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NEW YORK, SATURDAY, SEPTEMBER 24, 1910.

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Single-Phase for the Hoosac Tunnel

The decision of the New Haven railroad to adopt the single-phase system on the Hoosac Tunnel division and on its New York, Westchester & Boston line, just announced, is one of the most important developments of the year. Practically no equipment has been subject to more adverse criticism and has been more stoutly defended than the present single-phase system on the main line of the New Haven railroad. Its adoption as a motive power from New York to Stamford was announced in October, 1905, and the line still remains the most important single-phase road in the world. The electrification of the Hoosac Tunnel and of the New York, Westchester & Boston line, now announced, will practically be equal both in importance and mileage to that of the present electrified main line, and the electrification of the Harlem River branch and of the main line from Stamford to New Haven together will be practically equivalent to twice the present electrical system. Probably the most important feature of all of the new electrification work of the company is that it will be single-phase without direct-current complication, so that the equipment should be very much simpler and capable of very much better work than even the present equipment. The decision of the New Haven railroad is an important one to the entire industry for two reasons. It not only guarantees an extended application of the single-phase system to trunk-line service, but it indicates that the results with the present system have been so satisfactory as to warrant its extension.

From Chicago to New York by Electric Car

Many persons, even among those actually connected with electric railway systems, do not realize the possibilities of through travel by electric car. They consider that the local transportation which electric roads furnish constitutes their sole function, and though many know in a vague way that long distances can be traversed by electric cars, they look upon such trips as slow and involving too many discomforts to make the journey a pleasant pastime. It is safe to say that comparatively few people will undertake to duplicate the trip from Chicago to New York described by Mr. Van Valkenburgh in this week's issue. Nevertheless, some will undoubtedly do so each year and many more will take parts of the journey. The automobile has popularized road touring, and we do not see why a long excursion by trolley during nine months of the year should not present most, if not all, of the pleasant features of an automobile tour through the countryside. If not quite such fast traveling, it would certainly be far less expensive, and would avoid most of the discomforts of automobiling as well as all dangers of break-downs. An account of a long trip like that from Chicago to New York is instructive in two ways. In the first place it teaches the public the possibilities in the way of long-distance traveling by trolley, and, in the second place, it offers valuable hints to railway companies. Accord-

ing to the article in this issue long-distance traveling by trolley would be greatly facilitated if better connections were made at junction points and if the companies would provide means by which the public could obtain complete information in advance in regard to the expense and time required to make such tours.

Car Standing Room Here and Abroad

The last annual report of the street railway system in Zurich, Switzerland, contains a rather significant paragraph on the seating and standing capacity of the latest cars used in that city. It appears that the trail cars built during 1909 were constructed for a seating capacity of 16 persons and a standing platform load of 22, or 11 on each platform. This condition is not an isolated instance, for it is the general custom to build Continental street car platforms large enough to accommodate many standing passengers. As a rule passengers are not permitted to stand inside the car except in stormy weather. This latter practice is the one often quoted in city councils here in connection with "No seat, no fare" legislation. Evidently European street railway operators, like those in this country, recognize the practical impossibility of seating every passenger during rush hour periods. It is quite likely that the American passenger would soon find the foreign restrictions with regard to standing much more irksome than the "help-yourself" methods to which he is accustomed.

Maintenance of Service

From the days of Wellington's classic "Handbook of Railway Location" engineers have realized that the alignment and grade of a piece of track exert a profound influence upon the wear and tear of rolling stock, and upon power consumption and schedules. It is seldom, however, that the direct effects of a specified track installation can be expressed quantitatively, for in most cases when a track is laid it stays in service for many years, and changes in rolling stock design soon complicate comparisons of present with earlier results. The abandonment of the Tremont Street subway as a route for the elevated trains of the Boston Elevated Railway Company furnishes an interesting instance, however, of what may follow in maintenance matters when the rolling stock is operated upon more favorable trackage. When the elevated train service was opened in Boston in 1901 it was soon found that the operation of trains in the Tremont Street subway presented serious difficulties in the way of rail and wheel wear. Prior to the introduction of manganese steel rails, a minimum life of 44 days was obtained on the rails of one of the worst curves in the tube. As the train service became standardized the wear upon wheels necessitated grinding about 48 pairs per day at the Sullivan Square shops. In the late fall of 1908 the elevated trains were transferred to the Washington Street tunnel, which is characterized by relatively light grades and easy curves, over which operation can take place without any such marked speed reductions from alignment causes as hampered the movement of trains in the old subway. The result has been that the number of wheels ground has been halved, there being at present, with about 100 more cars in regular service, only 24 pairs per day handled, and this without requiring much if any overtime work. It is safe to say that a large part of this reduction is due to no other factor than the operation of the trains over a track laid out with a minimum number of curves and grades.

COMPARISON OF RESULTS IN BOSTON AND BROOKLYN

The Boston Elevated Railway and the Brooklyn Rapid Transit systems are somewhat similar in mileage, earnings and territory served and a comparison of the latest figures available regarding their operations shows interesting results. The statistics upon which we have based our comparison are contained in the annual report of the Boston company for the fiscal year ended Sept. 30, 1909, and of the Brooklyn system for the year ended June 30, 1910. For the sake of uniformity the gross and net earnings stated for the Brooklyn system include the figures of "other income" and therefore correspond to the classification followed in the Boston report.

In gross earning power the Brooklyn company makes the more conspicuous showing. With one-quarter more mileage than the Boston company, it earned gross about 50 per cent more. Operating a total of 606 miles of track, the Brooklyn system had gross earnings of $21,446,357, while the Boston company, with 484 miles of track, reports gross revenues of $14,493,853. As the gross earnings are derived chiefly from passenger traffic the difference is attributable principally to the greater density of passenger travel in Brooklyn. The Boston lines carried 580,596 revenue passengers per mile of track. As the form of Brooklyn report does not permit separation of the revenue passengers from a presumably small total of free passengers, it is necessary to state the average of those classes of traffic combined, 690,031 passengers per mile of track. Probably the elimination of free passengers from this computation would affect the comparison very slightly. Unfortunately a comparison of the relative transfer traffic on the two systems is impossible because of the absence of information on this point in the Boston report. It should be explained that a large part of the transfers in Boston are effected between elevated and surface lines at points where no transfer slips are required. A careful estimate by the Boston company in the fiscal year 1908 showed that the transfer traffic in that year reached 58 per cent of the revenue traffic. The transfer traffic in Brooklyn in the 1910 fiscal year amounted to 36 per cent of the revenue and free traffic.

The evident differences in transfer traffic are due to fundamental differences in the construction and operation of the two systems. It is not necessary in this comparison to make a detailed analysis of all of these conditions. But the important fact may be pointed out that the elevated mileage in Boston is designed mainly to supplement the surface facilities and to afford a rapid transit collection and distributing agency in the center of the city for the outlying lines, while in Brooklyn the elevated lines are almost entirely self-contained agencies for the collection and transportation of their own passengers. Of the mileage in Boston 95 per cent is surface and 5 per cent elevated; of that in Brooklyn 88.3 per cent is surface and 11.7 per cent elevated.

The Boston company used in operating expenses $9,488,484, or 65.5 per cent of its gross earnings, retaining for net earnings $5,005,369. The Brooklyn company, with operating expenses of $11,726,392, or 54.7 per cent of its gross had net earnings of $9,719,965. Reduction of the main figures relating to earnings to a track mileage basis brings out in another way the differences in results. The showing per mile of track is as follows: Gross, $29,946 for Boston and $35,390 for Brook-

lyn; operating expenses, $19,604 for Boston and $19,351 for Brooklyn; net, $10,342 for Boston and $16,039 for Brooklyn. Taxes, interest and rentals amounted to $8,189 per mile in Boston and to $11,729 in Brooklyn. The resulting balance was $2,153 for Boston and $4,310 for Brooklyn. The most striking figures here are the approximately equal operating expenses and the larger surplus per mile of track in Brooklyn.

Further analysis of the expenses shows differences in the expenditures for both maintenance and transportation. The companies do not give the same general operating expense accounts throughout. The Brooklyn system divides its total operating expense between eight accounts, as follows: Maintenance of way and structures; maintenance of equipment; operation of power plant; operation of cars; damages and legal expenses; general expenses; freight, mail and express expenses; American Railway Traffic Company expenses. The Boston classification shows general expenses, maintenance of roadway and buildings, maintenance of equipment and transportation expenses. In Boston 17 per cent of gross was applied toward maintenance, divided as follows: Way and structures, 9.8 per cent; equipment, 7.2 per cent. Corresponding expenses in Brooklyn were as follows: Way and structures, 6.1 per cent; equipment, 9.7 per cent; total, 15.8 per cent. Transportation expenses in Boston were 41.6 per cent of gross. Operation of power plant and of cars and damages and legal expenses in Brooklyn totaled 34.9 per cent of gross. General expenses were 6.9 per cent of gross in Boston and 3.2 per cent in Brooklyn.

Per mile of track the Brooklyn company expended more for total maintenance than the Boston company, but almost the same for transportation. Maintenance of way cost $2,925 per mile and maintenance of equipment $2,154 in Boston, a total of $5.079; the corresponding expenditures in Brooklyn were $2,161 and $3,413, a total of $5,574. Transportation costs, which were $12,460 per mile of track in Boston, can be stated in a little more detail for Brooklyn, as follows: Operation of power plant, $2,473; operation of cars, $8,352; damages and legal expense, $1,521; total, $12,346. General expenses were $2,065 per mile of track in Boston and $1,138 in Brooklyn. This does not complete the expenses of the Brooklyn system, whose classification shows in addition freight, mail and express and traffic company expenses, which were $293 per mile.

Revenue car-miles in Boston amounted to 51,127,681 and in Brooklyn to 77,984,651. Although Boston showed a little larger gross revenue per car-mile, larger relative operating expenses reduced its net earnings below those of the Brooklyn system. Car-mile gross earnings were 28.3 cents in Boston and 27.5 cents in Brooklyn. Operating expenses were 18.5 cents in Boston and 15 cents in Brooklyn. Net earnings compare as follows: Boston, 9.8 cents; Brooklyn, 12.5 cents. Car-miles run by United States mail cars and the revenue from such traffic are stated in the Boston report, from which it appears that the average car-mile revenue from this class of business was 16.3 cents. In Boston 5.5 revenue passengers were carried per car-mile and in Brooklyn the average was 5.4.

Separation of the operating expenses into average car-mile results shows the following for Boston: General expenses, 2 cents; maintenance of way and structure, 2.7 cents; maintenance of equipment, 2 cents; transportation, 11.8 cents. Brooklyn expended 0.9 cent per car-mile for general expenses, 1.7 cents for maintenance of way, 2.6 cents for maintenance of equipment, 1.9 cents for operation of power plant, 6.5 cents for operation of cars, 1.2 cents for damages and legal expenses and 0.2 cent for freight, mail and express. The 3.5 cents more per car-mile spent in Boston was used principally in transportation but partly in maintenance and general expenses.

HEAT-TREATED AXLES

When specifications for heat-treated axles were presented at the Denver convention of the Engineering Association the general impression seemed to be that such high-grade and expensive material was required only by roads operating a very severe service, such as the Interborough Rapid Transit Company, which stood as sponsor for the specifications. As a direct result of the interesting discussion on the subject which took place at the convention more than 20 electric railways have made inquiries from one axle maker during the past year for prices on heat-treated axles furnished under the specifications recommended and several orders have been placed. These prospective buyers were not confined to elevated and high-speed interurban roads, but included some city and suburban companies. This is encouraging evidence of a growing appreciation of the fact that in buying material to be used where a failure may result in a serious accident or interruption to service, the best is none too good, even for the small road.

The future demand for heat-treated axles will come from progressive master mechanics who, even though they have little expert knowledge of steel making, can appreciate the improvement in the quality of the metal in axles which results from the careful tempering and annealing to which they are subjected after forging. Most axle failures, except those resulting from defects in the metal, such as piping, seams and segregation, are caused by what is known as "fatigue" of the metal. The constant reversal of stress with every revolution of the axle tends to break up the fine-grained structure of the steel into coarse crystals and the cleavage lines between these crystals gradually develop into a crack or progressive fracture. Proper heat treatment greatly increases the resistance of the metal to fatigue and eliminates internal stresses in the axle which might cause a crack to develop when the journal load is applied.

The purchasing agent who is asked to get bids on heat-treated axles will probably be surprised at the higher prices which are quoted, but he should be reminded that the increased cost represents quality. The steel makers are prepared to make lower-grade untreated axles at cheaper prices if necessary to get the order. Last year's specifications, which will be presented again at the Atlantic City convention with only slight changes, were drawn with the purpose in view of excluding axles which are not heat-treated, while not imposing unnecessarily severe requirements for properly treated steel. A difference of 3000 lb or 4000 lb. in the elastic limit may not appear to warrant a difference of several cents a pound in the cost of the axles, but the requirements of the specifications are just above the limits of untreated steel. If axle makers are allowed to furnish material slightly below the requirements of the specifications at a reduced price, the purchaser has no assurance that the axles so bought are uniform in quality and will last in service. The master mechanic who wants heat-treated axles should insist on the manufacturer meeting the requirements of the specifications in every particular.

NOTES FROM WILMINGTON, NORTH CAROLINA

The street railway facilities of Wilmington, N. C., which has a population of about 35,000, are furnished by the Tidewater Power Company. This company is a consolidation of the original public service interests of the city and supplies all gas and electric lighting besides carrying on a general industrial power business. The accompanying map of the system shows the railway lines owned outright by this corporation and those leased by it from the Consolidated Railways, Light & Power Company. The combined properties are operated under A. B. Skelding, general manager. It will be seen that outside of the city system there is a line to Wrightsville Beach, an important summer resort to which extended reference will be made later. The track construction in Wilmington consists of a standard 7-in., 72-lb. T-rail laid in stone or wood paving on creosoted ties. The line to Wrightsville Beach has 60-lb. T-rail. All tracks are bonded with O.B. soldered bonds, which have been in successful use for the last four years.

POWER

The Wilmington company probably has the distinction of being the first Southern railway to use steam turbines. Its present equipment consists of one 1000-kw and two 400-kw units of the Westinghouse-Parsons type. One of the smaller units has been in service seven years, and the other was purchased by the company immediately after the maker's exhibition at the St. Louis Exposition. This 400-kw turbine has been in service for five years. The 1000-kw unit is guaranteed to take not more than 13.7 lb. of steam per brake-horse-power at full load, 15 lb. at half load and 15.5 lb. at 50 per cent overload.

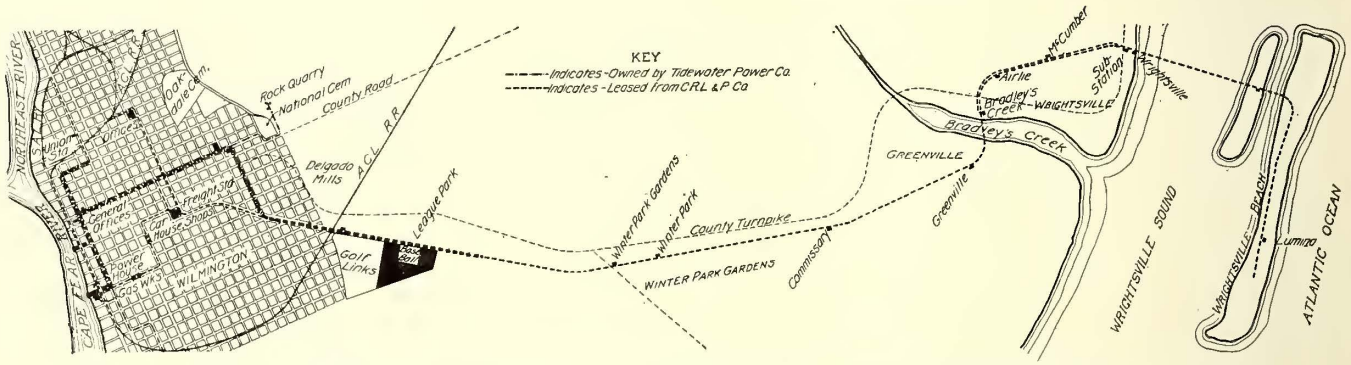
The electrical output of the main station not only serves to handle the railway business, but also to light the city, including ornamental arches on a number of important blocks. The cost of installing these arches was shared equally by the city and the company. There is also a good motor business, mostly on a.c. circuits, except elevator motors, which are operated by direct current and a few motors direct-connected to the trolley circuit. The power output throughout the year is quite steady, as the power requirements at Wrightsville Beach make up for the low summer lighting load in the city. The average daily load factor in 1909 was about 30 per cent.

SHOP PLANS

The company has built for a shop a structure consisting of a main building 50 ft. x 110 ft. with a lean-to 40-ft. x 30 ft. The construction is of the slow-burning mill type with a corrugated iron roof, the whole being capable of ready dismantling owing to the probability of changing the location of the building at a future date. The tool equipment is composed principally of a number of second-hand machines purchased from the abandoned Plant System shop of the Atlantic Coast Line. Previously the company was obliged to give out its work to high-priced local machine shops, but found that the prices were too high to continue this practice. No car house has been constructed. nor is one contemplated, as the rolling stock can be stored in the open in this mild climate. When cars are stored for any length of time they are enveloped with waterproof covers which cost about $15 apiece.

WRIGHTSVILLE BEACH

One of the best assets of the Wilmington Company is



Wilmington Railway System—Map Showing the City Lines and Suburban Route to Wrightsville Beach

All of these machines are operated at two-phase, 380 volts, 60 cycles. Part of the turbine output is raised to 2300 volts for lighting purposes and part to 11,000 volts, three-phase, 60 cycles, for transmission to the railway substation at Wrightsville Beach, 9 miles distant. In addition to the two-phase and three-phase transformers, the electrical portion of the power plant also contains one 500-kw and one 150-kw rotary converter, the larger machine having recently replaced a 300-kw unit. An adjoining building contains 264 chloride accumulator cells to steady the railway load.

The boiler-room equipment consists of four 250-hp B. & W. boilers, Blake feed-water pumps, Cochrane feed-water heaters, a De Laval circulating pump, a 24-in. Alberger barometric condenser for the smaller turbines and a 30-in. condenser of the same type for the larger turbine. Both condensers can be operated with the turbines in any desirable combination. Most of the fuel used at this station consists of slab timber, refuse of the nearby lumber mills, and unsalable coke from the company's gas works. The average labor and material cost of power per kw-hour at the a.c. side of the switchboard was about 0.9 of a cent in 1909.

The Wrightsville Beach substation, previously referred to, contains one 150-kw and one 200-kw rotary converter. During the summer the smaller rotary and its transformers were put in a box car which was kept near the middle of the line to maintain the voltage at that point. This portable station was a condemned freight car bought from the Atlantic Coast Line for $150.

Wrightsville Beach, 11.3 miles distant from Wilmington. This place is not only the favorite seaside resort of the better class of Wilmington residents, but it is also widely known throughout North Carolina and adjoining states. By arrangement with the Seaboard Air Line and the Atlantic Coast Line visitors have been brought direct from Atlanta, Birmingham, Athens and Augusta. This summer Pullman sleepers were run from Atlanta. The beach is an island several miles in length joined to the mainland by an electric railway trestle 1.1 miles long. The daily average attendance during the season is about 1500, aside from the 300 to 400 cottagers who commute from Wilmington.

As the company owns the only approach to the beach, the residents are dependent upon it for transportation, light, freight, express and mail service. There are about 75 cottages scattered along both sides of the track with platforms arranged for the easy delivery of groceries and other materials direct from the cars. There are also two large hotels at the beach. The summer population is about 5000. The round-trip fare from any part of Wilmington is 35 cents with the single exception that three tickets may be purchased for $1. No reductions are made on the combination steam-railroad tickets.

In first exploiting this resort the company tried all the ordinary seaside resort attractions, such as Ferris wheels, chutes and merry-go-rounds, but neither the local public nor the visitors seemed to care for these amusements. The principal attractions are bathing, dancing and music. For dancing the company has provided a ballroom, 120 ft. x 50 ft., where

music is furnished by a 16-piece band from June 1 to Sept. 1. The lower part of the pavilion has bathrooms and a refreshment stand. Despite the mild climate, the season is not longer than in many Northern cities since most Southern vacationists spend September in the mountains. The cottage season, however, has been growing longer from year to year.

No solicitation for business is permitted nor are there prohibitory signs of any kind on the grounds, the intention of the management being to make the visitors feel as much at home as if they were the guests at a social gathering. Concerts constitute the principal feature on Sunday afternoons and evenings. It is an interesting fact that operatic music is preferred to the kind ordinarily called "popular," the taste of the people having apparently been improved by the extended use of phonographs in this part of the country. Water sports also have proved a great drawing card, canoe races being especially popular. In one canoe game the contestants try to go over all the breakers without capsizing. One of the accompanying illustrations shows a sack race at the beach.

Wrightsville Beach is advertised on billboards in the larger towns and by posters at the steam railroad stations. Advertisements are also placed in the street cars of inland towns like Columbus, Atlanta, Augusta and Charlotte. It has been found, however, that the best advertising is that which comes from the patrons themselves, especially through the unique entertainments known as "souvenir dances." During the summer many organizations, such as those of the State bankers, lawyers, doctors, teachers, etc., assemble at the beach for their annual conventions. The company arranges to get in advance the mailing list of all probable attendants and sends to each a handsomely engraved invitation to a dance to be given on a certain night in honor of their organization. The pavilion is then decorated in a manner appropriate to the profession of the guests. When the entertainment is given, from 300 to 400 favors, costing perhaps not more than $50, are distributed to the ladies. These souvenir dances have proved so popular that the company has had inquiries about them from all over the United States.

The line to Wrightsville Beach is single-track part of the way and is protected by the staff system. When a conductor fails to meet a train from the opposite direction he must wait three minutes at a meeting point and then call up the dispatcher for instructions over the private telephone. The company operates its best rolling stock in this service. The cars are of the convertible type, seating 68 passengers. The two 75-hp motor equipments per car are operated on the Westinghouse multiple-unit system, five-car trains being run at the height of the season. The cars also carry Westinghouse air brakes, Knutson retrievers, solid-steel wheels and other specialties to insure safe, high-speed operation. The line terminates at the beach alongside an enclosure to which homegoing passengers are not admitted until they have paid fare. A similar enclosure is used at the baseball grounds on the Wrightsville line to avoid confusion in handling the patrons and getting their fares.

Wilmington Railway System—Leaving the Cars for Wrightsville Beach

Wilmington Railway System—Entrance and Exit to Cars at Wrightsville Beach

Wilmington Railway System—Dancing and Bathing Pavilion at Wrightsville Beach

Wilmington Railway System—A Sack Race at Wrightsville Beach

PROPOSED PLEASURE RESORT AND EXTENSION

The success of the Wrightsville Beach resort has led a number of capitalists to interest themselves in the construction of an all-year resort to cost about $10,000,000 and to require about five years for construction. The proposed site is about 5 miles

from Wrightsville Beach, and if the plan is carried out the Tidewater Power Company would construct an extension to reach it. The proposed resort would be readily accessible by steam railroads, as it is only 12 hours from Washington and 17 hours from New York.

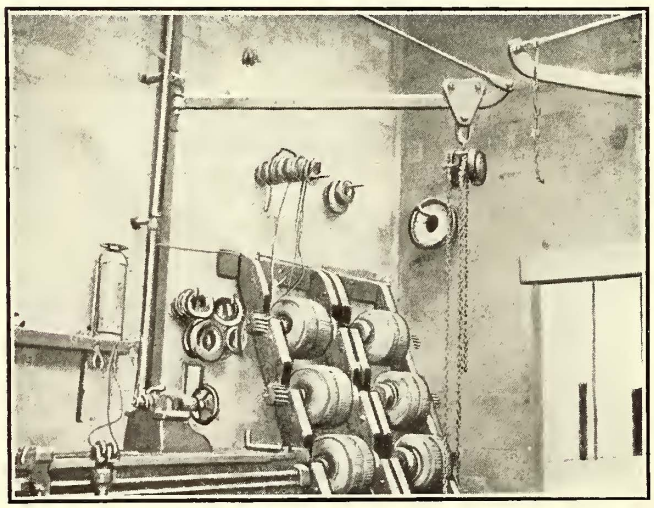
FREIGHT AND EXPRESS BUSINESS

The company does a general freight and express business. Through physical connections with the steam railroads, both freight and Pullman cars can be brought to any desired point on the street railway system. The usual charge for hauling a freight car up to the Wrightsville trestle is $5, and $7 is charged for taking the car over the trestle to the beach. Local freight is handled at 10 cents per 100 lb. By an arrangement with the Southern Express Company express packages are carried along with the regular freight. In summer the freight and express business is worth $50 to $70 per day. Small express packages up to 100 lb. are carried on passenger cars for 25 cents each.

REPAIR SHOPS OF THE BANGOR RAILWAY & ELECTRIC COMPANY

One of the most extensive repair shops in New England is that of the Bangor Railway & Electric Company, of Bangor, Maine. The shops, which were completed about three years ago, are combined with a car house. The property is located on the principal business thoroughfare of the city about a mile south of the commercial center. The space occupied is about 182 ft. long x 130 ft. in extreme width, of which nearly one-half is required by the repair department. The car house section is at the front of the building and extends toward the rear to a distance of 101 ft. The building is constructed of concrete blocks on a concrete foundation with a bay on the street side of the property containing quarters for the operating department superintendent, foreman and trainmen, and space for lavatory facilities, sand, salt and track tool storage. The natural lighting of the shops and car house is effected by ample window areas and skylights provided with ribbed glass. The grounds have been made attractive lately by the cultivation of lawns and flower beds, with a floral set of the company's initials at one side and potted plants in the window ledges.

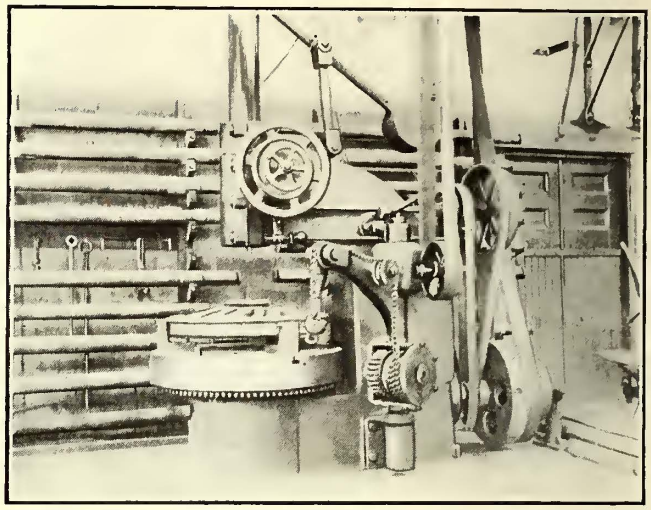
The car storage and shop are separated by a fire wall, while



Armature Rack, Crane and Lathe

Kinnear rolling steel doors are provided at the front of the former. Reinforced concrete columns and girders were employed in the construction of the building frame, the main girders being 10-in. wide x 30 in. deep. In general the columns are 12 in. square in horizontal cross-section with chamfered edges. Each column is reinforced with four 11/16-in. vertical steel rods, while the column foundations are reinforced by 12 ½-in. steel rods each. The latter roof beams are also thoroughly reinforced. The 6-in. granolithic floor used is reinforced by a 12 in. x 16 in. concrete pier below the rails except in the pits. The columns in general are 20 ft. apart. The car house has 10 tracks, which are connected with the main line of the company by suitable ladder tracks carried through a switching yard in front of the building, there being four tracks carried through the car house into the repair shop. All tracks are installed 11 ft. apart on centers, while in the machine shop a maximum of one track is all that is allowed in any bay. The shops and pits are steam heated from a boiler located on the premises.

The pit track rails are supported by 10-in. 25-lb. I-beams



Wheel Borer with Wheel on Bed

anchored into 18-in. x 23-in. concrete piers 42 in. high and placed 14 ft. apart on centers. The rails are held in place by angle iron braces 3 in. x 3 in. in section and riveted to the I-beams. The running rails are clamped into the I-beams. By this construction a space of 17 in. is left between the center of the rail and the nearest concrete wall carrying the floor, thereby giving room for a man to sit on the chamfered edge of the floor and let his legs hang comfortably into the pit while making truck repairs. The man working in the pit also finds this 17-in. space convenient in working on the car below the floor level. The pit lighting is arranged by special 104-volt plugs and sockets wired in iron conduit into all the columns of the shops, from which flexible leads are run as necessary. There are no permanent lighting fixtures in the pits. An interesting feature of the building construction was the later use for storeroom bin construction of much of the form timber employed in pouring the concrete.

