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SAVINGS OF ELECTRIFICATION

The latest report of the Norfolk & Western Railway is conspicuous for its statement in regard to the advantages that have accrued from the company's recently-completed electrification of its coal-gathering division in the famous Pocahontas region of the Alleghenies. In this President Johnson says that the traffic results already obtained from the substitution of electricity for steam "indicate that the capacity of the line has been doubled and that the operating cost per ton-mile will be materially reduced." Inasmuch as the cost of the electrification, including the period of trial operation, was $3,100,000 and the electrified route mileage 29.5, it is evident that these remarkable savings have been brought about through an expenditure of but $100,000 per mile. This route, it should be remembered, includes a great number of colliery sidings, passing tracks and yards which make the cost per track-mile something like $30,000. This is a truly negligible expenditure for doubling the capacity of a line through mountain country, especially when the same expenditure reduces operating expenses.

STARTING RESISTANCE OF ELECTRIC CARS

That the high starting resistance of railway cars is negligible in its effect on energy consumption has apparently been pretty thoroughly demonstrated, a very comprehensive review of this phase of the subject having been published in a recent communication signed by F. E. Wynne. The circumstances leading to this condition might be outlined by citing the fact that the change from a state of rest to one of motion which occurs when a street-car controller is moved to the first notch is, for all practical purposes, made instantaneously, and as time plays an equal part with force in the measurement of energy it is safe to neglect consideration of the friction of rest in so far as it affects the heating and the energy consumption of street car motors. However, as Mr. Wynne points out, there are certain cases wherein more data regarding starting resistance are greatly desired. One of these is where the motors are loaded up to the limit of their starting torque, as for example, in starting a freight train on a grade. Another is that very little information is available in regard to the apparent great increase of the starting resistance of motor cars over that of trail cars, either freight or passenger. Professor Ewing's tests on one particular car, published in the issue of Aug. 14, indicated the increase to be more than 100 per cent, and if this is to be the general rule more evidence regarding the fact and the reasons for it would be well worth digging out.

STANDARDIZATION IN CAR DESIGN

The communication by N. W. Storer on the subject of low-priced rolling stock, which appears elsewhere in this issue, as well as the recently-published letter of Ernest Gonzenbach, are notable contributions to a matter that ought to be of gravest interest to the electric railway industry. Both of our correspondents are in accord on the main point at issue, and this is that standardization in car design is a reasonable possibility and would be highly profitable. Their differences are on the reasons that have prevented the introduction of standards and may, perhaps, be caused to some extent by their different viewpoints. Be that as it may, electric railway car design is paying a daily penalty for its practical barrenness of standards, and with all the advantages of close organization which the industry possesses, this is rather a serious indictment. Of course, the adoption of standards does not mean that a single complete design with fixed over-all dimensions must be agreed on and adhered to until the end of time. In fact, as was pointed out in the Electric Railway Journal for Sept. 12 and Oct. 31, 1914, there are many details, such as side-post spacing, roof contours and the like, which need little more than official action for their standardization.

THE CONVENTION PROCEEDINGS

As a complement to the convention issue of the Electric Railway Journal which formed the second section of last week's issue, a convention report number will be mailed on Oct. 9. This will be the first full report of the convention proceedings available, and it will contain even an account of the exercises held in connection with the presentation of a commemorative plaque by the exposition company to the association on Friday afternoon, Eastern time. The discussion will necessarily all be sent by telegraph, the two sections of the editorial staff working in synchronism at the ends of the line. This will be no new experience for the editors, as each week's news is printed as received nearly up to mailing time. In the meantime Secretary Burritt has sent out a large assortment of reports and papers enabling the unfortunate ones who cannot attend the convention to digest them and to prepare written contributions to the discussion. It is especially important this year that such contributions be sent to the convention, as many of those who usually participate actively in verbal discussion cannot be present. Such unsolicited communications are the surest indication of vital and unselfish interest in the association of which the convention is such an important element. There is still time to send written discussions.

THE IDEAL ELECTRIC LOCOMOTIVE

The outline specification for an ideal electric locomotive, which was included by E. H. McHenry in his paper before the International Engineering Congress this week, supplies much food for thought. This is not only because of its suggestions as to the imminence of a widening of the speed range at rating for electric engines and of a system for multiple-unit control for freight trains, but also because of the timely emphasis that is laid upon the necessity for reducing track loads. Mr. McHenry proposes to limit the weight on each driving axle to 20 tons, although maintaining a tractive effort of 10,800 lb., and in so far as the latter figure is concerned it is within easy reach to-day because this proportion of weight and power has been practically equalled already. With regard to the proposed weight limit per axle it would seem that this is a problem solely of mechanical design which ought to be met without difficulty. Certainly there is every reason for its establishment, as there is no question but that the strength of the roadway has by no means kept pace with the loads that have been placed upon it by the monster rolling equipments of the past few years. The rail, indeed, bids fair to-day to constitute an effective obstacle to further growth in rolling stock design, and as the electric locomotive can successfully surmount this by reducing wheel loads it would seem only logical to establish weight limits now and thus take at least one step toward the ideal machine that Mr. McHenry describes.

THE P. R. R. PHILADELPHIA ELECTRIFICATION

The unobtrusive manner in which electric operation has been inaugurated in suburban service on the main line of the Pennsylvania Railroad out of the Philadelphia terminal is characteristic of the gradual nature of the electrifications of the future. The railroad operating department realizes the change when electric are substituted for steam locomotives, or multiple-unit trains are added to the equipment, and the engineers of the country are interested to note the passing of another milestone on the path of progress, but otherwise the event attracts little attention. The travelers directly benefited appreciate the freedom from smoke and dust, but one trip accustoms them to the new conditions. The general public is as little concerned with the Philadelphia electrification as it is with many another great but non-sensational event in industrial progress. The Pennsylvania Railroad has been fortunate in not being subject to external pressure in electrifying so that time could be taken to eliminate the defects in the equipment before beginning full operation. There has, therefore, been no haste in the work and even yet but a single train is running. That this is wise is evident from an inspection of the overhead construction in the yard where a bewildering network of contact, messenger and span wires was necessary to electrify the numerous tracks, cross-overs and switches.

When one realizes that not only must the contact wires be held in place but they must be insulated for 11,000 volts with a liberal factor of safety he gains an appreciation of what has been accomplished in Philadelphia. If "overhead" can be kept in place and insulated under these conditions it can be kept so anywhere. While a very light electric service is to be furnished for the present the overhead for the entire terminal is completed so that it will be a comparatively simple matter to extend it. For this reason and also because the present construction is the result of exhaustive experiments superimposed on the accumulated experience from other electrifications we regard the Philadelphia electrification as far more significant than the present extent of the service would indicate.

THE LONDON TRAFFIC SITUATION

The urban transportation system in London, England, is one of the most interesting that there is for a number of reasons. One is on account of the magnitude of the problems in the world's largest city. Another is that owing to the clay foundations and liberal parliamentary enactments, the construction of underground railways is comparatively inexpensive, and, in consequence, the city has more miles of underground roads than any other. A third reason is the great development of motor-bus transportation, and its sharp competition with tramway service. Another is the fact that several of the trunk-line railroads entering London divert their suburban trains or part of them from the regular terminal stations and send them into the city through the rapid transit underground railways. They thus relieve these stations from the large commuter traffic and use the rapid transit system for distribution just as several of the outlying electric lines near Chicago use the elevated system in that city as a terminal and as the Arnold commission recommended in the case of the steam roads in that city. Still another reason why the London traffic situation is interesting to American readers is because Sir Albert Stanley, managing director of the London Underground Electric Railways Company, Ltd., and of a large proportion of the other transportation systems, spent many years in this country as a transportation manager. It is the problems connected with these systems which Sir Albert discusses in a paper presented at the International Engineering Congress at San Francisco this week.

The recommendations made in Sir Albert's paper are of interest to American as well as to British readers. Without going into the financial and legal aspects of the situation deeply it might be said that not only is the ownership of the traffic facilities in diverse hands but their regulation by the authorities is similarly diverse. Parliament, the Board of Trade, the County Council, the authorities of the municipal and suburban districts, the chief commissioner of police of the Metropolitan area, and the abutting property owners or "frontagers" on a proposed route, each have something to say or some veto power in regard to the construction or operation of one or more of the three principal means of transit, namely, railroad, tramway and bus. The necessary solution, in Sir Albert's opinion, is the establishment of an independent traffic board with jurisdiction over all of the means of transit with power to act,

as was recommended by the Royal Commission on London Traffic in 1907. It is interesting to remember that this recommendation of the Royal Commission was based largely upon a study of American conditions of State regulation, especially in Massachusetts and New York, where large powers had been given to the Transit Commission in Boston and the Rapid Transit Commission in New York. Finally, the paper discusses the question of fares and reaches the conclusion that with the low fares now charged on the London transit systems, and seemingly necessary owing to the British system of coinage, an expansion of traffic is imperative. This, however, is not out of the question, as a comparison of the rides per capita in Greater London, at present 271, with those in Greater Berlin, 293, and those in Greater New York, 338, shows. To pay 4 per cent on the capital now invested in the London urban railways, that is, to realize a net earning value of £1,390,000 more, after allowing for increase in expenses, requires an additional thirty-six rides per capita at the present average receipts per passenger, and this, under the circumstances, does not seem impossible.

THE NEW BEDFORD & ONSET FARE INCREASE

The fare increase granted by the Massachusetts Public Service Commission to the New Bedford & Onset Street Railway in a decision abstracted elsewhere in this issue is another gratifying indication that the right of capital to a reasonable return is receiving important and continued official acknowledgment. Here was a solvent property unable even with unusually skillful and economical management to earn more than a meager return upon the investment, amounting in fact to only 3 per cent in declared dividends on four occasions in the company's history of fourteen years. With about 44 miles of single track and a permanent tributary population of 20,366, the road has been conducted on a self-supporting basis but has been unable to set aside a sufficient depreciation fund from earnings or to afford more than a pittance of reward to those who put their money into the property. In fact, the owners have waited ten years after the last increase in rates for traffic to develop to the volume requisite to compensate their faith in the enterprise.

Readers of the abstracted decision cannot but be impressed with the remarkably clean bill of health which the commission gave the management in its thorough inquiry into the handling of the property from its inception to the end of the 1915 fiscal year. Running through the finding one notes the constant efforts of the management to control expenditures and to increase revenue by every legitimate means. The company's new arrangements for power supply from the New Bedford (Mass.) central station company, with provision for the resale of energy above its own requirements to the Marion Gas Company are a bit unusual in their economic advantages. These and the policy of having car painting done and of purchasing supplies economically at the shops of the Union Street Railway in New Bedford and the advantageous traffic arrangements and executive direction common to the two companies were regarded by the commission as evidences of careful management. Few cases before the board have afforded so little ground for adverse criticism of methods of handling the property, and the clearly demonstrated inability of the company materially to increase its net earnings by further reduction in expenses was no mean factor in the commission's favorable decision, based as it was upon a minute and extended analysis of operations.

