraulic Jack

This action permits the liquid to pass back from the ram cylinder to the reservoir. The load may be lowered as slowly as desired or stopped at will by varying the pressure or lifting up on the lever.

Since the weight lifted by the jack is inversely proportional to the speed of ram travel the arrangement just described automatically adjusts the speed to the varying conditions of usage. The valve action is positive and there are no refinements of construction to cause trouble in a tool that is sure to receive rough usage. The tube which leads from the pump to the ram cylinder is made of flexible copper to withstand a pressure of 10,000 lb. per square inch, and is about 8 ft. long.

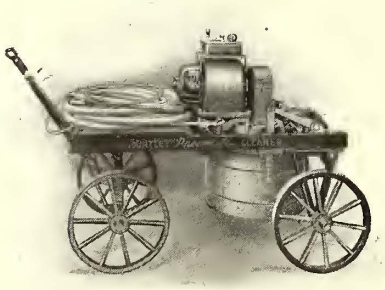
The ram cylinder is a solid steel forging with no joints at its base. This design gives greater stiffness and strength with minimum weight, and, what is more important, obviates the necessity of having a packed joint at the body of the cylinder. A base joint is a fruitful source of leakage and is the hardest to make water-tight because it is subject to the greatest pressure. The only packed joint in this jack is between the ram and cylinder walls, where packing is easy and leakage is less likely to occur owing to pressure being less direct and decreasing as the ram rises and quite inconsiderable when the load is at rest at the end of the lift.

SUBSTATION COSTS IN NEW YORK

In connection with the general subject of the labor and material required per kw-hour in substations, it may be of interest to give some figures on the substations of the Third Avenue Railroad Company, New York. This company operates three substations, the total output of which for the year 1909 was 40,877,186 kw-hours. The total cost of all material required for operation and repairs was $2,423.20 and the cost of labor was $19,302.31, making an average cost of $.0005315 per kw-hour. The substations do not suffer from lightning troubles, as all conductors are underground, but the engineers believe that the expense of static disturbances in the cables is quite as costly as an ordinary overhead system. The labor item covers the cost of 24-hour service. There are employed in each substation two men from 8 a. m. to 2 p. m., three men from 2 p. m. to 6 p. m., and two men from 6 p. m. to 8 a. m. The schedule of the substation forces is so arranged that there is a total of 52 labor-hours for every 24 hours. It is considered impossible in Manhattan borough to operate any substation properly without at least two men.

PNEUMATIC CAR CLEANER

The accompanying illustration shows a pneumatic car cleaner made by the Duntley Manufacturing Company, Chicago, Ill., for cleaning railways cars, stations and office buildings. It is mounted on a light truck, with 20-in. wheels, and can be easily moved from point to point in passenger yards. The electric machine is equipped with a 1½-kw motor of any current to suit the user. The vacuum pump is of special design, with diaphragm and only one ball bearing. It gives a 15-in. vacuum and has 75-ft. displacement. It is so constructed that the exhaust air from the pump can be used at about 8 lb. pressure for blowing dust and dirt from behind curtains, blinds, windows, seats. Thus this machine answers the double purpose of first blowing dirt and dust out of inaccessible places and then taking it up for deposit in a tank under the machine.

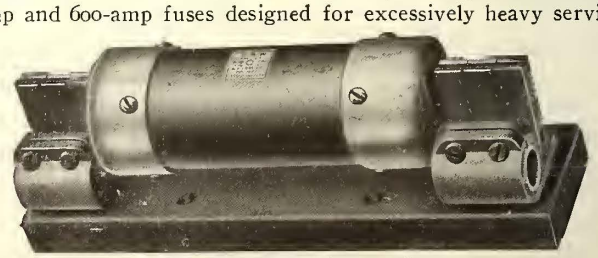


Vacuum Cleaner

The entire equipment consists of one 12-in. carpet sweeper; two 4-in. renovating nozzles; renovating handle complete; one 50-ft. piece of vacuum hose; one reducer, for reducing from hose nipple to small tools, and one blower to nozzle.

A 1000-AMP FUSE

The D. & W. Fuse Company, Providence, R. I., is now manufacturing 1000-amp fuses for 500-volt railway service. These are of this company's well-known cylinder link construction which has been so successfully employed in the 400-amp and 600-amp fuses designed for excessively heavy service.



A 1000-Amp Railway Fuse

The construction permits ready reloading at the factory, so renewals are a comparatively small expense. The accompanying illustration shows one of these fuses in its cut-out.

WOOD BLOCK PAVEMENT IN PHILADELPHIA

Work was recently completed by the United States Wood Preserving Company, New York, on the pavement by wood blocks of Market Street, Philadelphia. This street is the center of the retail shopping district and one of the busiest in that city. Because of the building of the subway, it was open, for more than a year, and the adjacent business houses suffered large losses through the diversion of traffic to other streets and the difficulties of handling goods. When the subway was completed, an association was formed by the merchants along Market Street to see that the street was paved with a material that would not be disturbed for years. A committee was appointed to investigate street paving, especially in New York. It returned enthusiastic for wood block pavement, on the ground that it was quieter than brick or asphalt, more durable and cleaner. The association then employed pavement testing experts, whose report was highly favorable to the use of wood blocks.

The contract awarded was for 85,000 sq. ft. of pavement at a cost of $3.49 per square yard, guaranteed for 10 years. The blocks used are 4 in. x 4 in. and of varying lengths, and are laid immediately against the rails. The foundation consists of 6½ in. of cement and a 1-in. cushion of four parts sand and 1 part mortar. A measure introduced in the City Council some time ago calls for wood paving on all the central streets of the city. At present, several petitions are before the authorities for other downtown streets, especially Walnut Street and Chestnut Street, urging an extension of wood block pavement.

UNIVERSAL ARMATURE REPAIR AND FIELD COIL WINDING MACHINE

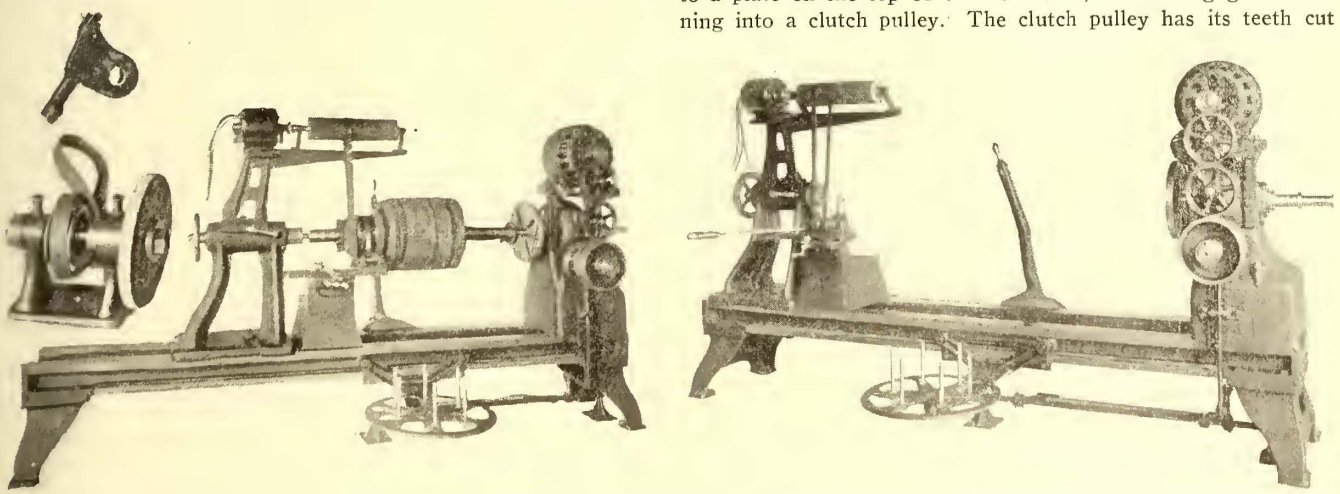
The American General Engineering Company, New York, has recently patented a novel combination machine for handling all kinds of armature repairing and field coil winding. It is made in two sizes—one model with 36-in. swing and 6-ft. centers is for the large motors used in elevated, subway and interurban work, and another, with 27-in. to 30-in. swing and 5-ft. centers, for street railway motors. A specimen of the larger size has just been furnished to the Panama Canal Commission. This machine is well adapted for shops where space is limited, as it is compactly designed and ordinarily is arranged for motor drive. It is particularly suitable for small shops, where there is not enough armature work to keep three or four special machines busy all the time. All the processes are carried out on one machine, so that it is unnecessary to remove the armature until every part has been repaired. The operation of the machine requires no skilled labor, as the various adjusting devices are of the simplest nature.

By referring to the accompanying illustrations it will be observed that the tailstock of the machine is adapted to receive the slotting, truing and grinding devices. The grinder and truing tool are made interchangeable merely by unscrewing one nut. The slotter is mounted on the same base as the grinder and is operated by the same transverse lever. The grinder can also be used for grinding armature shafts and similar stock. The commutators are slotted by a milling tool in preference to a saw, so that no finishing is necessary. The slotter is of the floating type to allow automatic adjustment to the mica in case the commutator bars are uneven. The slotter is belt-driven and is operated by a lever which gives a transverse movement of 12 in. The slotting tool is also fitted with a feed screw adjustment. Separate views of the truing tool and grinder are presented. The slotter and grinder are motor-driven through a belt drum, which can be swung backward or forward to permit the adjustment of the belt or the throwing out of the latter when the truing device is in service. The inside of the tail-stock may be used as a tool table.

The banding device has an arm mounted on a movable carriage with friction plates, one of which is adjustable by a screw attached to a steel spring. This arrangement permits the wire, as it passes from the reel on the carriage through the friction plates, to be adjusted to any desired tension by the operator. The construction of the friction plates allows uneven or kinked wire to pass through without changing its tension or breaking the wire, thus making the device automatic. The carriage is run in a double track to prevent dirt from accumulating or clogging its rollers. By adjusting a screw, the operator can vary the tension of the swing, while a fiber shoe is used to lessen the friction. A speed of about 30 r.p.m. is used for banding.

As shown in the illustrations, there is attached to the opposite side of the headstock an extension shaft on which armature coils are wound. On the reverse side of the headstock, not shown in the illustration, there is another extension shaft for winding field or magnet coils. These shafts are direct driven at 240 r.p.m.

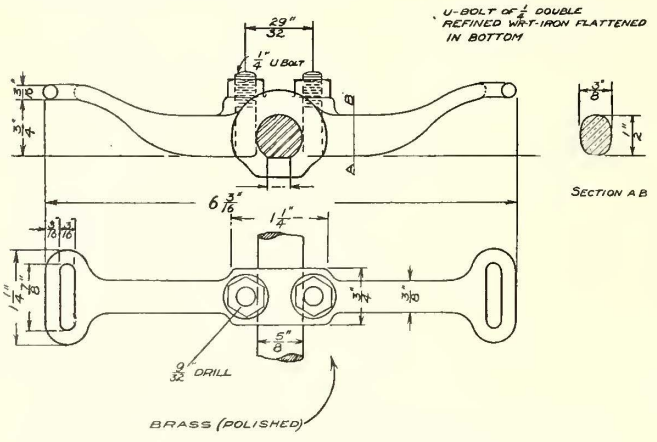
The machine is driven by a Westinghouse motor fastened to a plate on the top of the headstock, and having gears running into a clutch pulley. The clutch pulley has its teeth cut only half way, so that by removing the intermediate gears, which is done by taking out two cotter pins, the machine can be belt driven. When the machine is used for banding or coil winding, the clutch is thrown in or out at the will of the operator by means of an adjustable treadle. The reverse side of the headstock carries a starting box, which is within easy reach of the operator when he is running the machine. The main drive is self-contained, consisting of a worm and screw in a dust-proof gear case, which is split in the center, so that by unfastening two screws the gears can be removed without any further dismantling. When desired this machine can be furnished for variable speed operation.



Universal Armature Repair Machine, with and without Armature; Showing also Grinder and Truing Tool Separately

DETACHABLE REGISTER ROD HANDLE

The accompanying drawing shows a detachable center-rod register handle used by the Virginia Railway & Power Company, Richmond, Va. The handle is made of brass and is fitted over the rod by a pair of ¼-in. wrought-iron U-bolts. There



Richmond Detachable Register Rod Handle

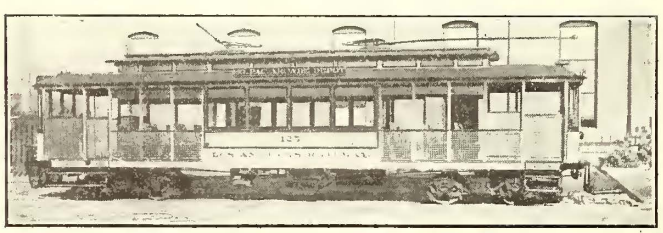
has been no difficulty in keeping these handles tight on the rod, not one having ever been loose. This device is the invention of and has been patented by A. Taurman, shop foreman of the company.

P.A.Y.E. CARS FOR LOS ANGELES RAILWAY COMPANY

The Los Angeles Railway Company has just completed and placed in operation on May 15 on its Central Avenue line 27 pay-as-you-enter cars. The cars were rebuilt from 27 old cars which had been practically discarded, as they had become somewhat out of date in comparison with the standard cars. These pay-as-you-enter cars were originally 34 ft. in length with a double floor framing and 19-ft. truck centers. They are of the California combination class, having both ends open with a closed center.