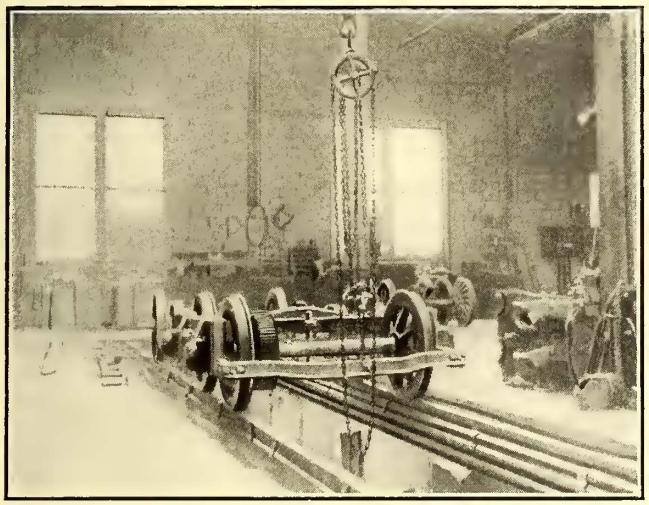
The roof of the entire building is of the slag concrete type, there being a maximum height of 20 ft. 6 in. from the floor to the bottom of the roof girders. The roof slopes from a central ridge in each direction toward the side walls, the latter being 16 ft. high from the floor to the bottom of the lintel. A sloping roof is also provided over the trainmen's quarters and sand storage room.

In the car house section are five tracks with inspection pits, the latter being 40 ft. long in each case, with their heads near the doorways, to facilitate the most rapid examination of the rolling stock after it enters the building. The car house is divided into two equal sections, with a fire wall between running parallel to the tracks, the pits being divided by the assignment of three to one section and two to the other. The offices of the foreman and superintendent, trainmen's quarters, etc., are all 10 ft. 6 in. wide, and the bay containing them extends throughout the entire length of the car house. A special feature is the length of the sand and salt room, which is 40 ft. The floor of the latter is carried 4 ft. below that of the rest of the building, to give increased capacity for storage. The motormen's and conductors' lobby is 20 ft. long. In the car house there are three stub-ended tracks without pits which terminate without passing through into the shop proper. The bottoms of the pits are waterproofed.

The shop proper consists of a machine shop division, with two pit tracks, one of which is 40 ft. and the other 60 ft. long; office for the master mechanic and storekeeper, carpenter shop and paint shop. Each of these four divisions is blocked from the others by a fire wall running through its whole length, with the exception of the office shared by the master mechanic and the storekeeper, which is set into the wall space between the machine shop and the storeroom, so that it will be most accessible from all parts of the shop. This office has glazed sash on two sides so that from his desk the master mechanic can follow the general run of all work in the machine and store divisions.

MACHINE SHOP

The machine shop proper is about 80 ft. long x 60 ft. wide. It is well equipped with tools, which are mainly group-operated. A 10-hp GE 550-volt, three-phase, 60-cycle induction motor furnishes the driving power through a line shaft and belting. The motor is mounted overhead and is started from the floor by a pair of levers attached to the short-circuiting handle of the rotor resistance, so that it is unnecessary to mount the motor platform to start the machinery. Each of the two pit tracks is served by a radial hoist which has proved invaluable in transferring work from the track to the nearest tool. The heavier tools are mounted on the floor near the two pit tracks, a space about 30 ft. wide being left between the westerly track and the storeroom and office wall. The most important tools now in service are a 42-in. Niles driving wheel lathe, employed chiefly



Pit-Work Facilities in the Bangor Shops

in turning steel-tired wheels, and fitted with two tool posts for multiple work; a 20-in. Flather engine lathe, an 18-in. Prentice Bros. drill press, a 1½-in. Reliance tapping and threading machine, a 36-in. Niles-Bement-Pond car wheel borer, a Niles 100-ton hydraulic wheel press, a 20-in. Wood engine lathe, a 17-in. x 17-in. x 48-in. Draper planer, a 10-in. emery wheel and an Ohio Brass gasoline pot for melting babbitt and heating large soldering irons. One of the illustrations shows the wheel boring machine with a home-made axle rack behind it.

Another view shows an armature rack and its radial hoist installed at one end of the machine shop, near the car house partition wall. All the radial hoists are so arranged that practically no manual labor is required in transferring heavy parts from the tracks to the tools. The unusually good natural lighting of the machine shop pits is indicated in the above cut, which shows a truck stripped for motor application on one of the pit tracks, with radial hoist above. The general type of pit construction is also shown in the same view. Field winding is carried on by means of a lathe shown at the left of the armature rack in one of the illustrations. When winding coils the wire is held taut by passing it under a trolley wheel fastened to the under side of an iron bar hinged to a strap bolted into the concrete floor. The wire reel is held on a horizontal rod and pair of bushings supported on a pair of tripods. The power service is supplied by a three-phase distribution system.

CARPENTER SHOP AND STOREROOM

The carpenter shop, which adjoins the machine division, occupies a room about 80 ft. x 20 ft. and is equipped with one combined 15-in. White cutoff and rip saw, a 36-in. band saw and a 12-in. buzz planer. These tools are group-driven by a 5-hp induction motor located on an overhead platform. A platform is provided 10 ft. above the floor for storing sash and signs. The machine tools in the carpenter shop are installed side by side so that they can be fed with lumber without mutual interference. A paint shop of the same size as the carpenter shop adjoins the latter.

The shop storeroom is about 81 ft. x 19 ft. in size. Three sides of the room are provided with storage bins and at each end of the room is a gallery with 300 sq. ft. of floor area, supported about 10 ft. above the floor level. In general the parts stored are segregated in the classification of truck parts, motor and control parts, line fittings and car fittings. The galleries are used for the storage of shovels, brooms, heavy tools and incandescent lamps. Although the company operates an extensive central station and power service in addition to its railway facilities, the shops are devoted exclusively to transportation repairs. The blacksmith shop is located at the southern end of the machine shop. It is equipped with a forge blower and exhaust fan driven by a 3-hp induction motor. Bar iron is stored in the blacksmith shop on a rack five tiers high and 14 ft. long. The storeroom lighting is effected by skylights of ribbed glass.

WHEEL PRACTICE

The company turns car wheels by revolving them in the heavy Niles lathe by pin drives through the space between the spokes. This enables the making of a positive drive from the face plates, without springing the shaft, and it avoids the uneven cutting sometimes resulting from an axle drive. When tires are turned a small shoulder is left on the wheel tread close to the flange, which frequently saves the loss of ¼ in. of stock on the tire. High-speed tools made by the Midvale Steel Company are used in the tire turning. The tool size is 1 in. x 1¼ in. and the tool holder is 3 in. long x 2⅛ in. wide.

Cast-iron wheels are used on the city lines and steel-tired wheels on the suburban runs. The company's standard axles are 4½ in. in diameter at the center and 5⅛ in. in diameter at the wheel seat, the wheel diameter being 33 in. The journals are of the MCB type, 7 in. x 3¾ in., and the tires are 2½ in. thick with 3-in. tread and 1⅛-in. flange when new. The tires are permitted to wear down to ¾ in. thickness. The company turns an average of two sets of wheels daily and obtains an average tire life of 120,000 miles. A solid gear has been adopted. On account of the rigorous Bangor weather the winter life of the cast-iron wheels is about 20,000 miles, compared with a summer life of 50,000 miles.

Tires are expanded for shrinking upon hubs and for their removal by gas and air heater consisting of a ring of 1¼-in. pipe 3 ft. in diameter, on the inside of which are bored ⅛-in. holes set 1½ in. apart. The air is supplied under a pressure of 25 lb. per sq. in. Although the heat is intense enough to drop off a tire in five minutes, the device may be held in the hand with perfect comfort. A six-station watchman's clock and recorder system of Holtzer-Cabot make is installed in the shops.

The master mechanic of the shops is C. H. Sanborn, who succeeded M. E. McCormick upon the advancement of the latter to the post of assistant superintendent of the railway system, following the death of former Superintendent W. H. Snow. The superintendent of the railway service is C. H. Johnson.

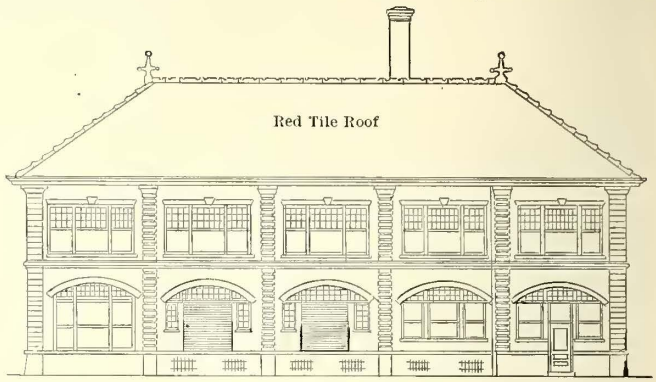
Ambassador Oscar Straus sends from Constantinople a translated copy of a new "Law of Concessions," recently passed by the Turkish Parliament. It is intended to apply to public utilities as distinguished from concessions governing mines and quarries, commercial, agricultural, industrial and financial enterprises. The copy of the law is filed for public reference in the Bureau of Manufactures.

NEW ST. LOUIS EXPRESS TERMINAL

The St. Louis Terminal Railway Company, a subsidiary of the Illinois Traction System, is erecting an express station at Twelfth Street and Lucas Avenue in St. Louis. This building is of particular interest because it is of a higher type of construction than usually is employed for electric railway freight or express stations. The new building has a frontage of 88 ft. 4 in. on Lucas Avenue and 263 ft. on Twelfth Street. It is "L" shaped, each wing having a clear inside width of 33 ft. 10 in. The ground space within the "L" will accommodate a series of parallel loading tracks so spaced that freight may be wheeled through the cars nearest the station and into other cars on parallel tracks.

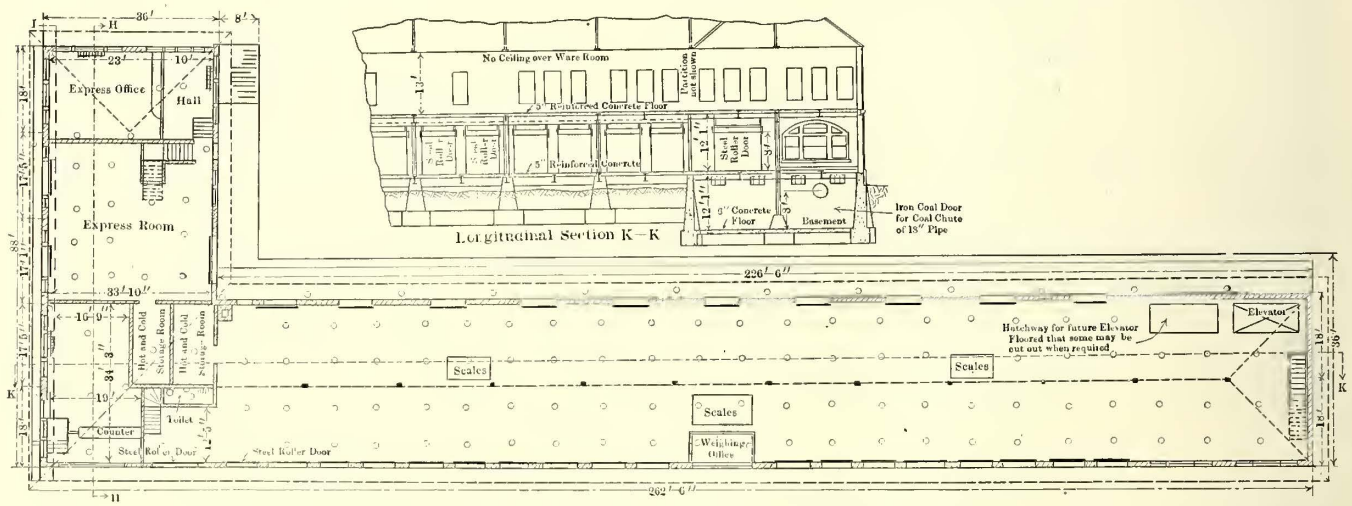
The building is two stories high. The longer wing will have two warehouse floors each 226 ft. 6 in. long by 33 ft. 10 in. wide interrupted only by a row of steel roof-supporting columns along the center line. The smaller wing will be subdivided on the first floor into an express room, space for clerks and two hot and cold storage rooms, each 7 ft. 10 in. by 16 ft. 5 in. in the clear. One of these storage rooms will open into the express room and the other will connect with the large freight room. The walls of the storage rooms are to be built of heat insulating material and steam radiating pipes will be installed in each so that, according to the time of the year, the two rooms may be used for hot or cold storage purposes. The second floor of the smaller wing will be subdivided into eight offices each about 15 ft. x 18 ft. in size and provided with a closet 3 ft. x 7 ft. in size. The second floor of the longer wing will not be ceiled and will provide storage space for heavy freight, which can be handled by either of two elevators 6 ft. x 14 ft. in size. Toilet facilities will be provided on both floors.

The new express terminal is located close to the center of the business district of St. Louis and just across the street from the proposed 12-story passenger station and office building of the Traction Company. Because of its prominent location special care has been taken to design a structure which will have an attractive appearance. The materials chosen for the side walls of the express station are Bedford stone for sills, watertable, lintels, etc., hard-burned buff brick for exterior walls and red French-A tile for the roof covering. The side and partition walls are to be supported on concrete foundations carried to a depth which will give a basement 12 ft. high in the clear. The basement will have a 6-in. concrete floor. All the foundations are to be made of a 1:3:5 mixture of concrete reinforced where necessary with 1-in. corrugated bars. The

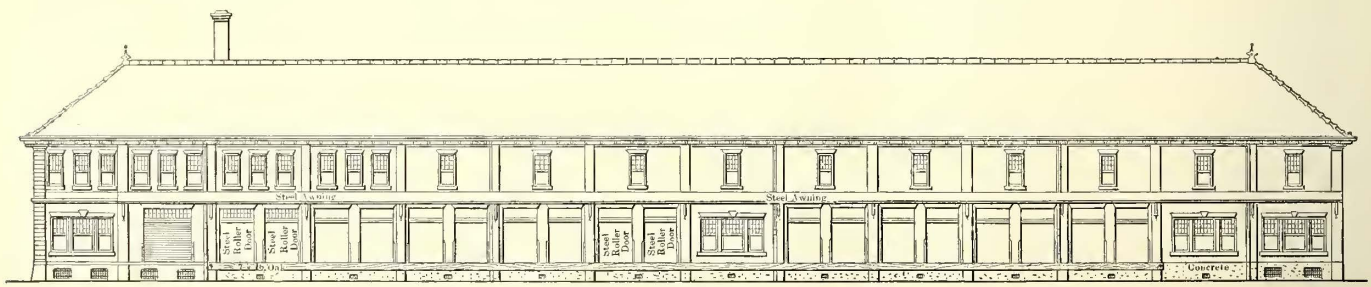


Illinois Traction System—End Elevation of St. Louis Express Terminal

side-wall foundations will be 18 in. thick at the ground line. Along the track side of the building will be a reinforced concrete loading platform 7 in. wide placed on a level with the floor of the freight warehouse. The partition walls, except those in the basement, which are to be made of concrete, will be made of Mackolite 4 in. thick, bonded and laid in lime



Illinois Traction System—First Floor Plan and Section of St. Louis Express Terminal



Illinois Traction System—East Elevation of St. Louis Express Terminal

mortar. Such partitions will be used to subdivide the office section of the building. The warehouse and the express room will have a 5-ft. wainscot laid with impervious buff brick. The floors throughout will be made of reinforced concrete carried on structural steel members and columns enclosed in concrete. A 1:2:4 concrete mixture with a 1-in. Granitoid wearing surface will form the floor structure. The floor slabs, which have a span of 9 ft. 6 in., will be reinforced with triangular-mesh

steel reinforcing material having a metal area of .162 sq. in. per 12 in. of width.

The roof will be carried on steel trusses 14 ft. deep having a span of 35 ft. 9 in. These trusses are to be spaced 19 ft. apart and will carry a concrete sheathing reinforced with Kahn Hy-Rib metal. The mixture for the sheathing will be 1 part of Portland cement and 3 parts of sand, to which will be added 2 per cent of Hydratite or similar concrete waterproofing powder. The roof covering will be ornamental French-A tile with special corners and angle pieces. The ceilings on the second floor and in the offices on the first floor will be plastered on No. 18 wire cloth supported on 1-in. channels.

The wall construction for the two hot and coal storage rooms on the ground floor will be composed of an outer wall of 4-in. Mackolite plastered on the outside and lined inside with ½-in. Union Fiber Company's refrigerator Linofelt. The doors to the hot and cold storage rooms will be 2-ply 2-in. matched wood with weather-stripped plank frames and lined on the inside with Linofelt. Floors will be given a uniform slope to a center drainage outlet.

The building will be heated by a low-pressure steam radiating system fed from a smoke-consuming type of boiler located in the basement under the office section. A complete system of illumination with a busbar type central control board designed for Edison plug fuses for each distributing circuit will be installed.

SINGLE PHASE FOR THE HOOSAC TUNNEL

The statement in the annual report of the Boston & Maine Railroad, just issued, that plans are being prepared for the electrical equipment of the Hoosac tunnel, calls renewed attention to the electrification plans of the New York, New Haven & Hartford Railroad, because owing to the control of the Boston & Maine Railroad by the New Haven Road this work of electrification will be conducted by the electrical engineering department of the New Haven company.

The New York, New Haven & Hartford Railroad has at present five electrification plans in consideration or under way as follows:

First, the equipment of the Hoosac tunnel, which is about 25,000 ft. in length and has two tracks.

Second, the electrical equipment of the New York, Westchester & Boston Railroad, which extends from 180th Street or Adams Street, in New York, to the corner of East Fulton Street and Columbus Avenue, thence across the present New Haven tracks to North White Plains on the north and New Rochelle on the east. At 180th Street, New York, the road will connect with the present subway, for which it will act as a feeder. This line is 21 miles in length and consists of two tracks and four tracks.

The third electrification plan is that of the Harlem River branch from New Rochelle to Morrisania and consists of six tracks.

The fourth is the extension of the present electrified section of the road from Stamford to New Haven, consisting of four tracks.

The fifth is a study of equipment of the Boston terminal and of the electrical zone around Boston.

It will be of great interest to learn that a decision has been reached to use the single-phase system at 11,000 volts on the first four of these systems. The system to be used in the Boston electrical zone has not been determined.

The section comprising the Hoosac tunnel line to be equipped will be from North Adams, which is beyond the west portal, to the immediate vicinity of the east portal. Both freight and passenger trains will be hauled through the tunnel by electric locomotives, of which there will be five of the straight single-phase type. Power will be obtained from a station which will be erected by the company. This station will have a capacity of 6000 kw in two 3000-kw turbine units. An 11,000-volt overhead system will be erected in the tunnel, which has a height of 18 ft. or a clearance of slightly more than 4 ft. above the cars. Work has already been commenced on this installation. Messrs. Stillwell and Putnam, of New York, have been retained as constructing engineers for the Hoosac tunnel electrification under the direction of the New Haven engineers.

The second electrification plan mentioned is that of the New York, Westchester & Boston Railway, which will also be single-phase, but the service will be entirely by motor cars. About 75 to 100 cars will be required. The ratio of motor cars and trail cars has not yet been finally determined. This will also be a straight single-phase road, without direct-current complications, and 11,000 volts will be used on the trolley. It is interesting to learn that before the adoption of the single-phase system on the New York, Westchester & Boston Railroad the New Haven road secured from Messrs. Stillwell and Putnam a report on the proper system to use. The decision of these engineers was in favor of the single phase, at 11,000 volts, similar to that used on the main line of the company.

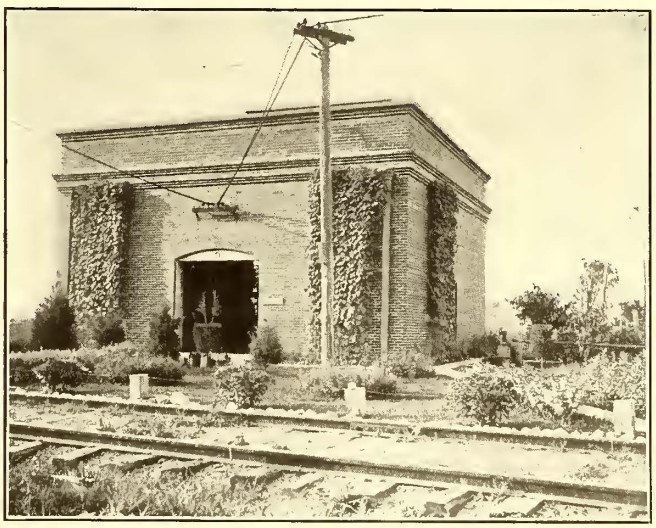
An account was published in the issue of this paper for April 16, 1910, of the details of the overhead equipment to be used on the Harlem River branch of the New Haven road, whose equipment with the single-phase system was authorized by the directors some time ago.

The extension of the main line electrification from Stamford to New Haven has been authorized by the directors, but will not be undertaken until some of the other work described above is further advanced.

All of the engineering work mentioned is under the direction of the engineering department of the New Haven railroad, of which E. H. McHenry is vice-president and W. S. Murray is electrical engineer.

PRIZES FOR ATTRACTIVE SUBSTATION GROUNDS

C. D. Morgan, general manager of the Indianapolis, Crawfordsville & Western Traction Company, announced in the spring that he would give money prizes to the substation employees who succeeded in getting the grounds around their buildings into the most attractive shape. The accompanying illustration shows a view of the yard and substation building at Raucks. The lawn has been seeded and ornamental shrubbery has been cultivated until the spot draws favorable attention from the passengers on the cars. This work is to be commended because the majority of the substations along the line of many interurban roads have been designed without much regard to outer appearance and usually the surroundings receive very little attention.



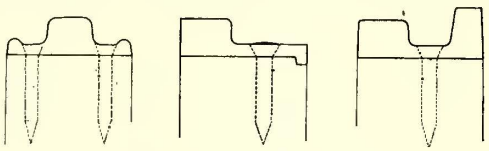
An Attractive Substation at Raucks, Ind.

Plans are at present being considered for the electrification of a portion of the North Western Railway in the environs of St. Petersburg, Russia. It is proposed to build a power station for the development of the water-power of the Wolchow River.

HISTORY OF STREET RAILWAY RAILS*

BY E. B. ENTWISLE, CHIEF ENGINEER, LORAIN STEEL COMPANY

Before electric traction became general, and, indeed, for a limited period thereafter, the use of the stringer rail was almost universal. Two types are illustrated herewith, the center and the side bearing, also the guard rail for curves. These were spiked to continuous wooden stringers which rested upon cross-ties spaced 7 ft. to 10 ft. apart. This type of construction has been replaced by the girder rail, the development of which is shown by the absence of any lower flange in the first designs. The difficulties encountered in rolling girder rails with

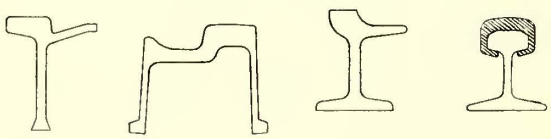


Stringer Rail Sections

wide lower flange, especially of the grooved or guard type, were many, but were finally overcome by the Universal mill which provides a separate roll with a vertical spindle for shaping the rail-head and guard in the final pass through the rolls.

The use of T-rails for industrial, steam and interurban railways is now general and is shown in the varying weights of from 8 lb. to 110 lb. per yard. The sections of the American Society of Civil Engineers are in most general use; they originally numbered 13 sections from 40 lb. to 100 lb. per yard. Other sections have been added from time to time. They are commercially known as "A" sections down to 8 lb. per yard and up to 110 lb. The heaviest T-rail rolled weighs 175 lb. per yard and has been used for traveling-crane tracks where excessive loads are carried. In addition to the A. S. C. E. sections we have the American Railway Association sections, types "A" and "B" from 60 lb. to 100 lb., varying by 10-lb. increments; also four Dudley sections and six Pennsylvania Railroad sections, old and new. Before the adoption of the A. S. C. E. sections there were more than 100 different shapes and weights of T-rails.

The manufacture of girder rails was begun when electric railways began to supplant the horse railroads and the old form of tram rail proved unequal to the demands of the



White's Rail, 1888; Lewis & Fowler, 1890; Beer's, May, 1859; Hunter's Renewable Head, 1869, Originally Proposed in 1820

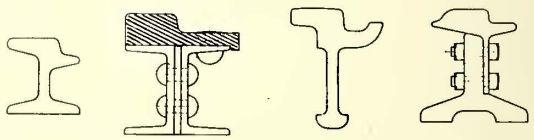
heavier equipment. The Cambria Iron Company was the first to roll a girder rail. It was 3 in. high and weighed about 35 lb. per yard. This rail had a tram ¾ in. wide and was used on one of the cable railways in San Francisco, where it rendered good service for over 20 years.

From 1885 to 1890 various other forms of girder rail were proposed. The Richards rail of 1887 was one of the earlier types of grooved rail, of which large quantities were rolled by the Johnson Company, this being one of the first to have any semblance of a lower flange. The present mode of rolling grooved and "Trilby" rails on a Universal mill had not yet been attempted.

To obtain the advantage of a groove, or a guard, such as we now find necessary on short radius curves, the ordinary form of girder rail was used and the guard was formed by riveting a bar of rectangular shape to the tram. As the demand for a more stable construction increased and the facilities for rolling advanced, there was produced the present guard rail in which the guard is united to the head in a solidly rolled section with a full lower flange. This rail was not successfully produced until 1892 and then only in sections 4½ in. high.

The need for rails of greater height than 4½ in., in order to take care of brick or stone block paving and yet keep the weight of rails under 60 lb. per yard led very early to the form of chairs much used in track laid in the '80s. These chairs were drop-forged, generally 4 in. high, and were in quite common use until rails 6 in. and later 9 in. high were rolled. The use of the higher rail has caused the almost entire disappearance of chair construction.

The 9-in. high girder rails first were rolled late in 1892 and about two years later the 9-in. guard rail followed. In 1890 the Gibbon rail was introduced. One railway at least tried the experiment of operating electric cars over this construction which consisted of the old form of stringer rail with a small depending flange through which the rail was secured to short cast-iron boxes placed at intervals of about 5 ft. No cross-ties were placed under the boxes, the rails being held to gage simply by tie bars. This proved to be unsuccessful. The same inventor later produced the duplex rail, in which one-half represented the head and the other half the tram. These broke joints about midway in each length and were secured through the vertical webs to cast-iron chairs, which in turn were spiked to cross-ties in the usual manner. So far as the writer knows, this was the only rail rolled in two distinct halves which ever secured an actual trial in track. Many other forms of duplex



San Francisco, 1877; Moxham Girder, 1885; Richards', 1887; Littell's, 1887

rail have been invented, but their alleged advantages do not appear to have induced many engineers actually to place them in use.

A box girder rail was patented by W. C. Wood in 1890 and was known as the Lewis & Fowler rail. This rail had many strong adherents and was for a time commercially successful, but of late years it has given way to the present single-web girder rail, which is now considered standard. One firm alone has produced more than 870,000 tons of girder rail within the last 10 years.

In the 25 years in which the Lorain Steel Company and its predecessor, the Johnson Company, have been rolling girder rails, 200 different sections have been produced. These have varied from 3½ in. to 9 in. in height and weigh from 30 lb. to 164 lb. per yard. About one-half of these sections are now available, the remainder having been declared obsolete. This census of the rail sections produced does not include T-rails, slot rails nor the electrically welded sections which for a brief period occupied the attention of track inventors and designers.

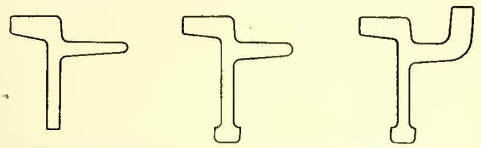
The limitations of this paper forbid a description of the various forms of current track construction. However, we may refer to one type of track construction recently adopted by the Board of Supervising Engineers of Chicago Traction and of which track a large mileage has been laid and is in successful operation. No other city in the United States has laid an equal amount of track material during the same time. The Lorain Steel Company alone furnished more than 65,000 tons of Chicago section for straight track, the rail being of the Trilby pattern 9 in. high and weighing 129 lb. per yard. The first rail of the new construction was laid June 18 1907.

One of the characteristics of the Chicago concrete track was the use of Carnegie steel ties weighing 14½ lb. per foot. It was considered that the best construction would be obtained by inverting the tie, placing the base, which is broader than the head, on top so as to get a broader bearing for the rail on the metal surface. These ties were laid 5 ft. centers in connection with 2-in. x 5/16-in. tie rods spaced 6 ft. centers. A similar

*Abstract of a paper read at the meeting of the Central Electric Railway Association, Indianapolis, Ind., Sept. 22, 1910.

construction was planned on the route of the old cable track, but with wooden ties spaced just the same as the old yokes of the cable track. This spacing was later reduced from 5 ft. to 3 ft. Where traffic prevented this construction, or because it was less costly to repair if disturbed by sewer or water-pipe construction, a trench about 2 ft. deep was dug and 8 in. of crushed stone used to fill in; wooden ties were laid on this and then concrete was applied to fill it up to within 6 in. of the top of the rail. The paving was separated from the concrete by a 1-in. sand cushion. The ties were placed 2 ft. centers and the tie rods 6 ft. centers.