It is noteworthy that under the new rates the cash fare over the main line from Fairhaven to Monument Beach will be 48 cents, or 2.18 cents per mile, and that with the tickets to be sold at twenty for $1, this rate per mile becomes 1.8 cents. On the route from Middleboro to Monument Beach the cash fare will now yield 1.69 cents and the ticket rate 1.41 cents per mile. The commission allowed a main-line rate of 1.67 cents per mile in the recent Blue Hill Street Railway case and 1.75 cents on the Norfolk & Bristol road. It has been pretty well exploded now that a rate of 1 cent per mile or even of 1.25 cents will meet the financial needs of a carefully managed road of the rural and semi-interurban type such as the New Bedford & Onset and many other lines in Massachusetts, and after all, the per mile rates mentioned are fairly low in comparison with the cost of transportation by other agencies. The commission wisely refuses to carry the per mile comparison too far, however, in view of the difficulties of harmonizing the differing zone lengths on the so-called main line and Middleboro branch, and in its conclusions properly treats the road as a complete entity.

Time will be required to show the effect of a 6-cent fare unit on the traffic in the New Bedford & Onset territory, as in other cases. It is hoped that about $20,000 more revenue per year will result from the changes in rates, but the commission points out that if due provision is made for depreciation, the company can hardly realize a 6 per cent return on its investment even if the falling off in traffic as a result of the 6-cent unit is small. The probabilities are that in no great length of time the communities affected will respond to the increased rate without more than a temporary lack of patronage. Certainly the large summer population served in the Buzzards Bay district is unlikely to balk at the change in view of the thoroughness with which its necessity has been set forth by the commission, and the sale of tickets on the reasonable terms offered is sure to commend itself to both regular and summer patrons, although the proportion of cash fare passengers will doubtless decrease, at least temporarily, following the inauguration of the new rate.

Space will not permit further discussion of the case other than the remark that it called for a valuation by the commission's engineering staff, in view of the acquisition of a part of the property in past years on terms resulting from a receivership on that section of the system. The engineering and accounting studies made by the commission in these fare cases are valuable features of the proceedings, and throw not a little light upon the standards of technical administration which the board views with favor.

The Portland & Lewiston Interurban

This 40-Mile Line, Which Has Recently Been Put in Operation in Maine, Was Built Without the Issue of a Single Bond or Share of Stock

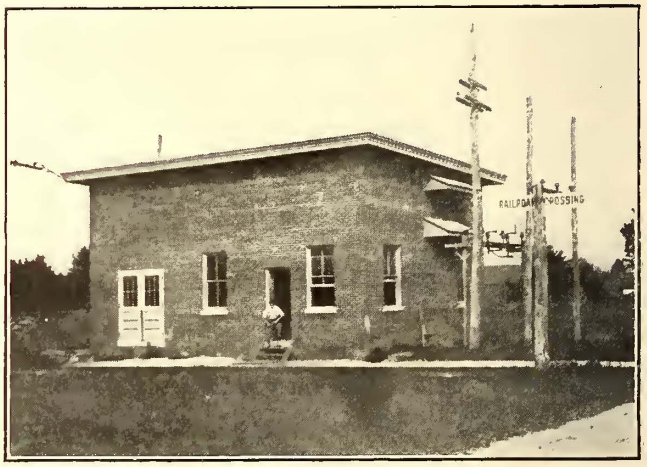
A year ago on July 2 a new high-speed electric line was opened for service between the cities of Portland and Lewiston, Me., by the Portland & Lewiston Interurban. The road is single track, occupying a private right-of-way about 30 miles in length and 50 ft. wide, its terminal connections covering 5 miles more in the cities of Portland, Auburn and Lewiston. The road was built without the issuance of a single bond or share of stock by Messrs. Libbey and Dingley of Lewiston, about four years being required for completion. Work was carried on only during the open season, with suspension of construction operations during the winter. The road provides an air-line route between its terminals and offers the public a schedule of one hour and fifteen minutes with ten stops over the 35 miles between Monument Square, Portland, and Lisbon Street, Lewiston, compared with a running time of three and one-half hours via the Portland-Brunswick trolley route. The running time between terminals in the center of each town is about the same as that of the Maine Central Railroad, and the fare on the new interurban is 75 cents, compared with 90 cents on the steam road.

Right-of-Way

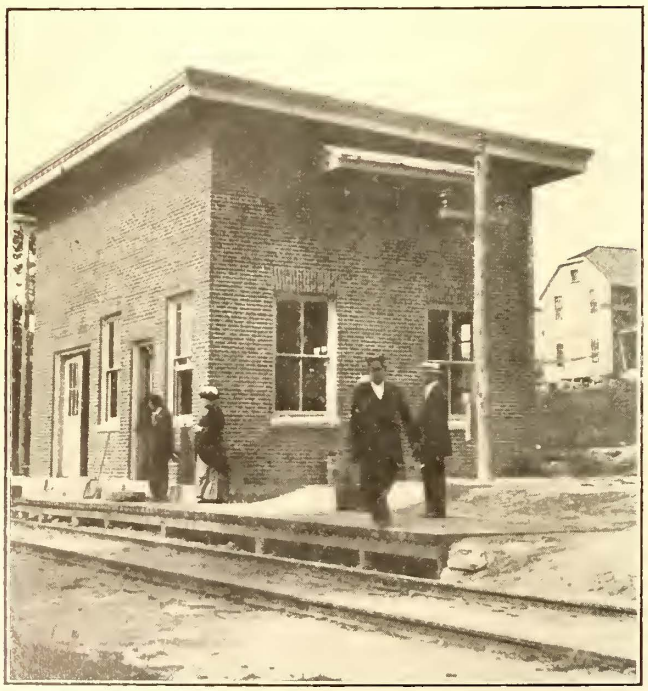
The track is of 70-lb. open-hearth T-rails laid in 33-ft. lengths with staggered joints and twin terminal copper bonds of American Steel & Wire Company's make. The company uses Duquesne joints, and the ties are of chestnut, 8 ft. 6 in. long, 6 in. x 8 in. in cross-section and laid 24 in. apart on centers. The conductivity of the bonds is equivalent to 2 ft. of rail. Gravel ballast was used throughout the private right-of-way. About 1 mile of the company's own line is located on the highway. The maximum grade is 4 per cent and the sharpest curve is 780 ft. in radius. Tie plates are used throughout. Eight reinforced-concrete bridges were built for the road, the largest being 200 ft. long, over the Presumpscott River. Two of the other bridges are 100 ft. long each. They were designed by Fred T. Ley & Company of Springfield, Mass., who also supervised their erection. All cattle passes on the road are of reinforced concrete, the pass being fenced by wire close to the top of the fill.

Power Supply

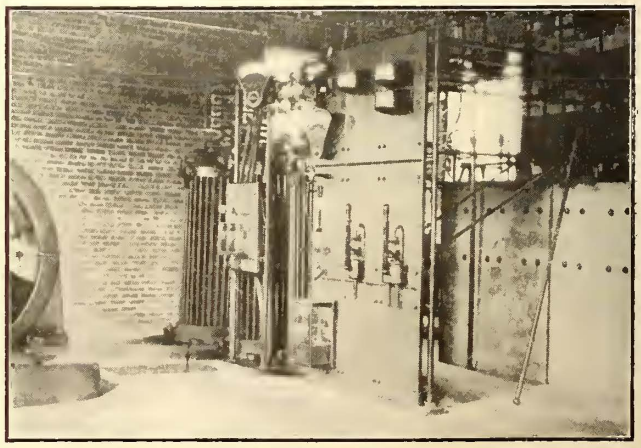
The power supply for the cars is 650 volts direct current, distributed from three rotary converter substations, located at Danville, Gray and West Falmouth. The generating plant is located at Deer Rips, on the Androscoggin River, and is supplemented by a steam turbine auxiliary station in Lewiston, both of these installations belonging to the electric service company of Lewiston and Auburn, which is owned and operated by the Androscoggin Electric Company. From Lewiston to Danville substation, a 10,000-volt, 60-cycle, three-phase line of No. 1 copper is used on account of the desirability of transmitting current at moderate voltage through Lewiston and Auburn, which occupy opposite shores of the Androscoggin River. At the Danville substation the pressure is raised to 33,000 volts for transmission to Gray and West Falmouth, this line also