In the work of changing the cars over the company was compelled to devise some new features to adapt these open cars for prepayment service. The bodies were rebuilt with an entirely new floor framing of 5-in. I-beams and increased in length to 44 ft. 8 in. with 29-ft. truck centers. It will be noticed that dropped platforms are not used, as they could not be installed on account of the short track radius on narrow street corners where the platform must not exceed 7 ft. 10 in. New open sections and vestibules were constructed to increase the seating capacity from 34 to 42 and the platforms were lengthened from 3 ft. 6 in. to 7 ft.

All changes made in the rebuilding of these cars are to standards of this company, every part being interchangeable with



Los Angeles Pay-As-You-Enter Car with California Body

the same part on any other car on the system. The platforms are equipped with swinging lattice gates which are held in position from the forward or motorman's end by locks. When open, the gates fold together to make a division for the exit and entrance on the rear or conductor's end. Over the front exit steps a lattice sliding gate is provided; this is operated on ball-bearing rollers and is controlled by a motorman's pneumatic double-acting four-way valve connected to the airbrake line. These cars have been equipped with Stanwood steps, ball-bearing center bearings and Westinghouse 38-B motors with a gear ratio of 16:66.

ATLANTIC CITY SELECTED FOR THE 1910 CONVENTION

Secretary H. C. Donecker, of the American Street & Interurban Railway Association has issued the following preliminary announcement in regard to the 1910 convention. It is addressed to the members of the association and of its affiliated bodies, the Engineering, Accountants, Claim Agents, and Transportation & Traffic Associations, and also to the members of the Manufacturers' Association:

PLACE OF MEETING

The annual convention of your association will be held at Atlantic City, N. J., on Monday, Tuesday, Wednesday, Thursday and Friday, Oct. 10, 11, 12, 13 and 14, 1910. Definite information will be given in later bulletins as to the days upon which the different affiliated associations will hold their meetings.

We have been particularly favored this year in the number of invitations received, among the cities which have cordially expressed a wish to entertain us being Atlantic City, Saratoga Springs, Niagara Falls, Toronto, Toledo, St. Louis, Richmond, Portland, Ore., and within the past few days, Cleveland. The executive committee at its meeting in January last gave considerable attention to this matter, finally appointing a Committee on Convention Location with power to decide upon the time and place for the 1910 meeting. This committee, working conjointly with a similar committee appointed by the allied Manufacturers' Association, has secured, with the kind co-operation of local representatives, complete details of the hotel, exhibit hall and other essential facilities available in the various suggested convention cities. It has also visited some of these places, and having in mind the fact that our 1909 convention was held in a far Western city, has in a general way endeavored to ascertain the prevailing sentiment of our members on the subject. The result of this thorough investigation has clearly indicated the advisability of selecting Atlantic City this year and has brought about the now announced decision of the committee.

HOTELS

Previous conventions have given the great majority of our members' personal knowledge of the splendid hotel accommodations obtainable in Atlantic City, and as this matter will be more fully covered in a later bulletin, nothing need now be said beyond a general statement concerning rates. Your committee has given this particular subject due attention and, in addition to securing the customary guarantee against an advance in rates, has effected an arrangement by which the association is to be provided with a complete schedule of hotel rooms, shown by numbers, and their corresponding daily rates. This unusual privilege will enable our members to secure at any time full information regarding charges for specific rooms and enable them to avoid misunderstandings or readily correct mistakes. A subsequent bulletin will give necessary general information with relation to hotel rates, the detailed schedules to be in the hands of the secretary (unless otherwise announced) for your inspection or reference.

EXHIBITS OF THE MANUFACTURERS' ASSOCIATION

As in 1908, the exhibits of the Manufacturers' Association will be located on Young's "Million Dollar" Pier. The steady growth in the membership of our allied association, its increasing efficiency and the advances in the art guarantee that the exhibits in 1910 will surpass even the high standard of former years.

ADDITIONAL INFORMATION

The association from time to time will issue bulletins containing information relating to hotel and railroad facilities, convention halls, manufacturers' exhibits, programs and the many other features of our annual meetings.

LONDON LETTER

(From Our Regular Correspondent)

The Leeds trackless tramway bill has been passed by the Lords' committee, and the bill to authorize a trackless system in Bradford has received the consent of the Commons' committee. Sheffield is also turning its attention to the same subject. The question of trackless trolleys in Sheffield is before the tramway committee, and as soon as Sheffield has other privileges to apply for, authority for trackless trolleys will be included in the first bill which it presents to Parliament. Mr. Fearnley, the general manager of the tramways, who visited the Continent some time ago to study the trackless trolleys, favors that system and gave evidence in their behalf in the cases of Leeds and Bradford.

In the appeal by the Corporation of Glasgow against the valuation of the Corporation Tramways made by the assessor of railways and canals, Lord Dundas has decided in favor of the corporation. The assessor fixed the valuation at £278,070, but the Corporation contended that it should be less on the plea that the tramway undertaking was a railway, and that accordingly the assessor was bound to deduct from the valuation one-half of the yearly repairs. Lord Dundas has reduced the valuation to £258,838, without expenses to either party. He held that the tramway is a railway. The growth of the business of the electric light plant and the electric tramways in Glasgow has been so great within the last year or two that, notwithstanding the large stations which have already been installed, the electricity committee has authorized the town clerk to secure a site for a new generating station.

For some months Belfast has been divided upon the question of the purchase of the Cavehill & Whitewell Tramways by the Corporation. It was finally found necessary to vote on the subject. At the election more than 26,000 voted in favor of the purchase while only 8000 voted against the proposal. Mr. Nance, the general manager of the Belfast Tramways, reported on the subject, and all his recommendations which have been carried out have proved successful.

C. W. Hill, manager of the Bournemouth Tramways, advocates the substitution of the overhead system for the conduit system through the center of Bournemouth. The total receipts of the Bournemouth Tramways last year were £85,539 and the operating expenses £55,677, leaving a balance of $29,862. After all the charges were met, however, the deficit was about £2,000. Mr. Hill considers that all the economies that can be effected have been worked, and unless traffic increases a demand will have to be made on the rates in the near future. Mr. Hill claims that by abandoning the conduit system a saving of £3,000 a year could be effected.

The directors of the City of Carlisle Electric Tramways, Ltd., which have not been successful financially, have sent a circular letter to the shareholders of the company in which they recommend the sale of the undertaking. An offer of £7,000, subject to the debenture debt of £40,000, has been made for the property. This offer will have to be submitted to the shareholders for approval.

Though no official statement has been made by the London, Brighton & South Coast Railway, the electrification of the south London line has been so successful that it is anticipated that the shareholders of the company will be asked to sanction the electrification of the entire main line between London and Brighton. Specifications are being prepared by Mr. Dawson for an extension of the electric system in the vicinity of London, and this extension will probably be proceeded with soon. The more ambitious Brighton project will undoubtedly be considered by the shareholders at the half-yearly meeting in June. The outer suburban area will be equipped first and the tracks electrified to Sydenham and the Crystal Palace. The development of the seaside traffic of the metropolis to the various pleasure resorts on the south coast demands more frequent service, and there is a large and growing residential long-distance traffic to places on the south coast. If the shareholders approve the proposal to electrify, it is understood that trains would be run at an interval of about one hour with a running time of 50 minutes between London and Brighton. Eastbourne and other popular health resorts on the south coast would be equally benefited.

At a recent meeting of the London County Council, the chairman of the finance committee stated that the financial condition of the tramways was extremely satisfactory and that there would be a surplus for the year of £244,132, which would be divided between the renewals fund and the general reserve fund. The profit, however, was not sufficient to justify anything being applied to the relief of rates at present. The chairman feels that in any event it would be better to reduce the fares than to relieve the rates.

An important extension of the tramways in east London has recently been completed and through service of electric cars established between Aldgate and Ilford and Aldgate and Leytonstone. The London County Council, the East Ham and West Ham Corporations and the Leyton Urban District Council are combined in the new service, the cars of the three outside bodies having been altered to suit the conduit system, which has been installed between Burdett Road and Aldgate. The fare between Aldgate and either Leytonstone or Ilford is threepence.

Sir George Gibb has resigned as managing director of the Metropolitan District Railway and Albert H. Stanley has been elected a director and appointed managing director. W. E. Mandelick, the secretary of the Underground Electric Railways of London, and of the Allied Tube Railways, has been appointed secretary of the District Railway. It is understood that Sir George Gibb has been appointed chairman of the board.

The Rhondda Urban District Council Tramways extension bill came before a committee of the House of Commons recently. For the promoters it was stated that among the objects of the bill was the construction of additional tramways at an estimated cost of £36,000. The Taff Vale Railway opposed the scheme. The committee, however, passed the proposals.

The report of the Anglo-Argentine Tramways for 1909 shows a large increase in traffic during the year, but there has been little saving in operating expenses. The effect of the economies which followed the merging of the several lines has not yet been felt, but the changes will undoubtedly work a considerable saving. The ratio of operating expenses to gross receipts last year was 62.26 per cent, a saving of 0.60 per cent in the 12 months and only 3.52 per cent below the average for the previous decade, for the greater part of which period the company was run in competition with other undertakings. The gross receipts of the company for 1909 were £1,939,900, as compared with £1,257,700 for 1908; operating expenses for 1909, £1,207,200, as compared with £790,700 for 1908; net earnings for 1909, £731,700, as compared with £467,000 for 1908; available balance for 1909, £768,600, as compared with £490,800 for 1908; city company annuity, preference interest, ordinary dividend for 1909, £758,300, as compared with £12,800 for 1908. A. C. S.

The Maryland Public Utilities Commission has moved from the Union Trust Building, Baltimore, Md., to the Builders' Exchange Building, Baltimore. Chairman Ambler and Mr. Laird have been conducting business pending the appointment of a successor to Walter W. Abell, who has declined appointment to the commission. Louis M. Duvall has accepted appointment as secretary of the commission. Frederick Wryght has filed a complaint against the United Railways & Electric Company, Baltimore, in connection with its method of handling cars at Frederick Avenue terminus. William H. Grafflin, Millersville, has complained against the Electric Express Company, a subsidiary of the Washington, Baltimore & Annapolis Electric Railway. He states that the company refuses to haul strawberries to Odenton and make a connection with the Adams Express Company, but that the company will take consignments to Washington, or bring them to Baltimore and make the transfer. This, he alleges, is done to secure a longer haul. He also complains that the company charges $1 for a round-trip ticket from Waterbury to Baltimore, the distance between which places is ten miles less than between Annapolis and Baltimore, for which the same fare is charged.

News of Electric Railways

Considerable Preparation Needed Before Detroit Arbitration Progresses

The prospects are that some considerable time will elapse before the board of arbitration will sit which has been appointed to consider the appraisal of the property of the Detroit United Railway made by the company and that made by Fred T. Barcroft for the committee of fifty. Frederick W. Walker, who has succeeded Mr. Barcroft as engineer for the committee, and Clyde I. Webster, general counsel for the committee, have addressed a statement to Mayor Breitmeyer, in which they estimate that the cost of making proper preparations and conducting the hearings will be more than $20,000. After reciting the need for exact information on various matters treated in the Barcroft appraisal, the statement by Mr. Walker and Mr. Webster continues:

"A number of engineers who assisted in making your appraisal have agreed to appear before the board of arbitration and testify and also assist in preparing the case, but unfortunately a large amount of detail matter prepared by them and forwarded to Frederick T. Barcroft, together with other important papers, have not been turned over to your committee. Furthermore, in some cases it is impossible to determine at the present how fully the work of these engineers has been incorporated in the appraisal and what modifications, if any, have been made in their conclusions. This can only be done, where the details are beyond your reach, by again working them up.

"It is to be hoped that as the work of preparing your case progresses every man who assisted in your formal appraisal will come forward and signify his willingness to appear and testify and assist, and that the detailed information and other papers previously mentioned will be delivered into your possession. Otherwise new men must undertake the work and prepare themselves to testify.

"It is evident that a determination of the valuation of the properties of the Detroit United Railway in some way is absolutely necessary before there can be any settlement of the street car situation in the city of Detroit. If the proceedings are to be continued before the board of arbitration under conditions existing as above outlined, we estimate that the cost of making proper preparation and conducting the hearings will be upwards of $20,000.

"This expense may be reduced if all the assistant engineers will appear and testify, and if the detail matter and papers are turned over to your committee, yet it would not be proper to proceed on such assumption in arranging for the funds for carrying on the work.

"We believe that the proceeding can be shortened by eliminating all items upon which there is no material difference in valuation and no disagreement as to their being properly included in the inventory, as it seems useless to take testimony except on those portions upon which there is a dispute."

Transit Affairs in New York

The corporate stock budget committee of the Board of Estimate of New York appointed to consider the amount of money which the city should spend during the coming year in permanent improvements submitted its report to the full board on May 27, 1910. It recommends the expenditure of $85,000,000, including $13,000,000 for new subways, between now and July 1, 1911. This will leave a debt limit margin, exclusive of the large sums which will be released under the constitutional amendment, approved by the people last fall, exempting self-sustaining subway and dock bonds from computation in the debt limit, of $8,400,000. It is expected that at least $100,000,000 will be added to the borrowing capacity of the city by the approval by the Appellate Division of the Supreme Court of the schedules to be submitted to it by the board under the enabling act under the amendment. It has been arranged that $60,000,000 in total shall be spent for subways in the next three years. The figures for the subway bonds will be presented within a few days. They total some $44,000,000. It will take several weeks to draw up the dock bond schedule.