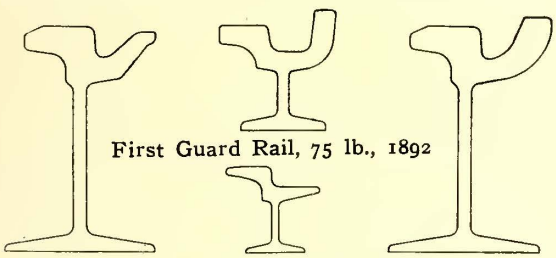
It has been said that the necessity for a girder rail weighing



Development of the Girder Sections

129 lb. per yard is questionable. However this may be, manufacturers are willing to roll lighter or even heavier rails provided railway engineers call for them. It is a long call from the first girder rail our company rolled in any great quantity, namely, section 38 lb., No. 111, to the Chicago section 129 lb., No. 403, but it must be remembered that cars and car equipments have been growing larger and larger. The weight relation between the bobtail car and the present pay-as-you-enter car (both having seen service in Chicago) is probably 1 to 25 or 30, whereas the increase in the height of rail is about 1 to 2½ and the weight about 1 to 3½. The bobtail car is 12 ft. long and the pay-as-you-enter car 48 ft. long.

It may be that we shall have still larger cars and that larger and heavier rails will be required, but to the writer it appears that for the width of street set apart for street railways in most of our cities we have about reached the limit in car



Chicago Straight Track, 129 lb.; 30-lb. Girder, 1885; Chicago Guard Rail, 145 lb.

width, if not in length, and perhaps in the weight of rail which will carry them at the minimum maintenance cost. Our efforts now should be directed toward the standardization of rolling stock and track, that economy in first cost as well as in maintenance may be successfully practised. The work begun and now being prosecuted with zeal by the standardization committees of the American Street & Interurban Railway Association deserves our warmest commendation as being a step in the direction of reducing cost to the manufacturers as well as to the user of street railway materials.

The report of the New York Public Service Comission, Second District, as to passenger train delays for July, 1910, shows that 68,715 trains were run, of which 82 per cent were on time at division terminals. The average delay for each late train was 25.2 min., and the average delay for each train run was 4.6 min. The principal causes of delay were: Waiting for trains on other divisions, 32 per cent; train work at stations, 16.2 per cent; waiting for train connections with other railroads, 14.6 per cent; trains ahead, 7.6 per cent; wrecks, 5.9 per cent; meeting and passing trains, 5.7 per cent; engine failures, 5 per cent. The best records were made by the Norwood & St. Lawrence Railroad, 98 per cent, and the Little Falls & Dolgeville Railroad, 98 per cent.

THE DESIGN AND EFFICIENCY OF HIGH-TENSION INSULATORS *

BY A. O. AUSTIN, ELECTRICAL ENGINEER, OHIO INSULATOR CO.

When we consider the importance of the insulator to any transmission system, we are surprised that so little systematic research work has been done. The principal reasons for this are that the manufacturer depends largely on secret processes and that experiments leading to the production of new types must extend over a very long period. In 1904 the Bay Counties and Standard Electric lines of California were being reinsulated, and it was decided to see what improvements could be made. Although the new insulators were the largest then manufactured, it was considered that it was only a matter of time before they would be giving trouble in fog sections.

The early experiments soon made it evident that if improvements could be made in the porcelain body and glaze, the efficiency of the insulator would be increased and its production cost decreased. By 1905 it was found that the high efficiency insulator could be made more cheaply than the regular types. It was during these early tests that there was developed the disk suspension insulator, which has been adopted on practically every transmission line installed in the last two years.

As the current for testing insulators is very small and the potential extremely high, ordinary methods of measurements cannot be used. To analyze the behavior of certain types, it is necessary to try a number of each. The insulator is designed to support the transmission conductors, and is much stronger than the pin or supporting structure, except in extreme cases. Unnecessary mechanical strength in the insulator is to be avoided where it is obtained at the expense of electrical reliability. Although very little has been done along this line, much can be accomplished by making the gripping or cementing surfaces small but of very high efficiency. Electrically, the insulator must prevent serious leakage of current between the conductors or between the conductors and ground, either through the air or over its surface.

While the rating of insulators is usually based on wet or rain tests, much more attention should be given to the dry flash-over characteristics. In rating the insulator careful consideration should be given to the effect of locality and the manner of installation. The insulator should be designed not so much for high limits in the laboratory as for working efficiency on the line.

Fig. 1, on page 466, shows two types of insulators, each composed of four shells. These insulators were connected in multiple for the test. In type "A," the low efficiency design, the arc followed a path of 46 in. and built up over the surface, while in type "B," the high efficiency design, the arc built up through the air a distance of 19⅛ in. The potential necessary to cause this flash-over was 225,000 volts, corresponding to a needle gap of 23 in.

It is well known that a little dirt on a surface will permit flash-overs at a very greatly reduced potential. In analyzing the two styles for dielectric strength, the possibilities of type "B" are very apparent. Type "A" is a four-part insulator with a short inner shell, two large intermediate shells and an 18-in. top. When this insulator is tested under dry conditions, it is found that the small inner shell flashes or spills over at about 200,000 volts depending on the size of the pin and the amount of cement. On an unassembled or part test this inner shell may be tested to flash-over but no higher. It follows that if the same character of flash-over occurs in the assembled insulator, the part receives the same potential, so that assembling gives no gain in the factor of safety against puncture. The same fact holds for the other parts, as the arc is formed over the surface in each case. This reasoning holds no matter what the aggregate of the individual test voltages may be. In this particular insulator the sum of the test voltages for the several parts exceeded 270,000 volts, so it might be supposed that

*Abstract of a paper read at the meeting of the Central Electric Railway Association, Indianapolis, Ind., Sept. 22, 1910.

some of the parts received a potential at flash-over on the assembled insulator less than on the part test because the assembled insulator flashed over at 225,000 volts. This supposition would be logical if the arc built up over all the shells simultaneously. However, investigation shows that first the small center flashes and then the other shells, one after the other, until the arc extends over the entire insulator. Owing to the large drop in potential over the large shells, the entire series cascades with the spilling of one of them, the complete action

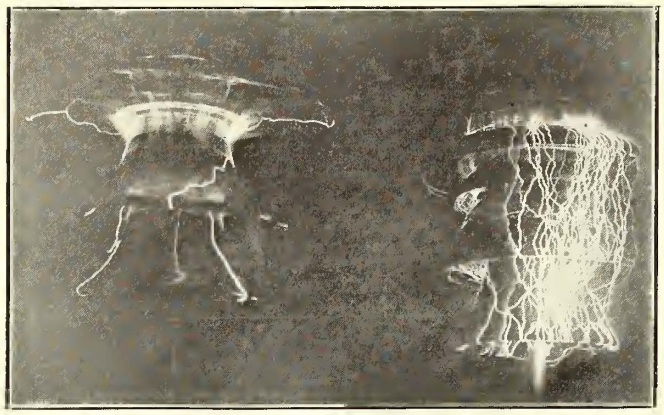


Fig. 1—Type "A" and Type "B" Four-Shell Insulators

taking place during a single alternation. The only intimation of this action is the spilling of the small inner shell, which can be plainly seen since it occurs before the flash-over of the entire insulator. In the assembled insulator when one part is stressed to the flash-over potential before the others, it is said to be overstressed. This overstressing applies to storm conditions as well as to dry flash-overs and it is responsible for the poor showing of a great many insulators.

Fig. 3 shows two insulators in series, the top unit of which is overstressed. The charging current for the large unit is seen jumping around the upper unit. The small insulator flashed over when tested alone at 57,000 volts and the larger

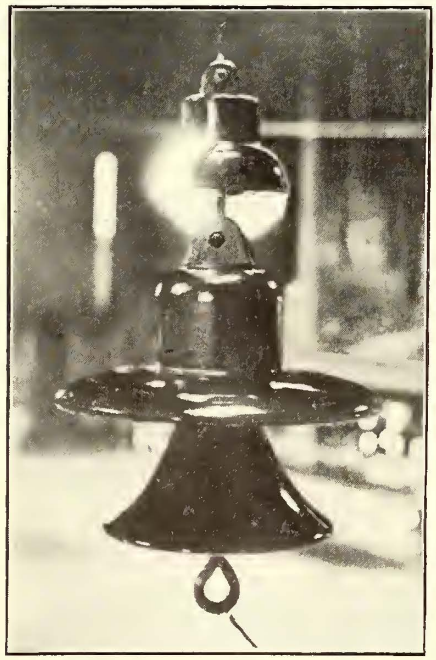


Fig. 3—Overstressed Top Unit of Two Insulators in Series

one at 150,000 volts, while a potential of only 63,000 volts on the series connection was necessary to cause a continuous flash-over of the small unit. On the precipitation test the following results were obtained: Wet flash-over of the small

unit, 35,000 volts, of the large unit, 92,000 volts, and of the series connection, 100,000 volts. From this it will be seen that the overstressed member furnished only 8000 volts and was practically worthless when most needed. In addition, the overstressed part was stressed to its arcing potential just before it spilled. This occurred on each alternation and the part was in danger of puncturing.

The two units may be considered as two electrostatic condensers in series, and the drop in potential will be inversely pro-

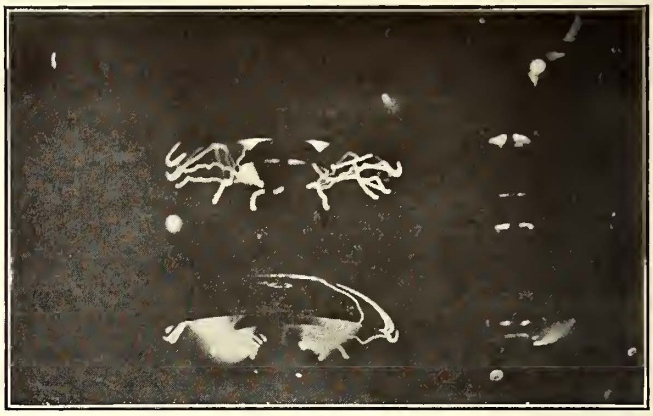


Fig. 2—Type "A" and Type "B" Insulators in Multiple

portional to the respective capacities of the insulators. In the pin type insulator the several parts may be considered as condensers in series, the cement forming the condenser plates and the porcelain forming the dielectric. The electrostatic capacity of the condenser varies directly as the area of the plate and inversely as the thickness of the dielectric. Applying this law to the ordinary pin type insulator, it is seen that the electrostatic capacity of the center shell must be small as compared to the other shells because its cemented area is smaller and the thickness usually greater. Since the electrostatic capacity is least it must carry a greater proportion of the stress on the assembled insulator. This accounts for the frequent punctur-

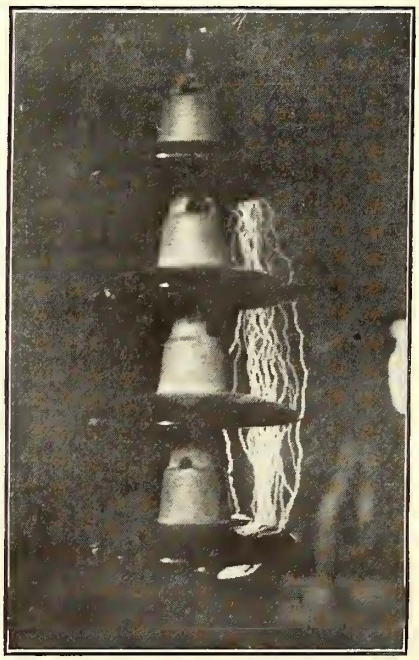


Fig. 4—Dry Flash-Over Tests on Type "B" Insulator

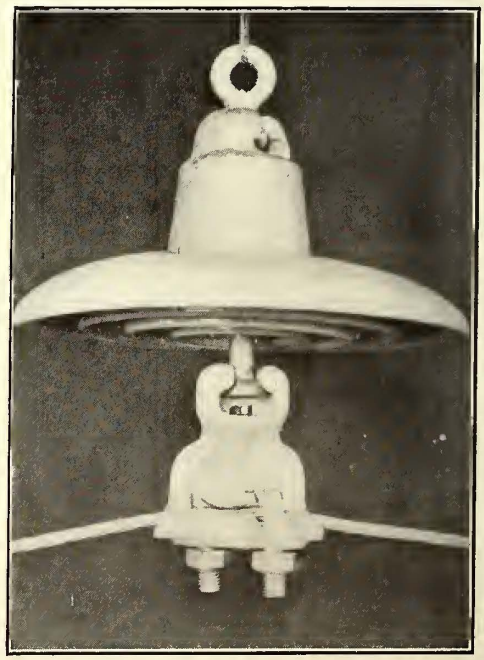


Fig. 5—Single Section of Type "B" Insulator with Tower Eye and Clamp

ing of the center shell on assembled test. The first insulator to be built for an assembly test of 175,000 volts was so designed and the assembled insulator passed the final test without a puncture, the parts first being tested to 60,000 volts each.

If the parts where plain shells are used are too thin, a very high flux density is the result and the parts are flooded with static electricity at comparatively low potentials. This flooding of the surface cuts down the insulation, as the static electricity forms arcs which partially break down the resistance of the air. As the stress in a dielectric varies inversely as the square of the distance from the electrodes, the importance of the distribution of material is apparent.

When the stress is too high the air breaks down and the surface is flooded with charging current or static electricity. The extent of this reduction in insulation is larger than supposed, as was shown by tests on two 10-in. disks having the same flash-over distance between the cap and pin. The plain disk flashed over at 65,000 volts and the petticoat disk at 92,000 volts. In each case the shortest distance between the cap and pin was 8⅜ in. In these designs the addition of 16 per cent in material resulted in an increase of 41½ per cent in the flash-over potential. When compared on wet test the increase in the flash-over due to the high efficiency construction was 60 per cent. In addition to standing much higher tests, the high efficiency type did not become flooded with static electricity and also noisy long before the flash-over potential was reached, as was the case with the plain disk. This example alone will show that it is quality of insulation that should be looked for rather than weight.

The following rules apply to any type of insulator and must be adhered to if the corresponding properties are desired:

To obtain a factor of safety against puncture greater than unity in the assembled insulator, the stress on any part must be less than the tested strength of that part.

To obtain maximum flash-over efficiency the equivalent striking distance between the surfaces should be in proportion to the difference in potential between those surfaces.

In addition to the electrostatic electricity, there is a distribution of stress due to surface leakage. The leakage path of a cylindrical rod has for resistance a quantity proportional to the length of the rod and inversely proportional to the circumference of the rod; the resistance of the path per inch length will then be the same at any point. If the diameter of the rod varies, the width of the leakage path varies in proportion to the circumference and the resistance per inch of length at any part will be inversely proportional to the diameter.

The curve, Fig. 6, shows the relation between the diameter and the surface resistance. Where the variables in the leakage path may be expressed in differential form the equation

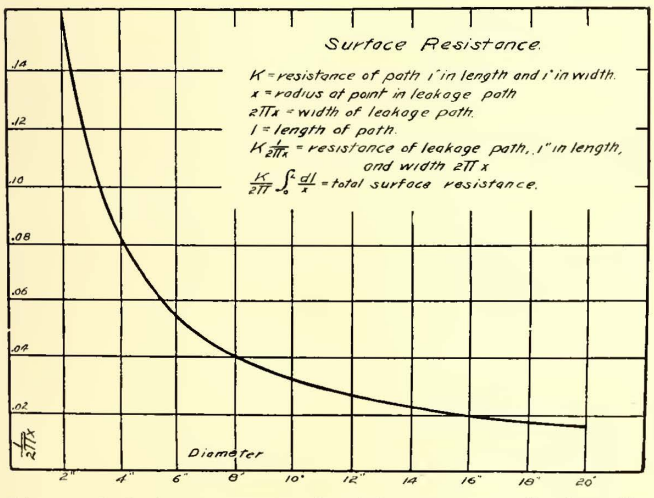


Fig. 6—Relation Between the Diameter and Surface Resistance of Insulators

may be integrated to find the resistance for the part. The curve shows that the surface resistance drops off very rapidly with an increase in diameter. The area between two points on the curve represents the resistance between those two points. The total area under the curve is proportional to the resistance of a flat disk. The curve shows that little surface resistance is gained by the use of parts of large diameter and that if the leakage surface is to be effective, it must have length and small diameter.

The vertical petticoat added to a flange furnishes surface resistance of best form, for it has the surface characteristics of the tube, namely, length of path of uniform width. The petticoats on a disk in addition to increasing greatly the surface resistance of the part increase the flash-over potential, thus serving a twofold purpose.

Fig. 2 shows on test two types of suspension insulator in multiple. Type "A" is flashing over while type "B" shows but

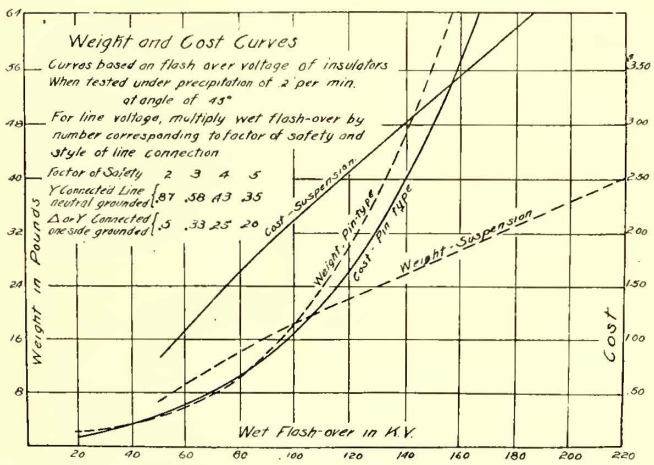


Fig. 7—Weight and Cost Curves of Pin and Suspension Insulators

little static electricity. Type "A" is composed of two 14½-in. sections having a total weight of 45 lb. and a length of 20½ in.; "B" is composed of three 10-in. sections, having a total weight of 24 lb. and a length of 17¼ in.

Fig. 4 shows four sections of type "B," on dry flash-over with the arc striking clear of the insulator at 285,000 volts.

The following table shows the properties of a 100,000-volt insulator of each type:

	Type "A"	Type "B"
Number of sections	4	6
Diameter	14½ in.	10 in.
Length of insulator	41 in.	34½ in.
Wet flash-over	235,000 volts	265,000 volts
Tested dielectric strength	440,000 volts	540,000 volts
Surface resistance	K 440	K 527
Per cent of minimum to maximum width of leakage path	10.6	16
Mechanical strength	10,000	10,000
Formation of arc, dry	over surface	through air
Formation of arc, wet	over surface	through air
Total weight	90 lb.	48 lb.
Weight of porcelain	62 lb.	30 lb.
Depreciation due to loss of one section	25 per cent	16⅔ per cent
Number of cemented joints	12	12

The table shows that type "B" is remarkably efficient, accomplishing more than type "A" with approximately half the material. Fig. 5 shows a single section of the type "B" high efficiency insulator with tower eye and wire clamp. Single sections of this insulator, when provided with an eye pin and cap, are used for guys and to make dead ends on the lower voltage lines found in railway work.

In insulating any line it is well to remember that stress thrown on the insulator, due to lightning, does not depend on the line voltage. For this reason, insulators with a much higher factor of safety should be used on the lower voltages. Types having long narrow shells close to the pin, or having little thickness of material between the pin and the conductor, should never be mounted on a metal pin but on a wooden pin of good length thoroughly impregnated with paraffine or oil. The insulator when mounted in this manner will give good service even when the lightning conditions are severe. In this case the pin must be considered as part of the insulator and the climatic conditions must be such that the pin will not burn. Only moderate sized insulators should be installed in this manner, as the charging current sufficient for the largest types is enough to burn a wooden pin. It is impossible to prevent breakage on

the line, but the insulator should be such that ample insulation remains should one part become broken.

Fig. 7 shows some weight and cost curves of pin type and suspension insulators based on the flash-over voltage of insulators when tested under a precipitation of 0.2 in. per minute at an angle of 45 deg.

When lines are equipped with insulators of high efficiency design and great dielectric strength, much of the trouble will be eliminated. Where thin parts are used, a high flux density may be set up in the material and the insulator puncture or shatter like an overcharged Leyden jar. In conclusion it may be said that when the properties which produce reliability in the transmission insulator are fully understood and ample insulation is provided, much will have been done to make the transmission line as reliable as possible.

THE DESTINIES OF 500-VOLT D. C., 1,200-VOLT D. C. AND 6,600-VOLT A. C. MOTORS*

BY W. E. DAVIS, VICE-PRESIDENT CLEVELAND CONSTRUCTION COMPANY

A few years ago, during the construction period of the Aurora, Elgin & Chicago Railroad third-rail system, the treasurer of one of the leading trust companies in Cleveland made to me the following statement: "What is the use of building a new power plant? Before it is completed it is obsolete, due to the extraordinary development of the methods of producing and distributing electrical energy." In this case this statement happened to be particularly true, for it occurred very shortly before the introduction of the steam turbine as a generating unit, but at the time of the remark this machine had not been quite perfected to a point where it could be unqualifiedly recommended. The same remark could, with great justice, be made at the present day, under similar conditions, when we see looming up before us the development of the internal combustion engine.

Steam railroads are demanding a system calling for a tremendous output of energy over long distances, and are slowly but surely feeling their way toward electrification and even more slowly but surely overcoming the tremendous existing prejudices of all steam railway employees against electrical application. But the managements of these lines are wise enough, in most cases, to see the handwriting on the wall, and no steam railway to-day is complete without its corps of competent electrical engineers. Yet practically all steam roads are holding back electrical development to-day, awaiting results. They have far too much at stake to move otherwise than with the greatest caution.

Cities are demanding the abatement of smoke and noise due to the operation of steam locomotives, and are passing ordinances compelling the adoption of other power than steam. This result in congested districts is inevitable—but what system can be used to fulfil such requirements? A few months ago the city of Chicago passed such an ordinance applying to all steam roads entering the city. No one stopped to think of the fact that within the city of Chicago there are upward of 3000 steam road sidings into the different factories, yards and warehouses, used more or less continually by heavy steam locomotives and trains of freight cars. No one stopped to think that there is in existence to-day no system of electrical application that would properly control such conditions. The ordinary 500-volt trolley is not to be thought of, being utterly inadequate. The third rail is impracticable with streets and highways. The high-tension trolley wire is equally so, because of its dangerous characteristics when placed at such locations. Therefore, the able attorney of the Chicago & Northwestern Railway, in an address on this question before the Chicago City Council, asked: "How shall we do it?" He is as yet unanswered.

A very few years ago the leading electrical manufacturing companies introduced to the public the so-called single-phase system, using not only alternating current for distribution but alternating current motors for car equipments. At last was found the remedy for all ills to which the electric railway is heir, and an enthusiasm was displayed in this respect by both companies that was too good to last. In other words, the departure was a little too radical to warrant immediate success. New principles were involved and the new conditions produced were ascertained only by actual operation.

One of the greatest supposed merits of the new system was the possible operation upon both a.c. and d.c. This was certainly ideal for long-distance lines, particularly when they entered and operated upon a city system at the terminals or elsewhere. The conclusion must not be drawn that we are prepared to condemn the single-phase system. Far from it. It is the writer's desire to designate what, in his opinion, are the weak points. One of the most important is the complication brought about by the interchange of alternating and direct current in the same apparatus. These complications may possibly be satisfactorily taken care of upon large locomotives, where there is ample room and accessibility of parts, but up to the present time this arrangement for ordinary interurban and city work is, in our opinion, to be strongly criticised.

On the Washington, Baltimore & Annapolis Electric Railway, where the single-phase system was introduced and where complications of single-grounded trolley d.c., double trolley d.c. (sometimes grounded and sometimes not) and the 6000-volt grounded a.c. were placed in combination on the same equipment, the intricacy and number of parts were such as practically to condemn the apparatus from the start and eventually the line was changed to the 1200-volt direct current.

Even when operating on alternating current alone, the car apparatus is more complicated than that of a d.c. equipment of the same capacity, and the motors, for the same horsepower, must be from 15 to 25 per cent greater in size. This necessitates larger axles, larger gears and pinions and other operating parts and causes a considerably greater weight and a consequently greater output of energy to operate the car. But the operating expenses due to this condition are to a certain extent offset by the elimination of substations, of heavy feed wire and the simplicity of overhead distribution.

The writer of this article was connected with the construction of the Aurora, Elgin & Chicago third-rail d.c. system west of Chicago, and with the Chicago, Lake Shore & South Bend Railway, using 6600-volt, single-phase current, east of Chicago. These lines are about the same length and have many conditions in common.

In first cost, with equal capacity of power house and equal number of cars and equipments, the average saving with the single-phase system is about 15 per cent so far as the electrical equipment itself is concerned. As both of these railways were built for extremely heavy service and as the consequent cost was large, this percentage saved was sufficient, in the writer's opinion, to offset the extra cost of the maintenance of car equipment, yet up to date the delays, due to defective apparatus, are considerably greater on the alternating than on the direct-current road. This is the one condition to which operating managers so strongly object, and they are thoroughly justified in so doing.

Tests of economy in the consumption of current, in connection with the single-phase equipment, show exceedingly well. It is greatly to be regretted that no standard for the consumption of electrical energy in connection with the operation of railways has yet been devised. We all know that the car-mile is a most ambiguous quantity, varying with the size and weight of car, and even the seat-mile and the ton-mile are no criterions of actual conditions.

The questions of speeds and stops alone are two most important factors and must be considered. Actual tests, covering a period of several months, on the Chicago, Lake Shore & South Bend Railway show an energy output per ton-mile at the power plant of less than 100 watts. The cars covered by such tests

*Abstract of paper presented at meeting of Central Electric Railway Association, Indianapolis, Ind., Sept. 22.

are 57 ft. long, weigh 56 tons and operate at a maximum speed of 60 m.p.h. Recent tests, made by the writer of this article, on six different types of cars in Detroit, the largest car being 44 ft. in length, weighing about 25 tons and equipped with two motors, showed an average consumption of from 85 watts to 150 watts per ton-mile. This difference, of course, is accounted for very largely by the excessive number of stops made by the city cars over and above the interurban, and these results are obtained at the car and not the power house; hence, from 10 to 15 per cent at least must be added for the intervening losses.

Tests made a short time ago on the Western Ohio Railway, a typical interurban high-speed 500-volt system, operating from 45 ft. to 50 ft. cars, with a maximum speed of 55 m.p.h., showed a consumption of current of from 93 to 97 watts per ton-mile at the car. Tests made in Cleveland on four-motor interurban cars of the Lake Shore Electric Railway, in suburban service, showed 73.9 watt-hours per ton-mile at the car. The weight of the car was 37 tons, and four 75-hp motors were used. Therefore, so far as the writer can judge, no criticism can be made upon the economy of current in connection with the operation of the single-phase system.

It might be of interest to state here that the comparative freedom from trouble on the Chicago, Lake Shore & South Bend Railway is probably due largely to the fact that the system is entirely a.c. at 6600 volts, with no d.c. or low-voltage complications.

Another objectionable feature of the single-phase railway motor, and a most important one as well, is the high armature speed. Much trouble has been caused by excessive centrifugal force at high speeds, with consequent loosening of armature coils, and the setting up of a rubbing or chafing of parts which in time is bound to develop inherent defects.

In locomotive work where great power and moderate speeds are demanded the a.c. motor appears to find its destiny. Tales galore can be told on the Chicago, Lake Shore & South Bend Railway of ordinary passenger cars starting 600-ton and even 800-ton trains on 2 per cent and 3 per cent grades, of the operation of trains with from 8 cars to 11 cars on holidays and excursions, and of the operation of the system in snowstorms when every other electric railway and even the steam roads in the same territory were out of business. Indeed, in one case which came under the writer's personal observation, a car ran from Michigan City to South Bend in a snowstorm that tied up every railway in the vicinity, both steam and electric. The snow was 3 ft. deep on the level. No track was in sight either in front or behind the car, but a stretch of unbroken snow as far as the eye could reach, in places as high as the sills of the car itself, and the car had no snow-removing device except a small iron-plate pilot about 30 in. in height. This result was possible because the system possessed the most important factor of all, a magnificent line voltage. Time was actually made up in the run of nearly 40 miles. The deck sash had to be closed to prevent the snow, driven by the car, from filling the passenger compartment, and in passing through the long drifts the car became so dark, at 2 o'clock in the afternoon, that all of the electric lights had to be turned on, yet several minutes of time were made up on this run. In the same storm the Aurora, Elgin & Chicago third-rail system was tied up to such an extent that no car was run for nearly a day. On the single-phase line not a trip was missed and every car was maintained practically on time.

These results are worth a great deal. One wrong impression which the purchasers of single-phase equipment have is that they expect all the virtues of the 500-volt motor to be superimposed upon whatever virtues the single-phase system may have. This expectation has not been their mistake, as they have been led by the manufacturers to believe that such results could be produced.

The single-phase locomotives of the Grand Trunk Railway in the tunnel between Port Huron and Sarnia have shown very economical results. This work is exceptionally heavy duty, namely, the hauling of freight trains up rather steep grades. During practically two years of operation this electric system has shown a net economy, including interest on the capital invested, of more than 15 per cent over the same operation with less favorable results by steam locomotives.