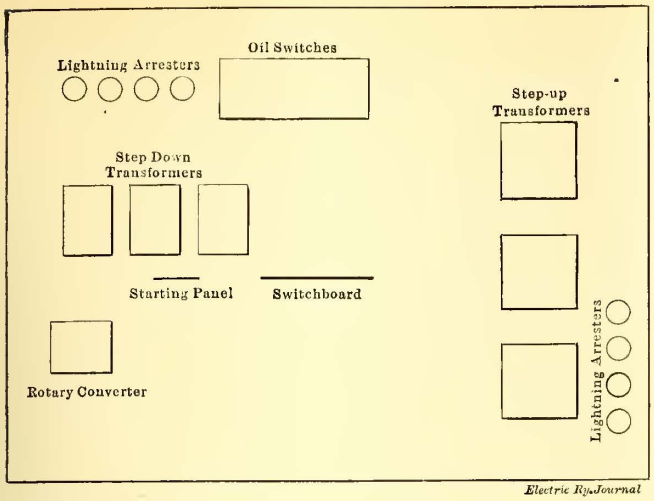
PORTLAND & LEWISTON—DANVILLE SUBSTATION



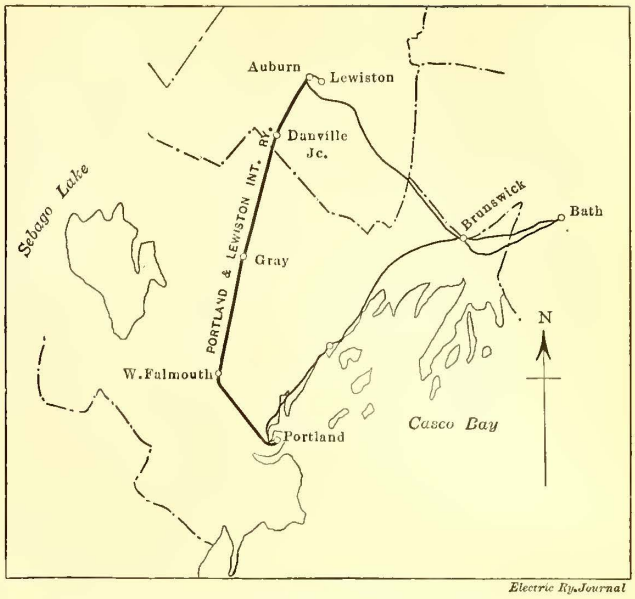
PORTLAND & LEWISTON—COMBINED PASSENGER STATION AND SUBSTATION AT GRAY



PORTLAND & LEWISTON—INTERIOR VIEW OF DANVILLE SUBSTATION



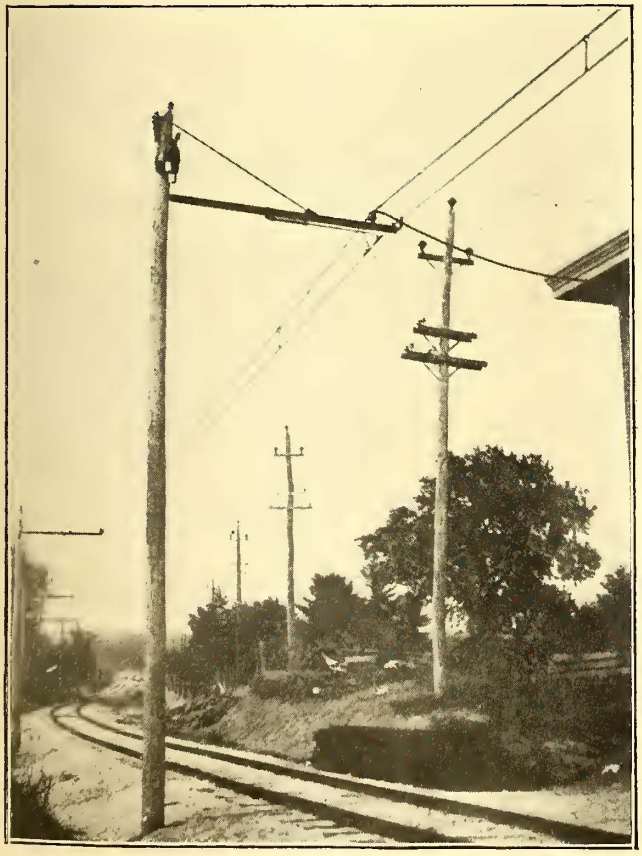
PORTLAND & LEWISTON—GENERAL ARRANGEMENT OF DANVILLE SUBSTATION



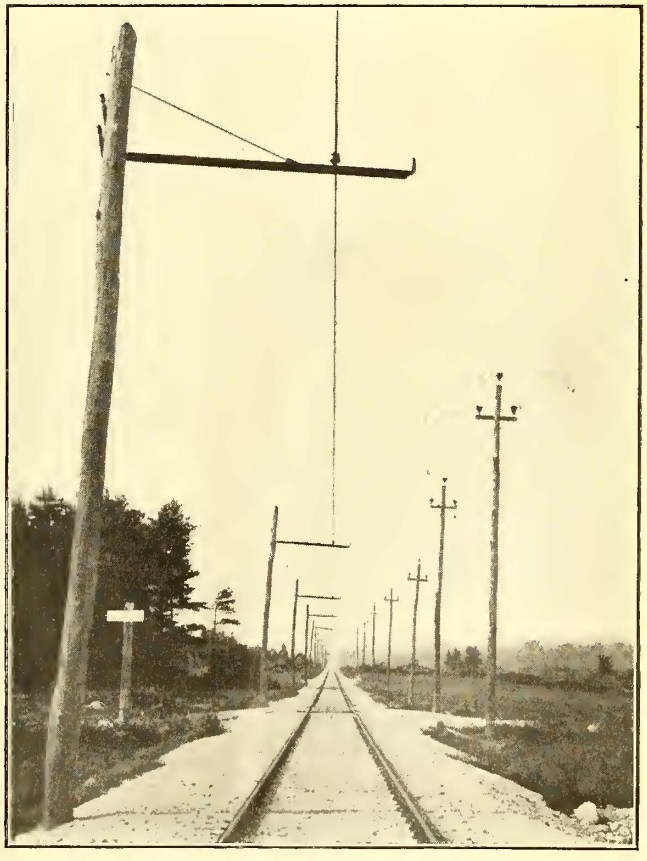
PORTLAND & LEWISTON—ROUTE OF RAILWAY WITH CONNECTING LINES

being a three-phase installation with No. 2 copper conductors mounted on pintype insulators and supported on 40-ft. chestnut poles. The 33,000-volt conductors are installed in a 42-in. equilateral triangle and the 10,000-volt line conductors have a 24-in. spacing. The transmission poles are set 6 ft. deep and are separate from the poles carrying the trolley brackets. No ground wire is installed. The high-tension lines loop through the intermediate substations.

The Danville substation contains a 300-kw. rotary converter, three 100-kw. step-down transformers and three 200-kva. step-up transformers feeding the high-tension line, with the usual oil switches and lightning arrester equipment. The apparatus is housed in a brick building 27 ft. x 40 ft. in plan, with a single operating room 20 ft. high. The roof is of mill construction, pitched toward the rear, and the floor is of concrete. The 10,000-volt line from Lewiston enters the substation on the north side, passing through choke coils and terminating on horizontal buses carried on a pipe frame at the rear of the operating room. Taps are taken from these buses through disconnecting switches to automatic oil switches, one set being provided for each transformer bank. From the transformer secondaries in one bank leads are run under the floor in conduit to the rotary, low-voltage switching connections being provided on a rotary starting panel near the main switchboard. The other transformer secondary connections



PORTLAND & LEWISTON—CATENARY TROLLEY ON CURVE



PORTLAND & LEWISTON—TYPICAL TANGENT TRACK

lead out of doors to the southbound 33,000-volt line, electrolytic lightning arresters being mounted on the floor of the substation on the south side of the operating room. Horn-gap arrester connections are made outside the building, and the outgoing high-tension lines are hooded as they pass through the wall and attached to insulators on a cross-bar before being carried to the ordinary line poles, to insure increased mechanical stability. The second high-tension line shown in one of the illustrations is a power and lighting circuit having no connection with the railway service.

The main switchboard in the Danville substation consists of three panels. One of these is devoted to the direct-current side of the rotary converter and contains the usual equipment of a railway feeder panel. The others carry the oil switch handles, overload relays and ammeters required in handling the 10,000-volt circuits within the building, no oil switches being provided on the high-tension sides of the transformers feeding the line leading to the Gray and West Falmouth substations, although disconnecting switches are installed with the substation, and at the other substations this line may be cut open by oil switches. Electrolytic lightning arresters are also provided for the incoming 10,000-volt line at Danville. The rotary is started on 320 volts. The 10,000-volt oil switches are mounted in concrete cells occupying a total space of 5 ft. x 3 ft. 4 in. x 8 ft. 6 in., a clearance of 31 in. being allowed between the wall and the switch cells on the east side of the substation. Short levers connect the oil switch handles on the front of the main board with the cells, as shown in the interior view. The substation is lighted by twenty 16-cp. lamps mounted along the wall 10 ft. above the floor. Each of the other substations contains a 300-kw. rotary and three 100-kw. step-down transformers. General Electric equipment is used throughout. The Gray substation is 8 miles from that at Danville and the West Falmouth substation is 7½ miles south of Gray.

PORTLAND & LEWISTON—END OF CAR SHOWING DOOR IN VESTIBULE

Overhead Construction

The trolley is installed with catenary suspension. To save line material the messenger wire is a No. 0000 copper conductor used as a feeder, the trolley, which is also of No. 0000 size, being attached to it by sherardized steel hangers 30 ft. apart. The trolley poles are 30 ft. long and are of chestnut, the spacing being 120 ft. Bracket suspension is employed, the messenger wire being laid upon porcelain insulators attached to 3-in. I-beams 8 ft. long, the bracket being stiffened by a ⅞-in. steel tie rod clamped to the pole. On curves a pull-off rod is used between the trolley and the bracket, as illustrated in one of the cuts. The use of a combination feeder-messenger wire saved the purchase and installation of a steel messenger, feeder insulated covering, cross-arms, brackets, tie wires and insulators. A private telephone line is carried on the trolley poles, and each car carries a portable Western Electric telephone set with jointed contact rod permitting the crew to communicate with headquarters at all times. The brackets are equipped at their outer ends with hooks to hold the messenger wire on the arms in case of a broken insulator. Six d.c. lightning arresters are installed per mile.

Cars and Equipment

Eight passenger cars are at present owned by the company. These are of the double-truck, solid vestibule type; two were built by the Wason Manufacturing Company and six by the Laconia Car Company. The over-all length is 46 ft. and the width outside 8 ft. 8¾ in. The cars are of the semi-convertible type and are divided into two compartments in addition to the vestibules, one compartment being assigned to smokers and the other to passengers in general. The main compartment, 30 ft. long, contains twenty 19-in. x 31-in. green plush cross-seats and two 18-in. x 32-in. end seats of the longitudinal type. The smoking compartment, which is 6 ft. long, contains two longitudinal leather-covered seats 18 in. wide. The center aisle is 24 in. wide between cross-seats, while the aisle in the smoking compartment is 4 ft. 10 in. wide. Interlocking rubber tiling is used, and the cars are finished in mahogany, with leaded glass windows and monitor type roof.

The vestibules are each 4 ft. 6 in. long and 3 ft. 4 in. wide. Each is provided with two sets of Pullman type steps with trapdoors in the floor, three steps being provided in each case. The steps are each 10 in. wide. The bottom step is 22 in. above the rail, each of the risers being 10 in. high. The windows are designed to slide vertically into monitor pockets, no sill pockets being provided. Heywood reversible seats are used, and the cars are fitted with baggage racks. The smoking and main compartments are separated by a bulkhead having a central sliding door with ribbed glass panels. The end of each seat is provided with a leather ticket holder, eight holders also being attached to the inside sheathing, with four more in the smoking compartment above the seats.

The car lighting is accomplished by two 60-watt lamps in each vestibule hood above the steps, three lamps of this size in the smoking compartment and sixteen in the main compartment. The last-named are installed in three parallel rows.