Justice Brady in the Supreme Court on May 27, 1910, directed an order to be served on W. R. Willcox, chairman of the Public Service Commission, to appear before him in court on June 1, 1910, to show cause why he should not be adjudged in contempt of court for alleged public utterances made before the West Side Young Men's Christian Association recently. Mr. Willcox is said to have attacked Frederick W. Whitridge, receiver of the Third Avenue Railroad, and is reported to have made the following reference to the suit brought by the commission against the Union Railway and the Third Avenue Railroad for failure to comply with an order of the commission, which suit was dismissed by Justice Brady: "This suit was, unfortunately, tried before a judge who admitted he was the owner of stock in the company, and the suit was dismissed on a technicality." Counsel for the commission and counsel for the receiver, knowing that Judge Brady was a stockholder in the Third Avenue Railroad, consented to have the case go on before him.

Samuel Rea, second vice-president of the Pennsylvania Railroad, conferred on May 24, 1910, with Chairman Willcox of the Public Service Commission regarding the plan for a west side subway. The company is anxious to have a subway built which will accommodate the passengers arriving at its new terminal at Thirty-third Street and Seventh Avenue, New York. It has heretofore expressed a preference for the extension of the present subway, operated by the Interborough Rapid Transit Company south from Forty-second Street and Seventh Avenue, as being the most speedy method of getting such a subway. Mr. Willcox assured Mr. Rea that the engineering department of the commission is giving attention to the west side problem, although at present it is chiefly occupied with the completion of plans and contracts for the triborough subway route.

Short Strike in Albany

The employees of the United Traction Company, Albany, N. Y., tied up the lines of the company in Albany and Rensselaer on May 27, 1910, by a strike which lasted one day. The issue involved certainly was far fetched. On the day mentioned the Barnum & Bailey circus was announced to show in Albany, and in order to accommodate the crowds which attend the circus the company decided that it would be advisable to operate cars of the Rensselaer division direct to the circus grounds over the Albany division north of Clinton Avenue, Albany, at which place passengers from Rensselaer are usually transferred to Albany cars. Despite the fact that the employees of the two divisions are both affiliated with the same parent union organization, the employees of the Albany division objected to the men of the Rensselaer division operating over the lines in Albany, and by refusing to take out their cars seriously interrupted the service. Toward the close of the day, however, when the men found that the company would not yield to their demand they returned to work. The cars of the Cohoes Railway were run as usual, but were unable to carry the crowds, so the Public Service Commission of the Second District of New York authorized the Delaware & Hudson Company, which controls the United Traction Company, to run trains from the station of the New York Central & Hudson River Railroad to the circus grounds.

Cleveland Traction Situation

The platform men of the Cleveland Railway have demanded 32 cents an hour, and the demand has been refused by J. J. Stanley, president of the company. The question will be arbitrated. Robert D. Beatty, receiver of the Eastern Ohio Traction Company, has been selected to represent the company, and Elroy M. Avery has been selected to represent the employees. If Mr. Beatty and Mr. Avery cannot agree on the question of wages, they will choose a third arbitrator to act with them. Little has been said of

late regarding the demand of the union that the men should be discharged who refused to take part in the strike which was declared when the lines in Cleveland were under the management of the Municipal Traction Company. The management refused to entertain the proposal, and also refused to reduce the standing of the men.

The company will begin work soon on the West Sixty-fifth Street line. The various sections in use on that street will be connected to make a crosstown line, which will extend south to Clark Avenue.

The West Side Chamber of Industry has started a movement to have West Sixty-fifth Street opened through to Denison Avenue and the track extended to an intersection with the line on that street, which would make possible a belt encircling almost the entire city. In order to do this, the Big Four Railway would have to erect a bridge across West Sixty-fifth Street. The company has agreed to meet half the expense of this change, so that the cost to the city would be about $30,000. The proposed belt route would start at the Public Square, extend to West Sixty-fifth Street, thence to Denison Avenue, over the Denison-Harvard bridge to Harvard and Broadway, thence to 105th Street, thence to St. Clair Avenue, and back to the Public Square.

Association Meetings

Central Electric Traffic Association.—Indianapolis, Ind., June 11.

Master Car Builders' Association.—Atlantic City, N. J., June 15, 16 and 17.

American Railway Master Mechanics' Association.—Atlantic City, N. J., June 20, 21 and 22.

Central Electric Accounting Conference.—Toledo, Ohio, June 25.

Street Railway Association of the State of New York.—Cooperstown, N. Y., June 27 and 28.

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

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

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

New Line Opened in Montana.—The Missoula (Mont.) Street Railway has placed its line in Missoula in operation. The system comprises 10 miles of track. The initial service is being given with three cars, which are operated on a 15-minute schedule.

Havana Electric Railway Moves Offices.—The Havana (Cuba) Electric Railway has moved its general office from 52 Broadway, New York, N. Y., to 55 Liberty Street, New York. David T. Davis, vice-president of the company, and H. Kreamer, secretary and treasurer of the company, are located in New York.

Decision in Ticket Suit in Philadelphia.—The Supreme Court of Pennsylvania affirmed the decision of Common Pleas Court No. 2 of Philadelphia in the case of the City of Philadelphia against the Philadelphia Rapid Transit Company, and has also affirmed the finding of the lower court in the case of Rudolph Blankenburg against the company. The lower court decided that the company had the right to withdraw the strip tickets as it was a matter of administration of the ordinary affairs of the company and not a matter of fare.

Increase of $847,986 in Valuation of Electric Railways.—The Indiana Tax Commission closed its first session on May 23, 1910, and has made a report on the increases deemed necessary on the several classes of property under review. The increase in the appraised value of electric railway property is $847,986. The totals on the electric railways follow: Main track, $19,344,709, an increase of $587,722; second main track, $233,670, an increase of $40,070; side track, $139,710, an increase of $6,195; rolling stock, $1,759,515, an increase of $175,565; improvement to right-of-way, $906,423, an increase of $37,434; total, $22,384,027, an increase of $847,986.

New Home of the Portland Railway, Light & Power Company, Portland, Oregon.—The Portland Railway, Light & Power Company, Portland, Ore., has issued a booklet for distribution to the public as a souvenir in commemoration of the opening of the company's new headquarters in Portland. The building was opened on April 23, 1910. It is nine stories high, and the Portland Railway, Light & Power Company occupies the entire basement and the first, second, third, fourth and fifth floors and part of the sixth floor. There are 24 pages in the publication. Notes on the progress of the electric street railway and the light and power systems in Portland since 1900 conclude the souvenir. Eight excellent half-tone engravings are used to illustrate the text. They include interior and exterior views of the new building, a view of the building occupied by the company in 1900, and a particularly striking view of the new building at night.

Special Trains to Master Car Builders' and Master Mechanics' Convention.—To accommodate those who propose to attend the annual conventions of the Master Car Builders' Association and the American Railway Mechanics' Association, at Atlantic City, the Central Railroad of New Jersey will run a special train of Pullman parlor cars, leaving New York from the foot of West Twenty-third Street at 3:20 p. m. and from the foot of Liberty Street at 3:40 p. m., on June 14, 1910. The one way rate is $3.25 and the round trip excursion fare, $5.00, tickets good for six months, via the direct route or Philadelphia, with privilege of stopover at Lakewood and Philadelphia. Regular trains of the Jersey Central Railroad leave New York at 9:50 a. m. and 3:20 p. m.; Saturday at 12:50 p. m.; Sunday, 9:50 a. m. and 2:20 p. m.; Liberty Street, 10:00 a. m. and 3:40 p. m.; Saturday, 1:00 p. m.; Sunday, 10:00 a. m. and 2:30 p. m. Those who propose to travel by the special train are requested to communicate with H. D. Vought, secretary of the New York Railroad Club, 95 Liberty Street, New York City.

LEGISLATION AFFECTING ELECTRIC RAILWAYS

Massachusetts.—The committee on street railways has reported to the Senate a bill to authorize the Boston Elevated Railway to purchase and hold the stocks of other street railways. In its present form the bill provides that the company may acquire and hold the stocks and bonds of any connecting or intersecting line, subject to the approval of the Railroad Commission. The facilities of travel on the railways of each of the companies are not to be diminished nor the fares increased. The company, subject to the approval of the commission, may issue its own stock or bonds to provide means for paying for securities purchased, but the par value of the stock and bonds so issued is not to exceed the par value of the securities purchased, and in no case is the amount of bonds to exceed the amount of bonds purchased. The railways whose stocks are owned in whole or in part are not to be considered as owned, leased or operated by the Boston Elevated Railway within the meaning of Chapter 500, Acts of 1897, which determines the rental to be paid upon the East Boston tunnel. The act is not planned to permit the Boston Elevated Railway to acquire the stocks and bonds of the West End Street Railway, now leased by it, or any other railway which may hereafter be constructed in any city or town in which the company now owns, leases or operates a street railway. A feature of the bill provides a 5-cent fare for 5.5 miles from the Massachusetts State House, but this is not to be regarded as affecting the law relating to fares on roads leased or operated or owned by the company at the time of the passage of the bill. The bill to permit the New York, New Haven & Hartford Railroad to own stock in the Berkshire Street Railway has been passed by the Senate to be engrossed. A bill has been reported by the committee on metropolitan affairs to permit street railways to use the tracks of railroads. The same committee has reported favorably on the question of authorizing the Boston & Eastern Electric Railroad to build a tunnel and subway under Boston Harbor. The bill to require street and elevated railways to transport pupils of industrial schools at half fare has been passed by both branches and laid before Governor Draper for signature. The Senate has rejected the bill to reduce the hours of labor of street railway employees.

Financial and Corporate

New York Stock and Money Market

May 31, 1910.

The Wall Street stock market opened fairly steady this morning after the three-day holiday with trading as listless as during the previous week. Then came the news that President Taft had instructed the Attorney-General to begin suit to enjoin the Western railroads from putting into effect the increased rate schedule. This was seized as a basis for a vigorous attack upon the market and prices broke sharply. Some of the more active railroad issues declined from 4 to 5 points.

The money market was little affected by the selling and rates continued easy. Quotations to-day were: Call, 3 to 3½ per cent; 90 days, 3 to 3¾ per cent.

Other Markets

Although Lehigh Valley and other railroad issues were very weak in the Philadelphia market to-day, traction shares were little affected. Transactions have not been heavy in these stocks during the past week and prices have remained practically stationary.

In the Boston market there has been little trading in traction shares. Before the holiday they were dull, and to-day only a few shares of Massachusetts Electric preferred and Boston Elevated made their appearance.

The feature of the Chicago market during the past week has been the weakness of the Chicago Railways issues. Series 1 during the week sold as low as 67, and Series 2 as low as 16. Northwestern Elevated preferred has also declined and closed to-day at 53.

There has been little doing in the Baltimore market. The stock of the United Railways & Electric Company has been traded in at 13¼ and the bonds at former prices.

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

	May 24.	May 31.
American Railways Company	a45	a44½
Aurora, Elgin & Chicago Railroad (common)	*57¾	*57¾
Aurora, Elgin & Chicago Railroad (preferred)	*94¼	*94¼
Boston Elevated Railway	128	a128½
Boston & Suburban Electric Companies	*16	*16
Boston & Suburban Electric Companies (preferred)	*74½	*74½
Boston & Worcester Electric Companies (common)	a10½	a10½
Boston & Worcester Electric Companies (preferred)	*43	a42
Brooklyn Rapid Transit Company	*81¾	78⅞
Brooklyn Rapid Transit Company, 1st pref. conv. 4s	85	84¼
Capital Traction Company, Washington	a132	a129
Chicago City Railway	a195	*195
Chicago & Oak Park Elevated Railroad (common)	*3¼	*3½
Chicago & Oak Park Elevated Railroad (preferred)	*7½	*7½
Chicago Railways, ptcptg., ctf. 1	*75	a80
Chicago Railways, ptcptg., ctf 2	a18	a18
Chicago Railways, ptcptg., ctf., 3	a9	a10
Chicago Railways, ptcptg., ctf. 4s	a4	*4
Cleveland Railways	*91½	*91½
Consolidated Traction of New Jersey	a76	a76
Consolidated Traction of New Jersey, 5 per cent bonds	a104	a104
Detroit United Railway	*59½	a60
General Electric Company	150¼	147
Georgia Railway & Electric Company (common)	*110	110¾
Georgia Railway & Electric Company (preferred)	*87	88
Interborough-Metropolitan Company (common)	20⅝	19½
Interborough-Metropolitan Company (preferred)	56¼	53¼
Interborough-Metropolitan Company (4½s)	80⅞	80
Kansas City Railway & Light Company (common)	a26	a26
Kansas City Railway & Light Company (preferred)	a76	*76
Manhattan Railway	135	a135
Massachusetts Electric Companies (common)	17½	16¾
Massachusetts Electric Companies (preferred)	86	a85
Metropolitan West Side, Chicago (common)	a17	a18
Metropolitan West Side, Chicago (preferred)	a58	a56
Metropolitan Street Railway	*15	*15
Milwaukee Electric Railway & Light (preferred)	*110	*110
North American Company	74⅜	*74⅜
Northwestern Elevated Railroad (common)	a18	a17
Northwestern Elevated Railroad (preferred)	a60	a56
Philadelphia Company, Pittsburg (commcn)	a49½	a49
Philadelphia Company, Pittsburg (preferred)	a44	a44
Philadelphia Rapid Transit Company	a19	a18
Philadelphia Traction Company	*85¼	a85¼
Public Service Corporation, 5 per cent col. notes	*96½	a96
Public Service Corporation, ctfs	103½	a102½
Seattle Electric Company (common)	111¼	a111½
Seattle Electric Company (preferred)	103	a102½
South Side Elevated Railroad (Chicago)	a59	a58
Third Avenue Railroad, New York	6½	7
Toledo Railways & Light Company	9	a9¼
Twin City Rapid Transit, Minneapolis (common)	111	a112
Union Traction Company, Philadelphia	a48	a47½
United Rys. & Electric Company, Baltimore	*12¼	*12¼
United Rys. Inv. Co. (common)	*37	*37
United Rys. Inv. Co. (preferred)	*65	*65
Washington Ry. & Electric Company (common)	a38	a35
Washington Ry. & Electric Company (preferred)	a89	a89
West End Street Railway, Boston (common)	88	87¾
West End Street Railway, Boston (preferred)	102½	*102½
Westinghouse Elec. & Mfg. Company	65	62½
Westinghouse Elec. & Mfg. Company (1st pref.)	*125	*125

a Asked. * Last Sale.