Reports from the New York, New Haven & Hartford single-phase locomotives operated in heavy passenger service are at the present time most flattering, showing a distinct economy over the old system of steam locomotives. W. S. Murray, the electrical engineer of the New York, New Haven & Hartford Railroad, who had the moral courage to recommend this system to his board of directors and the courage to install and successfully develop it, most truthfully said, in effect: "No one can criticise our installation, for there is no precedent or no parallel from which criticism can be derived. Our road is the only trunk steam line electrically equipped, consisting of 40 miles of some of the heaviest passenger service in the world. Unjust comparisons have been made with the direct-current equipment of the New York Central, which is simply a terminal proposition." It is the writer's strong opinion that should the New York Central & Hudson River Railroad decide to equip electrically its main lines from New York City to Albany it would not adopt 500-volt d.c. distribution. The cost would be absolutely prohibitive.

With these facts before us let us search for a sign of the future. We find the 500-volt d.c. system firmly entrenched in all the largest centers of population, with every indication of becoming permanent until some revolution of power application arrives. This condition will to a great extent govern the interurban or dependent lines. Changes will undoubtedly be made with feeder and transmission lines, but the 500-volt trolley application under these conditions is here to stay, at least for a long period of time. New and larger railways will be built, demanding higher voltage and less losses, mechanical and electrical, and to this end the higher potential direct-current system with from 1200 to 2400 volts looks very favorable. Such an arrangement has the decided advantage of being able to operate without complications on both d.c. interurban and city lines, as well as its own, by regulating the voltage at the motor terminals by means of motor combinations, each motor being nominally a 500-volt machine. Then comes the real work in comparison with which all others appear as play, namely, the electrification of the trunk lines of the steam railways. Here is a condition demanding hundreds of thousands of kilowatts, climbing mountains or crossing deserts hundreds of miles from any base of supply, tremendous suburban traffic in proximity to the greater cities, 3000-ton freight trains to be hauled over 2 per cent and 3 per cent grades and speeds of 90 m.p.h. for express passenger trains. Such conditions are to a great extent never thought of in ordinary electric railway practice. Somewhere in this field the single-phase system or modifications of it will find its own.

A short time ago, while the writer was in the factory of one of the largest electrical manufacturers, he saw a mercury gas rectifier which could be placed upon an ordinary directors' table, but from which was being taken nearly 1000 kw of direct current from an impressed alternating current. If this apparatus should become a commercial success it will very greatly simplify many problems of electric traction, because it will allow a conversion from a.c. to d.c. at frequent intervals with practically no substation attendance. New motors are being designed embodying a combination of a.c. and d.c. principles. New discoveries are being constantly made in the line of insulation and the handling of high-tension and apparatus. One of the leading electrical manufacturers is at present attempting to perfect a 2400-volt system with four 600-volt motors in series for each car, with indications that the result will be favorable. The most serious drawback at present seems to be the matter of commutation of generating units. At present it is customary to obtain 1200 volts by operating two rotary converters in series. The operation of four rotaries in series for 2400 volts would be an undesirable complication, and as in several instances in Europe currents of 2000 volts d.c. are being commutated with success, the writer sees no rea-

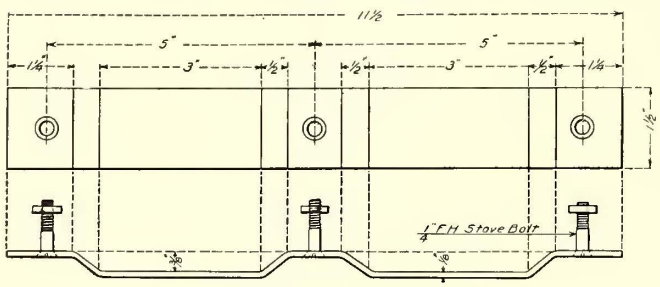
son why the 2400-volt system should not be a feature of the future.

In accord with the universal law, the greater the obstacles the higher we have to go to surmount them. The writer believes that the future of the electric railway will be developed in accordance with the following self-evident truth:

That the voltage employed must be proportional to the duty to be performed.

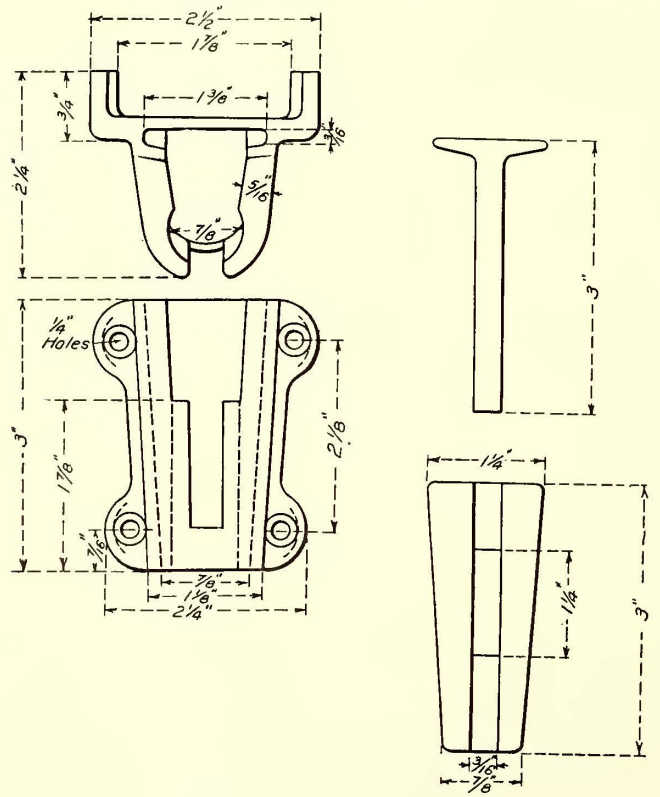
REPORT OF STANDARDIZATION COMMITTEE OF CENTRAL ELECTRIC RAILWAY ASSOCIATION

The standardization committee of the Central Electric Railway Association presented a report at the meeting in Indianapolis, Sept. 22, devoted principally to couplers, pilots, marker brackets and headlight hangers and plugs. A preliminary statement of the report of the committee was published in



Standard Headlight Holder

the issue of this paper for Sept. 10. The main features of the standard coupler, as mentioned in that article, were recommended. The committee, in its report, however, decided to recommend a distance from the center of the swivel pin of the tailpiece and the back end of the tailpiece of 4 in. instead



Marker Bracket and Arm

of 4½ in. as suggested at the Fort Wayne meeting. In addition, it recommended that article 10 of the report of the standardization committee presented at the meeting of the Central Electric Railway Association May 26 read: "Pulling face of coupler to project 6 in. beyond buffer face of coupler at maximum degree of lateral movement of drawbar."

PILOTS, MARKER BRACKETS AND HEADLIGHT HANGER AND PLUGS

In addition, the following recommendations were made:

Pilot to be 3 in. in rear of face of buffer band.

Marker bracket to be as per print and to be placed on corner posts of vestibules, also on center of dashboard.

Style of headlight plug to be as per print.

Style of headlight plug standard as per print.

The committee also decided to request the American Street & Interurban Railway Association to publish all adopted standards in loose leaf forms.

The committee decided to refer the trailer-circuit connector to the association, owing to the fact that the type of connector which the committee considers most desirable was covered by patents. The association was requested to take the adoption of this connector under consideration, subject to a stipulated price for the connectors and all parts pertaining thereto, as the connector meets the full requirements which the committee would recommend.

FROM CHICAGO TO NEW YORK ON ELECTRIC CARS

BY E. C. VAN VALKENBURGH

To the uninitiated the idea of a trip from Chicago to New York seems to be an idle dream, while among those actively engaged in electric railway work the trip is often looked upon as an undertaking involving so much discomfort and delay as to make it unavailable as an every-day undertaking. Honesty compels the writer to confess that, although familiar with the electric railway field generally, he was of somewhat the same opinion until the start was actually made. After that it was one pleasant surprise after another.

While a trip of this kind may not be practical from a commercial standpoint, it certainly offers wide possibilities to the vacationist or the tourist having a little time to spend, and a better way of seeing the country at a reasonable cost would be hard to imagine. All along the way the roads generally show a high standard of equipment and maintenance both in roadway and rolling stock and a very satisfactory rate of speed is maintained. On the few short stretches where roadways are crooked and speeds slow the improvements found or actually under way will make better speeds and service possible within a very short time.

Of the entire distance traveled on electric cars, 1643 miles in all, including numerous side trips, there was less than 250 miles which could not be covered on limited electric trains. As a means of spending a vacation or enjoying an outing, a trip of this kind affords many advantages in addition to the old ones of "No dust, no dirt, no smoke." By other methods of travel one fails to get the view of the various cities and towns that is afforded by the electric car in passing through the principal residence and business streets. And as far as loss of time at the terminals of the various roads is concerned, the delays are usually short and it is a poor town indeed that does not have something of sufficient interest to make all too short the time before the connecting car leaves. Most schedules are so arranged that the wait is rarely more than half an hour at the most, and in many places the cars make close connections.

Another advantage which will be appreciated by those who desire to see all that is possible along the way is the opportunity afforded for making side trips to points of interest. From the various interurban centers it is possible to make almost innumerable side trips, the number and extent of which are limited only by the time at the tourist's disposal.

Among the side trips taken by the writer were those from Toledo to Detroit and Mount Clemens; from Erie to Cambridge Springs; from Westfield to Chautauqua Lake and Jamestown; from Buffalo to Niagara Falls and Olcott Beach, and from Albany to Lake George, Glens Falls and Saratoga Springs and through the Berkshire Hills to Great Barrington.

On a trip of this kind the time required will depend entirely upon the time at the disposal of the tourist and his inclination

to stop and look around. The writer gave to it two days less than four weeks. This time, however, included that required to make side trips aggregating over 800 miles and stops of two or three days each at several points along the route. In only two instances was any traveling done after dark. The trip could easily be made by daylight in a week's time, allowing for short stops at junction points, or in from 45 to 50 hours of continuous traveling.

The distance covered without side trips, but including 30 miles on steam road and 114 miles by boat, was 1163 miles and the cost was $19.64. Excluding 823 miles of side trips, 138 miles of which was over steam roads, the distance traveled amounted to 1986 miles at a total cost of $33.50.

One of the obstacles encountered in planning a trip of this kind is the difficulty of obtaining reliable information before the start is made. It is comparatively easy, when once on the way, to get information covering the route for the next couple of hundred miles, but if the traveler wishes to plan in advance exactly the route he wishes to follow and to know the cost and connections, he has to have considerable perseverance and an ability to write letters asking for information.

Another feature which is apt to discourage the average traveler is the lack of uniform baggage regulation. Over parts of the trip it is possible to check baggage under practically the same conditions as apply on steam roads. Over other sections baggage is checked, but is carried only on certain cars or on express cars once or twice a day. This latter arrangement is not very attractive to one making close connections and covering a considerable distance each day. The other alternative of checking baggage in parcel-rooms during stopovers becomes expensive when there is more than one piece of baggage and the stops are frequent. If the various roads would check hand baggage free at terminal points as an accommodation to holders of their tickets it would do much to popularize through travel and would prove a real convenience and economy to the tourist. The good will engendered should prove of real value to the road. Then, again, in encouraging people to carry their baggage with them it would relieve the roads of handling such as might otherwise be left for the baggage or express car.

The route traversed was as follows:

City car to Pullman Station, Chicago, South Shore Lines (C., L. S. & S. B.) to South Bend.

Northern Indiana Lines (C., S. B. & N. I.) to Goshen.

Winona Interurban Railway to Peru.

Wabash Valley Route (Ft. W. & W. V. T. Company) to Fort Wayne.

Ohio Electric Railway to Lima.

Lima Route (Western Ohio & T., B. & S.) to Toledo.

Lake Shore Electric Railway to Cleveland.

Cleveland, Painesville & Eastern to Ashtabula.

Pennsylvania & Ohio Railway to Conneaut.

Cleveland & Erie Railway to Erie.

Buffalo & Lake Erie Traction to Buffalo.

Buffalo, Lockport & Rochester to Rochester.

Rochester, Syracuse & Eastern to Syracuse.

Oneida Railway to Utica.

Utica & Mohawk Valley Railway to Little Falls.

New York Central Railroad (steam) to Fonda.

Fonda, Johnstown & Gloversville (electric division) to Schenectady.

Schenectady Railway to Albany.

Albany Southern Railway to Hudson.

Hudson River Day Line steamer to New York.

The electric division of the New York Central could have been used from Yonkers to New York, or, as was learned after reaching the city, electric railways could have been used from Tarrytown to New York City. The first of these changes would have added 15 miles to the total electric railway mileage, while the latter would have added 25 miles.

The side trips were:

Detroit United line, Toledo to Mount Clemens.

Edinboro Route (Erie Transit Company) to Cambridge Springs.

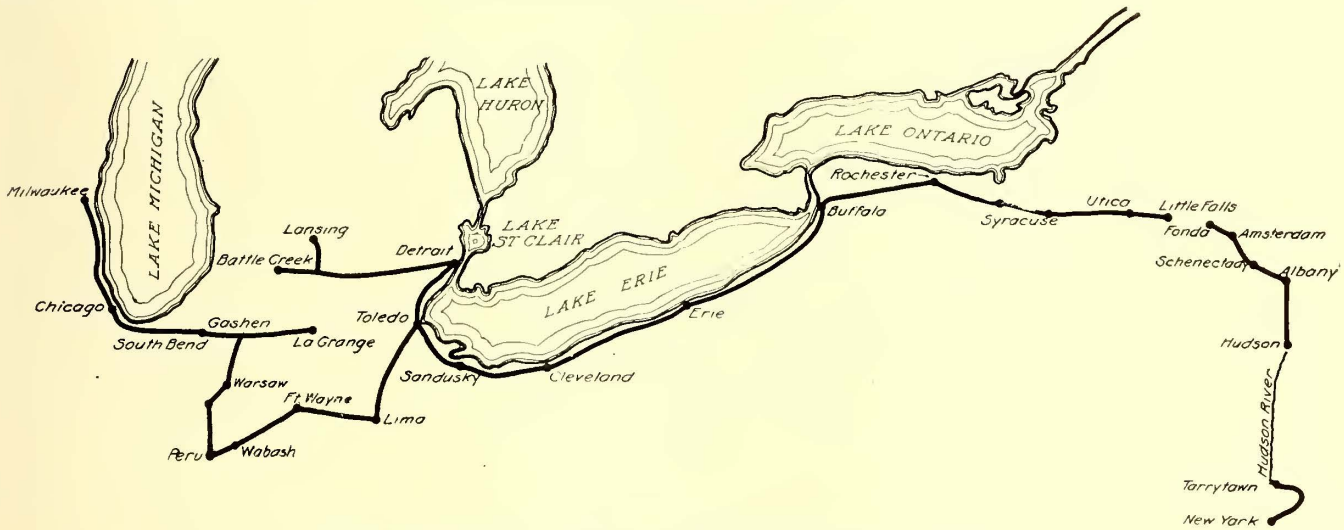
International Railway to Niagara and Olcott Beach.

United Railway, Albany to Troy.

Hudson Valley Railway, Troy to Glens Falls, Lake George and Saratoga.

Berkshire Street Railway, Hoosac Falls to Great Barrington.

In the matter of fares the average is practically 1¾ cents per mile. When compared with through rates on the steam roads there is little if any advantage in favor of the electric railway. When compared with local fares, as they should be, they are on nearly an even basis through the Central States In the Eastern States, however, where steam road fares vary from 2¼ cents to close to 3 cents, there is a decided advantage in favor of the electric railway.



Map Showing Route for Trolley Tour from Chicago to New York

ACCOUNTANTS' ASSOCIATION LUNCHEON

The American Street & Interurban Railway Accountants' Association will have a "get-together" luncheon at the Hotel Marlborough-Blenheim, Atlantic City, at noon on Oct. 11. A letter has been issued to members of the Accountants' Association, signed by President H. S. Swift and Secretary H. E. Weeks, urging a large attendance at the meeting and the luncheon, which is an annual feature of the conventions.

The Svenska Almenna Electricitiäts Aktiebolag, of Westeras, and the Siemens-Schuckert Company, Berlin, have contracted with the Swedish State Railway authorities to establish a large electricity generating station at Torju to supply the power for the trains on a section of the Swedish Railways.

FACILITATING TRAFFIC MOVEMENT IN INDIANAPOLIS FREIGHT HOUSES

A diagram of the freight houses used by the interurban lines reaching Indianapolis has been issued by the Indianapolis Traction & Terminal Company. It shows the ground floor plan of each of the three freight houses and the location of the doors at which shipments for the various points of destination should be unloaded. In order to avoid congestion a traffic rule is made for drivers of wagons. Copies of the diagram are being circulated in Indianapolis and vicinity. The diagram is reproduced herewith. A circular notice regarding the change in system reads as follows:

"On and after Sept. 20, 1910, all teams entering and reentering the traction terminal freight yards will enter from Ohio Street and move in a southerly direction to Wabash Street, thence in Wabash Street to Capitol Avenue. It is especially requested that shippers give instructions to their drivers to follow this rule in order to avoid the blockades and congestion in the freight house yards. Attention is also called to the diagram accompanying this notice, in order that wagons may be loaded in such a manner as to facilitate the movement of the teams in accordance with this rule.

"SUGGESTIONS TO SHIPPERS

"Send your shipments to the interurban freight houses at the earliest hour possible in the day. At present over 70 per cent of the teams reach the freight houses between 4 p. m. and 6 p. m. This causes congestion and a great deal of delay both to the shippers, teamsters and the interurban companies. Freight trains leave the terminal on nearly all the lines between 11 a. m. and 12 noon which could transport a great deal of the merchandise that now goes out on the late night and early morning trains, thereby reaching destination that much earlier.

"Shipping clerks and draymen should be instructed to load the drays so as to more readily and quickly reach the doors showing destination points on the diagram submitted. All teamsters should be instructed to enter the freight yards from Ohio Street on the north and not undertake to turn around when in the yard, but pursue a general southerly direction into Wabash Street and then west into Capitol Avenue. This will very much facilitate the movement of teams and avoid blockades that now sometimes occur.

"Consignees are urgently requested to remove their freight from the freight houses at the earliest hour possible in order to facilitate the handling of all the merchandise which is outward bound."

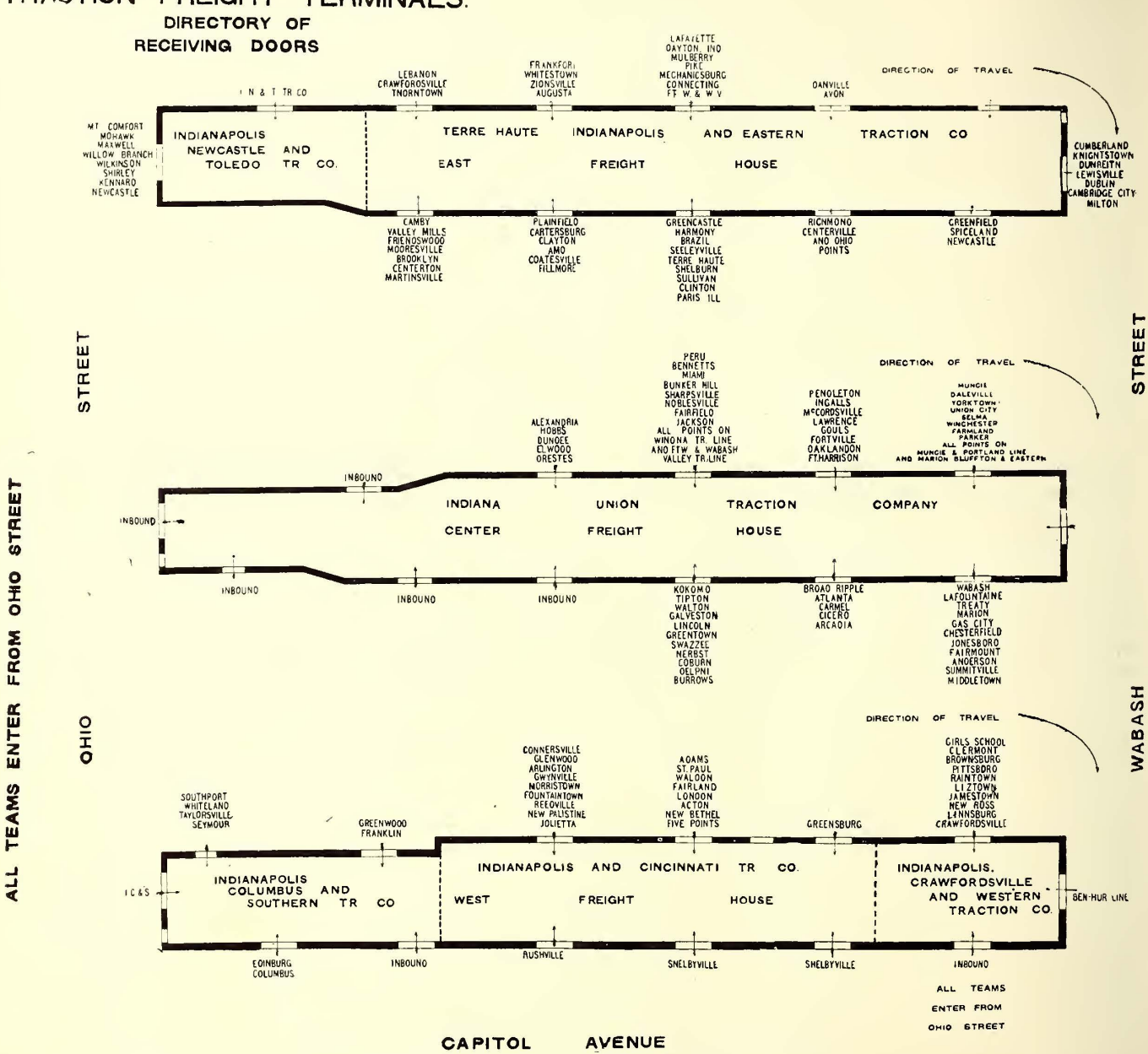


Diagram of Interurban Freight Houses in Indianapolis

REINFORCED CONCRETE POLES AT FORT WAYNE AND SYRACUSE

The Fort Wayne & Wabash Valley Traction Company has now in service about 125 reinforced concrete poles. These poles are used for the most part in city line work and straight track, but the company has placed some poles at corners to test their performance. About 60 additional poles are now being manufactured by the company. The following facts in regard to the poles are taken from a written communication presented at the last annual meeting of the Street Railway Association of the State of New York by one of the representatives of the Syracuse Rapid Transit Company.

The first reinforced concrete poles at Fort Wayne were installed about two years ago, and were two in number. Their satisfactory appearance and performance led the company to increase the number. The appearance of the concrete poles on the street is similar to that of wooden poles painted light gray. The spacing is from 100 ft. to 125 ft. and the same rake is given when setting as for wooden poles. The Fort Wayne & Wabash Valley Company has a large gravel bed on the same lot as its power house, and up to the present time all of its poles have been made by a contractor on this lot at prices ranging from 20 cents to 25 cents a foot, or $7.50 for a 30-ft. pole, depending upon the price of the reinforcing steel. A mixture of one part cement and four parts gravel is used, the gravel being of such a grade that the actual mixture is about one part cement, two parts sand and two parts fine stone. The reinforcing rods are ½-in. twisted bars, 30 ft. long, eight to a pole. The forms are made from three 30-ft. 2-in. hard pine planks, cleated across for the prevention of checking, with the chamfering strips nailed on the sides of the form. A complete form thus consists of three planks and two blocks for the ends. The forms are held together by ordinary bench clamps.

The Fort Wayne company has made a test of these poles as follows: A 40-ft. and 8-in. cedar pole and a 30-ft. reinforced concrete pole were set in concrete about 30 ft. apart and connected with a heavy span wire at the standard height for spans. The middle of this span was loaded with pig iron suspended in a large basket up to a weight of 980 lb., when complete failure of the wooden pole occurred. Before the weight dropped to the ground the concrete pole bent at the ground line and showed a crack on the back side ¼ in. wide down to the first reinforcing bars. After the removal of the load the concrete pole assumed its original form and it is now in use on a corner supporting a quantity of overhead special work.

The method of casting the poles is as follows: The forms are assembled on several blocks or sills to give a firm level bearing and 1 in. of concrete is placed on the bottom of the form throughout the length. Then three reinforcing rods properly spaced are laid on this concrete and more concrete is filled in until the forms are half full. Two more bars are now placed each 1 in. from the sides of the forms and concrete is filled to within 1 in. of the top of the forms, when the last three bars are placed. The remaining space is then filled with concrete and the top smoothed off with a float. As the form is filled the concrete is carefully troweled and spaded, but no other ramming is done and no surface finish is used. The holes for cross-arm and other bolts are made by iron rods which are run through the forms at the proper points and are taken out when the forms are removed. The poles is taken out of the forms three or four days after casting and is allowed to dry out for two weeks, after which it is ready for use.

By using a gin pole and a gin wagon the Fort Wayne company erects its 30-ft. concrete poles at a labor cost of $1.62, bringing the total cost of delivery and erection to $3.25, which compares very favorably with the cost for setting wooden poles.

The success of these poles has led the Utica & Mohawk Valley Railway Company to construct two poles of the same kind. In making this pole a mixture consisting of one part cement and two parts sand and two parts crushed stone was used. The length of this pole is 35 ft. and its calculated weight was about 3000 lb. In this connection it might be said that a 35-ft. iron pole weighs 1421 lb. when made of 8-in., 7-in. and 6-in. extra heavy pipe.

As only two poles were built by the Utica & Mohawk Valley Company, the cost was higher than for construction of a larger number. The cost of the latter in detail, based on a pole 35 ft. long, 6 in. square at the top, 11 in. square at the base and 10 in. square 8 ft. from the base, is estimated, per pole, as follows:

Cement, 5⅓ cu. ft. at $1.60 per bbl	$2.13
Sand, 10½ cu. ft. at $0.75 per cu. yd	.28
Stone, 10½ cu. ft. at $1.00 per cu. yd	.39
Steel, 237 lbs. at $0.016 per lb	4.60
Total material	$7.40
Labor	1.14
Total cost	$8.54
Or 24½ cents per foot.	

The company has found that these poles may be transported in the same manner as wooden or iron poles. It is necessary only to take care to avoid chipping of the corners. In future poles one of the reinforcing rods is to run out of the bottom and top of the pole to act as a lightning ground and protector.

The Utica & Mohawk Valley Railway Company has not built any more concrete poles than the two originally constructed, but is contemplating manufacturing about 50 of them soon. A few will first be made and given a thorough test. If these tests prove satisfactory the company will complete the order for the 50 poles.

REPORT OF THE MUNICIPAL RAILWAYS OF ZURICH, SWITZERLAND

The annual report of the Zurich municipal street railways for the fiscal year ending December, 1909, shows that the route length of track actually operated increased from 29.5 km (16.3 miles) to 31 km (19.2 miles) over 1908. These figures were equivalent to 1.65 km (1.01 miles) and 1.69 km (1.05 miles) per 10,000 inhabitants for the years 1908 and 1909 respectively. Practically all of the routes are double track. The gross earnings were 395,786 francs ($79,155), an increase of 13.3 per cent, and equal to 68.8 per cent of the total earnings against 72.8 per cent in the preceding year. The number of passengers per car-km was 4.29 (6.8 per car mile) and the gross earnings per car-km 51.37 centimes (16.4 cents per car mile). The operating expenses per car-km were 35.52 centimes (11.36 cents per car mile). The principal rolling stock consisted of 168 motor cars and 44 trailers. A rather striking feature of the latest trailers is that while the seating capacity of the car is only 16, each platform is intended for a maximum of 11 standing passengers. The car mileage in 1909 was 4,020,769 car-miles of which 260,623 car-miles were furnished by trailers.

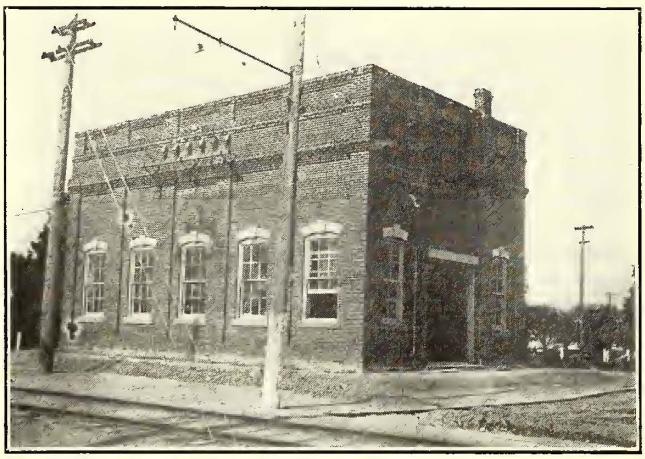
A popular innovation was the erection of a large number of signs at crossings and transfer points on streets where more than one car line is operated. These signs give the numbers of the routes and also show when the first and last cars leave for the opposite terminals. The signs are made up of enameled shields which may be removed for interchange whenever alterations are made in the service. The municipal railways opened three apartment houses for their employees during the year. The rents are very reasonable. In return for the reductions made, the tenants are obliged to be the first men on hand for emergency duty, as in snowstorms. In a paragraph of the report relating to traffic regulation it is stated that 966 reports were made to the police against obstructing vehicles and bicycle riders.