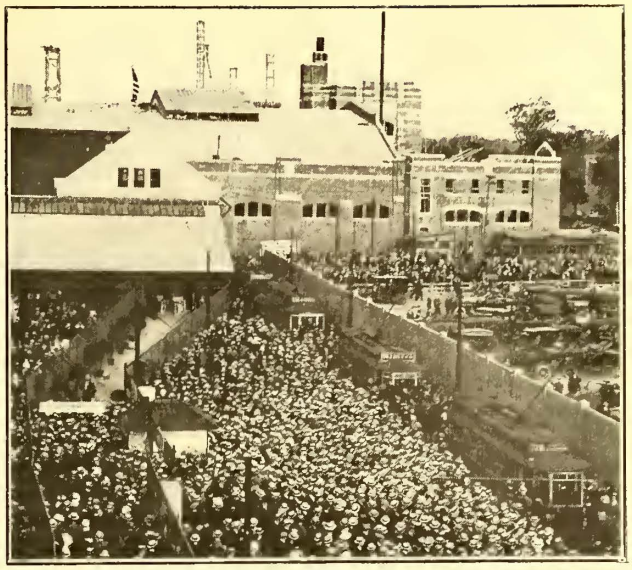
Each car is equipped with four Westinghouse 304, 90-hp. motors, with type HL automatic air multiple-unit control, Westinghouse straight-air brakes and Baldwin and Brill trucks. The total weight of the car

is 34 tons, and the motors are geared to a maximum car speed of 59 m.p.h. on the level. The wheels are of cold-rolled steel, 36 in. in diameter, with a standard M.C.B. flange and a 3½-in. tread. Each car is provided with two trolleys for double-end operation. Consolidated car heaters, Crouse-Hinds luminous arc headlights, and Westinghouse 15-B master controllers. In the front of each vestibule is a small door with a latch which can be opened from the outside only, to facilitate operating cars in trains.

Two brick carhouses, each 210 ft. x 75 ft., have been built at Portland and Lewiston for the use of the interurban. Each has four tracks with one inspection pit and concrete floors, and car-washing facilities.

There are no 5-cent fares on the interurban line and at present a two-hour schedule is being maintained. The schedule of fares is as follows from Lewiston: Littlefields, 10 cents; Danville Junction, 20 cents; Upper Gloucester, 25 cents; Lower Gloucester, 30 cents; North Gray, 40 cents; Gray, 45 cents; West Cumberland, 60 cents; West Falmouth, 65 cents; Deering Junction, 70 cents; Portland, 75 cents. In the month of July, 1914, the company carried 20,000 passengers. The population of the three terminal cities is 106,000.

The officers of the company are: President, William T. Cobb of Rockland; general manager, Fred D. Gordon of Lewiston.



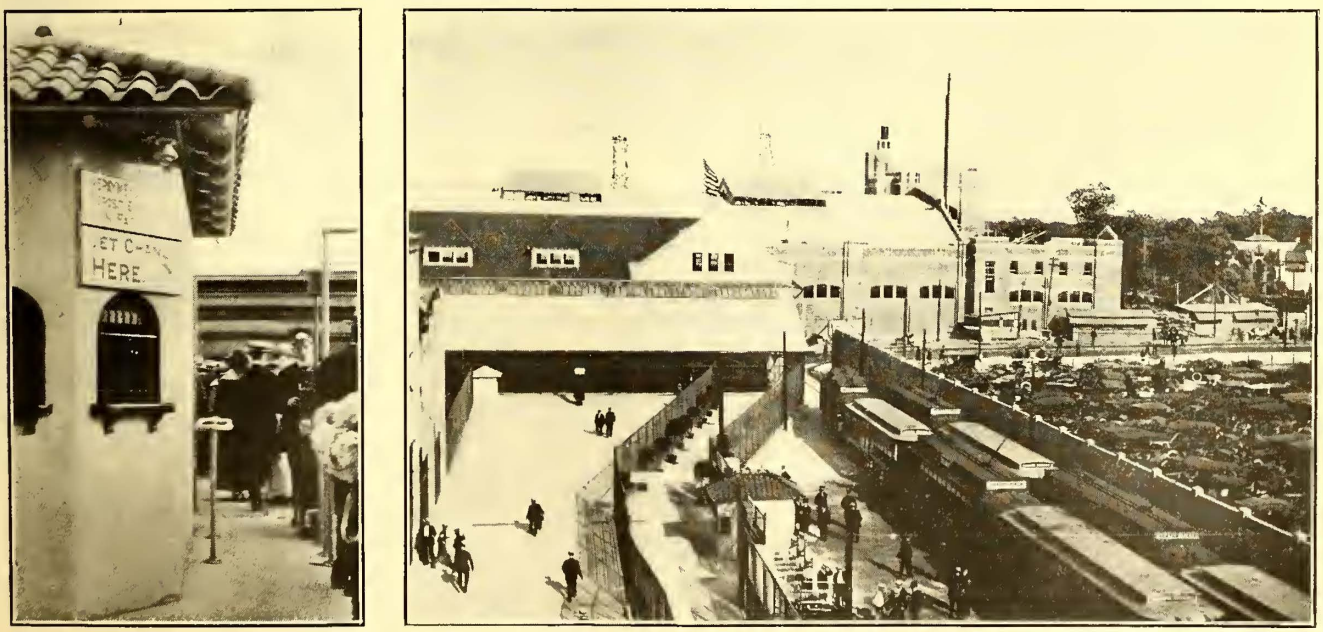
BOSTON BASEBALL TRAFFIC—CARS AT "BRAVES' FIELD" ON OPENING DAY

Handling Traffic at Largest Baseball Park

Arrangements Made by the Boston Elevated Railway to Accommodate the Immense Crowds Which Will Visit This Stadium

What is said to be the largest baseball park in the world was opened for business on Aug. 18 at Boston, Mass. On this occasion there was an attendance of almost 50,000 fans. The park, which is locally known as "Braves' Field," has been provided with transportation facilities consisting of a loop surface track that extends into the property from the Commonwealth Avenue line of the Boston Elevated Railway, and that company has arranged for the rapid handling of short-headway service, as illustrated in the accompanying views. Just outside the ball park proper and parallel to ramps leading from the grandstand is an inclosed area about 600 ft. long and 50 ft. wide, bordered on one side by a wire screen fence 10 ft. high and on the other by a concrete wall 12 ft. high and 6 in. thick. This area is utilized as a loading space and it contains two tracks capable of berthing about twenty cars of the semi-convertible, double-truck type.

Patrons of the game who desire to leave the park by trolley walk down one of the ramps to a prepayment station where change is made and then drop their fares directly into motor-driven International registering fare boxes which are located upon the platform, where cars are in waiting. Ten of these fare boxes are in service, and for the two prepayment stations there are six change windows, besides three more at other points along the platform. The leads for each fare box motor are run in conduit under the platform and are brought out at the box through a T-shaped fitting in one of the adjoining pipe standards. The prepayment stations are attractive semi-octagonal structures of concrete, 4 ft. 10 in. x 9 ft. 2 in. x 8 ft. in dimensions, with red tiled roofs. Incandescent lamps of 23 watt rating are installed in porcelain reflectors above the change windows for use in games that last until the late afternoon in the spring or fall.



BOSTON BASEBALL TRAFFIC—VIEW OF PREPAYMENT STATION AND BOOTH

International Engineering Congress at San Francisco

Traction in Its Broad Engineering Aspects Was Discussed at the Engineering Congress This Week by Sir Albert Stanley, E. H. McHenry, W. Barclay Parsons, Arnold Stucki, George H. Pegram, Prof. A. F. Ganz and Other Eminent Engineers

The International Engineering Congress of 1915 was held in San Francisco from Sept. 20 to Sept. 25. Partial summaries of the program were given in the issues of the Electric Railway Journal for Aug. 21, page 329, and Aug. 28, page 342. The congress was held under the joint auspices of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. The proceedings of the congress will be issued in twelve volumes, to two of which each member is entitled, the index volume and any other one.

The following abstracts cover some of the papers on topics related most closely to the electric railway field.

LONDON TRAFFIC IN 1913

In this paper Sir Albert Stanley, London, England, gave a résumé of traffic conditions and traffic facilities in that city. He outlined first the geographical conditions existing in London, which is composed of a central core with a small permanent population but surrounded by the Administrative County of London with an area of 112 square miles and a population density of sixty persons per acre. Around the County of London lies a further ring known as Greater London with an area of 576 square miles and a density of population approximating seven and one-half persons per acre. Beyond this is a population clustering around the stations of the railways running out from London, yet looking toward London for its interests. This is known as the outer suburban ring. It has an area of 2115 square miles with a density of population of less than one person to the acre.

The author then discussed the traffic facilities, which include railroads, both underground and main-line, tramway or street car systems, and omnibus lines. The underground lines serve the central core of the city and London County, there being 180 stations in all with only thirty-three that lie outside the County. There are nine main-line or trunk railroads, which serve the whole city, including the outer suburban ring, with a total of 574 stations. The terminals of all of these railroads are detached and, with the exception of Charing Cross, are not located at a really immediate traffic center.

The tramways are practically excluded from the central area for reasons of convenience based on the unsuitability of the narrow thoroughfares, but in the County of London 145 miles of tramway are operated. Outside of London County there are 201 miles of tramway which have 2780 cars. None of these lines enter the City of London and the interurban railway is unknown. The motor-bus industry has spread a network of routes all over the area covered by Greater London and to parts beyond in the outer suburban districts. The number of buses owned approximates 3500.

With regard to the control and regulation of London traffic the author discussed at length the procedure involved in the construction of the railways and the tramways and in the licensing of motor buses. He outlined also the consequences of the unco-ordinated character problems of the city's traffic as being the isolation and lack of correlation between the urban and trunk-line railway systems, the conflict between the tramways and the motor buses, and the exposed position of the motor buses together with the conditions that would be attached to a franchise if one was obtained for them. To solve these problems the Underground Electric Company of London has undertaken to bring a number of the different facilities under a single control, and today it is responsible for the operation of 61 route-miles of electric urban railway, 123 route-miles of tramway, and practically all the motor buses of London.

Data regarding the volume of London traffic in 1913 were cited both in relation to the traffic facilities and in relation to the population, the total being divided almost equally between the railways, tramways and the motor buses and the average number of journeys per head of the population working out at 271 per annum. Fluctuations in the volume of traffic were also discussed, seasonal variations being said to be not of major importance but the fluctuations in the course of the day being extreme. The latter are accentuated because of the workman's tickets at a reduced fare which is established by law on the railways and tramways, these giving a morning peak of extraordinary severity which is escaped altogether by the motor buses.

With regard to the improvements in railway capacity, the introduction of electric traction and automatic signaling was covered briefly, together with the results of an elimination of grade crossings at junctions which had been undertaken about the year 1910. The problem of the rush hours, however, was not acute owing to the numerous lines of approach, and the author saw no reason to anticipate that density of traffic would ever become a critical factor in London.