Athens Railway & Electric Company, Athens, Ga.—The Railroad Commission of Georgia has approved the application of the Athens Railway & Electric Company to issue $825,000 of 40-year 5 per cent first and refunding mortgage gold bonds, $300,000 of 5 per cent cumulative preferred stock, and $700,000 of common stock. The mortgage will be dated July 1, 1910, and will be drawn in favor of the Farmers' Loan & Trust Company, New York, N. Y. The Athens Railway & Electric Company will formally take over the property of the Athens Electric Railway and the James White power plant.

Atlantic City & Shore Railroad, Atlantic City, N. J.—The Atlantic City & Shore Railroad has purchased the Atlantic City & Suburban Railway.

Brooklyn (N. Y.) Rapid Transit Company.—James McKeen has been elected a director of the Brooklyn City Railroad to succeed D. G. Leggett, resigned.

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 further postponed until July 1, 1910.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind.—Judge Carter of the Superior Court at Indianapolis has authorized C. L. Henry, receiver of the Indianapolis & Cincinnati Traction Company, to sell $20,000 of the bonds of the Indianapolis, Shelbyville & Southeastern Traction Company, a subsidiary of the Indianapolis & Cincinnati Traction Company, and apply the proceeds to paying obligations.

Massachusetts Electric Companies, Boston, Mass.—The directors of the Massachusetts Electric Companies have declared a semi-annual dividend of 2 per cent on the preferred stock, payable on July 1, 1910, to stock of record on June 4, 1910. The last previous dividend was 1¾ per cent.

Metropolitan Street Railway, New York, N. Y.—Judge Lacombe, of the United States Circuit Court, in a memorandum filed on May 31, 1910, ordered the sale of the property of the Metropolitan Street Railway on July 1, 1910, under foreclosure of the mortgages held by the Guaranty Trust Company and the Morton Trust Company, and that the $10,000,000 upset price fixed on the sale under the prior one of these two mortgages shall cover the sale under both. An unsuccessful attempt was made to conduct a sale under the $12,500,000 mortgage held by the Guaranty Trust Company, as noted in the Electric Railway Journal of May 21, 1910, page 920, which has priority over the $16,000,000 mortgage held by the Morton Trust Company, with respect to most of the property of the railroad. In his memorandum the judge says that it is within the power of the court to reject all bids and order another offering of the road at auction if the bids received are not satisfactory.

Ocean Shore Railway, San Francisco, Cal.—J. Howard Smith and Sydney M. Van Wyck, attorneys for the bondholders of the Ocean Shore Railway, have asked Judge Van Fleet in the U. S. District Court to make an order directing that the indebtedness of the road be ascertained and suit begun against the stockholders to recover the amount necessary to pay the creditors.

Orange County Traction Company, Newburgh, N. Y.—The Public Service Commission of the Second District of New York has authorized the Orange County Traction Company to issue a first and refunding mortgage to the Union Trust Company, Albany, N. Y., as trustee, to secure the payment of $750,000 in 50-year, 5 per cent bonds. The company has also been authorized to issue at once bonds to the amount of $233,800 to be sold at not less than 85. The proceeds are to be used to discharge indebtedness incurred in additions, improvements and equipment. The company has also been further authorized to issue bonds to the amount of $425,000 at not less than par, without further authorization of the commission for the purpose of refunding existing bonded indebtedness, bonds to be exchanged at any time, par for par.

Pennsylvania Railroad, New York, N. Y.—Samuel Rea, vice-president of the Pennsylvania Railroad, and Charles S. Mellen, president of the New York, New Haven & Hartford Railroad, have both issued statements regarding the

increase in the holdings of stock of the New York, New Haven & Hartford Railroad by the Pennsylvania Railroad. According to Mr. Mellen, the Pennsylvania Railroad now holds 60,000 shares of stock of the New York, New Haven & Hartford Railroad, a little less than 5 per cent of the total stock of the company. When there is a vacancy on the board of directors of the New York, New Haven & Hartford Railroad a director to represent the Pennsylvania Railroad will be elected. Mr. Rea said: "It is true that the company has some stock which it has absorbed from time to time, but no such a thing as control was ever contemplated. The East River tunnel will be in operation about Aug. 15, 1910, and the North River tunnel will come later. It will be about three years before the line of the New York Connecting Railroad can be built, and also before the New York, New Haven & Hartford Railroad will get its trains into the Pennsylvania terminal by way of bridges extending from the Bronx across Hart and Ward Islands."

Philadelphia (Pa.) Rapid Transit Company.—On May 26, 1910, the Philadelphia Rapid Transit Company issued the following statement: "The joint committee of the Union Traction Company and the Philadelphia Rapid Transit Company have agreed upon a plan for financing the property, which has been approved and accepted by the fiscal agents of the company, Drexel & Company. The company will dispose of its insurance fund and replace the indemnity with fire insurance policies. It will issue $1,500,000 of the 10-year 5 per cent equipment notes, which will have the guarantee of the Union Traction Company. These notes have been taken by Drexel & Company, who have also taken car trusts on 20 new cars which will be purchased for the elevated road. These plans, with the $600,000 of the collateral loan of Dec. 15, 1908, now available, will give the company between $3,500,000 and $4,000,000. Of course, the guarantee of the Union Traction Company must be given by the stockholders and the question will be submitted to them at the annual meeting in September. But as the plan has the unanimous approval of the directors no doubt is entertained of their affirmative action." Formal permission has been granted the Philadelphia Rapid Transit Company to place the stock of the Lehigh Avenue Street Railway, a subsidiary of the Philadelphia Union Traction Company, on a 6 per cent dividend basis, by the directors of the latter company. This is a utility measure so that the stock could be used as a part of the collateral upon which the Philadelphia Rapid Transit Company proposes to borrow $2,500,000.

Shelburne Falls & Colerain Street Railway, Shelburne Falls, Mass.—The Shelburne Falls & Colerain Street Railway has decided to issue $100,000 of 5 per cent bonds to retire a similar issue of 6 per cent bonds.

South Side Elevated Railroad, Chicago, Ill.—The directors of the South Side Elevated Railroad on May 26, 1910, decided to resume dividends on the stock of the company, and authorized the payment of ½ of 1 per cent on June 30, 1910, to stock of record on June 18, 1910. The last payment made on the stock of the company was a quarterly disbursement of ¾ of 1 per cent paid on March 31, 1908.

Worcester & Southbridge Street Railway, Worcester, Mass.—The Worcester & Southbridge Street Railway has petitioned the Railroad Commissioners for authority to issue $140,000 additional stock, the proceeds to pay indebtedness incurred for the purchase of the property of the Hartford & Worcester Street Railway.

The New York, New Haven & Hartford Railroad has transferred all its gas and electric lighting properties, owned or leased, to the Housatonic Power Company, which includes the lighting plants at Norwalk, South Norwalk, Greenwich, Naugatuck, Waterbury and New Britain, Conn. The Housatonic Company already owns the New Milford Power Company, which supplies electricity for the electric railways in Waterbury, New Britain, and other parts of Connecticut. The capital stock of the Housatonic Power Company has been increased from $1,000,000 to $3,000,000, the proceeds to be used to pay for the newly acquired properties, which will also provide for extensions and working capital. The new company was formed for the purpose of segregating the lighting and power companies from the electric railways owned by the New York, New Haven & Hartford Railroad.

Traffic and Transportation

Special Tickets for Miners in Indiana Unlawful

The Railroad Commission of Indiana holds that the Terre Haute, Indianapolis & Eastern Traction Company is guilty of discrimination in making special rates to miners which are not available to other patrons of the road. The special rates to the miners were made because the fare generally charged would prohibit them from residing in Terre Haute and working in the mines in Brazil. The question raised was whether or not this constituted discrimination within the meaning of Section 13 of the Act of March 9, 1907, known as the Railroad Commission Act. So much of said section as was applicable follows:

"If any railroad subject hereto, directly or indirectly, or by any special rate, rebate, drawback or other device, shall charge, demand, collect or receive from any person, firm or corporation a greater or less compensation for any service rendered or to be rendered by it than it charges, demands, collects or receives from any other person, firm or corporation for doing a like and contemporaneous service in the transportation of a like kind of traffic under substantially similar circumstances and conditions, such railroad shall be deemed guilty of unjust discrimination, which is hereby prohibited.

"(a) It shall also be an unjust discrimination for any such railroad company to make or give any undue or unreasonable preference to any particular person, firm, corporation or locality, in connection with the transportation of any persons or property, or to subject any particular kind of traffic or any particular person, place, or locality to any undue or unreasonable prejudice, delay or disadvantage in any respect whatever."

Under the statute of Indiana commuters' tickets may be sold, and party tickets may be held under the Interstate Commerce Law. J. F. McClure, of the commission, in an opinion rendered on May 4, 1910, in the case of the Terre Haute, Indianapolis & Eastern Traction Company, said:

"I am of the opinion that the issuing of tickets either for single trips or for any number of trips to a certain class, such as to miners, as is being done by the Terre Haute, Indianapolis & Eastern Traction Company between Brazil and Terre Haute, to the exclusion of all other patrons of the line, is in contravention of Section 13 of the Act of March 9, 1907. If such special rates could legally be given to a class of workmen such as the miners, they might be given to another class who would be railroad employees working upon a steam railroad or the electric railway, to men engaged in quarrying stone, to farmers or farm hands who might be residing in the towns, going back and forth to their work in the country, to merchants as a class, to members of various religious and civil societies, and so on to the end of all possible classification of citizens.

"As was suggested by the commission in the case of Risher vs. the Evansville & Indianapolis Railroad, the company, if it so desires, may publish a special passenger rate at a reduced price for a specified number of trips to be used within a specified time, open to everyone who might desire to use the same, and so to do will be no violation of the law.

"Any other method would be a discrimination within the meaning of the statute unless some provision in the ordinance in Terre Haute or Brazil granting the company a franchise stipulated that such special rates might be so made, provided, however, that such ordinance had been enacted before the passage of the Act of 1907."

Transfer Talks in New York

The Metropolitan Street Railway, New York, N. Y., has for some time past been calling the attention of its patrons to a variety of subjects in messages printed on the back of its transfers. Six of such messages selected from a batch of recent transfers follow:

EVERY CONDUCTOR ON THIS SYSTEM

is expected at all times to be courteous and polite to passengers. If you notice any flagrant violation of this rule we will thank you for writing us in regard to it, giving the

conductor's number, time of day and date. This will help us to keep the service at its best and to discipline employees who depart from our rules."

LOOK ON THE OTHER SIDE

"This ticket is valid only when presented at regular transfer points printed on the other side. Do not blame the conductor if you forfeit your transfer privilege by getting on the car at the wrong place. When in doubt examine your ticket. It will set you right."

MOVE UP FORWARD PLEASE

"Somebody has estimated that on all the lines of this system conductors repeat 'Move up forward, please,' at least half a million times during every day. This phrase is an appeal to passengers who are standing to move up toward the front of the car and thus prevent crowding and blocking at the rear end."

DON'T GIVE AWAY THIS TRANSFER

"If for any reason you decide not to use this transfer ticket, destroy it. Do not pass it to somebody else to use. Such an act is unfair to the company, depriving it of legitimate revenue, and it engenders a habit of petty fraud on the part of the recipient who otherwise would be glad to pay his fare."

THE AQUARIUM IS FREE

"Hundreds of thousands of New Yorkers have never been to the Aquarium, yet it is perhaps the most wonderful and interesting institution in New York—a veritable fairyland of wonders for adults and children. The pleasantest way to get there is to take a Broadway car, to which all Metropolitan lines transfer, to Battery Park. Admission to the Aquarium is free."

THE ESQUIMAUX VILLAGES

"Take the children some Sunday afternoon to see the Esquimaux Village and other wonderful things at the Museum of Natural History. Take a Columbus Avenue or Eighth Avenue car to Seventy-seventh Street. Admission to the Museum is free."

Increase in Commutation Rates Out of New York

The New York Central & Hudson River Railroad has made public the changes in commutation rates over its divisions which will go into effect on July 1, 1910. The general effect of the new tariff is to increase the fare, although in some instances the present fares will be reduced. In the following table the present 60-trip commutation fare and the new 60-trip commutation fare are given from the principal stations along the several divisions of the road to New York:

HUDSON DIVISION.