NEW TYPE OF SUBWAY CAR

A. B. duPont, formerly general manager of the Municipal Traction Company, Cleveland, Ohio, has designed and built a subway car which has recently been tested in Cleveland. The car has side entrances and is built with low dropped side sills so as to reduce the height of the cars. The trucks are under the raised ends of the sills.

WELLAND SUBSTATION OF THE NIAGARA, ST. CATHARINES & TORONTO RAILWAY

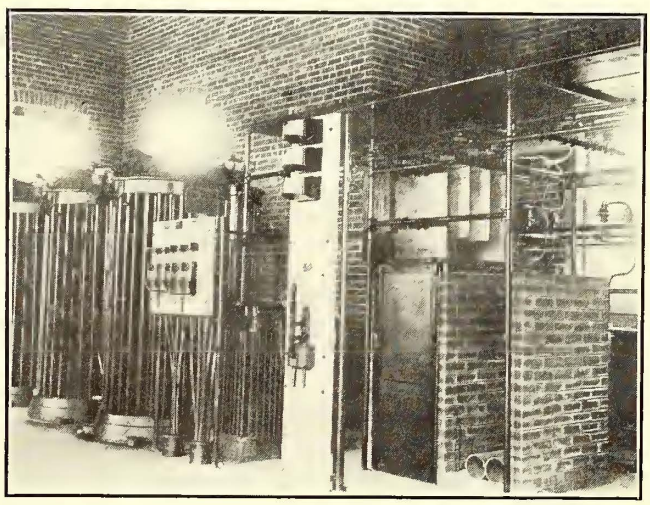
A new substation has recently been erected and put into operation on the Welland branch of the Niagara, St. Catharines & Toronto Railway, at Welland, Ont. The building is entirely fireproof with the exception of the doors and the windows, which are of wood. The main part of the structure is of red brick. The sills and arches of the windows are of concrete. The roof is of concrete reinforced with Trussit manufactured by the General Fireproofing Company, Youngstown, Ohio. It



Welland Substation of the Niagara, St. Catharines & Toronto Railway

is supported on I-beam purlins. The main floor is of concrete reinforced with expanded metal and it is also supported on I-beams. The building is large enough for two units, but at present only one is required. A neat appearance has been given to the substation interior by placing the high and low-tension cables of the transformers and rotary converters almost entirely below the main floor in the basement.

All of the electrical apparatus was made and installed by the General Electric Company, Peterboro, Ont. It includes one 500-kw, six-phase, 600-volt, 500-r.p.m. rotary converter; three single-phase, oil-cooled transformers, each rated at 185 kw



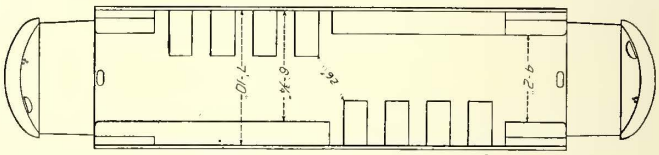
High-Tension Section of the Welland Substation of the Niagara, St. Catharines & Toronto Railway

and reducing the transmitted current from 12,500 volts to 430 volts with 4½ per cent taps in the primary and ⅓ and ⅔ starting taps in the secondary; one 75-k.v.a. oil-cooled reactance; and a 15,000-volt K-2 automatic oil switch installed in a brick cell on the station floor in front of the electrolytic lightning arresters. The disconnecting switches on the line entering the building are over a platform. The a.c. panel has a 12,000-volt switch-operating handle with special trip coils in addition to one voltmeter, one ammeter and one power factor indicator. The current transformers are in the basement. The potential transformers are supported by a pipe framework at the right of the a.c. panel. The d.c. switchboard consists of three panels, one for the rotary converter and the other two for feeders. One feeder goes north toward Thorold and the other south toward Port Colborne, on Lake Erie. A section break is placed in the trolley wire just outside the station.

The power for operating the substation machinery is supplied by the Electrical Development Company, Niagara Falls, Ont., but the transmission line was constructed by the railway company on its own right-of-way between Thorold and Welland, a distance of 11 miles. The substation and the transmission line were designed by W. H. Horton, electrical engineer for the railway. Mr. Horton also superintended the construction.

NEW SEATING PLAN FOR THE PHILADELPHIA PAY-WITHIN CARS

The next lot of pay-within cars which the Philadelphia Rapid Transit Company will place in service will be provided with a combination of longitudinal and cross seats, designed by C. O. Kruger, president and general manager of the company. As shown in the acompanying plan, the arrangement of seats on each side consists of a short longitudinal seat, four transverse seats and a long longitudinal seat. These two types of seats



Philadelphia Pay-Within Car with Combination Seating Plan

are arranged in the opposite order on the other side of the car, so that with a car 7 ft. 10 in. wide it has been possible to secure an aisle fully 26 in. wide at the narrowest point and 4 ft. 2 in. wide opposite the narrow platforms. This arrangement should relieve the congestion at the ends and even in the center of the car, so that passengers will have little difficulty in leaving by the front door. The rear platform is used as an exit only in extreme cases, as for cripples or aged people. The compromise seating plan described will accommodate 16 persons in the cross seats and 28 in the longitudinal seats.

THE PHILADELPHIA INVESTIGATION

The Pennsylvania State Railroad Commission reports that the investigation being conducted for it of the Philadelphia Rapid Transit system by Ford, Bacon & Davis is progressing satisfactorily. The preliminary work included the preparation of the details of the plan of report together with a general study of the situation and a comparison of the Philadelphia operations with those of other large cities. There is to be a systematic checking of the traffic and service by lines, principally at the rush hours, from observations taken by the experts' own force on the street and on cars. This force will also obtain by inspection a check of the car assignments and physical condition of the cars. The general passenger count will form the basis largely of the expert study of traffic and service. This comprehensive count of all of the lines of the system involves a considerable amount of detail comprised in the securing and training of checkers, preparing blanks, diagrams, etc. From these records will then be prepared the diagrams which will present a picture of the traffic and service for the entire city. A force of about 40 men has been employed.

The report on cars is well under way. In it will be included all of the information on the subject of cars, and, in brief, it will be practically a chapter on the car question which can be added to the general report as a part of the latter.

COMMUNICATION

THE ARNOLD PITTSBURGH REPORT

PITTSBURGH, PA., Sept. 19, 1910.

TO THE EDITORS:

We have noted Mr. Bion J. Arnold's letter of Sept. 3 in your issue of Sept. 17, but cannot agree with his new results. As every railway manager knows, car-mile records are used for comparison from day to day as a means of quickly noting any change in traffic on a line, and when so used are fairly accurate, since there is seldom a change in the car-mile unit in one day. Mr. Arnold, however, has made use of this analysis *for a long term of eight years*, and his conclusions, therefore, are incorrect, because of the great change in the car-mile unit during that time.

There is quite a difference, it seems to us, between "car unit" or "average number of seats" per car and "car-mile unit" or "average number of seat-miles per car-mile" in connection with a company having many sizes of cars, such as ours. The latter unit takes into account the number of miles each size of car operates, while the former disregards this very important consideration and can be correct only if every type and size of car happens to be operated the same number of miles per day. Mr. Arnold, in his new tables, in his letter of Sept. 3, has shifted from a "car-mile unit" to a "car unit," and his results are, therefore, incorrect.

For example, suppose a motor car seating 48 people runs 155 miles per day, and a trail car seating 26 people runs 25 miles per day, it is not right to average the seats of the two cars to arrive at the average seat-miles per car-mile. If we do this we shall get the erroneous result of $\frac{48+26}{2}=37$ as the average seating capacity per car, whereas the correct result is $48\times155=7440$ seat-miles for the larger car and $26\times25=650$ seat-miles for the small car, a total of 8090 seat-miles for the total of $155+25=180$ car-miles operated, or an average of $8090\div180=45$ seat-miles per car-mile. Mr. Arnold's method gave 37 seats, or an error of about 18 per cent.

Even with this incorrect method of getting his new "car unit," he admits that his original report needs a 5 per cent correction wherever car-miles are used in curves, data or analyses and proceeds to show that a 20 per cent correction will be needed if our statement is correct that the car service in 1908 was as good as in 1902. If he will read our former letter again he will find that we really did not say that 20 per cent was the exact correcting factor for his data for 1908; we did say that if the "increased seating capacity of the *cars operated*" be considered, the service of 1908 will be found equal to that of 1902.

The facts are there are a number of underlying conditions which Mr. Arnold did not take the trouble to investigate before making his report, and in arriving at a figure to represent the average effective seating capacity of our cars per car-mile, in his letter of Sept. 3, he has not confined himself to the actual "cars operated."

(a) He treats our summer cars, which operate only four months of the year, as if they were operated all the year round.

(b) He pulls down the average number of seats in the summer months by crediting the service at that time with a lot of small winter car bodies which were in the barn, having been replaced by summer cars.

(c) He gives no more value to a large car, operating all day, than to a trail car operating only two trips per day.

(d) He apparently does not know—or, at least, he does not give us credit for the fact—that during the panic of 1908 many of the small cars and trailers were left in the barn and not operated, so that the car-mile unit was larger than at any time previous.

(e) He did not investigate the service at the rush hour, the only time after all at which there has been any cause for complaint; had he done so he would have found a greater effort in later years to distribute the car-mileage to suit the traffic, a much larger number of cars being used in the rush hour than formerly. In this connection the facts are:

First.—The cars daily leaving the city between 5 p. m. and 6 p. m. in 1908 were more than 25 per cent greater in number than in 1902, and the effective seats per car operated were more than 15 per cent greater, giving a net increase in excess of 40 per cent above 1902.

The increase in traffic between the years mentioned was less than 20 per cent.

Which year has the better service in the peak?

Second.—The corresponding figures for 1909 are an increase in cars of more than one-third over 1902; an increase in seats per car of 20 per cent, or almost 60 per cent more seats between 5 p. m. and 6 p. m. than in 1902.

The increase in travel between the years mentioned was less than 25 per cent.

How much better is the service of 1909 than 1902 in the peak?

It is true that since 1902 our evening rush hour has become more pronounced but to no such extent as the increase in cars shown above.

We regret exceedingly the necessity for writing this as well as our former letter. It has been done solely for the purpose of attempting to correct the erroneous impression circulated among railroad men that we had adopted such a short-sighted policy as a gradual curtailment of service through a period of years.

Any such statement is incorrect, and if Mr. Arnold had just remembered to consider the following, we believe he could not have done otherwise than agree with us:

(a) The great change in the size of the car operated until at the present time there are more than 350 large, double-truck cars on the system, as against only 15 in 1902.

(b) The effort made in later years to change the headway to suit the traffic conditions, resulting in a very greatly increased service during the evening rush hours.

(c) That the length of time each size of car is operated should be considered in any effort to arrive at a definite figure for the effective seats per car-mile in any year.

(d) That at least the summer cars stored in the barn eight months of the year, and about 500 28-seat winter cars stored in the barns in the summer, should not be considered as if operating the year round.

PITTSBURGH RAILWAYS COMPANY,
by J. H. REED, Vice-President.

REPORT OF RHODE ISLAND COMMISSIONER

The annual report of Joseph P. Burlingame, railroad commissioner of Rhode Island, covering the year ended Dec. 31, 1909, shows that total receipts of street railway companies from all sources were $5,629,099. Total expenditures were $4,184,658, leaving net earnings of $1,444,441. As compared with the report for the previous year, these figures show a decrease in total receipts of $37,104 and in expenditures of $319,301. The increase in net earnings was $282,197. The report states that the street railways followed the policy of attempting to retrench in expenses during the year and that no extended development took place. Of the total receipts the passenger department furnished $4,257,098 and the freight department $210,120.

The 12 street railway corporations transacting business in the State reported 370 miles of road, or 406 miles of single track. The total number of cars was 936 motor cars, 75 freight cars and 83 other cars. There was a decrease of 2 motor cars, 9 freight cars and an increase of 2 other cars. The total number of passengers carried was 84,565,671, a decrease from the previous year of 2,462,183. All but two companies reported decreases in the number of passengers carried. The number of employees was 2602.

CENTRAL ELECTRIC ACCOUNTING CONFERENCE

The fourteenth regular meeting of the Central Electric Accounting Conference will be held at the Hotel La Salle, Chicago, Ill., on Sept. 24, 1910, at 10 a. m. The program is as follows:

Report of committee on uniform comparative statements, by W. B. Wright, chairman.

Paper—"Uniform Statistics," by J. D. Maynes, auditor of receipts, Illinois Traction System.

General discussion of the following questions:

"What do you consider the advantages or disadvantages of using fare registers in the cars as compared with the use of some form of cash-fare receipt?"

"What particular difficulties or inconsistencies have you encountered in the preparation of annual reports to commissions?"

"Do you consider it more practical to compute interurban passenger earnings from reports of tickets sold or by using the values of tickets which have been lifted by conductors, and why?"

"What do you consider the advantages or disadvantages of an interline baggage check having a separate coupon for each road?"

"In what respects do you consider the unit type of way bill superior to the so-called 'blanket' way bill generally used by steam railroads?"

At 1 p. m. the meeting will adjourn to a special car of the Chicago & Milwaukee Electric Railroad. Luncheon will be served on the car, and the program will be completed as the car proceeds to Milwaukee.

REPORT OF LIVERPOOL TRAMWAYS

The annual report of the Liverpool Corporation Tramways for the year ended Dec. 31, 1909, shows traffic revenue of £561,271 and gross revenue of £592,728. Operating costs, including rental of leased lines, amounted to £400,206. The gross profit of £192,522 was apportioned as follows: Interest, £50,919; sinking fund and repayment of loans, £59,249; reserve, renewal and depreciation account, £54,903; contribution in aid of the general rate, £27,451. The number of passengers carried was 121,532,940, a decrease of 3 per cent from the previous year. The number of car-miles run was 11,952,373. The car-mile earnings were 11.27d. in 1909, as compared with 11.04d. in 1908. Operating costs per car-mile in 1909 were 8.036d.

The number of passengers carried under the through-ticket arrangements between the Liverpool Overhead Railway Company's system and Garston, which became effective on July 12, 1909, was 1220, yielding a revenue of £40, of which the Liverpool Corporation Tramways received £12 and the Liverpool Overhead Railway £28.

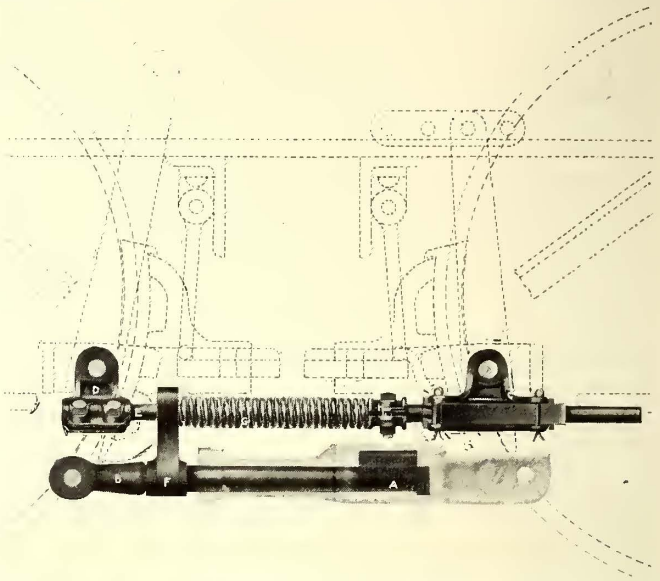
ADDITIONAL EXHIBITORS AT ATLANTIC CITY

The following companies have reserved exhibit space at the Atlantic City convention. This list is supplementary to the list of exhibitors published in the Electric Railway Journal of Sept. 17, p. 438, and includes all companies to which space was assigned between Sept. 2 and Sept. 20.

Space, No.	Name.	Location.
606	American Rolling Mill Co.	Middletown, Ohio
686	Best Manufacturing Co.	Pittsburgh, Pa.
838	Buffalo Foundry & Machine Co.	Buffalo, N. Y.
540	The Crocker-Wheeler Co.	Ampere, N. J.
937, 939	C. W. Hunt Co.	New York City
821	H. R. Langslow Co.	Rochester, N. Y.
517	Leeds & Northrup.	Philadelphia, Pa.
941, 943	Meyer Safety Guard Co.	Omaha, Neb.
634	The Alexander Milburn Co.	Baltimore, Md.
559	W. K. Mitchell Co.	Philadelphia, Pa.
687	Morgan Crucible Co.	New York City
A, B, C,	Elmer P. Morris & Co.	New York City
810	National Lead Co.	New York City
685	Railway & Traction Supply Co.	Chicago, Ill.
835	Railway Improvement Co.	New York City
812	Wright Wrench Co.	Canton, Ohio

A SHIM TYPE BRAKE SLACK ADJUSTER

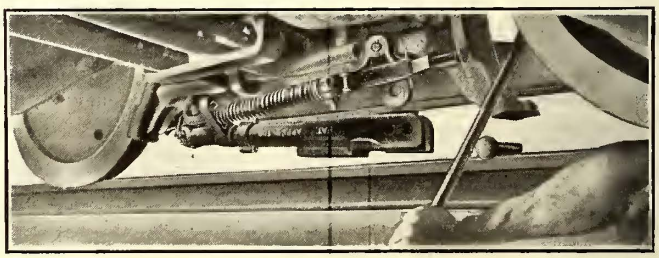
Since July, 1909, the New Jersey & Hudson River Railway & Ferry Company, Edgewater, N. J., has had in service on all of its cars the Sauvage automatic brake slack adjuster which is being manufactured by the Standard Coupler Company, New York. The operating conditions on the railway named are unusually severe, as part of the route is made up of steep grades and curves up the Palisades, opposite New York, while the cars used are almost as heavy and as fast as the average



Application of the Automatic Brake Slack Adjuster to an Electric Railway Truck

interurban rolling stock. The new adjusters have, therefore, been subjected to very hard tests, especially during the winter. As the results they gave have been satisfactory to the railway, it may be of interest to mention some of the improvements which they have effected in the braking maintenance before describing the mechanism in detail.

In the first place, these adjusters made it possible to change from a three-day to a weekly brake inspection, and the average mileage between inspections was brought up to 1800 miles. Further, the piston travel of practically all the cars was standardized for 5½ in. to obtain uniform braking effort in place of having a piston travel which varied from 6 in. to 11 in. The new apparatus weighs only 12 lb. per truck more than the original turnbuckle equipments, and requires no attention whatever, whereas the turnbuckles required frequent adjustment and had to be rethreaded every year. The effect on brake



Changing Shoes on a New Jersey & Hudson River Car Equipped with Brake Slack Adjusters

shoe life has also been very favorable. Formerly, in the winter service brake shoes had to be discarded after 15 days' service, during which they made an average of 3500 miles. Last winter the shoes were replaced about every 25 days, which represented an average of 5000 miles. Of course, the latter figure is much lower than the life obtained on roads with more favorable topographical conditions, but it must be borne in mind that on this particular railway it represents a reduction of 50 per cent to 60 per cent in brake shoe cost.

The lettered engraving on page 476 shows the principal parts of this brake slack adjuster as installed. The rod *E* is connected to the live lever fulcrum pin by the bracket *D*. The friction clamp *C* is connected to the pin of the dead lever fulcrum; it has a slot made larger than the fulcrum pin by twice the distance of the required brake shoe clearance. Thus, if 1/16-in. brake shoe clearance is needed, the slot is ⅛ in. larger than the fulcrum pin. The push bar *B* is connected to the bottom of the live lever and its barrel *A* is connected to the bottom of the dead lever. The second hole in the barrel provides for the take-up necessary after a wheel has been turned down. The spring *G*, which is placed on the rod *E*, is kept in tension by the clamp *H*. The pushing of this spring against the yoke *F* keeps the shoes off the wheels and the levers in full release. On trucks with beamless brakes the spring, spring clamp and yoke are not necessary, but in the New Jersey & Hudson River installation they are installed on this style of truck as well as on those which have no truck lever release springs to insure the finest possible adjustment.

When the brakes are applied the rod *E* pulls through the friction clamp *C* if the total clearance between the opposite shoes and the wheels is greater than the clearance in the fulcrum pin slot. When the brakes are released the dead lever fulcrum pin drops back the allotted distance provided by the slot in the friction clamp. This slot prevents the taking up of too much slack. The shoes are now off the wheels for the predetermined clearance, and are held in position by the rod *E* and the clamp *C*. Consequently, when the brakes are in the release position the shoes are not tight on the wheels, so that all wear from dragging is eliminated.

The additional movement of the live lever, due to excessive slack, pulls the lower bar *B* out of the barrel *A*. Upon this, one, two or more of the shims riding on the bar drop behind it to make a solid continuation of the bar. Since the bar cannot recede, the slack is taken up absolutely by the shims. The dropping of shims is continued automatically whenever any additional wear of the shoes takes place. In this way the brakes are adjusted in accordance with the operating conditions with an exactness which would be impossible if the adjustment had to be made for standing piston travel. All other styles of release springs heretofore provided for brake beams are dispensed with where this shim adjuster is used.

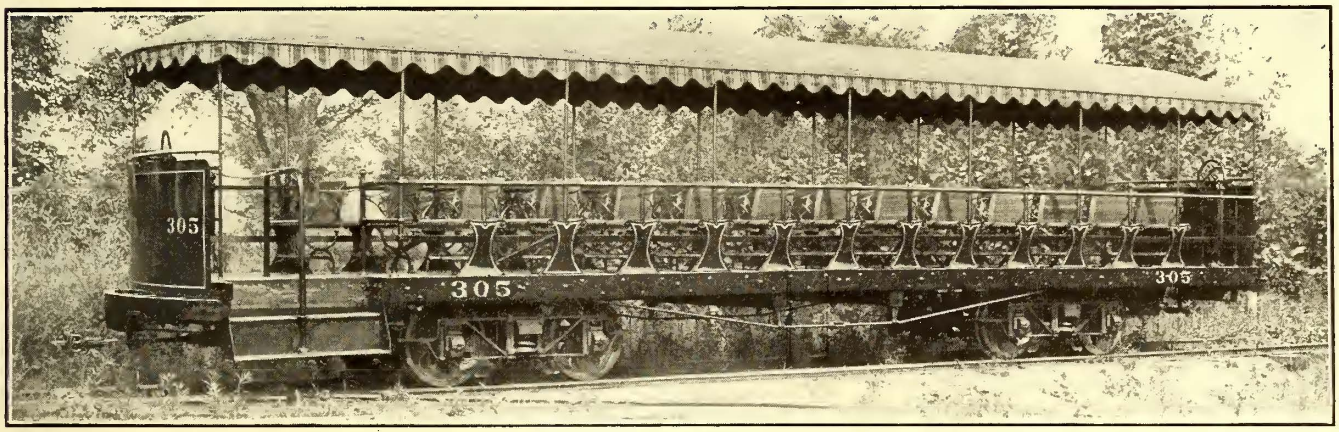
The only attention which this device requires is the simple process of installing a new shoe. To do this the pin at the bottom of the dead lever is removed, the barrel is turned upside down and pushed back on the bar to restore the shims to their original position, and then the friction clamp is pushed back on the rod with a pinch-bar to take out the worn shoe, as illustrated. The new shoe is then inserted, the barrel is turned right side up and the pin replaced, thereby completing the process.

When the piston or chain travel (as in the case of hand-braked cars) does not exceed the predetermined limit, the adjuster mechanism is at rest. The working parts of the adjuster are fully protected against the entrance of foreign substances and require no oil or grease lubrication. The shims are of specially treated, non-corroding steel, and are thoroughly coated with flaked graphite. All parts are made of malleable iron or forged steel, in accordance with the service.

MOONLIGHT TRAIL CARS

The Wichita (Kan.) Railroad & Light Company has received from the Danville Car Company four open cars of the unusual design shown in the accompanying illustration. These are intended for trailer service only and are known as moonlight excursion cars. The seating capacity of 48 is furnished by 24 reversible ash-slat seats arranged 12 on each side. The car body is 40 ft. 6 in. long over the crown piece and 7 ft. 11¾ in. wide over the sills. The width of the car body over the posts at the seat ends is 8 ft. 6 in. The bottom framing consists of 4¾-in. x 7¾-in. long leaf yellow pine side sills, which are plated with ⅝-in x 8-in. steel; 11-in. white oak crown pieces; 3½-in. by 4 9/16-in. crossing of white oak; Brill angle-iron bumpers to protect the crown pieces. The step side of the car is supported by Z-bar knees. The floor boards are of yellow pine. The roof consists simply of yellow and brown duck, supported by 1¼-in. pipe, as illustrated.

The steps are double and are supported by wrought-iron hangers. A dividing rail is installed on each platform. Brill angle-iron buffers are fastened to the car sills and center knees. The sills and the center knees project beyond the crown pieces, thereby affording secure support for the buffer. To do away with mortising the panels to the sill malleable wrought corner seat-end panels are used; these are secured to the sills with lag screws and to the seat rails with joint bolts. The cars are mounted on Brill 420 trailer trucks, having a wheel base of 4 ft. 6 in., 30-in. diameter cast-iron wheels and 4¼-in. diameter axles. The radius of the shortest curves on which these cars will be operated is 35 ft.



Moonlight Trail Car for the Wichita (Kan.) Railroad & Light Company

ELECTRIC WELDING IN PHILADELPHIA

The electric welding process devised for cast steel by the Philadelphia Rapid Transit Company, which was described on page 356 of the ELECTRIC RAILWAY JOURNAL of Feb. 26, 1910, has now been in use for over 18 months with uniform success. By means of a water rheostat, the ordinary trolley potential is reduced to about 20 volts. The arc can be easily manipulated for a great variety of welding purposes, such as relining or filling worn holes, thickening the worn ends of brake beams, building up armature shafts and repairing truck frames without disassembling, etc. The welding flux is a secret composition discovered by Harry Branson, superintendent of rolling stock and equipment. The arc has also been found equally convenient for cutting metal. Owing to its intense whiteness, each operator is provided with a metal hood, which has a colored lens prescribed for this work by a Philadelphia oculist.

News of Electric Railways

Proposal from Hudson & Manhattan Railroad for West Side Subway in New York

William G. McAdoo, president of the Hudson & Manhattan Railroad, which operates under the Hudson River between New York and New Jersey, has sent to the Public Service Commission of the First District of New York a proposal for the construction by that company of a tunnel from Broadway and Thirty-third Street, near the new terminal of the Pennsylvania Railroad, south along Broadway to Union Square and thence under University Place, Wooster Street and Church Street to connect with the terminal station of the Hudson & Manhattan Railroad at Church Street, Cortlandt Street and Fulton Street. He suggests that the proposed road be constructed on the city's credit: that the Hudson & Manhattan Railroad equip and operate the line under a lease for a reasonable term of years at sufficient rental to pay interest on all bonds issued for the purpose, and that a sinking fund be established sufficient in amount to amortize the cost of the line within a reasonable period. After suggesting to the commission that it lay out a line covering the route previously mentioned, the company in its letter continues substantially as follows:

"This company will immediately, upon preparation of the plans and specifications therefor, and providing the same are satisfactory to our engineers, submit an offer to the city to construct said line and to operate the same. Said offer will be to the following effect: That the said line shall be constructed upon the city's credit, and that this company will equip and operate the same under a lease, for a reasonable term of years, to be agreed upon, at a rental sufficient in amount to pay full interest on all bonds issued by the city therefor, and a sinking fund sufficient in amount to amortize the cost within some reasonable period. We are also willing to agree that the city may participate, on some reasonable basis, in the net earnings from the operation of said line.

"Under this plan a sufficient rental would be immediately assured to the city, so that under the recent constitutional amendment the bonds issued therefor can be excluded in determining the city's debt limit. We believe that this line, operated in conjunction with our Hudson tunnel facilities, and drawing a large traffic from that source, will be self-sustaining from the beginning. Any objection that this plan would involve the devotion of the public credit and important streets to a private undertaking is fully met by the fact that the city, in the franchises covering the Sixth Avenue and Grand Central extensions, has reserved the right to take over those lines at any time after the expiration of 25 years. As any contract entered into under this plan would, in accordance with the provisions of the Rapid Transit Act, reserve to the city the right to take over the road constructed under it at any time after the expiration of 10 years, the city's interest would be adequately protected.

"The effect of the carrying out of this plan would be this: At the end of 25 years the city could take possession of a complete West Side line from the Grand Central Station to Cortlandt Street; whereas under the lease of the present subway to the Interborough Rapid Transit Company the city cannot get possession until the end of 75 years.

"As before stated, this company already has the right to construct an extension from Thirty-third Street and Broadway to the Grand Central Station. It also has constructed at Thirty-third Street a large and commodious underground station, which could be connected with the proposed new line, thus providing unusual accommodations at that point. At the Hudson Terminal there is already built one of the most complete and satisfactory underground railroad stations for rapid transit uses in the world. The new road could be connected with the Hudson Terminal in such way as not to interfere with the proposed Broadway-Lexington Avenue line through the lower end of Church Street. Having these terminal facilities all prepared, and having already the necessary power houses and organization, this company could construct and put the proposed road into operation in a very short time—probably within two years after the work is authorized.