The fare problem in London was discussed at considerable length, the traffic being classified and distributed according to the rate of charge. This showed that there is no "fares system" in London at the present time. On the motor buses more than 99 per cent of the traffic is carried on a straight ordinary fare, the average receipt being 2.66 cents per passenger. On the tramways there are the workmen's reduced fares and the ordinary traffic corresponding to that of the motor buses, the former being almost 10 per cent of the whole. Variable fares are the rule, the average receipt approximating 2 cents per passenger. On the railways there are three distinct classes of passengers, namely, the statutory workman's traffic, a commuter traffic traveling on special tickets and the ordinary traffic, the latter covering 76 per cent of the whole. The average receipt of the whole traffic on the underground line of the London Electric Railway alone was 3.36 cents per passenger. The key to the fare situation of London is the rate of charge for ordinary passengers, as the fares charged to workmen and other classes are placed in relation to the fare of the ordinary passenger.

In the discussion of the subject the author took up the factors affecting the amount of the ordinary fare, the existing system of coinage in relation to fares, and the cost of operation per passenger. The existing scale

of fare was commented on at length. The author then took up the possibility of equalization of fares, speaking of the existing excessive differentiation between different rates of fare and upon the characteristics of a good fare system.

In conclusion, comment was made upon the heavy capitalization and low return from the traction enterprises in London, the only real remedy for this condition being expansion of traffic, and to this end the policy of advertising for traffic had been undertaken. This had been generally successful, but the solution of the London problem could never be conclusive unless to the detailed solution of the commercial and operating problems of the movement of traffic there could be brought a spirit of co-ordination and co-operation. Only in this way could the development of the traffic facilities be carried with economy, and the traffic conserved to afford opportunity for dividends on the money already sunk in their provision.

ELECTRIC MOTIVE POWER IN THE OPERATION OF RAILROADS

In this paper E. H. McHenry, McHenry & Murray, consulting engineers, traced the development and outlined the present status of heavy electric traction. He commented at length upon the advantages and limitations of electric motive power and discussed its adaptation to traffic requirements.

In connection with the future possibilities and tendencies of electric traction he spoke of the desirability of speed-torque control, believing that a better utilization of the possibilities of the electric locomotive is probable through this means. The radical difference in the speed-torque characteristics of steam and electric engines involves the necessity for closely designing electric locomotives for the service to which they will be assigned, as they cannot be operated above the critical speed corresponding to their horsepower rating without serious reduction of capacity. Nor can their effective adhesion be continuously utilized at lower speed without exceeding safe temperature limits.

However, a promising opportunity is presented for reducing and limiting the present rate of expenditures incurred for maintenance of equipment and for maintenance of way and structures by reducing axle loads of electric locomotives. The strength of rails and tracks on steam railways has not kept pace with increasing wheel loads, which, if not dangerous, certainly involve very costly construction standards and track maintenance. While the recent development of engines of the Mallet type permits lighter axle loads for equal tractive power it is not likely that such machines will long hold the field against their electric competitors in view of their disabilities of great weight, high machinery friction and costly repairs.

The author considered it probable that some form of multiple-unit control will be developed for the operation of freight trains. This would relieve and distribute the present excessive strains on draft rigging, tracks and bridges. The necessity for such equipment is close at hand in connection with similar requirements for electro-pneumatic brake control and the growing need for better means of communication throughout the length of great modern freight trains.

A set of specifications were submitted which were considered to provide ideal characteristics for an electric locomotive. While these were seemingly difficult of attainment there were no inherent difficulties in their way, and the author considered that such qualities would soon be forthcoming should the commercial demand for them become insistent. These ideal characteristics are shown in the accompanying table.

Variable speed-torque control.	
Electric braking and power regeneration.	
No reciprocating parts.	
Rigid wheelbase not exceeding	8 ft.
Number of axles	Draft rigging limit
Weight on driving axle, per axle	40,000 lb.
Tractive power, 27 per cent adhesion per axle	10,800 lb.
Horsepower, continuous, per axle	720 hp.-864 hp.
Maximum speed, full traction rating	25-30 m.p.h.
Horsepower per ton weight on drivers	36 hp.-43 hp.
Horsepower per ton of total weight	30 hp.-36 hp.

The author then took up the economic conditions suitable for the application of electric traction, covering such subjects as yield on investment, train frequency and speed, competitive conditions, multiple track levels, real estate and land values, track capacity, legislation, economic comparisons of steam and electric conditions, train mileage, helper engine service, terminal, yards and tunnels, length of division, engine fuel and repairs. In connection with this he cited a rule-of-thumb method for quick approximation of conditions suitable to electrification, to the effect that the fixed charges of an electric installation should not exceed one-half of the cost of engine fuel and engine repairs under steam operation plus 10 per cent.

The ratio of coal consumption of steam and electric engines was stated to vary in different classes and conditions of service, but as ascertained by experience on the New Haven road the ratio in passenger service is approximately 1 : 2, in freight service 1 : 2½ and in switching 1 : 3. Under normal conditions the cost of repairs per engine-mile will vary between one-third and one-half of the cost in similar service.

In conclusion the author stated that there were many existing opportunities for capital investment in electrification upon a large scale which will earn from 20 per cent to 10 per cent with reasonable certainty. There is little reason to doubt a continued development and further expansion in the field as soon as the financial and legislative conditions permit. The paper concluded with an extended bibliography on the subject.

RAILWAYS

This subject was discussed by W. Barclay Parsons in most comprehensive detail, the author tracing the development of steam traction from the time of its inception up to the present. Statistics covering the railway track mileage in existence in the various countries of the world were submitted in tabular form by decades from 1830 to 1910, this being supplemented by data which included consideration of area and population with regard to railway mileage.

With regard to the details of operation tables were submitted showing the length of line, capitalization, equipment, revenues and expenses, number of passengers carried, number of tons of freight hauled, average number of employees, etc., for the important countries of the world, these figures also being summarized for each decade since the introduction of the railway. This data showed the great extent of railways in the United States with regard to total figures and indicating in a most striking manner the way in which the railways of the United States exceed those of other countries in the volume of their freight traffic. This superiority, however, does not extend to the volume of passenger traffic either in the total number of passengers carried or in the number of passengers carried per mile of line, but does exceed any of the other countries in regard to the total number of passenger-miles. Data regarding the receipts per passenger-mile and per ton-mile were also submitted in detail, these showing that the cheapest travel is found in India and the most expensive in the United States. When the receipts from freight per ton-mile are considered India, Canada, Japan and the

United States are close competitors for the lowest charge.

Statistical tables regarding the development of the steam locomotive and the freight car were also submitted, including a particularly interesting curve showing the number of cars of various capacities in service in the United States by years from 1902 to 1914. This showed a constant increase in the number of 100,000-lb. cars, an almost constant increase in the number of 80,000-lb. cars, and a decrease in the number of 60,000-lb. cars since the year 1908. The 50,000-lb. and 40,000-lb. cars have decreased steadily since 1902. The subject of gage for track rails both in the United States and abroad was also discussed in considerable detail.

Elaborate statistics for the last four decades regarding the number of passengers and employees killed and injured on railroads were also included, the figures for the United States standing out with totals that, without explanation, are appalling, the number of injured increasing in a much higher ratio than the increase in killed. However, this does not mean that there has been so great an increase in persons injured but rather an increase in the number of injuries reported.

In regard to the matter of ownership and regulation the author stated that, while there was a great diversity in practice throughout the world, undoubtedly there was a steady tendency toward government ownership, or at least more rigorous government control. When railways were first projected in England and in the United States they were regarded much as turnpike enterprises —purely private concerns with no thought of participation by national or local government, either as part owner contributors or controlling agents. This policy, except as to some form of government control, has been adhered to in the United Kingdom but in no other country. There followed a statement covering the titles and powers of the various commissions in existence in the different States of this country which have jurisdiction over railways. In a discussion on taxation it was pointed out that, notwithstanding their private ownership and public regulation, the railways contributed to the State treasuries more than 50 per cent as much as was paid out in dividends during the year 1914, a ratio that has steadily increased since the year 1904.

TRACK AND ROADBED

In this paper George H. Pegram, chief engineer Interborough Rapid Transit Company, presented in tabular form data regarding the track construction of a number of prominent steam and electric railways, accompanying this with cross-sectional elevations of track to show the various arrangements of ballast and drainage. After briefly discussing the different designs the author took up the subject of cross-ties and fastenings in considerable detail as they constitute the largest item of track expense and conditions affecting their use are rapidly changing. He stated that the hardwood untreated cross-tie probably makes the best track that can be devised owing to its elasticity, facility for making fastenings, resistance to displacement in the ballast, insulation of electric currents and, especially, its ability to resist destruction by derailed wheels. It is harder, stronger and tougher than a treated tie of equally good material. However, the use of sawed cross-ties treated with creosote or zinc chloride is desirable in most cases, as this leads to the greater conservation of the timber supply. Tie plates should be used on all treated ties, these preferably being designed with a flat bottom so as not to cut into the tie and allow the entrance of water. Screw spikes are necessary with ribbed tie plates but time and experience are still wanted to prove finally the merits of the screw spike as compared with the cut spike. Cut spikes, when used with treated ties, should be driven in bored holes 7/16 in. x 4 in. but with hardwood untreated ties should be driven without previous boring. The present tendency is to use four-bolt joints, but six-bolt joints will ultimately prove better. In either case the bolts should be made of steel with a high tensile strength. Anti-creepers should be used on all tracks having one-way traffic, particularly on grades.

The author also advocated the use of rails of small section as these distribute the load over a poor roadbed with less proportionate stress because of greater flexibility and because the rail can be made of better quality, and submitted data to indicate that the performance of heavy sections from 85 lb. to 100 lb. is not as good as that of lighter sections ranging from 72 lb. to 80 lb. He considered that more attention should be given by the railroads to securing better wearing rails and that the carbon content of open-hearth rails can be increased to from 0.72 to 0.85 inasmuch as the phosphorous contents can be made considerably less than 0.04. He suggested also that it might be wise to lay rails normal to the coning of the wheel tread rather than normal to the axle, as at present, and thus getting more central pressure on the head.

In general the author considered that the mills were alive to the necessity for producing better rails and that it was in the mills that improvement must be made. The paper concluded with brief comments on alloy steel rails and on the composition of conductor or third-rails, a carbon content of 0.15 for the latter being possible without raising the conductivity ratio with copper above 7, thus giving a harder, more easily handled rail.