	Miles from New York.	Present fare.	New fare.	Per cent of increase.
Kingsbridge	10	$4.75	$5.25	10
Yonkers	15	5.90	6.75	14
Hastings	19	6.65	7.55	13
Dobbs Ferry	20	6.90	7.70	11
Tarrytown	25	7.60	8.25	8
Ossining	31	8.05	9.20	14
Peekskill	41	10.30	11.05	7

HARLEM DIVISION.

	Miles from New York.	Present fare.	New fare.	Per cent of increase.
Fordham	9	$4.45	$4.85	9
Williamsbridge	11	5.15	5.60	8
Mount Vernon	14	5.60	6.50	16
Scarsdale	19	6.65	7.55	13
White Plains	23	7.35	8.10	10
Hawthorne	29	7.90	8.95	13
Pleasantville	31	8.05	9.20	14
Mount Kisco	37	8.90	10.15	14

PUTNAM DIVISION.
(Including fare on the elevated.)

	Present fare.	New fare.	Per cent of increase.
Kingsbridge	$5.95	$6.00	8
Van Cortlandt	6.45	6.05	*6
Caryl	6.75	7.00	3
Lowerre	6.75	7.00	3
Park Hill	7.15	7.45	4
Yonkers	7.15	7.85	9
Nepperhan	7.45	8.60	15
Mount Hope	8.05	9.05	12
Ardsley	8.20	9.20	12
Elmsford	8.60	9.75	13
Tarrytown Heights	8.90	9.75	9
Pocantico Hills	8.90	9.75	9

* Decrease.

The West Shore Railroad, the Delaware, Lackawanna & Western Railroad, the Lehigh Valley Railroad, the Central Railroad of New Jersey and the Erie Railroad, all of whose lines out of New York are still operated by steam, and the Long Island Railroad, operated by steam and electricity, have made public the increases in commutation fares over their various divisions.

Increase in Speed Limit.—The City Council of Columbus, Ind., has passed an ordinance which increases the speed at which street cars can be operated within the city from 8 m.p.h. to 12 m.p.h.

Additional Station on Forest Hill Line, Boston.—The Railroad Commission has suggested that the Boston Elevated Railway should install a station at Green Street, on its Forest Hill extension, which was opened on Nov. 12, 1909.

Collision on Indiana Line.—A freight car and a passenger car of the Indiana Union Traction Company collided head-on near Wabash, Ind., a few days ago. The wreck took fire and the cars were partially destroyed. The motorman and conductor of the passenger car were injured, but none of the passengers was hurt seriously.

New Jersey Company Discontinues Sale of Tickets in Quantities.—The Public Service Railway, Newark, N. J., has discontinued the sale of tickets at the rate of 21 for $1 and in books of 106 for $5, the demand for tickets having lessened so much recently that the company did not feel that the patronage warranted the clerical expense involved in disposing of the tickets.

Arbitration of Terms of Service in Massachusetts.—E. C. Foster, who is now connected with Sanderson & Porter, New York, N. Y., has been selected by the New England Investment & Security Company to represent it as a member of the board of three which will consider the question of wages and terms of service of the employees of the company, and former Senator William P. Hays has been chosen to represent the men. The third member of the board of arbitration has not yet been selected by Mr. Foster and Mr. Hays.

Fare Complaint Against the Schenectady Railway.—The Public Service Commission of the Second District of New York has served upon the Schenectady Railway a complaint in which it is alleged that the fare from Troy to various points between the stations known as Lathams and Niskayuna has been 15 cents each way for each passenger and from Schenectady the sum of 15 cents each way; that the rate charged by the company from Troy to Lathams is 10 cents and from Schenectady to Niskayuna 10 cents, and that the fares charged are inequitable, unfair and unjust. The commission is asked to make an order which shall fix an equitable rate of fare between the points stated. A hearing was set to be held before the commission in Albany on June 1, 1910, at which all those who objected to the fare schedule were to be permitted to make known the cause of their objections.

Increase in Wages in Kansas City.—The Kansas City Railway & Light Company, Kansas City, Mo., has announced an increase in the wages of the employees of the railway department of the company, which affects motormen, conductors, division superintendents and assistant superintendents. The wages of the division superintendents and the assistant superintendents are increased $10 and $5, respectively, a month, and the wages of conductors and motormen are on a sliding scale, as follows: First year, 20 cents an hour; second year, 20 cents and a bonus of $3 a year; third year, 21 cents and a bonus of $5; fourth year, 23 cents and a bonus of $8; fifth year, 24 cents and one uniform; sixth to tenth year, 25 cents and one uniform; tenth year and over, 26 cents and two uniforms.

Fares in Revere to Be Investigated.—Two petitions have been addressed to the Massachusetts Railroad Commission by the Selectmen of Revere to secure modifications in the fare and transfer arrangements on the Boston & Northern Street Railway and the Boston Elevated Railway in Revere. The principal issue is the fare to and from Revere Beach in connection with proposed through car service from Boston. Another feature is a desired 5-cent fare between Lynn and the Park Avenue district by means of transfers. The fare question is complicated somewhat at present by the status of the proposed Boston Elevated Railway holding bill before the Legislature, and it is unlikely that the Rail-

road Commission will order any marked changes while the above measure is pending, although any hearings which are considered necessary will be assigned by the commission.

Campaign with Buttons to Prevent Accidents.—In its campaign to prevent accidents the Denver (Col.) City Tramway is distributing buttons which bear the legend: "I don't get off the car backwards." Recently the company gave the buttons out among the pupils of the McKinley School, and Clara J. Coney, of the school, addressed a letter to John A. Beeler, vice-president and general manager of the Denver City Tramway, in which she said that several of the classes from the school had recently made trips by trolley and that the girls had counted the men and women who got off the car correctly. According to Miss Coney, for a long distance the girls counted only two women who alighted correctly. She thought that "if the cars passed to the left, as in England and Victoria, women and girls would not have such a hard time learning to alight from them."

New York Commission Rules on New Haven Rates.—The Public Service Commission of the Second District of New York holds that the New York, New Haven & Hartford Railroad cannot legally put in effect its proposed increase in commutation rates on June 1, 1910, and that fares now in force will continue in effect after June 1, notwithstanding the filing with the commission and partial publication of these tariffs at stations. The company has been ordered to continue to charge the fares duly established and set forth in its tariffs now in effect until these tariffs shall have been superseded by tariffs filed with the commission and published at stations as required by the Public Service Commission's law. It is further ordered that the company be permitted to establish and put in effect on one day's notice commutation passenger and round-trip rates and school commutation rates between Harlem River and its stations in New York State, and also joint rates between its New York State stations and stations of the Interborough Rapid Transit Company at 129th Street, New York City.

Railroad Tariff Bulletin in Indiana.—The Railroad Commission of Indiana has issued tariff bulletin No. 1, dated April, 1910, in which information is given concerning changes in the freight rates on railways within the jurisdiction of the commission. In announcing the publication of the bulletin the commission says: "In accordance with circular No. 64 of the commission these tariff bulletins will be issued monthly, and will be distributed to commercial bodies throughout the State. They are also free to the public and will be mailed to any interested party upon written request with necessary postage enclosed. It has been found impossible with the amount of money at the disposal of the commission to give in these bulletins the number of tariffs and full information with reference to the changes made. We have endeavored, however, to call attention to all increases in rates in the State; more specific information and full description of the tariffs and changes made will be given upon inquiry by letter, telephone or at the office of the commission."

Collision on Illinois Traction System.—An express train and a sleeper of the Illinois Traction System collided near Carlinsville, Ill., on May 20, 1910. The trains had orders to meet at a siding called Loveless, seven miles south of Carlinsville. The motorman of the express train repeated his order to his conductor and flagman when the order was received from the dispatcher, and designated Loveless as the meeting point. The sleeper had approached within about 80 feet of the meeting point and was running about 2 m.p.h. when the motorman noticed the express train approaching at high speed without slowing up for the siding. He jumped and sustained a broken rib. The conductor of the sleeper had his hip broken. None of the five passengers was injured, however. After the collision the wreckage caught fire and all the cars were destroyed. The motorman and conductor of the express train were killed. It has been established that the motorman of the express train clearly understood his orders. The sleeper which was destroyed was the "Springfield," which was in use in the Springfield-East St. Louis service of the company.

Personal Mention

Mr. A. B. Stitzer, formerly electrical engineer of the Philadelphia (Pa.) Rapid Transit Company, has become associated with the engineering department of Ford, Bacon & Davis, New York, N. Y.

Mr. Marshall Craig has been appointed assistant engineer of the Waterloo, Cedar Falls & Northern Railway, Waterloo, Ia. Mr. Craig was formerly city passenger and ticket agent of the Chicago Great Western Railroad at Omaha.

Mr. Edward M. Bigelow, formerly director of public works of Pittsburg, Pa., has been appointed by the commissioners of Allegheny County as consulting engineer to report on the construction of tunnels through Mt. Washington at Pittsburg, with particular reference to their utilization for transit purposes.

Mr. Louis M. Duvall has been appointed secretary of the Maryland Public Utilities Commission. Mr. Duvall was for many years the business manager of the Baltimore *News*. He began his business career as expert accountant with the Northern Central Railway. He next served in the Baltimore *Record* office as cashier for 10 years, and then went with the Maryland Title Insurance & Trust Company, of which he was secretary-treasurer for three years. Mr. Duvall resigned from the Maryland Title Insurance & Trust Company to become connected with the Baltimore *News*. Meanwhile he studied law, and has been engaged in the practice of his profession recently.

Mr. W. B. Tuttle, who was elected president of the Southwestern Gas and Electrical Association at the meeting held in Beaumont, Tex., on May 12, 13 and 14, 1910, is vice-president and general manager of the San Antonio (Tex.) Traction Company. Mr. Tuttle was educated at the University of Virginia, and entered the employ of the Consolidated Gas Company of New Jersey in 1896 as an apprentice. Subsequently he became superintendent of the gas department of the company, and finally general manager of the company, with jurisdiction over both the gas and electric departments. Mr. Tuttle also worked for some time as assistant to the chief engineer of the American Light & Traction Company. In July, 1906, he was elected vice-president and general manager of the San Antonio Traction Company and the San Antonio Gas & Electric Company.

W. B. Tuttle

Mr. L. E. Lynde, whose appointment as superintendent of the Manchester Traction, Light & Power Company, Manchester, N. H., was noted in the ELECTRIC RAILWAY JOURNAL of May 7, 1910, has entered upon the duties of that office. Mr. Lynde entered street railway work as a conductor with the Stoneham Street Railway in 1884. In 1887 the Stoneham Street Railway was purchased by the Lynn & Boston Street Railroad, and Mr. Lynde was made inspector of the Stoneham branch, in which position he continued until 1889, when he was appointed superintendent of the Woburn division. In 1891 he was appointed superintendent of the Malden, Revere Beach and Chelsea branch of the Lynn & Boston Railroad. In 1893 Mr. Lynde resigned from the Lynn & Boston Railroad to become assistant superintendent and clerk of the Haverhill & Amesbury Street Railway. In 1895 he was appointed superintendent of the Haverhill & Amesbury Street Railway, which later became part of the system of the New Hampshire Electric Railways, with which he served as superintendent of the Eastern Massachusetts and Eastern New Hampshire divisions.

OBITUARY

Alfred John Greathead, who has been connected with John A. Roebling's Sons' Company for 23 years, and who had been secretary of the company for the last five years, died at his home in Chicago, on May 21, 1910. Mr. Greathead was born at Barnstaple, Eng., on May 5, 1861.

Construction News

RECENT INCORPORATION

Evansville, Mount Carmel & Olney Electric Railway, Evansville, Ind.—Incorporated in Illinois to build a railway from Mount Carmel to Olney, Ill. Capital stock, $30,000. Incorporators: E. Q. Lackrie, C. J. Seibert and S. J. Laubscher, Evansville; Thomas Marvel and E. B. Rider, Cynthiana, Ind.; Aden Knoph and J. F. Hyatt, Olney, and Lewis Seitz and Robert Parkinson, Mount Carmel. [E. R. J., Feb. 12, '10.]

FRANCHISES

*Rogers, Ark.—The Rogers-Bentonville-Decatur Interurban Railroad has been granted a 50-year franchise to build a railway in Rogers. Construction will begin at an early date. J. D. Houseman and G. G. Southerland, St. Louis, Mo., are promoting this railway.

*Portersville, Cal.—F. W. Nofziger, who is promoting the building of an electric railway in Portersville, has asked the City Council for a 50-year-franchise for that purpose.

Carterville, Ill.—The Egyptian Traction Company, Eldorado, has asked the Council for a franchise to build a railway in Carterville. [E. R. J., May 7, '10.]

Chicago, Ill.—The Eastern Illinois Traction Company, a subsidiary company of the Consolidated Railways Company, Chicago, has secured franchises in West Hammond, Thornton Township, Blue Island, Riverdale and Harvey, and it is reported that construction will begin within a month.

Peoria, Ill.—The Peoria & Galesburg Railway has been granted a franchise by the Council to build a railway in Peoria. This is part of a plan to connect Galesburg and Peoria. S. F. Atwood, Peoria, secretary. [E. R. J., Sept. 25, '10.]

Brockton, Mass.—The Old Colony Street Railway, Boston, has been granted the approval of the Board of Aldermen of its plans to rebuild and extend some of its lines in Brockton.

*Summit, Miss.—The Summit-McComb Motor Line Company has been granted a franchise to build a railway within the corporate limits of Summit. This is part of a plan to connect Godbold, Mineral Wells, Summit and McComb with a gasoline motor railway. J. E. Randell, Gulfport, contractor.