"This being done, a new rapid transit line, running through the heart of the hotel, theater, shopping, and wholesale dry goods districts and extending from the Grand Central Station to the Hudson Terminal, would be in operation within about two years. At Thirty-second or Thirty-third Street and Broadway a convenient underground foot passage could be constructed connecting the new Pennsylvania Railroad station with this line.

"It is our idea to operate the road from the Grand Central Station to the Hudson Terminal as a through route, with a quick service and every convenience that the best of modern appliances and experience can provide.

"We have not, of course, attempted to go into detail, and are submitting to you simply the general features of the plan. We believe that it offers the best and promptest solution of the present rapid transit need for the West Side. It does not interfere with any other projected lines along the West Side, such, for instance, as the Seventh Avenue line, leaving the field open for the construction of that or any other West Side line, whenever opportunity presents itself.

"I may add, in conclusion, that should this company become hereafter the successful bidder for the operation of the proposed Broadway-Lexington line, when it is completed we would be willing to consider the Grand Central-Hudson Terminal line herein proposed as a West Side connection, to be operated in conjunction with the Broadway-Lexington system, and for a single rate of fare."

The line proposed by the Hudson & Manhattan Railroad would connect at the Grand Central Station with the New York Central & Hudson River Railroad, the New York, New Haven & Hartford Railroad, the Third Avenue elevated line of the Interborough Rapid Transit Company and the subway line of that company. At Thirty-third Street and Broadway it would connect with the present line of the Hudson & Manhattan Railroad, the Pennsylvania Railroad, the Long Island Railroad, the Metropolitan Street Railway and the Sixth Avenue elevated line of the Interborough Rapid Transit Company. At Lexington Avenue and Forty-second Street it would connect with the proposed Broadway-Lexington Avenue subway. At the Hudson Terminal it would connect with the proposed Broadway-Lexington Avenue subway.

Appeal of Boston & Eastern Electric Railroad for Rehearing

The Railroad Commission of Massachusetts has heard the appeal of the Boston & Eastern Electric Railroad from the decision of the majority of the members of the commission that action on the petition of the company to construct an electric railway between Boston, Lynn, Salem and Beverly should be postponed until the Legislature of 1911 has made known its attitude regarding the electrification of the steam railroads operating into Boston. Charles H. Baxter conducted the appeal of the company for a rehearing. Mr. Baxter said in part:

"We have asked you to reconsider your finding because we believe that an error in law has been made, and that chapter 630 of the Acts of 1910 has not been properly construed by this board. This board has undoubtedly been granted wide discretionary powers, but as in the case of all public boards, there are certain bounds set by existing laws which control the actions of this commission, and the Legislature that created this board is at all times the superior authority. If these bounds did not exist, the act creating this board would be unconstitutional, as it would amount to the delegating of the power to legislate, which the constitution does not permit.

"The Legislature in 1906 passed an act authorizing the formation of the Boston & Eastern Railroad, and by the passage of that act the Legislature meant that such a type of railroad should be built in Massachusetts. The Legis-

lature has gone further. By chapter 630 of the Acts of 1910, the company is expressly authorized to construct and operate a tunnel under the harbor.

"The Legislature and Senate clearly made it known to you and to the public that they desired to have this road built, and built without delay; that they did not desire to have any postponement of this matter until 1911.

"I believe it is the duty of this commission to examine what the Legislature meant by chapter 630 of the Acts of 1910. It is my opinion that the majority of the commission in their memorandum handed down on Aug. 22 have acted in direct violation of the will of the Legislature.

"Your memorandum states that a majority of the board is of the opinion that further consideration of the application of the company for a certificate of exigency should be suspended until the General Court of 1911 shall have made known its opinions with respect to metropolitan improvements.

"The Legislature considered these proposals, and the Legislature and the Governor decided that there was no reason for any such delay, and that the Boston & Eastern Railroad would in no way interfere with any of the projects, as stated in the memorandum.

"We therefore feel that a majority of this commission has vetoed the direct will of the people of Massachusetts as expressed to them through the Legislature and the Governor of this Commonwealth. You have misconstrued the action of the Legislature and we ask you to right the error and use your discretionary power as to the issuing of the certificate as intended.

"If you are to put off the building of this great enterprise until 1911 because of questions that exist now and are not to be decided until then, there is no reason in the world why in 1911 the matter should not again be put off until 1912 on the ground that in 1911 questions may arise that cannot be decided until 1912, and so on for years to come.

"You must realize, gentlemen, that the position taken by the majority of the board is absolutely unsound, and we feel that it is perfectly tenable for this board to change the opinion, as expressed on Aug. 22, 1910, and to change it without loss of dignity.

"We contend we have presented to you a sound legal reason whereby your memorandum of Aug. 22, 1910, may be reversed, and whereby you may follow the wishes of the Legislature and take immediate action on the petition before you, and we ask you in fairness to us, and in fairness to the people whom we desire to serve, that you give this matter your immediate consideration."

Columbus Strike

By consent of both parties the temporary order granted by E. B. Dillon, judge of the Common Pleas Court at Columbus, to restrain the trainmen of the Columbus Railway & Light Company from interfering with the operation of cars was continued indefinitely by the court on Sept. 17. The order was granted on the application of the company, and is said to have contributed materially in preserving order.

Petitions have been in circulation to ask Governor Harmon to remove Mayor Marshall from office for incompetence and for not suppressing rioting in connection with the strike. They were to have been presented to the Governor during the week ended Sept. 17, 1910, but friends of the Governor are said to have induced the leaders in the movement to delay presenting the petition on the ground that it would embarrass the Governor in his campaign for re-election.

Karl Webber, prosecuting attorney of Columbus, is investigating the riots with a view to presenting evidence to the grand jury for consideration. He will be assisted by Attorney General Denman, at the request of Governor Harmon. Mr. Webber has assured the Governor that his department will prosecute the cases vigorously and with dispatch.

Mayor Marshall addressed a second letter to Governor Harmon on Sept. 13, 1910, in which he reiterated his belief that a special session of the Legislature should be called to enact laws that would make arbitration compulsory in the case of differences between a public service corporation and its employees. The Governor did not direct a reply to the Mayor in answer to this letter, but issued a statement in which he said that eminent legal authorities believe that the present arbitration laws go as far as the constitution permits. He quoted section 1 of Article IV of the Laws of Ohio, which follows:

"The General Assembly may establish courts of conciliation and prescribe their powers and duties, but such courts shall not render final judgment in any case, except upon submission by the parties of the matter in dispute and their agreement to abide by such decision."

E. K. Stewart, general manager of the company, states that the position of the company is unchanged. The company has no objection to its men becoming members of any body that may be organized among the employees, but no organization of employees will be recognized by the company. With the exception of perhaps 50 men, the company, it is stated, would be willing to re-employ old employees, but they would have to take such runs as are open. A few more men have deserted the union and returned to work, and quite a number of the men engaged to operate cars during the strike have left the city, and their places have been filled with new men who have accepted permanent employment.

At a meeting of delegates from the various labor organizations on Sept. 13, 1910, it was definitely decided that it would be inadvisable to call a general strike out of sympathy for the street railway men.

John F. Brady, one of the men engaged to operate cars during the strike, who was accused of injuring two women and a child while shooting at strike sympathizers, several weeks ago, was arrested in Cleveland on Sept. 13, and returned to Columbus. He was bound over to the grand jury on the charge of shooting to kill. Mr. Brady claims that he left Columbus after the shooting to escape the possible vengeance of a mob, and not because he feared the legal action that might be taken.

Dynamite was exploded under three cars on the evening of Sept. 18, 1910, one on the South Side, one on the West Side, and another at Bexley, where a car was dynamited two weeks before. The car at Bexley was badly shattered, but no one was seriously injured. The other cars were only damaged slightly.

Michigan Central Railroad Establishes Electric Freight Service in Detroit Tunnel.—The Michigan Central Railroad established freight service with electricity as motive power in its tunnel under the Detroit River between Detroit, Mich., and Windsor, Ont., on Sept. 17, 1910.

Council of Toronto Adopts Municipal Ownership Resolution.—The City Council of Toronto, Ont., has accepted that part of the report of the committee on rapid transit of the Council which was submitted to it with the approval of the Board of Control and has adopted a resolution which authorizes the Board of Control to negotiate for the purchase of the property of the Toronto Railway. It is further provided in the resolution that if a basis of purchase agreeable to the Council should be arrived at legislation shall be applied for to enable the city to acquire the property.

No Special Council Meeting to Consider Chicago Consolidation Traction Ordinance.—Mayor Busse of Chicago has announced that no special meeting of the City Council of Chicago will be called before the Council convenes in regular session on Oct. 3, 1910, to act on the proposed ordinance to authorize the Chicago Railways to take over the Chicago Consolidated Traction Company. The principal features of the ordinance as approved by the committee on local transportation of the City Council on Aug. 18, 1910, were published in the ELECTRIC RAILWAY JOURNAL of Aug. 27, 1910, page 340.

Tentative Plan for Subway Loop in Boston.—A project for the construction of a subway loop under the West End of Boston in connection with the termination of the Cambridge Subway at Park Street is being advocated by real estate interests centering at Scollay Square and Bowdoin Square. The movement is headed by E. D. Codman, and tentative plans have been prepared by Guy C. Emerson, former superintendent of streets of Boston, for submission to the joint board consisting of the Massachusetts Railroad Commission and the Boston Transit Commission for study. A hearing will be given by the two boards on Sept. 27, 1910.

Financial and Corporate

New York Stock and Money Market

September 20, 1910.

Interborough-Metropolitan stock has furnished the only point of real interest in the stock market during the past week and reason appears now for the story that J. P. Morgan & Company, together with other large banking interests, have agreed to finance the reorganized property. On July 26 the common stock sold at 14¼ and the preferred at 41½. The close to-day was common 21, preferred 55¼.

The money market continues unchanged. Call loans to-day were 1⅝ to 2 per cent; 90 days, 4 to 4½ per cent.

Other Markets

There has been some selling pressure in traction shares in the Philadelphia market during the past week and in consequence there has been rather more activity than usual. Prices, however, have declined only fractionally. At the close to-day Rapid Transit sold at 17¾. Philadelphia Traction at 81½ and Union Traction at 42½.

In the Chicago market there has been some trading in Series 1 and 2 of the Chicago Railways Company, but there has been little character to the movement. Only small lots have been handled and prices have been well sustained. Other tractions have not been in the market.

About the only traction dealings in the Boston market have been those in Boston Elevated. Small blocks of this issue have been picked up and the price during the week has fractionally advanced. Massachusetts Electric is no longer active.

United Railways stock has sold in the Baltimore market during the week, in small lots, at about 14. The bonds of the company continue to be active at former prices.

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

	Sept. 13.	Sept. 20.
American Railways Company	a44	a43½
Aurora, Elgin & Chicago Railroad (common)	50¼	a46
Aurora, Elgin & Chicago Railroad (preferred)	85	a85¼
Boston Elevated Railway	126½	127
Boston & Suburban Electric Companies	*15	*15
Boston & Suburban Electric Companies (preferred)	*74	*74
Boston & Worcester Electric Companies (common)	10	a10
Boston & Worcester Electric Companies (preferred)	37	35
Brooklyn Rapid Transit Company	74½	74¾
Brooklyn Rap. Transit Company, 1st pref. conv. 4s	82⅜	83
Capital Traction Company, Washington	*131	a131½
Chicago City Railway	a195	a102¾
Chicago & Oak Park Elevated Railroad (common)	*3¼	*3¼
Chicago & Oak Park Elevated Railroad (preferred)	*7¼	*7¼
Chicago Railways, ptcptg., ctf. 1	a70	a65
Chicago Railways, ptcptg., ctf. 2	a11½	a15
Chicago Railways, ptcptg., 3	a8½	a8
Chicago Railways, ptcptg., ctf. 4	a4½	a4¼
Cleveland Railways	91½	*91½
Consolidated Traction of New Jersey	a73	*73
Consolidated Traction of N. J., 5 per cent bonds	a104	*104
Detroit United Railways	*45	*45
General Electric Company	144	142½
Georgia Railway & Electric Company (common)	a110½	a111
Georgia Railway & Electric Company (preferred)	*86	*86
Interborough-Metropolitan Company (common)	18⅞	21
Interborough-Metropolitan Company (preferred)	50¾	55¼
Interborough-Metropolitan Company (4½s)	79½	81¼
Kansas City Railway & Light Company (common)	a25	a26
Kansas City Railway & Light Company (preferred)	a79½	a79½
Manhattan Railway	131	135
Massachusetts Electric Companies (common)	a18	a18
Massachusetts Electric Companies (preferred)	81¾	a82
Metropolitan West Side, Chicago (common)	20	a20
Metropolitan West Side, Chicago (preferred)	62	a62
Metropolitan Street Railway	*15	*15
Milwaukee Electric Railway & Light (preferred)	*110	*110
North American Company	67	64⅞
Northwestern Elevated Railroad (common)	a18	a18
Northwestern Elevated Railroad (preferred)	a60	a60
Philadelphia Company, Pittsburg (common)	a44	a44¾
Philadelphia Company, Pittsburg (preferred)	a42	a42
Philadelphia Rapid Transit Company	a18¼	a17¾
Philadelphia Traction Company	82¼	a82
Public Service Corporation, 5 per cent col. notes	95	95
Public Service Corporation, ctfs.	101	101
Seattle Electric Company (common)	*109	*109
Seattle Electric Company (preferred)	*98½	*98½
South Side Elevated Railroad (Chicago)	60¾	58
Third Avenue Railroad, New York	9	9¾
Toledo Railways & Light Company	*7	*7
Twin City Rapid Transit, Minneapolis (common)	110½	110⅜
Union Traction Company, Philadelphia	a43½	a42¾
United Rys. & Electric Company, Baltimore	a15	14¼
United Rys. Inv. Co. (common)	*31	*15
United Rys. Inv. Co. (preferred)	55¼	56
Washington Ry. & Electric Company (common)	*32⅞	a32¼
Washington Ry. & Electric Company (preferred)	*89½	a88
West End Street Railway, Boston (common)	a88	a88
West End Street Railway, Boston (preferred)	a100¾	a100½
Westinghouse Elec. & Mfg. Company	61	60
Westinghouse Elec. & Mfg. Company (1st pref.)	*125	*125

a Asked. * Last sale.

Annual Report of the Philadelphia Rapid Transit Company

Losses due to strike fell heavily upon the Philadelphia Rapid Transit Company in the fiscal year ended June 30, 1910. Decreased receipts and larger expenses caused a deficit after the payment of taxes, licenses and fixed charges of $1,329,723, or $1,105,453 more than the deficit in the previous year. A comparative statement for two years follows:

	1910.	1909.	Increase.
Passenger receipts	$17,979,152	$18,306,963	*$327,811
Chartered cars	11,948	10,566	1,382
Total	$17,991,100	$18,317,529	*$326,429
Maintenance of way and buildings	$1,025,015	$889,777	$135,238
Maintenance of equipment	1,019,983	938,758	81,225
Transportation	4,527,960	4,413,417	114,543
Power	1,460,677	1,445,077	15,600
General expenses	1,853,123	1,677,708	175,415
Total expenses	$9,886,758	$9,364,737	$522,021
Net earnings from operation	$8,104,342	$8,952,792	*$848,450
Miscellaneous earnings	510,256	480,463	29,793
Total income	$8,614,598	$9,433,255	*$818,657
Taxes, licenses and fixed charges	9,944,321	9,657,525	286,796
Deficit	$1,329,723	$224,270	$1,105,453

* Decrease.

The decrease in passenger receipts in 1910 as compared with 1909 was equivalent to 1.8 per cent. In total receipts from passenger and miscellaneous sources the decrease was a shade less, or 1.6 per cent, because there was a small gain in miscellaneous earnings. Last year was the only one since the organization of the company in 1902 when the total revenue from all sources failed to show an increase over the preceding year. The 1910 total, including miscellaneous receipts, was a little less than the results for 1908. The 1910 passenger earnings were smaller than the corresponding results for any year since 1906.

A statement relating to the strike losses contained in the report of Charles O. Kruger, the president, is as follows:

"Had it not been for the strike of your motormen and conductors, which lasted from Feb. 19 to April 25, a very different report would have been submitted.

"At the time the strike was called the company had, in the seven months of the fiscal year, shown an increase of $681,964 in gross receipts, and of $285,819 in net receipts. Had the same rate of increase continued for the fiscal year, your company would have shown gross receipts of $20,059,462, an increase of $1,261,469. The actual loss in passenger receipts during the 66 days of the strike, comparing with the receipts of the year before, was $1,558,105. This is considering only the loss of receipts while the strike was in progress. It takes weeks, and even months, after a prolonged strike to get traffic back to its former condition, and it is doubtful whether even at the end of the fiscal year, June 30, the receipts of the company had become normal.

"In addition to the very heavy increase in the operation of the road during the strike period, there were many extraordinary expenses incurred in protecting your property during this time which were not properly chargeable to current expenses; these expenditures were accordingly carried to strike account. They amount, in the aggregate, to $836,856.

"Two courses were open with respect to this account, either to charge a portion of it off each year, or to close the whole account into profit and loss; the latter course was adopted, as your management felt it was for the best interests of the property to have the whole strike expenses closed out on your accounts."

All the general operating expense accounts show increases and operating expenses amounted to 54.95 per cent of passenger receipts, as compared with 51.12 per cent in the previous year. The proportion of gross passenger receipts used in operating expense is divided as follows: Maintenance of way and buildings, 5.7 per cent; maintenance of equipment, 5.6 per cent; transportation, 25.2 per cent; power, 8.1 per cent; general expenses, 10.3 per cent. The maintenance expenditures therefore aggregated 11.3 per cent of passenger receipts.

An increase in the amount charged for taxes, licenses and fixed charges made the total for the year $9,944,321, which is equal to 53.7 per cent of the total passenger and

miscellaneous receipts. The report shows separately the taxes and licenses, which aggregate $1,569,858, or 8.5 per cent of passenger and miscellaneous receipts. The charge for these items was increased $104,905 over the preceding year. Of this increase $78,428 was due to the new Federal tax, $25,000 was on capital stock and loans, and $4,040 was on real estate, while there was a decrease of $2,563 in the tax on gross receipts. Fixed charges were increased by $181,890, due to larger interest and rental requirements, which were offset in part by a reduction in miscellaneous interest charges.

Regarding various features of the operation Mr. Kruger says:

"With a view of furthering the welfare of our employees, your board of directors approved on Dec. 31 an insurance and pension plan, under which the beneficiaries of motormen and conductors, power-house and shop employees receive $500, payable at death to the heirs of any one who was in the employ of the company on Jan. 1, 1910, and who shall have remained in the service continuously from that date to the date of death. Pensions at the rate of $20 a month are made payable to any employee who has reached the age of 65 years and completed 25 years of continuous service.

"Under this plan 34 insurance payments of $500 each were made between Jan. 1 and June 30.

"In the period from Jan. 1 to June 30 12 employees have been placed on the pension roll; two died after going on this roll, making the pension expense to the company at the present time $200 per month. The total length of service of the 10 pensioners now on the roll is 364 years, and their average length of service 36 years.

"The sliding scale of wages approved at the same time the pension and insurance plans were put into effect provides a wage scale for motormen and conductors of from 23 to 25 cents, according to length of service. The maximum for men now in the service will be reached in 1914. Pay at the rate of 23 cents an hour for all men who were in the service on Jan. 1, 1910, went into effect on July 1, 1910.

"Another phase of the welfare work of the company is the establishment of a department where men who need temporary loans can obtain same without interest. This plan was adopted mainly to make it unnecessary for our employees to patronize 'loan sharks,' and pay the ruinous rates of interest demanded by them. Upon a capital of $1,200 loans to twice that amount have been made to deserving employees, the instalments received in payment being reloaned as they are turned in.

"The total mileage of the system including car barns and sidings is 627.65; of this 207 miles are laid with heavy section of girder-rail weighing 141 lb. to the yard, the rail adopted as the standard by this company.

"We have relaid during the year 7.24 miles of track. This has all been built with a heavy section of girder-rail, weighing 141 lb. to the yard.

"We have renewed special work at 133 locations with a total of 258 pieces.

"During the year 255 cars have been changed over to the pay-within type and are in actual operation. In addition to the changing over to the pay-within cars, the equipment department has placed in operation 20 new cars on the elevated division, these cars being the standard style of equipment adopted for this division. Five single-truck cars have been rebuilt into freight cars; six double-truck four-motor ash cars have been built and placed in service and one new coal car has been purchased and placed in service.

"At the present time the shops are busy changing over 10 of the old style 18-ft. single-truck cars to the pay-within type; these cars will be lengthened out, so that they will have a total length over all of 26 ft. 6 in. This is an experiment and we think will be a good way of utilizing equipment, which is getting too small on certain of our divisions. These 10 cars will be equipped with ball-bearing armatures and roller bearing journal boxes, it being the hope of the management that the power consumption can be materially reduced and cars of this size operated with two motors instead of four.

"The shop department is also equipping at the present time with manual brake devices 25 trains of two cars each; it is the intention to run these trains on some of the divisions where a larger car than the present single truck car could be used to advantage. This is more or less in the form of an experiment and if successful will be a method of utilizing a number of cars which in themselves are too small to operate to any profit at the present time.

"In the power-house department you are constructing at the present time an addition to the power-house property at Thirty-third and Market Streets; in this building there is to be erected an exhaust steam turbine with 6000-kw generating capacity. This will give you 5000 kw additional current from the power-house, without any additional boiler plant installation. After a careful study of the situation the chief engineer decided that this was far the most economical way of securing additional power at this particular location, as there will be no increase in the labor account.

"As a preliminary to the new financing required at the end of the fiscal year, your fiscal agents, Messrs. Drexel & Company, selected a disinterested expert and had a careful examination made of your property, particularly of the equipment. It is very gratifying to be able to state that this report was most favorable in every particular.

"The loss of revenue from the strike made necessary new financing of your property. Accordingly a special meeting of stockholders was called at which two plans were submitted to you. One provided for the sale of securities in the insurance fund and the replacing of the fire protection with fire insurance policies, the other a transfer of your equipment to the Union Traction Company of Philadelphia, and leasing the same from that company, and using this lease, with the Union Traction Company's guarantee of the rentals, as the basis of an issue of car trust certificates. The result of this plan was the raising of $1,500,000, which has to be paid off at the rate of $75,000 each six months with interest at the rate of 5 per cent. Both plans were approved by you, and both plans also received the approval (which was requisite) of the Union Traction stockholders, and accordingly the securities in the insurance fund have been disposed of and the equipment transferred to the Union Traction Company. All of these matters were not completed at the end of the fiscal year, so that the full result of this financing does not show in the fiscal statements. There had also been unissued $600,000 of the former $5,000,000 collateral loan pending the reformation of the lease of the Lehigh Avenue Passenger Railway Company. This was accomplished during the year and the bonds sold to your fiscal agents. The result of these different plans of financing is to put a very comfortable cash balance in the treasury of the company.

"The relations between the city and the company under the contract of July 1, 1907, have continued very satisfactory. The company is regularly paying into the city treasury the $500,000 required by the contract, and all plans of financing are first submitted to City Councils for approval. This secures the fullest publicity, and City Councils, after investigation, have given their assents to the steps which it was necessary to take to place the company in funds.

"The 600,000 shares of stock of your company are held by 2297 shareholders of record, an average holding of 261 shares; of the 2297 shareholders, 2091 hold 500 shares or less."

The total number of passengers carried during the year was 432,884,253, a decrease of 38,671,977, from the preceding year. Of the total 62,923,399, or 14.53 per cent, used free transfers. This number is 7,291,574 larger than the aggregate of free transfer passengers in the previous year. The average number of cars operated daily during the year was 1862, an increase of 4.31 per cent. The cars made a total of 5,624,080 trips. The car mileage was 70,943,404.

Statistics of the passenger traffic for two years are as follows:

	1910.	1909.
Total passengers carried	432,884,253	464,264,656
DIVISION OF PASSENGER RECEIPTS		
Package tickets used, per cent	.1233	41.6830
Cash fares paid, per cent	74.9570	37.3059
Exchange tickets purchased, per cent	5.0044	4.2641
Exchange tickets used (received), per cent	4.8060	4.2125
Transfer tickets used, per cent	14.5358	11.0828
Carried free, per cent	.5735	.5517
	100.0000	100.0000
Receipts per passenger, cents	4.1533	3.9432

Atlantic Shore Line Railway, Sanford, Maine.—It is stated that most of the $1,191,000 of 4 per cent refunding bonds of the Atlantic Shore Line Railway, the coupons on which are in default, have been deposited with the reorganization committee, and that the mortgage trustee is preparing to purchase the property of the company in behalf of the bondholders at foreclosure. It is denied that E. H. Knowlton, Brookline, Mass., has secured an option on the property of the company in behalf of Massachusetts capitalists.

Babylon (N. Y.) Railroad.—The Public Service Commission of the Second District of New York has authorized the Babylon Railroad to increase its capital stock from $25,000 to $75,000 and to execute a first mortgage upon all its property for $300,000 to secure the payment of its coupon bonds, payable in 60 years from date, with interest semi-annually at the rate of 5 per cent per annum. The company is authorized at present to issue coupon bonds to an aggregate amount of $237,000 to be sold at not less than 85, and to use the proceeds to pay indebtedness incurred in constructing its railroad. The new bonds are authorized on condition that a mortgage executed to the Metropolitan Trust Company in 1888 to secure the payment of bonds in the aggregate amount of $600,000, under which bonds to the amount of $450,000 have been issued, shall be satisfied and discharged at the time the new mortgage is recorded.

Boston (Mass.) Elevated Railway.—The stockholders of the West End Street Railway have ratified the proposed increase of the common stock of the company by the issue of not more than 27,800 shares of a par value of $50 each to reimburse the Boston Elevated Railway for improvements. The Railroad Commission of Massachusetts has approved the petition of the company to issue the additional stock at $75 a share, plus the amount of dividends that shall have accrued under the provisions of the lease to the Boston Elevated Railway at the time that payment for the stock is made.

Central Park, North & East River Railroad, New York, N. Y.—On Sept. 17, 1910, Judge Lacombe, in the United States Circuit Court, returned an order of foreclosure in the case of the $1,200,000 mortgage on the property of the Central Park, North & East River Railroad, of which the Farmers' Loan & Trust Company, New York, N. Y., is trustee.

Chicago (Ill.) Railways.—In a bill filed by the Securities Company, New York, N. Y., in the Circuit Court in Chicago, for the appointment of a receiver for the Chicago Railways, it is asserted that the company is insolvent; that its indebtedness exceeds its capital stock by $87,000,000; that all of its property and assets will not reach within $25,000,000 of its aggregate of debts and liabilities; that even such assets as it has are mortgaged to secure its bonded indebtedness; that it has defaulted on its debts for interest which was due June 1, 1908, and has not yet been paid; that a large number of unsatisfied judgments, aggregating more than $1,400,000, are in existence on which executions have been returned "no property found," and that its credit is destroyed. The Securities Company owns $20,000 of the bonds of the Chicago Railways, and it asserts that creditors whose claims aggregate between $5,000,000 and $6,000,000 are interested in the suit.

Connecticut Valley Street Railway, Northampton, Mass.—As announced in the Electric Railway Journal of July 16, 1910, page 125, the Railroad Commission of Massachusetts recently authorized the Connecticut Valley Street Railway to issue $100,000 of 6 per cent cumulative preferred stock, to retire an equal amount of first and refunding bonds. There were originally $200,000 of first and refunding bonds outstanding, and the company has now received authority from the Railroad Commission to issue an additional $20,000 of preferred stock and $80,000 of bonds, secured by the first mortgage of 1900 of the Northampton & Amherst Street Railway, to retire the $100,000 of first and refunding bonds of the company which are still outstanding.

Kansas City Railway & Light Company, Kansas City, Mo.—The Kansas City Railway & Light Company reports earnings as follows for the year ended May 31, 1910: Gross earnings, $7,161,042, as compared with $6,627,977 for the previous year; operating expenses, $4,153,250, as compared with $3,766,788 for the previous year; net earnings, $3,007,792, as compared with $2,861,189 for the previous year; other income, $17,399, as compared with $1,218 for the previous year; gross income, $3,025,191, as compared with $2,862,407 for the previous year; taxes, interest on bonds, etc., $2,628,337, as compared with $2,576,155 for the previous year; net income, $396,854, as compared with $286,252 for the previous year.

Los Angeles (Cal.) Railway.—The proposed increase in the authorized capital stock of the Los Angeles Railway from $5,000,000 to $15,000,000, to which reference was made in the Electric Railway Journal of July 23, 1910, page 162, has been approved by the stockholders of the company.