EFFECTS OF ELECTROLYSIS ON ENGINEERING STRUCTURES

This paper, which was presented by Albert F. Ganz, M.E., professor of electrical engineering, Stevens Institute of Technology, is an exceptionally complete treatise on the results of electrolytic action on various structures and the remedies that could be applied without making extensive changes in the near-by electric distribution systems. With regard to the effect of electrolysis on electric railway tracks and on iron or steel structures supporting them the author stated that, in future construction of elevated and tunnel structures, every precaution should be taken to maintain as high a resistance between the tracks and structure as possible. Where desirable, connections between structure and track may be made through suitable resistance at neutral points in order to avoid excessive potential differences between track and structure. These connections, however, should not under normal conditions carry substantial currents. Where the resistance between structure and track is low and cannot be adequately increased the most practical way to reduce the shunting of current through the earth is to reduce the track voltage drop.

With regard to the effect of electrolysis on underground lead-covered cable systems the author advocated the use of insulating joints installed in building laterals directly inside of the building wall. The cable ducts also should be constructed so as to be as nearly water-proof as possible and should drain to the manholes, the latter being drained to sewers wherever practicable. For main cable runs insulating joints may be installed in special cases to break up the electrical continuity of the lead sheath, but such joints must be installed only with great caution, and only where they do not cause the sheath on one side of the joint to become dangerously positive. Insulating joints cannot be generally applied to the sheaths of cable networks.

In discussing the effect of electrolysis on underground

systems for gas or water the author pointed out the limitations of the drainage system as compared with its efficacy for use with cable sheaths. He advocated the installation of insulating joints at the entrances of pipes to carhouses and, in some cases, the use of insulating coverings of adequate thickness, although he considered the latter to be actually dangerous unless they were perfect at all points. He opposed metallic contacts between pipes and railway tracks or other structures of metal, such as bridges.

With regard to steel foundations of buildings and reinforced-concrete structures insulating joints were recommended for all pipe and cable sheaths in connecting the structure to outside piping systems. Damage to reinforced-concrete structures requires special situations; for example, where stray current is brought in by way of a service pipe or where there is a direct contact between the reinforcing steel and one side of a grounded d.c. lighting system. While negative connections to the reinforcing steel will prevent corrosion by electrolysis it may result in destruction of the bonds between the reinforcing and the concrete, as this results when current flows from concrete to steel.

A brief outline of the status of electrolysis in Great Britain and Germany was included in the paper together with a discussion on the probable future tendency in electrolysis mitigation, support being given to the insulated return feeder system in the latter section. The paper closed with a bibliography covering the subject.

SIGNALS AND INTERLOCKING

The author of this paper, Charles Hansel, member American Society Civil Engineers, discussed the use of a.c. track circuits for signals, stating that the development of the a.c. signal marked an epoch in safe and economic railway operation. He spoke also of the importance of the development which came with the introduction of the upper quadrant semaphore signal and commented at length upon automatic train control.

He considered that the use of an automatic control system as an auxiliary would constitute a prominent forward step which would increase the unit of safety even though but one locomotive and but one block were equipped. It is unnecessary to have a definite percentage of all locomotives equipped before the benefit of the apparatus is secured as in the case of the air-brake system. The failure of the automatic control system is not by any means as serious as the failure of the visual system because it is only an auxiliary. The engineer has to depend upon the indication given him by the visual signal to advance or stop, but there is nothing in the automatic control which authorizes him to advance.

The perfecting of a system of cab signaling and automatic control of trains was stated to be a duty which should not be left to the unassisted effort of the individual. It seemed reasonable to expect that the governing powers should join the railroads and offer such incentives as would stimulate practical work, thus hastening the day when the traveling public would be more fully protected.

ROLLING STOCK OTHER THAN MOTIVE POWER

Under this title Arnold Stucki pointed out the improvements made in car equipment during the past decade in the United States and Canada, calling attention to the modern provisions for the safety and comfort of passengers, for efficiency in handling freight and moving trains and for the protection of freight in transit. Credit, he said, was due to the Master Car Builders' Association for most of the progress that had been made along these lines, and the standards and recommended practices of that association were listed to show the scope of its activities. In connection with the development of special parts, attention was called to the modern brakes which will stop a train in 1000 ft. from a speed of 60 m.p.h.; to couplers which operate successfully under the most unfavorable conditions without the necessity for operators going between the cars; to the rapid introduction of electricity for train lighting; to the use of cast steel for bolsters and truck parts; to the friction draft gear which frequently provides capacity of 200,000 lb., and to frictionless side bearings and similar specialties.

Beginning with the all-steel cars built for the Erie Railroad in 1904 a history of steel passenger-car construction was outlined. Various types of freight cars were also described, special attention being given to the all-steel box cars which are rapidly coming into use. Various types of trucks for cars were also discussed, including the six-wheel freight-car truck used by the Norfolk & Western Railroad for its 90-ton coal cars. The paper was profusely illustrated with photographs of complete cars and trucks as well as drawings of details and it ended with a bibliography treating with modern railroad car design.

PRESERVATIVE TREATMENT OF TIMBER

The authors of this paper, Howard F. Weiss and Clyde H. Teesdale, presented a general review of the results of wood preservation obtained in the United States by showing the quantity of wood preservative used and the amount of timber treated annually, as well as the extent to which the various treatments have prolonged the natural life of wood. In addition a partial bibliography was appended covering American practice.

The authors' conclusions were that the wood preserving industry has become firmly established. This is shown by the fact that more than 150,000,000 cu. ft. of timber is being treated annually, the increase in the amount of wood treated between the years 1908 and 1913 being 230 per cent. The industry has made possible the use of quantities of non-durable timber which, without treatment, would be but little used, and it has relieved the heavy demand from a naturally durable woods which were rapidly becoming exhausted. Even when the more durable species are treated their length of service is increased.

The industry has materially lessened the drain upon the forests, especially in the case of the more valuable woods, because of the greater life given to timber that is subject to decay. The extensive practice of preservative treatment has been too recent to make its influence on forest demands apparent. It seems likely, however, that unless new systems are developed the demand for treated timber will ultimately decrease because replacements will be made less frequently.

Six impregnation practices are now in general use in this country. These are the Bethell (full-cell creosote), boiling, Burnett (zinc chloride), Card, Lowry and Rueping. Considerable quantities of telephone poles and construction timbers are also treated by the open-tank, kyanizing, dipping and brush methods.

The oldest records reported to the authors on the efficiency of treatment are on the full-cell creosote, Burnett and Wellhouse processes. It is reported that 150,000 pine ties treated with 10 lb. of creosote per cubic foot gave nineteen years of life on the H. & T. C. Railway; 12,000,000 Douglas fir ties treated with 0.27 lb. of zinc chloride per cubic foot gave from ten years to twelve years average life on the Southern Pacific Railway; 4,800,000 Douglas fir ties treated with 0.35 lb. to 0.50 lb. of zinc chloride gave from ten years to twelve years of

life on the C., B. & Q. Railway; 5,600,000 hemlock ties treated with 0.50 lb. of zinc chloride by the Wellhouse process gave eleven years average life on the C., R. I. & P. Railway. Relatively little data are as yet available on the complete durability of timber treated by the Card, Lowry and Rueping processes as applied in the United States.

Experience has shown that timber improperly prepared for treatment is very liable to give unsatisfactory service. It is of prime importance to have timber properly peeled and seasoned before treatment, and also to be sure that it contains no advanced decay. In general the most approved method of treatment is in the open air. Conditions sometimes demand artificial seasoning, which is satisfactorily accomplished either by steaming or boiling in oil. High temperatures during artificial seasoning have been shown to injure the timber, and the best practice is not to exceed 260 deg. Fahr.

The following table was also included in the paper to show the status of the principal wood preserving processes now in use in the United States:

Table Showing the Principal Wood-Preserving Processes in Use in the United States

Name of Process	Preservative Used	Patent Number	Date Patent Was Issued	Company or Individual Controlling Patent
Bethell or full-cell	Creosote	Expired		Open to all
Boiling	Creosote	Expired	Aug. 27, 1895	Open to all
Burnett	Zinc chloride	Expired		Open to all
Card	Creosote and zinc chloride	815,404	March 20, 1906	J. B. Card
Kyanizing	Mercuric "	Expired		Open to all
Lowry	Creosote	831,450	Sept. 18, 1906	American Creosote Co.
Open Tank	Creosote	Expired		Open to all
Rueping	Creosote	709,799	Sept. 23, 1902	Lembcke von Bernuth Co.
Wellhouse	Zinc chloride, glue and tannin	Expired		Open to all

THE MECHANICAL PROBLEM OF THE ELECTRIC LOCOMOTIVE

The author of this paper, G. M. Eaton, engineer railway division, Westinghouse Electric & Manufacturing Company, confined his discussion closely to the side-rod type of locomotive in which the motor is connected to a jackshaft by rods and the jackshaft in turn is connected to the drivers by rods. The only type of locomotive of this design used in this country is that now being operated on the New York electrified zone of the Pennsylvania Railroad.

In the analysis of the stresses and strains upon the rods and bearings it was stated that the maximum stress would vary as an inverse function of flexibility, this constituting an argument in favor of the heat-treated and alloy steels since high-unit stresses and greater deflections were permissible. The maximum stress varies as an inverse function of the load, as a direct function of the speed (with motors of series characteristics) and as a direct function of pin and journal clearances.

A series of elaborate polar diagrams were included to indicate the force distribution on the crank pins and jackshafts and their bearings, these showing that the movements of the contact points in the bearings were extraordinarily irregular. The contact point at the jackshaft bearing moves in a direction in general opposite the direction of the shaft rotation, traveling around the shaft twice for every shaft revolution. It was shown that there was a tendency for the wear of the bearing brasses to be downward. During a hard start, however, the wearing tendency is practically the same in the upper and lower half of the bearing brass so that the nature of the actual wear becomes a function of the service. If the service is starting a train on a level and running at high speed for long distances the jackshaft bearing brass may be expected to wear downward. There is also a tendency for the shaft to pound in the bearing on one side. With the materials, proportions and clearances customary in electric locomotive practice in the United States and at 40 per cent rail adhesion, the maximum stress on either rod is about 115 per cent of that imposed with the cranks at the 90 deg. position. At maximum speed this maximum stress rises to 135 per cent.

MACHINE SHOP EQUIPMENT, METHODS AND PROCESS

In this paper E. R. Norris, director of manufacturing operations, Westinghouse Electric & Manufacturing Company, took up a number of the important recent developments in machine shop equipment and practice, discussing first the origin and present status of the high-speed-steel tool and outlining tests that could be made to determine the best steel for each purpose from among the many different makes of steel that were offered to the manufacturer. He stated that tests have been made on butt-welded tools formed by welding tips of high-speed steel to low-grade carbon-steel shanks, the process being quite successful, but though the initial outlay for the solid tool is considerably greater than that for the welded tip tool, the cost of upkeep increases the cost of the latter so much that in the end it does not constitute a real economy. In connection with the use of high-speed steel for dies it has been found that the costs of carbon-steel dies and high-speed steel dies for a given production are approximately as two is to one, the loss due to hardening being very small, or less than 1 per cent. The heat-treatment of tools was also discussed briefly.