Hastings, Neb.—The Omaha, Western & Lincoln Railway, Lincoln, has been granted a franchise to build a railway in Hastings. This is part of a proposed plan to build a railway from Hastings to Omaha. Frank E. Schaff, president. [E. R. J., May 21, '10.]

Englewood, N. J.—The Hudson River Traction Company, Hackensack, has been granted a 50-year franchise for the extension of its line north to Tenafly.

Bolivar, N. Y.—The Southwestern New York Traction Company, Bolivar, has been granted a 50-year franchise to build a railway in Bolivar. This is part of a plan to connect Bolivar, Scio, Allentown and Wellsville, a distance of 15 miles. B. F. Patterson, Bolivar, N. Y., general manager. [E. R. J., April 16, '10.]

Saratoga Springs, N. Y.—The Hudson Valley Railway, Glen Falls, has asked the Council for a franchise to build a railway through East Avenue in Saratoga Springs for the purpose of connecting the Glen Falls line with the Troy-Saratoga line and thus forming a direct route from Troy to Warrensburg.

Woodsdale, N. C.—The North Carolina Traction Company, Winston-Salem, has asked the Council for a franchise for a street railway in Woodsdale.

*Ontario, Ore.—A. N. Soliss, representative of Henry Lewitt, Spokane, has asked the Council for a franchise to build a railway in Ontario which would connect at Snake River near Nyssa with the Pierce line to Caldwell.

Greenville, S. C.—The Greenville, Spartanburg & Anderson Railway has applied for an electric railway franchise in Greenville. This railway will connect Belton, Greenville and Spartanburg.

Brownsville, Tex.—B. G. Stegman and associates have been granted a 25-year franchise to build a railway over certain streets in Brownsville. Construction is to be started within four months and 3 miles must be finished within one year. The whole line must be completed within two years. [E. R. J., March 12, '10.]

Port Arthur, Tex.—The Council has amended the franchise of the Port Arthur Traction Company by extending its franchise to 50 years instead of 30 to build a line over streets of Port Arthur. [E. R. J., May 14, '10.]

*Raymond, Wash.—P. E. Hall, Jr., has asked the Council for a 45-year franchise to operate a street railway in Raymond.

TRACK AND ROADWAY

British Columbia Electric Railway, Ltd., Vancouver, B. C.—This company has awarded a contract to M. P. Cotton for clearing and grading line and constructing roadbed ready for ballasting and tracklaying of its 7½-mile extension from Burnaby to Vancouver.

San Francisco, Vallejo & Napa Valley Railroad, Napa, Cal.—This company reports that it expects to ballast the entire length of its line and all additions on private right of way. It will also build together with St. Helena a combination stone bridge which will cost approximately $9,000.

City Suburban Railway, Brunswick, Ga.—This company has started construction on a belt line in Brunswick. F. D. Aiken, general manager.

*Habersham Orchard & Improvement Company, Clarkesburg, Ga.—This company is considering the construction of a 7-mile electric railway from Clarkesburg to its orchard property. Norman T. Poole, president.

Caldwell-Roswell Interurban Railway, Caldwell, Idaho.—This company advises that it will start construction in July on its proposed 27-mile railway to connect Roswell, Caldwell, Notus, Greenleaf and Big Bend. Capital stock, authorized, $250,000; issued, $27,000. Headquarters, Caldwell. Officers: H. W. Dorman, president; J. H. Lovell, vice-president; H. S. Kneedler, secretary; E. A. Clark, treasurer, and H. W. Dorman, general manager. [E. R. J., May 7, '10.]

Murphysboro Electric Railway, Light, Heat & Power Company, Murphysboro, Ill.—This company, which is building an extension to Carbondale, is reported to be planning to extend the railway from Carbondale to Du Quoin, Herrin, Carterville, Marion and Harrisburg. S. B. Newton, general manager.

Fort Wayne & Springfield Railway, Decatur, Ind.—It is reported that this company will let a contract for the construction of an 18-mile extension of its railway south to Portland. W. H. Fledderjohann, general manager.

Sioux City & Eastern Traction Company, Sioux City, Ia.—This company advises that it has not completed any definite plans for the construction of its proposed 100-mile railway to connect Sioux City, Ida Grove and Dennison. The company wishes to communicate with some engineering firm to build the line. Capital stock, authorized, $100,000. Headquarters, 520 Farmers' Loan & Trust Company, Sioux City. Officers: A. H. Tennis, president; W. B. Goodrich, vice-president; W. F. Harding, secretary; H. C. Fedderson, treasurer, and Walter H. Foss, general manager. [E. R. J., May 14, '10.]

*Iowa City, Ia.—It is reported that Messrs. Rheins and Chamberlain, Des Moines, are planning to build an interurban railway from Iowa City to Des Moines via Williamsburg and Montezuma.

Louisville (Ky.) Railway.—This company is making arrangements to construct the 3½-mile extension of its Orell line to Kosmosdale. W. H. McClure, purchasing agent.

*Summit-McComb Motor Line Company, Summit, Miss.—This company is clearing the right-of-way for its proposed 5-mile interurban railway between McComb and Goldboldt Wells via Summit. J. E. Randall, Gulfport, has charge of work. Construction will begin this month.

St. Louis, Creve Cœur & Western Railway, Clayton, Mo.—This company advises that it will start construction in July on its proposed 14-mile railway to connect St. Louis, Mt. Olive, Olivette, Stratmann, Creve Cœur, Fern Ridge,

and Creve Cœur Lake. Power will be purchased from the United Railways or the Union Electric Company. Capital stock authorized $300,000. Issued $300,000. Bonds authorized $300,000. Officers: William F. Pfeister, Creve Cœur Route 27, president; Carl Feld, Clayton Route, vice-president; S. H. Werremeyer, Clayton, secretary, and Jacob Studt, treasurer. [E. R. J., March 27, '09.]

Eastern Montana Electric Railway, Billings, Mont.—This company advises that it is securing right-of-way for its proposed electric railway from Billings to Bearcreek via Laurel, Red Lodge Bridge, Rockvale, Belfry and Fromberg. It has received and accepted long time franchises from Laurel, Red Lodge and Bridges. F. A. Kesselhuth, chief engineer. [E. R. J., Jan. 29, '10.]

***Hutchinson, Neb.**—J. J. Booth is reported to be interested in promoting a railway to connect Hutchinson, Arkansas City, Conway, Wellington and Gueda Springs.

***Norfolk-Newman Grove Interurban Railway, Norfolk, Neb.**—W. R. Martin and associates are promoting an electric railway to connect Norfolk and Newman Grove.

Nebraska Traction & Power Company, Omaha, Neb.—This company advises that it has started grading on its 4-mile extension from Ralston to Papillion.

Citizens' Traction & Power Company, Albuquerque, N. Mex.—This company is said to have started construction on its 2-mile line in Albuquerque. Wyman & Barton, Amarillo, will superintend the construction work. A. W. Hayden, Albuquerque, president. [E. R. J., April 18, '10.]

Westchester Northern Railroad, White Plains, N. Y.—The Public Service Commission of the Second District has granted a certificate of public convenience and a necessity to this company and authorized it to begin the construction of its proposed 45-mile railway. It will extend from White Plains through Lewisboro, with a branch line from Pound Ridge, near Cross Pond, northerly through Westchester and Putnam Counties for 14 miles to a connection with the New York, New Haven & Hartford Railroad at the boundary line between the States of New York and Connecticut. L. S. Miller is interested. [E. R. J., Feb. 12, '10.]

Central Ohio Promoting Company, Columbus, Ohio.—This company advises that it proposes to begin construction next spring on its proposed 60-mile railway to connect Columbus and Zanesville via Millers Port, Thornville, Glenford and Gratiot. Its repair shop will be located at Glenford. Capital stock authorized $25,000. Officers: James L. Holden, 1050 Bryden Road, Columbus, president; Henry A. Auxline, first vice-president and secretary; James L. Holden, treasurer, and Albert E. Boone, Zanesville, general manager. [E. R. J., May 21, '10.]

Wilkes-Barre & Wyoming Valley Traction Company, Wilkes-Barre, Pa.—This company is extending its Hughestown line from No. 9 breaker to West Avoca, and eventually will be built to Rocky Glen. T. A. Wright, superintendent.

***Paris and Mount Pleasant Railway, Paris, Tex.**—This company has been organized to build a 53-mile railway from Paris to Mount Pleasant. Grading on the first section from Paris to Bogota, 25 miles, has been finished, and contract for track laying and bridge work has been let to D. J. Trigsby, Dallas. The company will build a 2,100 ft. trestle. N. H. Rageland, Paris, general agent.

Ogden Rapid Transit Company, Ogden, Utah.—This company reports it will build soon 20 miles of new track. J. W. Bailey, superintendent.

Tacoma Railway & Power Company, Tacoma, Wash.—This company announces that it will build an extension railway from Tacoma to Bismarck. L. H. Bean, general manager.

Clarke County Suburban Railway, Vancouver, Wash.—This company, which is a subsidiary company of the Vancouver Traction Company, has just completed its new line from Vancouver to Orchards. It is expected to continue the line to Sifton and La Center. O. C. Spencer is interested. [E. R. J., Aug. 21, '09.]

South Morgantown Traction Company, Morgantown, W. Va.—This company is preparing plans for the extension of its line across Chancery Hill into South Park and thence to Marilla.

Morgantown & Dunkard Valley Railroad, Morgantown, W. Va.—This company has started work on its extension between Morgantown and Blackville. The part of the line between Fairmount and Mannington has been completed and is in operation.

Chicago & Wisconsin Valley Railroad, Milwaukee, Wis.—Press reports state that the company will let contracts within 30 days for the construction of its railway from Janesville to Merrill via Friendship, Easton, Portage, Lodi, Middleton and Madison. Allen T. Russell, Chicago, general manager. [E. R. J., March 19, '10.]

Ontario & Northern Railway, Ontario, Wis.—This company advises that it will begin construction as soon as necessary incorporation and bonding matters are arranged on its proposed 8-mile railway from Ontario to either Oil City and Wilton or Oil City and Norwalk. Power station will be located in Ontario. Steam will be used until hydro-electric developments are made. Capital stock authorized $75,000. Bonds issued $50,000. A. E. Rau, Sparta, engineer in charge. [E. R. J., May 21, '10.]

SHOPS AND BUILDINGS

Athens (Ga.) Electric Railway.—This company has awarded a contract to the Foy Proctor Company, Nashville, for building a reinforced concrete car house. Plans are being prepared by J. W. Barnett, Athens. C. L. Proctor, Athens, general manager.

Old Colony Street Railway, Boston, Mass.—This company will erect a new car house, 280 ft. by 134 ft. with a ten-track entrance, at the corner of Torrey street and West streets, Brockton. It is stated that construction will begin at once.

Nebraska Traction & Power Company, Omaha, Neb.—This company advises that during the next few weeks it will let contracts for building a new car house and office building at Ralston. George D. Rice, general manager.

New York, Westchester & Boston Railway, New York, N. Y.—This company will build a new station at Weaver Street in upper New Rochelle. It will be 30 ft. by 340 ft., of concrete construction, and will be known as the Quaker Ridge Station.

Philadelphia Rapid Transit Company, Philadelphia, Pa.—This company has awarded a contract for a substation, 59 ft. by 32 ft., at Germantown avenue and Erie avenue, to Charles McCaul Company.

POWER HOUSES AND SUBSTATIONS

Augusta Railway & Electric Company, Augusta, Ga.—This company will install a 1000 kw. turbine at its power house in Augusta, with necessary boilers, etc., increasing the capacity of the plant by 25 per cent. John H. Adams, chief engineer.

Mason City & Clear Lake Railway, Mason City, Iowa.—This company expects to move its principal power station from Emery to Mason City. F. J. Hanion, general manager.

Nebraska Traction & Power Company, Omaha, Neb.—This company is considering the purchase of a rotary converter.

Public Service Railway, Newark, N. J.—This company will erect a power plant at Perth Amboy to have a capacity 8000 kw.

Galveston-Houston Electric Railway, Galveston, Tex.—Press reports state that this company has decided to build its power plant on the north bank of Clear Creek, near Webster.

Wheeling (W. Va.) Traction Company.—In connection with its plan to increase the capacity of its power station by the addition of a 1875 kva. low pressure turbine and condenser, as mentioned in the Electric Railway Journal of May 21, 1910, this company will install a dry well and motor driven pumps with a capacity of raising 3500 gallons of water a minute a height of about 40 ft. Up to this time the company has been using non-condensing engines. The water for condensation will be taken from the Ohio River.

Manufactures & Supplies

ROLLING STOCK

Philadelphia (Pa.) Rapid Transit Company will order 20 new cars for its elevated division.

Cumberland (Md.) Electric Railway has ordered two 22-ft. closed cars from the John Stephenson Company.

St. Petersburg (Fla.) Investment Company will purchase six cars for its street railway. A. Welton, superintendent.

New York & Queens County Railway, Long Island City, N. Y., has drawn specifications and is asking for bids for 25 cars.

Third Avenue Railroad, New York, N. Y., has placed an order with the General Electric Company for motors, control, etc., for 30 storage battery cars.

San Francisco, Vallejo & Napa Valley Railroad, Napa, Cal., expects to purchase four light trailer cars with seating capacity of 60 or more, which can be operated in trains.

Nebraska Traction & Power Company, Omaha, Neb., expects to purchase one electric locomotive, 10 freight cars and several passenger cars. George D. Rice, general manager.