Metropolitan Street Railway, New York, N. Y.—Judge Lacombe, of the United States Circuit Court, has denied the motion of the Farmers' Loan & Trust Company and the Guaranty Trust Company for an indefinite postponement of the sale of the property of the Metropolitan Street Railway under foreclosure, and has fixed Nov. 4, 1910, as the date of the sale. The New York & Harlem Railroad has resumed dividends on its stock by declaring a semi-annual dividend of 1½ per cent on its $10,000,000 of stock, payable on Oct. 1, 1910, to holders of record on Sept. 19, 1910, out of $400,000 received annually as rental from the Metropolitan Street Railway under lease of 1896. Up to October, 1908, the New York & Harlem Railroad used the rental from the Metropolitan Street Railway to pay semi-annual dividends of 2 per cent each, but in April, 1909, October, 1909 and April, 1910, the dividends were not paid because there remained unpaid about $800,000 of special franchise taxes assessed against the company. In June, 1910, the New York & Harlem Railroad was reimbursed by the Metropolitan Street Railway at the instance of Judge Lacombe, of the United States Circuit Court, for $400,000 advanced by the New York & Harlem Railroad. Pending a full adjustment of the tax matter it was deemed inexpedient by the New York & Harlem Railroad to declare a dividend at the rate of more than 3 per cent a year.

Montreal (Que.) Street Railway.—In connection with the reports about the amalgamation of the Montreal Street Railway and the Canadian Light & Power Company, it is stated that a holding company will be formed with a capital of at least $50,000,000, and that the shareholders of the Montreal Street Railway will receive 4½ per cent debenture bonds in the proportion of $250 in bonds for each share of stock of the Montreal Street Railway and, in addition, a bonus of common stock in the new company on the basis of one-half share of the new stock for every share of stock of the Montreal Street Railway. The shareholders of the Canadian Light & Power Company will receive in this bonus stock, so it is said, 150 shares for every 100 shares of stock which they hold at present. They will, however, receive no debenture bonds.

Rio de Janeiro Tramway, Light & Power Company, Ltd., Rio de Janeiro, Brazil.—The interim report of the Rio de Janeiro Tramway, Light & Power Company for the year 1909, subject to adjustment, shows gross earnings for the tramway system of £748,310 and net earnings of £357,043. The corresponding figures for 1908 were £744,865 and £314,324. Additional shares of capital stock of the Jardin Botanico Tramway Company have been purchased. The Rio de Janiero company previously held a controlling interest in that property. Gross earnings of all the departments for the year were £1,546,759 and net earnings were £626,049. Including the estimated income of the Jardin Botanico system for 1910, the earnings of the property for this year are estimated as follows: Gross, £2,009,589; net, £1,014,246.

Sedalia Light & Traction Company, Sedalia, Mo.—The protective committee of bondholders of the Sedalia Light & Traction Company, composed of Otto T. Bannard, H. K. Hallett and R. T. Sheldon, announced on Sept. 13, 1910, that $329,600 par value of the bonds of the company had been deposited with the New York Trust Company, and that $152,000 of the bonds had been deposited in Chester, Pa., under an agreement to act in concert with the committee of bondholders of the company composed of Messrs. Bannard, Hallett and Sheldon. The time for receiving further deposits of the bonds has been extended to Sept. 27, 1910.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.—An initial dividend of 1¼ per cent has been declared on the preferred stock of the Terre Haute, Indianapolis & Eastern Traction Company for the quarter ended Sept. 30, 1910, payable on Oct. 1, 1910, to holders of record on that date.

Third Avenue Railroad, New York, N. Y.—The Public Service Commission of the First District of New York has adopted a final order denying the application for the approval of the plan for the reorganization of the Third Avenue Railroad submitted by the bondholders' committee. On July 29, 1910, the commission announced its decision refusing the application chiefly on the ground that the amount of the proposed issue of new securities—$55,000,000—was excessive. The proceeding was continued, however, so as to permit the committee to amend the application if it desired. William D. Guthrie, chief counsel for the committee of bondholders, on the other hand, served on Chairman Willcox of the commission a formal demand that a final order be entered, the idea being, it is said, to open the way for an appeal to the courts by the bondholders from the finding of the commission.

Union Street Railway, New Bedford, Mass.—The Union Street Railway and the Dartmouth & Westport Street Railway have applied to the Railroad Commission of Massachusetts for permission to consolidate. As stated in the ELECTRIC RAILWAY JOURNAL of Aug. 27, 1910, page 343, the plan is to increase the capital stock of the Union Street Railway from $1,125,000 to $1,625,000, the $500,000 of new stock to be exchanged, dollar for dollar, for the stock of the Dartmouth & Westport Street Railway.

United Railways, St. Louis, Mo.—It has been announced that the quarterly dividend of 1¼ per cent on the preferred stock of the United Railways, which has been paid regularly since April, 1900, will not be paid in October. Robert McCulloch, president and general manager of the company, has issued the following statement to the holders of the preferred stock of the company in explanation: "The company has a floating debt of $1,300,000, all growing out of a betterment of the physical condition of the property, which condition is constantly being improved. A duty to the preferred stockholders impels a suspension of the dividend until this indebtedness is liquidated. The dividend being cumulative, its payment is only deferred. The usual October dividend will not be paid."

Dividends Declared

Bangor Railway & Electric Company, Bangor, Maine, quarterly, 1½ per cent.

Capital Traction Company, Washington, D. C., quarterly, 1½ per cent.

Cleveland (Ohio) Railway, quarterly, 1½ per cent.

Germantown (Pa.) Passenger Railway, quarterly, $1.31¼.

Halifax (N. S.) Electric Tramway, Ltd., quarterly, 1¾ per cent.

Illinois Traction Company, Champaign, Ill., 1½ per cent, preferred.

Kokomo, Marion & Western Traction Company, Kokomo, Ind., 3 per cent, preferred.

Manila Electric Railroad & Lighting Corporation, Manila, P. I., quarterly, 1 per cent.

Northwestern Elevated Railroad, Chicago, Ill., quarterly, 1 per cent, preferred.

Ridge Avenue Passenger Railway, Philadelphia, Pa., quarterly, $3.

St. Joseph Railway, Light, Heat & Power Company, quarterly, 1¼ per cent, preferred.

Second & Third Streets Passenger Railway, Philadelphia, Pa., $3.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., quarterly, 1¼ per cent, preferred.

Toronto (Ont.) Railway, quarterly, 1¾ per cent.

Union Traction Company of Indiana, Indianapolis, Ind., 2½ per cent, preferred.

Washington Water Power Company, Spokane, Wash., quarterly, 1¾ per cent.

West End Street Railway, Boston, Mass., $1.75, common.

Wheeling (W. Va.) Traction Company, 1 per cent.

Traffic and Transportation

Transfer Changes in Brooklyn to Prevent Abuses

The Brooklyn (N. Y.) Rapid Transit Company has notified the Public Service Commission of the First District of New York that on Oct. 15, 1910, it proposes to modify its transfer system so as to compel passengers who transfer to travel in one general direction, and has posted in its cars over the name of the Brooklyn Heights Railroad the following notice to the public in which the reason for the change is given:

"Effective Oct. 15, 1910, the rules and regulations regarding the issuance and acceptance of transfers on the lines of this company, and certain reciprocal privileges with the lines of other companies, will be modified. These changes are made in accordance with existing law. They are intended to afford the public every legitimate privilege, and at the same time relieve the company from transfer abuses.

"Between the lines of this company (excluding the 10-cent fare routes to Flushing and North Beach) the present plan of three rides for a single fare (including the additional privilege to and from feeder lines) will be retained, with the exception that the route taken shall be in the same general dirction. Direction tickets will be issued which, while permitting this, will prevent the use of transfer tickets for travel in a reverse direction, or to return to the starting point for a single fare.

"At the points where, for reciprocal convenience, passengers of certain lines of the Brooklyn Union Elevated Railroad, the Nassau Elevated Railroad, Brooklyn, Queens County & Suburban Railroad, Sea Beach Railway, and South Brooklyn Railway are carried free over certain lines of this company, and passengers of certain lines of this company are carried free over certain lines of the companies above mentioned, such reciprocal privileges will be continued to passengers paying a cash fare, but no transfers will be issued to such passengers by the second company."

The company has also announced that a number of changes in the routes of its lines of purely local interest will go into effect on Oct. 15, 1910.

The management states that the governing reason for the new rules and regulations regarding transfers is the prevalent abuse of the transfer privilege. The changes embodied in the new system, so far as they relate to the lines of each company, have been based upon decisions of the higher courts rendered since May 9, 1907, when the last transfer system was made effective. On account of the curious topography of Brooklyn it is possible under the present transfer system for a passenger to make return journeys to a starting point for a single fare on more than 150 different routes, comprising two, three or four ride loops. While it is the purpose of the new transfer system, as stated in the notice, to afford every facility to passengers who desire to make a continuous trip in the same general direction on the lines of the same company, the use of direction tickets will prevent travel in a reverse direction or the return to a starting point for a single fare.

With reference to the practice of using transfer tickets for riding in a reverse direction or to return to the starting point for a single fare, the company calls attention to the opinion of Judge Gray, of the Court of Appeals, in the case of Kelly vs. the New York City Railway, 192 N. Y., 97, decided April 24, 1908, which upheld the right of the New York City Railway to carry people only in the same general direction for one fare. This opinion says:

"In this instance the plaintiff, upon the one fare paid on entering the southbound car on the Bowery, under his interpretation of the law, could have continued northerly from Chambers Street on West Broadway to Canal Street and there have boarded an eastbound car on the Canal Street Line, which would have returned him to the Bowery near to his starting point. * * * I do not think that the statute intended to confer any such extraordinary right, and, in my opinion, the regulation of the defendant was a reasonable one and not in contravention of the statute. It was as liberal in the privileges which it accorded to the traveling public as it was possible for the company to be, short of allowing a round trip upon payment of a single fare. It might happen, as in this case, that the passenger

was taking as direct a route by the use of street railway lines as was possible from the point at which he boarded the car of the Third Avenue line to the point at which he left the car of the Eighth Avenue line. It is manifest, however, with the enormous number of passengers carried daily to and fro upon the defendant's cars, 30 to 40 per cent of whom are transferred, that it would be almost, if not quite, impossible, by any plan workable under congested conditions of travel, to provide for a transfer that would indicate the destination of a particular passenger intending, in good faith, to reverse his direction of travel by taking the third side of a quadrilateral route. * * * What was intended by the Legislature, when authorizing a leasing, or consolidation, of competing lines of railroads, appears to have been the attaching of a condition by which the public would gain some advantage from it and its convenience be promoted thereby. That condition was that the contracting companies should 'carry * * * between any two points on the railroad, or portions thereof embraced in such contract, any passenger desiring to make one continuous trip between such points for one single fare.' The statute, more or less, defines the scope of the legislative enactment in the language used: 'that the public convenience may be promoted by the operation of the railroads as a single railroad with a single rate of fare.' But a single railroad would never be required to give a passenger a return transfer for one fare, and it is hardly conceivable that it should be. A trip, ordinarily, conveys the idea of transportation in one direction. Unless connected with some other expression it does not carry the idea of a return. A 'continuous trip' does not add to the import. A continuous trip, like a continuous line, is supposed to extend in the same general direction. * * * The defendant was required to carry him (the passenger) upon the several lines which it operated for a single fare and with the right to a transfer, but 'substantially as a single railroad with a single rate of fare.' If the Legislature had intended to require railroad companies coming within the purview of the statute to carry a passenger for a single fare in a reverse direction from that in which he started, or on a round trip, as the result would certainly be in the great majority, if not all, of the cases, it would not have resorted to the comparison 'of a single railroad' to express its object. The statute should be read in the light of the habitual method of the railroad transportation of passengers, which is to require one fare for a trip upon its line and another fare for a return trip."

The lines comprised in the Brooklyn Rapid Transit System exchange transfers at more than 600 line intersections. At nearly one-half of these intersections reciprocal privileges have been exchanged between the lines of separately operated companies, without legal obligation on the part of the companies to give or continue such transfers. It is not proposed under the new transfer plan to discontinue these reciprocal privileges, but to limit them to two rides. For example, a passenger paying a cash fare on the Vanderbilt Avenue line of the Nassau Electric Railroad may transfer to the Fulton Street line of the Brooklyn Heights Railroad, and vice versa, but in neither case will he receive an additional transfer. On the lines of the same company a passenger will have the same privilege as heretofore of making a continuous trip in the same general direction, including the additional privilege to and from feeder lines. It will no longer be possible, however, to leave Park Row on a Fulton Street car, transfer to Nostrand Avenue and return by Myrtle Avenue to Park Row. Again, a passenger from Ridgewood on the Bushwick Avenue line will be able to transfer to the Union Avenue line toward Greenpoint Ferry, in the same general direction, but will not be able as heretofore to return to Ridgewood for a single fare.

Answer of New Haven Road to Complaint Regarding Advance in Commutation Rates

An answer has been filed with the Interstate Commerce Commission by the New York, New Haven & Hartford Railroad in relation to the complaint respecting the advance in commutation rates between points in New York State and Connecticut. The answer states in substance:

"1. The commutation rates as set forth in said tariff are less than the normal passenger rates from the points therein mentioned, and the making of such rates is within the discretion of said railroad, and such rates are exempt from condemnation of the provisions of the act to regulate commerce and the amendments thereof, as has been repeatedly held by this commission. The defendant thereof pleads to the jurisdiction of the commission, denying that it has any power to pass an order reducing said rates.

"2. Without waiving the above plea to the jurisdiction of the commission, and without admitting its power to pass an order affecting said rates, the company, in compliance with the request of the commission, pleads the following facts:

"The rates covered by the tariff in question are commutation rates between points in the State of Connecticut and the Grand Central station, New York. The railroad of the New York, New Haven & Hartford Railroad Company ends at Woodlawn Junction in the State of New York, where it connects with the New York & Harlem Railroad. For the convenience of passengers upon its trains, this company has made the best arrangement which it could with the New York & Harlem Railroad, owning said connecting railroad, and with the New York Central & Hudson River Railroad, owning Grand Central station in New York City, for the transportation of such passengers without change of cars over the New York & Harlem Railroad and into said Grand Central station, and also out of said Grand Central station over the New York & Harlem Railroad to points upon its own railroad.

"The amounts paid to the New York Central & Hudson River Railroad for the use of the Grand Central station have recently increased very much, in consequence of the large expenditures that have been made upon said station. The total amount paid to the New York Central & Hudson River Railroad for the transportation of passengers beyond the terminus of the New York, New Haven & Hartford Railroad to and from Grand Central station is so large that the resulting cost per commuting passenger is in many cases greater than the price paid by such passenger for his commutation ticket. The addition of this large element of cost to the operating cost of transporting the commuting passengers over the New York, New Haven & Hartford Railroad renders the total cost of this service so great that none of the rates as advanced by tariff I. C. C. A.-833 are fully remunerative to the carrier, and in no case are they unreasonable or unjust to the passenger."

Hearing in Massachusetts on Lenox Fares

The Massachusetts Railroad Commission gave a hearing on Sept. 14, 1910, upon the petition of the Selectmen of Lenox, Mass., for a 5-cent fare in Lenox on the Berkshire Street Railway. The company was represented by Bentley W. Warren, Boston, who stated that the petitioners would be given as a concession a 5-cent fare, including a transfer from the center of Lenox to New Lenox, a point about half a mile south of the Pittsfield-Lenox boundary line. This would afford a 5-cent fare throughout the town, and protect the through line of the company from Lee to Pittsfield from undue reductions. Chairman Hall called the petitioners' attention to the fact that what they really seemed to desire was a reduction in the rate from Lenox to Pittsfield, which is now 15 cents, and which would be only 10 cents if the 5-cent fare was established to the town line. Mr. Warren said that the company could grant fare schedules in the rapidly growing city of Pittsfield which it could not afford to maintain in a community like Lenox, which has only 3000 people in winter and 6000 in summer. If a 10-cent fare should be established to Pittsfield the rate would be only about 1 cent per passenger mile, an unprofitable rate, considering the present costs of labor and material, except in densely populated districts where the average ride is short. The Lenox portion of the Berkshire line has a low density of traffic. The company could not afford to increase its car service in the morning, as requested by the petitioners. Mr. Warren offered to submit figures later regarding the earnings of the Lenox line. The commission took the case under advisement.

Through Cars Between Pottsville and Tamaqua.—The Eastern Pennsylvania Railway, Pottsville, Pa., proposes to operate through cars between Pottsville and Mauch Chunk.

At present passengers between Pottsville and Mauch Chunk have to change cars at Tamaqua.

Change of Place of Meeting of Central Electric Traffic Association.—The meeting of the Central Electric Traffic Association which was arranged to be held at Winona Lake, Ind., on Sept. 27, 1910, will be held at Warsaw, Ind., on that date instead of at Winona Lake, on account of the closing of the hotel at the latter place at which it was proposed to hold the meeting.

Elevated Traffic Over Brooklyn Bridge Tied Up.—Just at the height of the evening rush hour on Sept. 13, 1910, a fire occurred in the switch tower at the Manhattan end of the Brooklyn Bridge which governs the movement of elevated trains, and train service over the structure was suspended for about an hour. Passengers who ordinarily patronize the elevated lines had to resort to the surface cars which cross the structure and to the subway to Brooklyn.

Hearing on Necessity for Additional Equipment in Albany.—The Public Service Commission of the Second District of New York ordered the United Traction Company, Albany, N. Y., to show cause before the commission on Sept. 20, 1910, why the company should not purchase 30 double-truck passenger cars for use on its Pine Hills and West Albany lines by Jan. 1, 1911. This order followed the complaint made by the Common Council of Albany and the investigation of the facilities of the company made by the commission.

Petition for Reduction in Fare in Newburyport.—The Aldermen of Newburyport have petitioned the Massachusetts Railroad Commission to reduce the fares of the Haverhill & Amesbury Street Railway, the Citizens' Electric Street Railway and the Boston & Northern Street Railway within the municipality on the ground that the existing charges are excessive. The petitioners urge that the reduction be made either through the issuance of transfers or by a direct reduction in the cash tariff. A hearing has been assigned for Oct. 19, 1910.

Massachusetts Company Complains About Snow Removal Conditions.—Complaint has been made to the Railroad Commission of Massachusetts by the Connecticut Valley Street Railway, Greenfield, Mass., about the regulations imposed by Greenfield for the removal of snow from 32,854 ft. of street railway track. The company says that the regulations are burdensome and involve great and needless expense. It wishes to have 36 hours after a storm in which to remove the snow, and it wants the regulations to provide that it shall not be compelled to remove snow unless the fall is at least 6 in. A date for a hearing has not been set.

Freight Service Between Philadelphia, Frankford and Fox Chase.—The Philadelphia (Pa.) Rapid Transit Company has established freight service between the station at Front Street and Market Street, Philadelphia, and Frankford and Fox Chase. The route traversed by the cars operated in the new service is west on Market Street, from Berks Street to Eleventh Street to Montgomery Avenue to Fifth Street to Berks Street. Cars for Fox Chase continue from Berks Street on Fifth Street to their terminus. Cars for Frankford traverse Berks Street to Front Street, Front Street to Kensington Avenue, Kensington Avenue to Frankford Avenue, Frankford Avenue to Arrott Street.

Ticklers in the New York Electric Zone.—The Public Service Commission of the Second District of New York has denied the application of the New York Central & Hudson River Railroad for an order authorizing it to dispense with the maintenance of bridge ticklers in the electric zone. The company claimed that on account of the change in motive power from steam to electricity between Grand Central Station and Croton on the Hudson Division and North White Plains on the Harlem Division it would be unnecessary for employees to go on top of cars and, there being no danger on this account, that the use of ticklers was unnecessary.

Public Service Commission Exhibit at State Fair.—The Public Service Commission of the First District of New York exhibited at the State Fair held in Syracuse during the week ended Sept. 17, 1910, charts and maps which show the nature of the traffic problem in New York City and the work of the commission in relieving traffic congestion, photographs of the fender and wheel-guard tests held by the commission, and charts which show the annual saving in human life effected during the three years the commission has been in office. During the three years ended June 30, 1910, the charts showed that the number of deaths by accident on the street surface railways in the territory under the jurisdiction of the commission had decreased from 303 in the year ended June 30, 1908, to 152 for the year ended June 30, 1910. The commission also exhibited the plans and contracts for the new Tri-Borough Subway system.

Report on Service in New Haven Needless.—The question of the advisability of New Haven retaining an engineer to report on street railway service in that city furnished by the Connecticut Company has recently been discussed among members of the City Council. There is considerable opposition, however, to action of this kind on account of the expense that would be involved. The attitude of the company regarding the proposal is indicated in the following statement which it made in reply to an inquiry from one of the local papers: "The Connecticut Company will be glad to receive information and suggestions from any authorized representative of New Haven regarding the operation of its street railway system in New Haven and vicinity. The company will continue to co-operate with the city in adopting any reasonable proposition looking to the improvement of the property and its operation. It is suggested, however, that, in view of the extensive improvements now under way and the additional facilities to be added in the near future, the employment of an expert to indicate defects which will soon be remedied will involve an unnecessary expense."

British Columbia Electric Railway Discontinues Profit-Sharing Plan.—The profit-sharing plan of the British Columbia Electric Railway, Vancouver, B. C., was revoked on June 30, 1910, at the request of the employees, and the following schedule of wages was adopted: For conductors and motormen, per hour, first three months, 22 cents; second three months, 25 cents; second six months, 27 cents; second year, 29 cents; third year, 31 cents; fourth year, 33 cents; fifth year and after, 35 cents per hour. This schedule to continue till June 30, 1913. The hours of labor and rates for extra time, viz., one and one-half after 11 p. m. to 1 a. m. and double pay from 1 a. m. to 5 a. m., remain the same. The system which has existed since July 1, 1903, gave a share of the profits to all employees who had been one year in the company's service. The plan was: First, a dividend of 6 per cent on capital stock of company. Then the balance of the year's profits was divided into three equal parts, of which two-thirds were given to the stockholders and one-third to the employees. Of this latter sum, in addition to their regular salaries, every employee received the same amount. This yearly bonus amounted during the seven years 1903-1909 to the following sums: $30, $35, $40, $45 (1907 not given), $62 and $57 per employee.

Reduction in Fare Refused to Places Now Part of Los Angeles.—The Los Angeles-Pacific Company, Los Angeles, Cal., has refused the request of citizens of Hollywood and Colegrove, which are now part of Los Angeles, for a 5-cent fare to Los Angeles, instead of the present 10-cent fare. A special commutation fare, which remains to be fixed, will, however, be established between Los Angeles, Hollywood and Colegrove. In replying to the committee which represented the citizens of Hollywood and Colegrove, Paul Shoup, assistant general manager of the Southern Pacific Company, in charge of electric railways, pointed out that the entire "shoestring" district and San Pedro are part of Los Angeles, yet the company could not reduce its rate. Hollywood and Colegrove are the same distance from Los Angeles as Pasadena and Glendale, yet passengers from Pasadena and Glendale to Los Angeles pay a higher fare than is in effect on the line of the Los Angeles-Pacific Company. In reply to the statement that a 5-cent fare would increase traffic, Mr. Shoup said that it undoubtedly would in the long run. While the Hollywood line is paying expenses, the Colegrove line is, however, run at a loss. Should a 5-cent fare be put into effect, neither line would pay. Mr. Shoup explained in detail plans which the company has in contemplation for expending $500,000 in improving the Hollywood and Colegrove lines.

Personal Mention

Mr. F. P. Vogt has resigned as auditor of the Evansville (Ind.) Railways.

Mr. Charles S. Mellen, president of the New York, New Haven & Hartford Railroad and the Connecticut Company, New Haven, Conn., has been elected acting president of the Boston & Maine Railroad and the Maine Central Railroad to succeed Mr. Lucius Tuttle, resigned.

Mr. C. H. Hile, assistant to the vice-president of the Boston (Mass.) Elevated Railway, has been appointed acting superintendent of transportation of the company in place of Mr. George C. Tripp, who has been absent for a protracted period on account of illness.

Mr. G. A. Harvey, formerly electrical engineer of the International Traction Company, Buffalo, N. Y., is assisting Mr. Horatio A. Foster, who is associated with Mr. Bion J. Arnold, on some work in connection with the Southern California Edison Company, Los Angeles, Cal.

Mr. Allen McCarty has been appointed general auditor of the Delaware & Hudson Railroad, Albany, N. Y., a newly created position. Hereafter the comptroller of the company will have charge of the general, corporate and fiscal accounts and the general auditor will have charge of the operating, revenue and expense accounts.

Mr. H. W. Firth, electrical engineer of the Great Eastern Railway Company of England, is making a short trip in this country, to inspect heavy electric traction installations and electric power station practice. The Great Eastern Railway is one of the large trunk lines of England, and serves the Eastern counties of England. Its main terminus is in London.

Mr. M. O. Robinson, superintendent of the power house of the Canadian Pacific Railway at Fort William, Ont., has been appointed manager of the Port Arthur & Fort William Electric Railway, Port Arthur, Ont., to succeed Mr. N. C. Pilcher, who as noted in the Electric Railway Journal of Aug. 6, 1910, has been appointed general manager of the Sherbrooke (Que.) Street Railway.

Mr. J. O. Hilliard has been appointed trainmaster of the Puget Sound Electric Railway, Tacoma, Wash., to succeed Mr. D. B. Rose. Mr. Hilliard is a native of Wisconsin. He has filled a number of places of importance and responsibility with steam railroads in the Middle West and on the Pacific Coast. He was for a time chief dispatcher for the Oregon Railroad & Navigation Company, The Dalles, Ore. Since then he has been dispatcher for the Northern Pacific Railway in Tacoma.

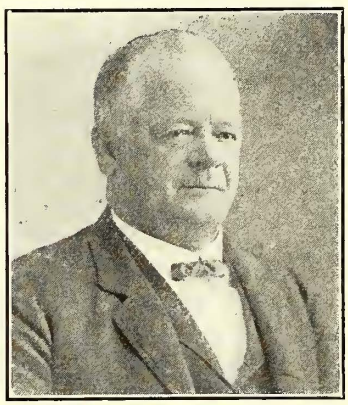
Mr. A. L. Adams has been appointed superintendent of distribution of the Puget Sound Electric Railway and the Tacoma Railway & Power Company, Tacoma, Wash., reporting to Mr. K. C. Schluss, superintendent of power of these companies. Mr. Adams is a recent graduate of the University of Maine. He served with the transportation department of the Tacoma Railway & Power Company upon entering the employ of the company. Later he became connected with the office of the superintendent of power.

Prof. George F. Swain, of Harvard University and consulting engineer of the Massachusetts Railroad Commission, has been selected to supervise the appraisal of the property of the New York, New Haven & Hartford Railroad in Massachusetts authorized by the Massachusetts Legislature to determine the relation between the assets of the company and the aggregate of its outstanding capital stock and indebtedness. The commission, or validating board, in charge of the appraisal consists of the Railroad Commissioners, the Tax Commissioner and the Bank Commissioner.

Mr. Nugent Fallon has been appointed acting superintendent of Division 5, South Boston Lines, of the Boston (Mass.) Elevated Railway to succeed Mr. Frank M. Damon, resigned. Mr. Fallon was graduated from the Massachusetts Institute of Technology in 1906, with the degree of civil engineer. He immediately became a conductor with the Boston Elevated Railway, and then passed through successive posts of motorman and pitman and employee in the road department, wire department, armature shop and power station. Later he worked under the storekeeper, purchasing agent and superintendent of the Grove Hall division. From three to five months were spent in each of these "cadet" assignments. For six months Mr. Fallon was assistant to the superintendent of transportation of the company. Subsequently he became chief clerk of the Charlestown Division. He is a member of the New England Street Railway Club.

Mr. George E. Moffatt, for the past year and a half general superintendent and consulting engineer of the British Columbia Electric Railway Company, Ltd., has just resigned. Mr. Moffatt has had an extended experience in electric railway work. From 1893 to 1899 he was superintendent of the Philadelphia Rapid Transit Company. After leaving that company he become consulting engineer for the London United Railways of London. He returned to this country in 1900 to act as one of the constructing engineers for the Lackawanna & Wyoming Valley Railway and the Rochester, Auburn & Syracuse Railway. In 1903 he was general manager of the Fargo & Moorhead Street Railway, and left that company to accept a similar position with the Conneaut & Erie Traction Company. In 1905 and 1906 he was general manager of the Citizens' Street Railway of Richmond, Va., and the Pittsburg, Binghamton & Eastern Railway. In 1907 he severed his connection with operating work to act as general superintendent of the Danville Car Company, and a year later accepted the position of consulting engineer of the Federal Construction Company of New York. This position he resigned in 1909 to accept that of general superintendent and consulting engineer of the British Columbia Electric Railway Company, Ltd., Vancouver, B. C.