The author commented upon a new substance that has been placed upon the market under the name of Stellite, which is not the steel but is a composition of cobalt, chromium, tungsten and iron with small amounts of nickel, manganese, silicon and molybdenum. This material cannot be forged, rolled or machined and must have the cutting edge well supported close to the work. Stellite tips may be brazed or electrically welded to shanks of carbon steel and may be reused until repeated grinding renders the cutting material very thin. Cutting speeds on machinery steel have been quadrupled over those of high-speed steel, thin cast-iron frames which were very hard because of a slight chill having been successfully planed at a cutting speed of 300 ft. per minute, whereas high-speed steel gave but 45 ft. per minute. In this case also the Stellite tool finished nine pieces for each grinding as against one piece finished for each grinding of the high-speed steel. On sandy brass castings the cutting speeds with Stellite have been doubled.

With regard to the selection of machinery for various machine shop purposes the process for manufacture of accurately finished steel shafts of medium size were outlined in detail and the advantages of milling under stream lubrication were discussed. There was mentioned also the continuous method of milling in which the work is mounted upon a circular table which has several independent chucks for holding different pieces of work, these being set under the tool in rotation, the operator having time to take out the finished casting and put in new castings while the cut proceeds. Comment on modern drills and drilling machinery was included, reference being made to the use of attachable multiple drill heads for machines which may even be arranged for drilling in five or more directions at one time.

In connection with grinding and grinding machines the author said that considerable saving is being effected by the use of disk grinders on many flat surfaces

that were formerly milled, this being more noticeable in dealing with castings that are liable to be chilled and brittle. Grinding also possesses decided advantages where the shape of the casting is such that, in order to prevent springing, great care is necessary in chucking the work in the milling machines.

Among the grinding machines described was one where two cupped grinding wheels with parallel faces are used, the work being fed between them and thus being ground with parallel surfaces. This machine is used in advantage in finishing bosses on resistance grids, completing them at the rate of forty-five grids per hour. Ring wheels may be used to advantage for removing scale and for stock which is rough. They have the advantage of a much longer life than the steel wheels with abrasive circles of cloth glued to them. In the case of the resistance-grid grinder above mentioned, ring wheels 3 in. thick were ground down 1/16 in. on the face after one month's work, whereas two abrasive circles would usually be worn out by four days' work. Another form of dry disk grinder was described in which the wheel is horizontal and the work bears directly upon the abrasives, being ground by the pressure exerted by its own weight. This is especially suitable to frail castings which might spring while being clamped. For the production of true flat surfaces on hardened steel dies the vertical surface grinder was highly efficient, the work being held by means of a strong magnetic chuck. The vertical grinder has displaced the horizontal grinder in most cases, producing from 50 per cent to 75 per cent more work although the vertical grinder costs five times more than the horizontal machine in the upkeep of wheels. In connection with cylindrical grinding the advantages of the wide grinding wheel were outlined, as this eliminated lost time at the end of each pass of the wheel along the work.

Successful results in sharpening files by the use of the sand blast were also cited, the files being sharpened by being held in such a manner as to expose the backs of the file teeth to the cutting action of the sand. In conclusion the author commented upon electric drives for machine tools, and also upon the advantages of actual demonstration as a basis for selecting new machines.

NOTES ON THE PROCEEDINGS OF THE CONGRESS

Interest in the administration and technical features of the Panama Canal and in the development of the Diesel engine were the chief features of the sessions held prior to the recess on Wednesday afternoon. The session devoted to these subjects drew the largest attendance. Discussion, however, in all of the sessions was disappointing due to the limited advance distribution of papers. Furthermore, the authors in most cases were absent, a fact tending to suppress the questions which might ordinarily be put. The papers, however, a number of which are abstracted above, possessed unusual value. The first session, on Monday morning, was an impressive gathering fully befitting the magnitude of the work which occasioned the congress. On the platform with the honorary president of the congress, Major-General George W. Goethals, were the vice-presidents, the foreign delegates and the presidents and secretaries of the national engineering societies.

The real business of the convention began on Monday afternoon with a well-attended session on the Panama Canal. The papers were of a general rather than an engineering character. Technical details regarding the canal were treated in ten papers presented in two succeeding well-attended sessions. On Tuesday morning the congress split into sections with six to eight sessions in progress simultaneously. The second session on railways following the presentation of the paper by William Hood, chief engineer Southern Pacific Railroad, brought out a discussion on the extent to which practice for locating steam lines should be modified for a line to be operated electrically. It was advanced that the shorter wheelbase of the electric locomotive allowed the use of sharper curves, while its great overload capacity for shorter periods permitted steeper short grades than does the steam locomotive. Mr. Hood, however, was of the opinion that it is not advisable to locate a line on the theory that steam equipment will never be used on it as such an assumption is not likely to be borne out.

Discussion on transit problems at the first municipal session developed comment from M. M. O'Shaughnessy, city engineer of San Francisco, that in a very short time a system of elevated tracks would be necessary in that city. Preliminary studies that have already been made show that the double-track elevated line may be expected to cost $800,000 per mile, as against $3,500,000 per mile for a subway system. He estimated the construction of surface lines to cost about $215,000 per double-track mile. He pointed out that under present traffic conditions a trip to the western residence district during rush hours requires twenty minutes longer than would be required with an effective rapid-transit system, and that this time saving multiplied by the total number of passengers carried represented an annual saving warranting a considerable investment in a rapid-transit system.

Steam Railroad Earnings for 1915

According to the returns of the Bureau of Railway Economics for steam railroads operating an average mileage of 228,554 during the fiscal year ended June 30, 1915, the total operating revenues during the year amounted to $2,889,029,457, or an average of $12,641 per mile of line. Operating expenses amounted to $2,032,689,894, an average of $8,894 per mile, and net operating revenue amounted to $856,339,581, an average of $3,747 per mile. Compared with the fiscal year 1914, the current year shows a decrease in aggregate operating revenues of $163,404,055, or 6.3 per cent per mile; a decrease in aggregate operating expenses of $186,244,099, or 9.3 per cent per mile; a resultant increase in net operating revenue of $22,840,044, or 1.8 per cent per mile. Taxes decreased $2,765,192, or 3 per cent per mile, while operating income increased $24,991,787, or 2.6 per cent per mile. It should be noted that nearly half the decrease in expenses represents decreased maintenance expenditures, which in all probability are merely deferred.

Reduced to a per-mile basis, the operating revenues of the Eastern group of railways decreased 4.9 per cent; operating expenses decreased 10 per cent; net operating revenue increased 11.5 per cent; taxes decreased 1.9 per cent, and operating income increased 14.4 per cent. On a similar per-mile basis, the operating revenues of the Southern railways decreased 10.4 per cent; operating expenses decreased 10 per cent; net operating revenue decreased 11.3 per cent; taxes decreased 3.6 per cent, and operating income decreased 12.9 per cent. Again, on a per-mile basis, the Western railways show a decrease in operating revenues of 5.6 per cent; a decrease in operating expenses of 7.5 per cent; a decrease in net operating revenue of 1.6 per cent; a decrease in taxes of 3.7 per cent, and in operating income of 1.3 per cent.

The above figures are based upon monthly returns to the Interstate Commerce Commission of all steam railroad companies, including switching and terminal companies, having annual operating revenues above $1,000,000. The compilation covers about 90 per cent of the total mileage of the steam lines in the United States.

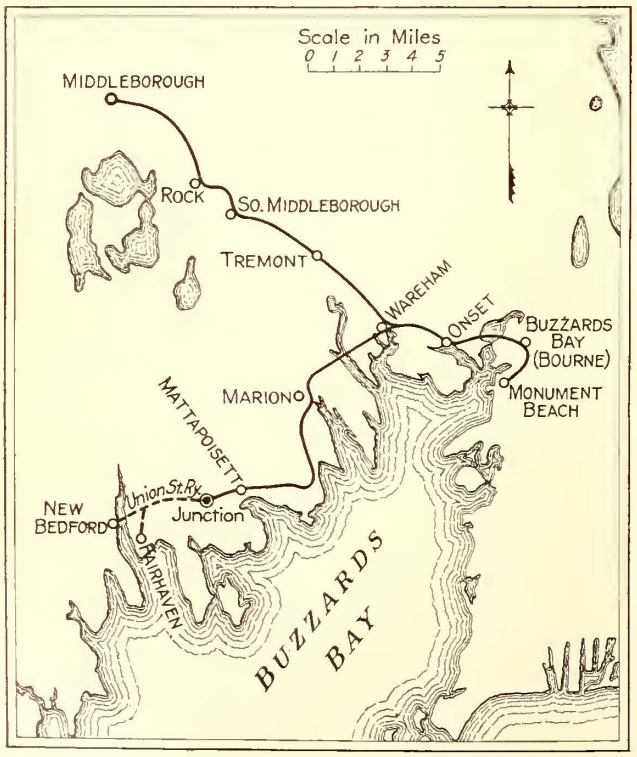
Another Six-Cent Fare Granted

Petition of the New Bedford & Onset Street Railway for Authority to Increase Fares is Granted in Its Entirety by the Massachusetts Public Service Commission—the Main Features of the Commissions' Decision Are Abstracted in This Article

The Massachusetts Public Service Commission on Sept. 8 unanimously authorized the New Bedford & Onset Street Railway, New Bedford, Mass., to revise its fares according to its petition of April 14. In this petition, which is to go into effect on Oct. 8, the company proposed: (1) To make the cash fare 6 cents for every ride within the limits of any fare zone, the previous cash fare being 5 cents. (2) To sell tickets at the rate of twenty rides for $1, the previous rate being twenty-four tickets for $1. (3) To sell special school tickets at the rate of ten for 30 cents to pupils entitled by law to half-fare transportation. The previous rate was ten tickets for 25 cents. A résumé of the decision now rendered is published below.

History of Company

The company was organized in 1900. The main line, about 22 miles long, runs from a connection with the tracks of the Union Street Railway of New Bedford at the Fairhaven-Mattapoisett boundary line through Mattapoisett, Marion and Wareham to Monument Beach in the town of Bourne, as shown in the accompanying map. The Union Street Railway and the New Bedford & Onset line are virtually under one management, and traffic in and out of New Bedford is handled by agreement. A branch of the New Bedford & Onset line, about 15 miles long, extends from Wareham through a corner of Rochester to Middleborough, where there is a connection with the Bay State Street Railway. The total single track mileage is 44.01 miles, of which 9.27 miles is on private right-of-way and the balance on the public streets. The population of the six principal towns served is now 20,366, an increase of 36.5 per cent over 1900. Comparatively little manufacturing is done, for the towns are mainly rural communities popular as summer resorts.