West Jersey & Sea Shore Railroad, Camden, N. J., which was noted in the Electric Railway Journal of May 28 as receiving bids for eight new cars, complete with new motors, etc., has placed an order with the General Electric Company for eight type M control equipments.

Ogden (Utah) Rapid Transit Company has bought six interurban cars and one electric locomotive from the St. Louis Car Company. The company has also ordered from the General Electric Company two GE-80 four-motor equipments, four GE-219 four-motor equipments and one GE-210 four-motor equipment.

Interborough Rapid Transit Company, New York, N. Y., mentioned in the Electric Railway Journal of April 18, 1910, as having completed specifications for 100 cars for elevated service, has placed the order as follows: 40 cars with Wason Manufacturing Company, 40 cars with Jewett Car Company and 20 cars with the Cincinnati Car Company.

New York & North Shore Traction Company, Mineola, N. Y., which was noted in the Electric Railway Journal of May 28, 1910, as contemplating the purchase of several motor equipments, has placed an order with the General Electric Company for four 40-hp motor equipments for passenger cars, two 75-hp motors for a sweeper and two 75-hp motors for a sprinkler.

Houston (Tex.) Electric Company, reported in the Electric Railway Journal of March 12, 1910, as having ordered 15 closed motor cars from the American Car Company, has drawn the following speifications for this equipment:

Length of body.....26 ft.	Gongs ..... Brill
Over vestibule....37 ft. 6 in.	Hand brakes..Brill; Peacock attachment
Width over sills....8 ft. 5 in.	
Over posts at belt..8 ft. 5 in.	Headlights ... Crouse-Hinds
Body.....wood and metal	Journal boxes ..... Brill
Interior trim ..... bronze	Motors ..... G.E. 219A
Underframe ..... wood	Push button signal.....Brill
Axles ..... Brill	Registers ..... International
Bolsters, body..... Brill	Roofs ..... turtle back
Bolsters, truck..... Brill	Sanders ..... Brill
Brakeshoes ..... Brill	Seats .....Brill, long
Car trimmings..... Brill	Seating material .....rattan
Center bearings..... Brill	Side bearings .....Brill
Couplers ..... Brill-Hovey	Springs ..... Brill
Curtain fixtures... Forsythe	Step treads.Murray & Jacobs
Curtain material ..Pantasote	Trolley retrievers .. Wilson
Destination signs... Hunter	Trucks, type.....Brill 39-E
Fare boxes .....Brill	Varnish ..... Murphy
Fenders ..... Pfingst	Wheels .....St. Louis

TRADE NOTES

E. Saxton, Washington, D. C., has moved his office from 841 Bladensburg Road to the Washington Loan & Trust Building.

Beers-Offutt Construction Company, Fort Wayne, Ind., has been incorporated to engage in general electric railroad construction work. George W. Beers, president, and H. C. Offutt, secretary.

Ackley Brake Company, New York, N. Y., reports a cable order for 100 brakes for the Shanghai Construction Company, Shanghai, China, and eight brakes from the Tranvias de Caracas, Caracas, Venezuela.

Lintern Car Signal Company, Cleveland, Ohio, has received an order for 100 marker equipments from the Cincinnati Car Company to be applied to cars now being built for the Public Service Railway, Newark, N. J.

Pawling & Harnischfeger Company, Milwaukee, Wis., designers and builders of electric traveling cranes and hoists, have recently appointed A. B. Bowman, 720 North Second Street, St. Louis, a special sales representative.

Ohio Brass Company, Mansfield, Ohio, has received an order from the Chicago-Joliet Electric Railway for 54 Tomlinson automatic couplers instead of 20 couplers, as was noted in a previous issue of the Electric Railway Journal.

The Inter-Ocean Steel Company, Chicago Heights, Ill., has recently constructed a plant for the manufacture of tires for locomotive and cars and also for steel-tired wheels. The company also makes at its works roll shells, die rings, flanges and other rolled circular shapes. The plant is very modern in its equipment.

Wonham, Sanger & Bates, New York, N. Y., report that the Chicago City Railway has installed 668 additional "H-B" lifeguards on its cars. About 1100 "H-B" lifeguards were installed by the Chicago City Railway during 1909. Ralph Sanger, of this company, recently sailed for Europe on an extended business trip in the interests of the firm.

Browning Engineering Company, Cleveland, Ohio, has received an order from the Cincinnati Traction Company for a 15-ton locomotive crane mounted on M.C.B. trucks. It is to be electrically operated, equipped with a 36-in. lift magnet for loading and unloading steel rails, and a 1½-cu.-yd. clamshell bucket for handling ashes, crushed stone, coal, etc.

Nichols-Lintern Company, Cleveland, Ohio, has recently received orders for sander equipments from the Niles Car & Manufacturing Company, American Car Company, Kuhlman Car Company, and an order for 100 equipments from the Cleveland Railway. The company also reports that its auxiliary valves are being received favorably by many of its customers.

General Electric Company, Schenectady, N. Y., has leased a six-story building on Second Street in San Francisco, which it will use for its Pacific Coast headquarters. The building has a frontage of 60 ft. on Second Street and 74 ft. on Minna Street, and is a handsomely finished office structure. It is the purpose of the General Electric Company to occupy the entire building.

American-La France Fire Engine Company, Elmira, N. Y., has recently sold a No. 9 chemical engine to the Susquehanna Railway, Light & Power Company, and a number of Arctic non-freezing fire extinguishers to the Union Railway, New York, N. Y. These extinguishers are also being used by the Washington Railway & Electric Company and the Milwaukee Electric Railway & Light Company.

Frank F. Fowle, Chicago, Ill., has made extended investigations into the subject of protecting high-tension transmission line crossings. In the course of this work he has examined many types of crossings, and has gathered considerable data on sleet and wind loads. A recent book by Mr. Fowle, entitled "Transmission Line Crossings," gives an extended treatment of this subject that should interest street railway officers whose systems employ high-tension distribution.

Condit Electrical Manufacturing Company, Boston, Mass., has devised a shock absorber for tungsten lamps which will translate the sudden shock into an easy spring movement and will also act as a cord adjuster. It consists of a piece of flexible non-rusting wire, coiled into a spiral with extended arms, one end of each arm being formed into a U-shaped loop. The arms are crossed so that the spring is under compression and not under tension, and the

U-shaped loop in the ends permits the adjustment of the cord. The device can be readily applied on present installations without necessitating any changes in the electrical features.

E. G. Long Company, New York, N. Y., has concluded negotiations with Robert Wilkinson, trustee in bankruptcy of the New York Car & Truck Company, for all the right and interest in the Peckham system of street railway trucks and the supply part business and property of the New York Car & Truck Company. The E. G. Long Company is now the sole manufacturer of the renewal parts for the various types of Peckham trucks and the Taylor brake. Frank Van Anden, secretary of the company, was formerly connected with the Peckham plant in Kingston, N. Y., and will give his whole time to this branch of the business. Mr. Van Anden as secretary will be assisted by John P. Cullen, Jr.

Western Electric Company, New York, N. Y., was well represented at the convention of the Pennsylvania State Engineers' Society in Harrisburg, on June 1, 2 and 3. An exhibit of telephones, including interphones, mine telephones and an artillery telephone set and a line of Hawthorn motors, exhaust fans and transformers, together with street railway and sundry electrical supplies, was shown. This company reports that the St. Louis & San Francisco Railroad is now installing new telephone circuits from St. Louis to Springfield, Mo.; from Springfield to Thayer, Mo., and from Amory, Miss., to Birmingham, Ala., a distance of 500 miles. The equipment which is now in service and that which is soon to be installed consists of telephone apparatus and selectors made by the Western Electric Company.

Indianapolis Switch & Frog Company, Springfield, Ohio, has opened an office at 1528-29 McCormick Building, Chicago, Ill., in charge of J. C. Jameson. The company reports extensive sales of special track work, especially its manganese line of solid frogs, crossing and switch points. It has recently placed on the market several designs embodying features which are meeting with recognition. A new feature added is a universal type of manganese frog adaptable for all railroads, making it possible for the company to carry regular sizes and numbers of manganese frogs in stock for the various weights of rail, overcoming the heretofore necessary length of time and delay required to manufacture manganese or hard service frogs after orders are placed. One of its special types, known as design R-N-R rigid frog, is a radically new departure, and while not placed on the market until the first of the year, is already in use on over 25 of the largest railroads using manganese track work.

ADVERTISING LITERATURE

W. L. Buckland, Utica, N. Y., illustrates and describes the Buckland rail joint and safety clamp, which he manufactures, in an 8-page folder.

Climax Car Cleaner Company, Cleveland, Ohio, has issued a folder devoted to the application of its car cleaning compounds, paste, thinners and oil soap on passenger cars for both interior and exterior work.

A. O. Schoonmaker, New York, N. Y., in his 1910 standard price list of India and amber electrical mica, gives the various grades of mica which he handles, with details as to the sizes in which the mica is furnished.

Holland Trolley Supply Company, Cleveland, Ohio, in Catalog A, describes and illustrates its trolley supplies, including Holland bases, harps and wheels and other electric railway equipment. The publication contains 32 pages.

Flower Waste & Packing Company, New York, N. Y., has issued a 16-page booklet entitled "Flower's Resilient Journal Packing." Illustrations are presented which show the proper method of using packing and tools for use in packing journal boxes in shops and shop yards.

Economy Oil Cup Company, Augusta, Ga., has issued a booklet in which the merits are discussed of the Economy oil cup, which it manufactures. Another booklet issued by the company contains a reprint of the famous poem "Casey at the Bat" and the "companion" poem "When Casey Hit the Ball."

Sellers Manufacturing Company, Chicago, Ill., has issued a folder describing its anchor bottom tie plate. It is made in several sizes and punched to fit any weight of rail. The company states that there are over 75,000,000 of these plates in use to-day on 100 of the largest railroads in this country and Canada.

Pawling & Harnischfeger Company, Milwaukee, Wis., describes and illustrates its traveling electric cranes in Bulletin No. 18, which supersedes Bulletin No. 16. A feature of the bulletin is an illustration of the product of the company applied to the power house of the Milwaukee Electric Railway & Light Company.

H. W. Johns-Manville Company, New York, N. Y., has issued the first number of the J.-M. Roofing Salesman, which is devoted to J.-M. roofings and other J.-M. building materials. The first article, entitled "The Roof of the World," describes briefly the primitive attempts at building and waterproofing, and will be continued in the June issue of the publication. The publication also contains other reading matter relative to the merits of the various products manufactured by the company.

Chas. R. Morse Manufacturing Company, Chicago, Ill., which manufactures calculating machines, has moved to its new factory at 181 East Madison Street, Chicago. The company reports repeat orders from Stone & Webster, Commonwealth Edison Company, New York Telephone Company, Chicago Union Traction Company and others. The company is manufacturing a new calculating machine known as the Morse rotary slide calculator, a cylindrical slide rule, on which calculations can be performed with speed and accuracy.

Electric Storage Battery Company, Philadelphia, Pa., has issued a 12-page booklet, entitled "The Story of the Storage Battery." It contains some interesting facts relative to the wide use of storage batteries for various purposes and the position of the Electric Storage Battery Company in the storage battery field. The company has also issued Bulletin No. 124, which contains data on the performance of the Exide battery for emergency service in central station work. Only recently has the Exide battery been adapted to this class of service, and the record of its performance during the past year has been very satisfactory.

American-La France Fire Engine Company, Elmira, N. Y., includes among its recent publications the following: "Everything for Fire Prevention and Fire Protection in Fire Department Supplies," "Two-Wheel Chemical Fire Engines," "The Story of the Chemical Fire Engine," "Fire Protection for Automobiles, Motor Boats and Railroad Coaches," and "Alert Fire Extinguisher," "Salvage Fire Extinguisher," "Arctic Fire Extinguisher," and "No. 1 Standard Babcock." The application of the fire extinguisher to railway rolling stock in service is shown in "Fire Protection for Automobiles, Motor Boats and Railroad Coaches," in which is illustrated a Junior Arctic mounted in a car of the Elmira Water, Light & Railroad Company, Elmira, N. Y.

Murray Iron Works Company, Burlington, Ia., has issued Catalog No. 60, which is devoted to its water-tube boilers, and a publication which is entitled "Murray Corliss Engines." The catalog on water-tube boilers contains 38 pages, and in it the construction of the company's product in boilers is thoroughly described and illustrated. Illustrations which are presented of a number of plants in which Murray boilers have been installed include railway shops, school buildings, starch works, office buildings, mills, water works, etc. "Murray Corliss Engines" is a publication which is in the nature of a reference work, covering the subject of the Corliss engine as made by the Murray Iron Works Company. The different types of engines made by the company are described and illustrated; directions are given for ordering the engines, and detailed descriptions and illustrations are presented of the castings of the engines, the fly-wheels, the cylinders, the governors, pistons, cross heads, dash pots, connecting rods, etc. A chapter is also devoted to the high-pressure Murray boilers. A feature of the work is a series of miniature plans for power-plant installations, made to represent original blue prints.

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 Ferry earnings to April 1, 1909.