Mr. Alexander Shane, chief inspector of the Indiana Railroad Commission, has been appointed general manager of the Indianapolis, Columbus & Southern Traction Company, Columbus, Ind., to succeed Mr. A. A. Anderson, who resigned several months ago to become vice-president and general manager of the Springfield (Ill.) Consolidated Railway. Mr. Shane is a native of Louisiana. Since 1866 he has been engaged in constructing railway bridges and superintending railroads. During 1866 and 1867 he was employed by the Louisville & Nashville Railroad in repairing damages done to the road during the war. From 1868 to 1870 he was engaged in erecting the bridge over the Ohio River at Louisville, Ky., for the Louisville Bridge & Iron Company. After this work had been completed Mr. Shane became a foreman with the company and assisted in erecting bridges in various parts of the United States. In 1875 he accepted a position with the Louisville Bridge Company in charge of repair and maintenance of the Louisville bridge. He remained with the Louisville Bridge Company until 1880, when he accepted a position with the Keystone Bridge Company, Pittsburgh, Pa., as foreman of erection of superstructures. In 1884 Mr. Shane became supervisor of bridges and buildings on the Chicago Division of the Cleveland, Cincinnati, Chicago & St. Louis Railway and held this position until 1898, when he was appointed superintendent of the bridges and buildings of the Toledo, St. Louis & Western Railroad. In 1902 he was appointed superintendent of maintenance and way of the Toledo, St. Louis & Western Railroad and he remained with the company until June, 1907, at which time he was appointed chief inspector of the Railroad Commission of Indiana. During his connection with the Railroad Commission of Indiana Mr. Shane devoted much of his time to supervising the construction and maintenance of electric railways and assisted in the work of preparing the uniform code of rules which was adopted by the electric railways in Indiana.



Alexander Shane

Construction News

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

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

RECENT INCORPORATIONS

***Greenville, Greenwood & Augusta Railway, Augusta, Ga.**—Chartered in Georgia to build a 125-mile railway from Augusta, Ga., via Greenwood to Greenville, S. C., connections to be made with the Carolina, Knoxville & Western Railway. Capital $1,000,000. Incorporators: Henry Briggs, Frank Hammond and J. P. Charles, Greenville, S. C.; J. C. Fawcett and Henry L. Zimmerly, New York.

***Springfield & Western Railroad, Springfield, Mo.**—Incorporated in Missouri to build a 100-mile electric railway from Springfield to Carthage and Joplin, via Bennetts, Plano, Halltown, Paris Springs, Miller, Red Oak and Avilla, with a branch from Paris Springs via Mount Vernon and Monett to Pierce City. Surveys have been started at Springfield. Capital stock, $2,000,000. Incorporators: Hector D. Mackay, president, and Mortimer M. Hollenback, chief engineer, both of Springfield.

***Georgia & Carolina Railway, Spartanburg, S. C.**—Application for a charter will be made in South Carolina by this company to build a 120-mile railway from Hamburg to Spartanbug, S. C., via Saluda, Newberry, Whitemire, Glen Springs and Pacolet. Capital stock, minimum, $100,000, to be increased later to $2,500,000. Incorporators: Allen W. Jones, Charles C. Howard and G. R. Coffin, Augusta, Ga.; A. E. Padgett, Edgeville, and Dan Crosland, Aiken, S. C.

FRANCHISES

Montgomery, Ala.—The Montgomery Traction Company has been granted a franchise by the Council to build an extension of its tracks from the end of the present Cloversdale system to the new woman's college in Montgomery.

Los Angeles, Cal.—The Pacific Electric Railroad has applied to the City Council for a franchise to build tracks in Pedro Street.

Oakland, Cal.—The Southern Pacific Company, San Francisco, will apply for a franchise to the City Council to build its tracks on Occidental Street in North Oakland for the purpose of connecting its Oakland and Berkeley ferry train systems.

San Francisco, Cal.—The Ocean Shore Railway has asked the Board of Supervisors for a 5-year extension of time to its franchise to construct the tracks of its Richmond and Sunset concessions as well as the right of way across the park.

Genoa, Ill.—The Woodstock & Sycamore Traction Company, Woodstock, has applied to the Board of Trustees for a franchise to build an electric railway in Genoa.

Peoria, Ill.—The Peoria & Galesburg Railway has accepted the franchise granted it by the City Council to use the tracks of the Peoria Terminal Railway on South Washington Street at Peoria and work will be started at once. This projected 60-mile electric railway will connect Peoria and Galesburg. S. T. Atwood, secretary. [E. R. J., Sept. 17, '10.]

Rockford, Ill.—The Paris (Ill.) Traction Company has asked the City Council for a 50-year franchise to extend its tracks as far as Chrisman.

Owensboro, Ky.—The Owensboro & Rockport Bridge & Terminal Company has been granted a franchise by the City Council to construct a railroad along the entire river front of Owensboro. This was a preliminary necessary to the work of beginning construction of a line from Rockport, Ind., to Owensboro, Ky. Work will begin in the near future.

Ludlow, Mass.—The Springfield Street Railway, Springfield, it is stated, will ask the Council for a franchise to extend its railway into Ludlow.

Bessemer, Mich.—Messrs. Sullivan and Appleyard have been granted a franchise by the Council to build an electric railway in Bessemer. This railway will connect Bessemer and Ironwood. [E. R. J., May 7, '10.]

Saginaw, Mich.—The Saginaw Valley Traction Company has been offered a 17-year franchise extension by the City Council and Board of Trade in exchange for three track extensions in the factory districts.

South Amboy, N. J.—The Jersey Central Traction Company has been granted a franchise by the City Council to install a curve on Main Street connecting with a private right-of-way in South Amboy.

Schenectady, N. Y.—The Schenectady Railway will ask the Common Council on Sept. 26 for a franchise to extend its tracks in Schenectady.

Tonawanda, N. Y.—The Frontier Electric Railroad, Niagara Falls, has reached an agreement with the city authorities of Tonawanda and North Tonawanda by which a franchise through those cities will be granted. This proposed railway will connect Buffalo and Niagara Falls and has acquired all the rights to the old Buffalo, Thousand Island & Portland Railroad between Buffalo and Niagara Falls. James S. Simmons is interested. [E. R. J., Aug. 6, '10.]

Dayton, Ohio—The Dayton, Springfield & Xenia Southern Railway, Dayton, has asked the City Council for a franchise to build a loop in the central section of Dayton.

Allentown, Pa.—The Lehigh Valley Transit Company has secured the signing of all borough franchises and township agreements, which will permit it to build an extension from Quakertown to Perkasie.

Morristown, Pa.—The Philadelphia & Western Railway, Philadelphia, has been granted a franchise to build an electric railway in Norristown. This is part of a plan to build an extension from Villanova to North Wales, via Norristown.

New Castle, Pa.—The New Castle, New Wilmington & Sharon Electric Railway, New Castle, has been granted a six-months' extension of time to its franchise by the City Council to build its railway in New Castle. This proposed 15-mile railway will connect New Castle, Bethel, Five Points, Sharon, South Sharon, New Wilmington, West Middlesex, Sharpsville and Meadville. James Campbell is interested. [E. R. J., Aug. 20, '10.]

Beaumont, Tex.—T. D. Polk and associates have been granted a franchise by the City Council to be adopted for the Beaumont Traction Company to build an electric railway in Beaumont and between Beaumont and Port Arthur.

Logan, Utah.—Leo Neilsen and associates have been granted an amended franchise by the County Commissioners to build an interurban electric railway to connect Wellsville, Hyrum, Logan, Hillville and Providence. [E. R. J., Sept. 3, '10.]

Spanish Fork, Utah—Abel J. Evans and associates have been granted a franchise by the City Council to build a railway in Spanish Fork. This is part of a plan to build an interurban railway through Utah County. [E. R. J., Sept. 3, '10.]

Richmond, Va.—The Virginia Railway & Power Company has applied to the City Council for a franchise to build an extension of the Broad Street and Twenty-fifth Street lines. This proposition is independent of the plan for a general franchise covering all lines, which was before the Council for several months.

Madison, Wis.—The Chicago & Wisconsin Valley Railway, Madison, has been granted a franchise by the Council to build an electric railway in Madison. This projected railway will connect Janesville and Merrill via Friendship, Easton, Portage, Lodi, Middleton and Madison. Allen T. Russell, Chicago, general manager.

Milwaukee, Wis.—The Milwaukee Electric Railway & Light Company has been granted a franchise by the Council to build extensions of its tracks on Seventh Street and Eleventh Street in Milwaukee.

TRACK AND ROADWAY

Phoenix (Ariz.) Railway.—This company has made arrangements for several extensions to its lines. An extension of the Indian School line to Glendale with 11 miles of added trackage will be built, also a line north on Second Avenue into the northwestern part of Phoenix.

Little Rock & Hot Springs Electric Railway, Little Rock, Ark.—This company advises that it will let contracts within the next 30 days for the construction of its line from Little Rock to Hot Springs. L. Garrett, 219½ Main Street, Little Rock, general manager.

Vallejo & Northern Railway, Vallejo, Cal.—This company has begun the work of grading at Woodland for its proposed branch from Sacramento to Woodland. T. T. C. Gregory, Suisun, president. [E. R. J., Sept. 17, '10.]

Norwich, Colchester & Hartford Traction Company, Norwich, Conn.—This company, recently incorporated, has organized by electing the following officers: Costello Lippitt, president; H. M. Pollock, secretary, and Albert L. Potter, treasurer. Work has been begun at the Hartford end of the line. [E. R. J., Sept. 10, '10.]

Chicago (Ill.) Railway.—This company is receiving proposals for furnishing rails and ties with which to carry forward the work of rehabilitation of the Consolidated Traction Company's lines. The purchases will include 6000 tons of steel rails and between 45,000 and 60,000 ties.

***Bristol, Ind.**—Herbert E. Bucklin is promoting the building of an electric railway to connect Bristol, Mottville, Constantine, Battle Creek and Kalamazoo. It will be operated to connect with the Northern Indiana Railway, South Bend, at Bristol. It is expected to begin the work of grading this fall.

***Liberty, Ky.**—Plans are under way for building an electric railway to connect Liberty and Moreland.

Louisville, Lincoln Farm & Mammoth Cave Junction Company, Glasgow, Ky.—It is announced that this company has completed financial arrangements and will begin work within 90 days on its projected 60-mile railway to connect Louisville and Mammoth Cave. J. M. Richardson, president. [E. R. J., July 30, '10.]

***Lafayette, La.**—At a meeting in Lafayette, Sept. 6, plans were considered to establish an interurban line to connect Lafayette, Cade, St. Martinville, Breaux Bridge, Arnaudville, Broussard and Port Barre.

Aroostook Valley Railroad, Presque Isle, Me.—This company is said to be making preparations to bridge the Presque Isle stream near the present terminal on Dyer Street.

Frederick (Md.) Railroad.—This company advises that it is building extensions to its lines in Frederick which will form a belt line in that city. The electrification of its line from Frederick to Thurmont for passenger service is now under way, and it is expected that the work will be completed by Dec. 1. The Union Electric Company, Pittsburgh, Pa., has the contract for the material used in connection with this work. The overhead system is being built 22 ft. above the rails so that the present steam freight service can be continued. Direct current will be used. It is also the plan to build an extension to Emmitsburg next spring. Several new bridges are being built along the line to replace the wood trestles now in use.

***Vicksburg, Miss.**—Press reports state that plans are under way for the construction of a 43-mile railway to connect Jackson and Vicksburg via Edwards, Bolton and Clinton.

St. Louis-Kansas City Electric Railway, St. Louis, Mo.—This company has let the contract to the Toledo (Ohio) Bridge Company for building its bridges over the Missouri River at St. Charles and Arrow Rock. D. C. Nevin, Commerce Building, Kansas City, Mo., is president. [E. R. J., Aug. 6, '10.]

Gallatin Valley Electric Railway, Bozeman, Mont.—This company has finished grading work and track laying is now in progress on its proposed 27-mile extension from Bozeman Springs, Mont., to Three Forks on the Chicago, Milwaukee & Puget Sound Railroad. N. C. Van Natta, Bozeman, Mont., chief engineer.

Atlantic Coast Electric Railroad, Asbury Park, N. J.—This company has completed surveys for the Haines City branch and construction will be started in the near future.

Elizabethtown (N. Y.) Terminal Railway.—This company has begun grading on its proposed 8-mile railway to connect Elizabethtown and Westport. It is expected to have it in operation by Jan. 1, '11. George W. Jenkins is interested. [E. R. J., Feb. 5, '10.]

New York & North Shore Traction Company, Mineola, N. Y.—This company has applied for a permit to build a double-track street railway on Bayside Boulevard from Ashburton Avenue to Tenth Street and on Tenth Street from the Bayside Boulevard to Broadway in the Third Ward, Long Island City.

New York, Westchester & Boston Railway, New York, N. Y.—This company announces that it has acquired the entire right-of-way on its main line within the city limits and that between West Farms and the city line about 65 per cent, exclusive of rails and power, has been built. In all 18 miles of railroad has been constructed or is under construction. Contracts have been let for the construction of the entire line between West Farms and Mount Vernon and White Plains and New Rochelle, and it is expected that the line will be completed within a year.

Western Ohio Railway, Lima, Ohio.—This company is receiving bids for the construction of an electric line from Fostoria to Fremont, Ohio, to be used in connection with the Western Ohio Railway for through service to Cleveland. It has already made trackage arrangements with the Toledo, Fostoria & Findlay Railway to use the property from Fostoria to Findlay.

Muskogee (Okla.) Transit Company.—This company has under consideration plans for the construction of a bridge over the Arkansas River so that it can extend its railway to Fort Gibson. This 225-mile railway will connect Wagoner, Tulsa, Sapulpa and Muskogee. M. F. Hancock, Muskogee, is interested. [E. R. J., May 7, '10.]

Southern Oregon Railway & Power Company, Albany, Ore.—This company, recently incorporated, has secured the franchises for its proposed electric railway in Medford, Ashland and Grants Pass. It is expected to begin work soon. Trustees, J. S. Vilas, J. R. Allen and S. V. Beckwith. [E. R. J., Aug. 13, '10.]

***Dillsburg, Pa.**—A company headed by Dillsburg business men and Philadelphia bankers is being organized with a capitalization of $180.000 for the purpose of building a 14-mile electric railway from Dillsburg to Dover via Franklintown, Mountain Top, Wellsville, Rossville and the Picketts, connecting with the York and Dover street railway line, thus making a direct route to York.

Hummelstown & Campbellstown Street Railway, Hershey, Pa.—This company is said to be considering plans for building a 5-mile extension from Campbellstown to Bismarck and a 5-mile extension from Bismarck to Lebanon. J. R. Kreider, superintendent.

***Oxford, Pa.**—M. C. Martin, New York, is said to be interested in a plan to build an electric railway between Oxford, Newark and Wilmington, making a belt line with the local railways, and then to Philadelphia.

***Wilkes-Barre, Pa.**—It is reported that Wilkes-Barre and Philadelphia capitalists are working upon a plan to build a street railway between Wilkes-Barre and Berwick, to connect with the Columbia & Montour Electric Street Railway at Berwick. It is said to be the intention to continue the line from Northumberland and Sunbury and from there to Shamokin.

Washington-Virginia Railway, Falls Church, Va.—This company, organized to build a 50-mile electric railway from Bluemont to Vienna, has been authorized to increase its capital stock from $1,000,000 to $3,000,000. M. E. Church, Falls Church, president. [E. R. J., July 16, '10.]

Richmond & Henrico Railway, Richmond, Va.—This company, it is said, will extend its tracks to the National cemetery and thence to Fort Lee. W. S. Forbes, president. [E. R. J., Aug. 6, '10.]

Waterville (Wash.) Railway.—This company has nearly completed work on its 7-mile railway between Douglas and Waterville. George C. Wiley, secretary. [E. R. J., Oct. 30, '09.]

Milwaukee Western Electric Railway, Milwaukee, Wis.—The State Railroad Commission has issued a certificate of necessity permitting the construction of a line from Beaver Dam to Fox Lake.

SHOPS AND BUILDINGS

Los Angeles (Cal.) Railway.—This company will erect a reinforced concrete paint shop on Fifty-fifth Street, between South Park and San Pedro Street. The Aiken Reinforced Concrete Company has received the contract.

Chicago, South Bend & Northern Indiana Railway, South Bend, Ind.—This company has awarded a contract to Peter T. Longachre and Frank Kelly for the construction of its new passenger and freight station in Elkhart on Marion Street, between Second Street and Third Street. The structure is to be two stories high and built of ornamental concrete blocks. It is to furnish accommodations for a passenger and freight depot and warehouse and for the local offices of the company. The estimated cost will be in excess of $9,000.

Frederick (Md.) Railroad.—This company advises that it is making preparations to build terminal stations for freight and passengers and is also building a new car house.

Detroit (Mich.) United Railway.—This company contemplates the construction of a 1 and 2 story brick depot and car house in Pontiac, and will receive bids about Mar. 1, 1911, Smith, Hinchmann & Grylls, architects, Detroit.

Springfield (Mo.) Traction Company.—This company is preparing plans and will receive bids about Dec. 1 for the construction of a 2-story brick and concrete addition to its car house at Division Street and Park Street, in Springfield. The cost is estimated to be about $35,000. W. A. Bixby, general manager.

Cohoes (N. Y.) Railway.—It is reported that this company has awarded the contract for the building of the station and waiting room at the corner of Broadway and Third Avenue, Rensselaer, to George Van Allen.

Ottawa (Ont.) Electric Railway.—This company has let the contract to Sanders Brothers, Ottawa, for building its new car house in Ottawa. Construction will begin at once. The cost is estimated to be about $50,000. The company will also erect a freight house at Princeton and Spring Valley, and it will double the capacity of its freight house at De Pue.

Erie (Pa.) Traction Company.—This company has awarded the contract to Constable Brothers, Erie, for building its new brick station at Cambridge Springs.

Pittsburgh & Allegheny Valley Railway, Leechburg, Pa.—This company has purchased land at North Vandergrift on which it expects to build a car house.

Aberdeen (S. D.) Street Railway.—This company is building a temporary car house at Aberdeen to be used until a location for the permanent structure is determined.

Roanoke (Va.) Railway & Electric Company.—This company is said to be making preparations for the erection of its new car house on Walnut Street, Roanoke, near its power house.

POWER HOUSES AND SUBSTATIONS

Montgomery (Ala.) Traction Company.—This company reports that it will build a power house in Montgomery. It has been buying power from the Montgomery Light & Power Company for its railway. W. J. Ginnivan, purchasing agent.

Philadelphia & Wilmington Company, Wilmington, Del.—This company has purchased through J. G. White & Company, Inc., New York, a 500-kw motor-generator set from the Westinghouse Electric & Manufacturing Company.

Southwestern Interurban Railway, Arkansas City, Kan.—This company has begun the work of building a power house at Hackney. The structure is to be 80 ft. x 40 ft.

Yonkers (N. Y.) Railroad.—This company has purchased a 1000-kw rotary converter from the General Electric Company for installation in its power station.

Pittsburgh & Allegheny Valley Railway, Leechburg, Pa.—This company has recently purchased land at North Vandergrift, on which it will erect a power station.

Sheboygan Light, Power & Railway Company, Sheboygan, Wis.—This company is said to have plans in progress for the building of a 1-story, 150 ft x 250 ft., brick, concrete and steel car house, fireproof doors and windows. W. B. Voth, 428 Eighth Street, Sheboygan, Wis.

Manufactures & Supplies

ROLLING STOCK

Washington, Baltimore & Annapolis Electric Railway, Washington, D. C., it is reported, will soon purchase 10 new cars.

Philadelphia & Wilmington Traction Company, Wilmington, Del., has ordered, through J. G. White & Company, Inc., New York, 100 railway motor equipments from the Westinghouse Electric & Manufacturing Company.

North Jersey Rapid Transit Company, Paterson, N. J., which was noted in the ELECTRIC RAILWAY JOURNAL of July 16, 1910, as considering the purchase of several cars, has placed an order with the Jewett Car Company for three cars.

New York, New Haven & Hartford Railroad, New Haven, Conn., will require from 75 to 100 motor cars for service on the New York, Westchester & Boston Railway, a third-rail line under construction from 180th Street, New York, to White Plains.

Boston & Worcester Street Railway, South Framingham, Mass., which was reported in the ELECTRIC RAILWAY JOURNAL of April 9, 1910, as contemplating the purchase of five new cars, has placed an order with the Osgood-Bradley Car Company for five closed car bodies. These cars will be equipped with the Standard Motor Truck Company's trucks.

Jacksonville (Fla.) Electric Company, reported in the ELECTRIC RAILWAY JOURNAL of July 23, 1910, as having ordered 10 double-truck closed prepayment cars from the Cincinnati Car Company, has specified the following details for this equipment:

Length body.....29 ft. 6½ in.	Destination signs....Hunter
Over vestibule.....39 ft. 1 in.	Hand brakes,
Width over sills....8 ft. 4 in.	Sterling Meaker
Body .....composite	Headlights.....U. S. Incan.
Interior trim.....mahogany	Motors.....2 G. E. 219-A
Underframe .....composite	Push button signal..Consol.
Air brakes.....G. E.	Roofs.....turtle back
Bolsters, body.....cast steel	Sash fixtures..Edwards 13-O
Bumpers.....channel iron	Seats, style.....H. B. & W.
Car trimmings,	Seating material.....rattan
mall. iron & bronze	Trolley retrievers...Knutson
Curtain fixtures....Forsythe	Trucks....Stand. max. trac.
Curtain material...Pantasote	Ventilators .....Star

TRADE NOTES

John Franklin Robinson, the senior member of the firm of Robinson & Orr, Pittsburgh, Pa., died on Sept. 9, 1910.

Yale & Towne Manufacturing Company, New York, N. Y., has appointed John B. Milliken treasurer with headquarters in New York. Mr. Milliken was formerly controller of the Crocker-Wheeler Company, Ampere, N. J.

Mann Indicator Company, Pittsburgh, Pa., announces the appointment of A. W. Hargett as manager of its equipping department. Mr. Hargett was formerly manager of the Meadville-Cambridge Springs Street Railway, Meadville, Pa.

Pawling & Harnischfeger Company, Milwaukee, Wis., which designs and builds electric traveling cranes and hoists, has appointed Arthur Fritsch manager of its Chicago branch in the Monadnock Block, succeeding W. E. Kreamer, resigned. Mr. Fritsch was formerly connected with the engineering and sales department of the Allis-Chalmers Company.

H. W. Johns-Manville Company, New York, N. Y., has opened new branch offices in Atlanta, Ga., and Rochester, N. Y. The Atlanta office is located in the Empire Building, in charge of W. F. Jones, who has been traveling in this territory for the company for several years. The Rochester office is located at 725 Chamber of Commerce Building, in charge of H. P. Domine, formerly with the Buffalo branch of the company.

Mathias Klein & Sons, Chicago, Ill., manufacturers of linemen's and electricians' tools, report that they are actively engaged in both of their factories filling the numerous orders which they have on hand. The old Van Buren Street factory is now almost exclusively employed in the production of Klein pliers of various styles and sizes. Various

items comprised in the general line of the company's products are manufactured at the new plant on Clybourn Avenue.

The Ackley Brake Company, New York, has an exhibit of its brake at the Brussels International Exposition. A sample platform is shown, equipped with the ordinary brake and with the Ackley brake. By means of a dynamometer the demonstrator shows how a pull of 70 lb. on the handle of the ordinary brake is changed to 600 lb. on the brake chain, while on the Ackley brake the same effort is converted to 1800 lb. The exhibit is in the Transportation Building.

Glacier Metal Company, Richmond, Va., is placing on the market a new ribbonized plastic metallic packing for steam, air, gas, ammonia, water, etc., manufactured from the finest alloy of white metal which can satisfactorily be made into fine shreds or ribbons. It is very pliable, will not score the rods, and shows no corrosion when it comes in contact with acids. No sizes are required to be carried in stock, as a rope can easily be made with the hands to the size required for packing the rods.

National Brake & Electric Company, Milwaukee, Wis., at the Atlantic City convention will occupy spaces 539 to 545, inclusive, comprising about 648 sq. ft. of floor space, which will be used to display its large and comprehensive line of air brake equipments and air compressors. Among the apparatus shown will be a complete line of National motorman's valves, National emergency and variable release valves and various types of National governors. In addition to these the company will exhibit motor-driven air compressors in both stationary and portable types.

Charles Goble, mechanical superintendent of the Railway Audit & Inspection Company, was tendered a banquet by the officers of the company prior to his leaving Philadelphia to take charge of the new office of the company, in the Calumet Building, No. 189 La Salle street, Chicago, Ill. Mr. Goble will be district manager of this office. Previous to entering the service of the Railway Audit & Inspection Company as mechanical superintendent five years ago, Mr. Goble had charge of several electric railway properties and had considerable experience in steam railroad work.

Whipple Supply Company, New York, N. Y., selling agent for the Tool Steel Gear & Pinion Company, of Cincinnati, has just closed a contract with the Chicago Railways Company for the supply over a period of two years of the Tool Steel Gear & Pinion Company's specially hardened and toughened gears and pinions. This contract was taken on a definite mileage guarantee, like all similar contracts negotiated by the Whipple Supply Company. The "Cincinnati" make of tool steel gears and pinions is always guaranteed against wear and breakage and a definite mileage is guaranteed, based upon results obtained from materials in use.

Western Electric Company, New York, N. Y., reports that there has been no occasion so far to revise the estimate of a gross business for the year of $61,000,000, which was made last February. Three-quarters of the company's fiscal year had elapsed on Aug. 31. The gains which the company has recorded consistently in the current year continue. August showed an increase of 50 per cent over the corresponding month in 1909. This year's business will be divided among approximately 800,000 orders as compared with 475,000 orders received in 1906, with an average value per order of $71 for 1910, as compared with an average value of $145 per order in 1906. There are at present 23,000 persons on the company's pay roll. Plans are now being considered for the erection of further extensions to its buildings at Hawthorne, Ill.

Middle West Engineering Company, Cincinnati, Ohio, of which James E. Hewes is president, was recently organized under the laws of Ohio, with a capital of $100,000, to do a consulting engineering business and to take charge of construction work. Mr. Hewes, the president of the company, has had 10 years' experience in construction and engineering work. He was associated with the General Electric Company in railway engineering work for five years. During this connection he had charge of the installation of electricity on the West Jersey & Seashore Railroad, under the direction of W. B. Potter, of the General Electric Company, and George Gibbs, consulting engineer of the Pennsylvania Railroad. Prior to entering the service of the General Electric Company, Mr. Hewes was consulting engineer to the Water Board of Baltimore. He also served as engineer in charge of the installation of the Kanawa Water & Light Company at Charleston, W. Va.; the Hagerstown Municipal Electric Power & Light Plant, Waynesboro, Pa., and the Shepardstown electric light plant at Shepardstown, W. Va. During the Spanish-American War Mr. Hewes served on the staff of Col. Eugene Griffin. Prior to this Mr. Hewes had charge of several electric railway installations in different parts of the country.

General Electric Company, Schenectady, N. Y., has furnished the Metropolitan Electric Company, Reading, Pa., which is controlled by the United Power & Transportation Company and supplies power to the United Traction Company, Reading, with four switchboards for use in its main generating station and main substation. The main generating station will have 41 panels, made up as follows: A 2-panel exciter board, 17-panel railway and feeder board and 22-panel controlling benchboard to control 5625 kva. The main substation switchboard will consist of a 25-panel benchboard with incoming line panels and rotary converter panels. The General Electric Company is also building a 16-panel board for the Metropolitan Electric Company, which will be installed in the main substation and will control 1275-light 4-amp 60-cycle 13,200-volt (primary) constant current transformers, which will be used with mercury arc rectifiers for arc lighting, and 4 16-kw. 60-cycle 13,200-volt primary, 5.5 amp secondary constant current transformers for incandescent lighting. The General Electric Company furnished the entire switching equipment for the panels, which are now being installed in the main generating and main substation of the Metropolitan Electric Company, and will also furnish the entire equipment for use with the 16-panel lighting board, which is to be installed in the main substation later.

ADVERTISING LITERATURE

Frank Ridlon Company, Boston, Mass., has issued its September, 1910, list of second-hand electrical machinery.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., is mailing a post card showing a sky photograph of its main offices and factories at Rochester.

Ohmer Fare Register Company, Dayton, Ohio, has issued a booklet entitled "What It Means to the User," in which the Ohmer indicating, printing and recording fare registers are described.

Peter Smith Heater Company, Detroit, Mich., has issued an illustrated folder containing data relative to the three sizes of forced ventilation, hot-air car heaters which it manufactures.

Thomson Electric Welding Company, Lynn, Mass., describes and illustrates, in a new 32-page catalog, its various types of machines used in the Thomson process of electric welding. It also contains several extracts from reports on electric welding made by well-known scientists. A folder containing a list of some of the users of Thomson welders accompanies the catalog.

Railway Roller Bearing Company, Syracuse, N. Y., has issued a catalog describing and illustrating its roller bearing journal box. This publication also contains a brief account of the anti-friction bearing tests conducted by the engineering department of the Philadelphia Rapid Transit Company, also several statements quoted from the official report of these tests which was published in the Electric Railway Journal of Aug. 27, 1910.

General Electric Company, Schenectady, N. Y., has issued bulletin No. 4749, which is descriptive of alternating-current switchboard panels. The panels illustrated are of the sectionalized type, and each section has a separate catalog number. These panels are in three sections, and the pages of the bulletin are sectionalized so that the user may have before him a picture of the complete panel desired, together with a full description of the equipment. The company has also issued bulletin No. 4755 describing and illustrating the electrical equipment of the Great Northern Railway.