Company	Period	Gross Income	Operating Expenses	Gross Income Less Operating Expenses	Deductions From Income	Net Income
AKRON, O. Northern Ohio Tr. & Light Co.	1m., Apr. '10	173,763	*103,683	70,080	43,292	26,789
	1 " " '09	151,906	*89,586	62,320	43,779	18,541
	4 " " '10	658,339	*389,856	268,483	173,167	95,317
	4 " " '09	586,989	*341,557	245,433	175,266	70,167
BANGOR, ME. Bangor Ry. & Elec. Co.	1m., Apr. '10	41,705	19,390	22,315	13,103	9,212
	1 " " '09	38,424	18,018	20,406	12,956	7,450
	10 " " '10	467,355	200,844	266,511	131,106	135,405
	10 " " '09	438,528	204,930	233,588	123,740	109,848
BATON ROUGE, LA. Baton Rouge Elec. Co.	1m., Mar. '10	8,407	5,400	3,007	1,959	1,048
	1 " " '09	7,689	5,772	1,917	1,671	246
	12 " " '10	103,474	70,723	32,752	22,845	9,907
	12 " " '09	93,885	64,545	29,340	.....	.....
BELLINGHAM, WASH. Whatcom Co. Ry. & Lt. Co.	1m., Mar. '10	32,837	20,421	12,416	8,370	4,047
	1 " " '09	32,172	18,063	14,109	8,190	5,919
	12 " " '10	412,458	235,457	177,000	100,650	76,350
	12 " " '09	369,849	214,970	154,879	101,554	53,325
BINGHAMTON, N.Y. Binghamton St. Ry.	1m., Apr. '10	26,924	17,762	9,162	8,845	317
	1 " " '09	24,972	16,281	8,691	8,966	†275
	4 " " '10	106,658	64,876	41,782	35,622	6,160
	4 " " '09	100,881	59,102	41,779	36,468	5,311
BIRMINGHAM, ALA. Birmingham Ry. Lt. & Pwr. Co.	1m., Apr. '10	214,835	114,669	100,166	.....	.....
	1 " " '09	182,667	100,384	82,283	.....	.....
	4 " " '10	851,127	458,991	392,136	.....	.....
	4 " " '09	733,514	404,532	328,982	.....	.....
CHAMPAIGN, ILL. Illinois Traction System.	1m., Mar. '10	486,490	*281,460	205,030	4,781	202,249
	1 " " '09	375,391	*221,642	153,749	3,038	150,711
	3 " " '10	1,110,685	*646,315	469,370	8,664	455,706
	3 " " '09	1,030,897	*606,314	434,583	.....	434,583
CHICAGO, ILL. Aurora, Elgin & Chicago Railroad.	1m., Mar. '10	118,709	69,443	49,266	32,263	17,002
	1 " " '09	101,972	60,350	41,622	28,764	12,858
	9 " " '10	1,181,898	655,610	526,289	273,955	252,333
	9 " " '09	1,076,990	589,257	487,732	251,692	236,040
CLEVELAND, O. Cleveland, Painesville & Eastern R.R.	1m., Apr. '10	25,207	*13,236	11,971	8,714	3,257
	1 " " '09	21,807	*12,559	9,248	8,283	965
	4 " " '10	90,062	*48,416	41,647	34,703	6,943
	4 " " '09	77,620	*44,398	33,222	32,840	382
Lake Shore El. Ry.	1m., Apr. '10	86,915	*48,513	38,402	34,903	3,450
	1 " " '09	78,574	*45,651	32,923	34,353	†1,430
	4 " " '10	322,770	*193,470	129,300	138,823	†9,523
	4 " " '09	289,316	*182,481	106,836	137,590	†30,754
DALLAS, TEX. Dallas Electric Corporation.	1m., Mar. '10	114,849	77,240	37,608	26,347	11,261
	1 " " '09	102,667	62,996	39,671	28,918	10,753
	12 " " '10	1,359,384	864,695	494,689	330,458	164,231
	12 " " '09	1,208,226	786,701	421,525	346,081	75,444
DAVENPORT, IA. Union Ry., Gas & Elec. Co.	1m., Apr. '10	230,323	131,780	98,543	65,397	33,146
	1 " " '09	216,016	109,694	106,332	63,892	42,430
	4 " " '10	982,928	561,997	420,931	261,554	159,377
	4 " " '09	927,399	466,960	460,459	255,454	205,005
DETROIT, MICH. Detroit United Ry.	1m., Apr. '10	737,608	486,897	250,711	161,489	89,222
	1 " " '09	619,705	374,203	245,502	154,155	91,347
	4 " " '10	2,766,649	1,781,487	985,162	641,159	344,003
	4 " " '09	2,322,302	1,438,353	883,949	614,404	269,545
EL PASO, TEX. El Paso Elec. Co.	1m., Mar. '10	51,579	29,564	22,015	8,574	13,440
	1 " " '09	45,602	29,005	16,597	7,911	8,686
	12 " " '10	621,847	359,758	262,089	100,193	161,896
	12 " " '09	542,404	377,654	164,750	89,198	75,552
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.	1m., Apr. '10	121,522	71,523	49,999	44,988	5,011
	1 " " '09	106,250	65,974	40,277	39,965	312
	4 " " '10	476,008	271,737	204,271	179,656	24,615
	4 " " '09	420,971	253,257	167,714	162,839	4,875
FORT WORTH, TEX. Northern Texas Elec. Co.	1m., Mar. '10	128,679	67,290	61,389	18,786	42,603
	1 " " '09	109,013	60,357	48,656	17,173	31,482
	12 " " '10	1,306,550	710,843	596,067	207,821	388,246
	12 " " '09	1,124,025	657,058	466,967	198,310	268,657
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., Mar. '10	105,144	67,673	37,471	23,080	14,391
	1 " " '09	95,611	59,076	36,535	21,578	14,957
	12 " " '10	1,228,619	734,835	493,784	268,126	225,658
	12 " " '09	1,119,176	649,063	470,113	249,067	221,046
GRAND RAPIDS, MICH. Grand Rapids Ry. Co.	1m., Apr. '10	86,632	44,052	42,580	19,593	22,987
	1 " " '09	77,625	37,291	40,334	18,875	21,459
	4 " " '10	337,663	171,128	166,535	79,735	86,800
	4 " " '09	302,801	150,214	152,587	75,681	76,906
HARRISBURG, PA. Central Penn. Trac. Co.	1m., Apr. '10	65,774	46,458	19,316	.....	.....
	1 " " '09	57,168	43,612	13,556	.....	.....
	4 " " '10	249,861	188,061	61,800	.....	.....
	4 " " '09	224,500	174,058	50,442	.....	.....
HOUGHTON, MICH. Houghton County Trac. Co.	1m., Mar. '10	27,019	13,131	13,888	6,317	7,572
	1 " " '09	25,457	14,906	10,551	5,797	4,754
	12 " " '10	323,604	168,395	155,209	75,933	79,275
	12 " " '09	280,676	156,311	124,365	61,618	62,747
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., Mar. '10	52,558	26,974	25,584	9,469	16,115
	1 " " '09	41,047	23,591	17,457	9,558	7,899
	12 " " '10	514,129	275,060	239,069	112,350	126,719
	12 " " '09	445,411	259,254	186,157	112,155	74,002
KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1m., Mar. '10	622,555	347,084	275,472	160,666	114,806
	1 " " '09	561,774	315,171	246,603	156,800	89,803
	10 " " '10	5,961,714	3,354,467	2,607,247	1,576,179	1,031,067
	10 " " '09	5,500,067	3,130,220	2,369,848	1,572,076	797,772
LEWISTON, ME. Lewiston, Augusta & Waterville St. Ry.	1m., Apr. '10	37,883	24,221	13,662	14,432	†770
	1 " " '09	34,579	22,341	12,238	13,253	†1,015
	10 " " '10	433,552	252,526	181,026	149,921	31,105
	10 " " '09	373,905	234,180	139,725	132,372	7,353
MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.	1m., Apr. '10	376,793	266,831	109,962	47,116	62,847
	1 " " '09	339,718	224,128	115,590	46,714	68,876
	4 " " '10	1,494,477	1,071,834	422,642	185,678	236,965
	4 " " '09	1,341,187	913,978	427,209	186,237	240,972
Milwaukee Lt., Ht. & Traction Co.	1m., Apr. '10	116,202	46,193	70,009	54,980	15,029
	1 " " '09	105,596	38,840	66,756	50,442	16,315
	4 " " '10	455,866	184,272	271,595	221,334	50,260
	4 " " '09	412,597	156,767	255,830	201,607	54,223
MINNEAPOLIS, MINN. Twin City Rapid Transit Co.	1m., Apr. '10	584,378	268,045	316,332	140,229	176,103
	1 " " '09	537,049	261,714	275,335	140,367	134,968
	4 " " '10	2,303,697	1,157,069	1,146,628	560,917	585,712
	4 " " '09	2,087,748	1,100,631	987,117	547,256	439,861
MONTREAL, CAN. Montreal St. Ry.	1m., Apr. '10	344,765	190,842	153,923	49,136	104,787
	1 " " '09	294,374	170,552	123,822	40,623	83,197
	7 " " '10	2,337,001	1,407,826	929,175	264,115	665,060
	7 " " '09	2,107,716	1,320,135	787,581	238,666	548,915
NORFOLK, VA. Norfolk & Portsmouth Trac. Co.	1m., Apr. '10	155,338	91,988	63,350	.....	.....
	1 " " '09	138,859	87,817	51,041	.....	.....
	4 " " '10	605,115	353,301	251,814	.....	.....
	4 " " '09	‡607,417	357,561	249,856	.....	.....
PENSACOLA, FLA. Pensacola Electric Co.	1m., Mar. '10	21,536	12,649	8,888	4,913	3,974
	1 " " '09	19,013	11,549	7,464	4,339	3,125
	12 " " '10	250,741	144,606	106 136	54,041	52,094
	12 " " '09	214,323	138,677	75,646	51,808	23,837
PLYMOUTH, MASS. Brockton & Plymouth St. Ry. Co.	1m., Mar. '10	7,282	5,790	1,493	1,795	†302
	1 " " '09	7,580	6,393	1,186	1,980	†794
	12 " " '10	130,144	94,121	36,023	20,822	15,201
	12 " " '09	123,479	86,112	37,367	25,925	11,442
PORTLAND, ORE. Portland Ry., Lt. & Power Co.	1m., Apr. '10	440,560	187,615	252,945	133,093	119,852
	1 " " '09	377,489	170,839	206,650	123,610	83,040
	4 " " '10	1,700,298	732,668	967,630	526,592	441,038
	4 " " '09	1,442,446	699,812	742,634	484,134	258,500
ST. JOSEPH, MO. St. Joseph Ry., Lt., Ht. & Power Co.	1m., Apr. '10	77,990	45,564	32,426	22,350	10,276
	1 " " '09	72,440	41,862	30,658	20,818	9,840
	4 " " '10	329,028	181,989	147,039	88,676	58,363
	4 " " '09	300,637	162,649	137,988	83,332	54,656
SAN FRANCISCO, CAL. United Railroads of San Francisco	1m., Mar. '10	648,203	381,772	266,431	.....	.....
	1 " " '09	606,615	363,062	243,553	.....	.....
	3 " " '10	1,846,852	1,089,402	757,450	.....	.....
	3 " " '09	1,716,626	1,045,743	670,883	.....	.....
SAVANNAH, GA. Savannah Elec. Co.	1m., Mar. '10	49,907	32,049	17,858	17,846	11
	1 " " '09	46,814	29,215	17,599	17,512	87
	12 " " '10	605,093	393,127	211,966	210,675	1,291
	12 " " '09	600,274	369,179	231,095	207,778	23,317
SEATTLE, WASH. Seattle Electric Co.	1m., Feb. '10	431,075	262,799	168,276	111,643	56,633
	1 " " '09	379,692	230,038	149,653	96,511	53,142
	12 " " '10	5,970,447	3,487,395	2,483,052	1,265,205	1,217,847
	12 " " '09	4,589,625	2,690,751	1,898,874	1,117,084	781,789
TACOMA, WASH. Puget Sound Electric Ry.	1m., Mar. '10	157,779	125,178	32,061	50,607	†18,006
	1 " " '09	142,049	98,928	43,120	45,911	†2,790
	12 " " '10	1,912,138	1,290,038	622,100	586,833	35,268
	12 " " '09	1,671,109	1,092,390	578,719	523,431	55,288
SYDNEY, N. S. Cape Breton Elec. Co., Ltd.	1m., Mar. '10	20,135	11,615	8,520	5,049	3,471
	1 " " '09	16,462	11,142	5,320	5,023	296
	12 " " '10	250,538	143,780	106,758	60,642	46,116
	12 " " '09	241,910	141,349	100,562	59,506	41,055
TAMPA, FLA. Tampa Elec. Co.	1m., Mar. '10	54,061	28,083	25,978	4,566	21,412
	1 " " '09	48,176	27,702	20,475	4,609	15,866
	12 " " '10	607,394	344,248	263,146	55,907	207,239
	12 " " '09	568,206	365,701	202,505	47,078	155,427
TOLEDO, OHIO. Toledo Rys. & Lt. Co.	1m., Apr. '10	215,553	122,473	93,080	70,915	22,165
	1 " " '09	242,941	144,283	98,659	76,220	22,439
	4 " " '10	873,085	494,498	378,587	283,781	94,806
	4 " " '09	982,094	582,104	399,990	303,736	96,255
TORONTO, ONT. Toronto Ry. Co.	1m., Mar. '10	341,999	184,150	157,849	.....	.....
	1 " " '09	298,142	161,133	137,009	.....	.....
	3 " " '10	974,264	526,803	447,461	.....	.....
	3 " " '09	861,768	464,831	396,937	.....	.....