MAP OF NEW BEDFORD & ONSET STREET RAILWAY LINES

Fare Zones

The road is divided into a system of overlapping fare zones, those on the branch line being somewhat longer. The fare from Fairhaven to Monument Beach is 40 cents. From Middleborough to Wareham it is 20 cents for 15.2 miles, while owing to the shorter zones on the main line the fare from Fairhaven to the same point, a distance of 12.4 miles, is 25 cents. On the original line the charge from Fairhaven to Onset Beach was at first 20 cents, but in 1904 the number of zones was increased, making the through fare 30 cents. The through fare from Middleborough to Monument Beach over the line originally operated by the Middleborough, Wareham & Buzzards Bay Street Railway (which went into a receivership in 1904 and subsequently became a part of the New Bedford & Onset system) was at first 25 cents. During the receivership it was increased to 40 cents, but after reorganization it was fixed at 35 cents, where it has remained. Since 1905 there have been no changes in regular rates of fare or in zones upon any parts of the system, except that the reduced rate tickets (sold at twenty-four for $1) have been introduced. In summer the company sells, in conjunction with the Bay State Street Railway, special excursion tickets good from Brockton to Onset Beach via Middleborough, at the rate of 40 cents, equally divided. The regular fare for that portion of the journey on the New Bedford & Onset system is 25 cents.

Investment Record

The assets of the company on June 30, 1915, totaled $993,921, the larger items being cost of railway, $598,-614; cost of equipment, $117,299, and land and buildings, $215,948. The capital stock was $550,000 and the funded debt $280,000, current liabilities were $28,987, and accrued liabilities $7,257; sinking and other special funds amounted to $77,703 and the surplus was $32,299. The company asserts that it did not take over the mortgage debts of the Middleborough, Wareham & Buzzards Bay Street Railway, that it is the owner only of the equity of redemption in that property and that it pays interest merely to protect that ownership. The commission holds that for purposes of comparison these bonds should be included with the liabilities, and that the full book value of the Taunton & Buzzards Bay company (successor of the M., W. & B. B. line) should be included with the assets. The board finds the total capital investment to be $997,675. The company also has outstanding short-time notes to the amount of $19,500, which may represent in whole or in part additional capital investment.

By the accumulation of reserve funds since 1906 the company has been able to provide for all additions and improvements out of income, and at the same time to effect a considerable reduction in its floating debt. The table included in the report of the commission in the Blue Hill case, decided on July 31, 1915, shows that the $21,666 per mile book value of the company's permanent property is low in comparison with others in the State.

With allowance made for the fact that the returns do not include with the assets the real cost of the Taunton & Buzzards Bay property, the book value becomes $25,075 per mile, still a comparatively low figure. The cost of the original New Bedford & Onset line was about $40,000 per mile, owing to a high standard of construction and to the company's share in highway construction involved in its location grants.

Reproduction Cost

The company recently made an inventory of all its property, together with an estimate of the cost of reproduction new as of Dec. 31, 1914, and the accrued depreciation. The engineers of the commission carefully checked this inventory and also made an estimate of the reasonable original cost of the property as it existed on July 1, 1915, separating what was formerly the property of the Taunton & Buzzards Bay line from that directly constructed or acquired by the New Bedford & Onset company. The report of the engineers has been made a part of the record. The following table shows the various values:

	Reproduction Cost, New	Original Cost Estimate	Book Cost
New Bedford & Onset Line.....	$895,562	$795,711	$933,824
Taunton & Buzzards Bay Line.	421,023	354,045	190,902
Total	$1,316,585	$1,149,756	$1,124,726

In the case of the Taunton & Buzzards Bay line the engineers estimated, not its reasonable cost to the New Bedford & Onset company but the reasonable cost of construction. This portion of the road was acquired at a reduced price some years subsequent to construction after depreciation had set in. The total reasonable cost of all the property is estimated at $986,613, obtained by adding the estimated reasonable cost of the New Bedford & Onset road ($795,711) and the actual cost of the Buzzards Bay property ($190,901). This compares with a total capital investment of $997,675, exclusive of short-time notes, and the difference is nearly offset by the cash assets.

In their estimates the engineers included substantially the same overhead charges as appear on the company's books, and also allowed about $37,000 more than ordinarily would be reasonable for grading item, owing to the contention that the work was done largely in winter. An estimate of reasonable cost made some years after the construction period cannot be considered a wholly reliable guide, for legitimate items of cost entering into the construction of most railways are not apparent upon subsequent inspection of the property. The discrepancy between the estimate and the book figures, however, seems too great to be entirely accounted for in this way. The company's own estimate of replacement cost is about $40,000 less than the book figures. The evidence indicates that the reasonable cost of the property is at least equal to the proceeds of the bond and stock issues, and the amount upon which a fair return should be reckoned is not less than $997,675 (which does not include the short-time notes) unless deduction should be made for accrued depreciation.

Depreciation

From 1902 to 1915 the yearly expenditures for maintenance and depreciation averaged $25,576, or 22.42 per cent of operating revenue. The greater part of these outlays were for maintenance, but the company has from time to time written off, through the profit and loss account, the value of items of property abandoned or destroyed. Moreover, in a sense, it made a partial provision against depreciation in the low cost at which it acquired the Taunton & Buzzards Bay property. While a company, if it purchases property at less than its original cost, is entitled to a return only upon the actual amount of its investment, it is fair that depreciation should be estimated on the basis of the original cost and that the low purchase price should be an offset to depreciation.

In its appraisal the company estimated the total depreciation at $421,109, making the present value $895,476. The commission's engineers placed the depreciation at $408,702, making the present value $741,053. Since the depreciation reserves and a portion of the unappropriated surplus have gone into the property, the latter present value shows a loss of about $256,000 from the investment of $997,675, represented by the stock, bonds and premiums on bonds. It seems clear that the company has not made sufficient provision for depreciation. Yet in view of the meager dividends paid, the efforts to increase revenues, and the low price at which the Taunton & Buzzards Bay property was acquired, it does not appear that this failure can justly be attributed to mismanagement. The return, therefore, should be figured upon the capital investment of $997,675, without deduction for accrued depreciation. As stated in the Blue Hill case, however, this must not be understood as a ruling that the company, if it earns the amount to which it is entitled, can properly pay dividends before past depreciation has been provided for.

Results of Operation

The company's operating records from 1902 to 1915 inclusive show operating revenues, $1,596,837; operating expenses, $1,070,514; net operating revenues, $526,323; no miscellaneous income; deductions from income, $356,997; net divisible income, $169,326; dividends, $66,000; surplus, $103,326; profit and loss adjustment (debit), $72,413. Dividends were paid only in four years, and then only to the extent of 3 per cent. Last year no dividends were paid. In the last ten years the net divisible income, without allowing for depreciation allowances or other necessary charges to profit and loss, has ranged from 0.63 to 3.72 per cent on the outstanding capital stock. Interest upon unfunded debt has been insignificant. It is clear that additional net earnings, either through a decrease in operating expenses or an increase in gross revenue, are necessary in order to yield an adequate return upon the stockholders' investment.

Operating Expenses

The commission finds no apparent indication of extravagance or unnecessary expenditures. The company may be criticised for its failure to secure any interest upon its bank deposits, though these returns would be small. Management expenses have been low, the salaries of the four principal officers in 1915 aggregating only $3,150. Wages of motormen and conductors increased from 2.71 cents per car-mile in 1905 to 4.24 cents in 1914, but no blame attaches to the company for this.

Relations with the Union Street Railway

The New Bedford & Onset cars are taken at the Fairhaven line by the Union Street Railway and are carried into New Bedford over its own tracks, under its own power and with its own crews, or with New Bedford & Onset crews, which it pays while they are in its territory. The Union Street Railway keeps all the fares collected during this journey and grants the usual transfer privileges to all parts of its system. It pays the New Bedford & Onset company 3 cents a car-mile for the use of its cars and also 2 cents for every adult passenger delivered at the Fairhaven line and also 1 cent for every pupil riding on a school ticket. In 1915 the New Bedford & Onset company received $2,090 for the use of its

cars and $3,557 for the passengers delivered. The car rental is a usual charge, but the payment for passengers delivered is unusual if not unique in the State. It is in the nature of a commission paid for new business furnished and is analogous to the division of joint freight rates in certain cases, where the company on whose lines the traffic originates receives the larger proportional share. The arrangement is distinctly favorable to the Onset company.

Power Requirements

The Union Street Railway also sells the New Bedford & Onset company power for use between the Fairhaven line and a point about 1.5 miles distant from Mattapoisett at the rate of 3 cents per car-mile with 1 cent additional when the cars are heated. For the small amount used this rate is not excessive. Until recently the New Bedford & Onset company generated its own power, with the exception of small amounts purchased, and sold its surplus to the Marion Gas Company. The station equipment was antiquated and inefficient, and the cost comparatively high. To remedy this situation the company contracted on May 1, 1915, for more than nine years with the New Bedford Gas & Edison Light Company for the supply of power. Under this contract the railway company has shut down its generating plant and has installed suitable converting apparatus. Power from the Edison company costs from 0.95 to 1.1 cents per kilowatt-hour, according to the amount supplied. The railway company sells energy to the Marion Gas Company at from 1.1 to 1 cents per kilowatt-hour. Under certain conditions the railway company makes a slight profit upon the power thus sold and under others none, but in no case does it lose. The arrangement, by increasing the quantity purchased from the Edison company, makes a lower cost possible to the railway. Under these contracts no transmission losses are assumed by the railway company except between its own substation and its cars. The contracts have been carefully examined by the commission's engineering staff and appear economical, but the board holds that the idle and antiquated equipment should be written off the books in a reasonable time.

Equipment Maintenance

The New Bedford & Onset cars are painted at the Union Street Railway's shops, and the former road buys from the latter certain materials and supplies which it cannot buy to advantage direct from the dealers. For all labor furnished in such cases the Union Street Railway charges cost plus 20 per cent. Materials and supplies are sold at cost plus 10 per cent. The percentages cover use of tools and shops, storage, purchasing department expense, etc., and the terms seem in line with the practice of other companies. The Boston Elevated Railway, for example, on such outside work charges cost plus 25 per cent for labor and cost plus 10 per cent for materials.

Maintenance Expenses

During the last few years maintenance expenses have increased rapidly, and in 1915 were higher than ever before. The inspection department of the commission reports that the track is in fair condition generally, about two-thirds of the original ties being in the ground. These should all be renewed within the next five years. Many of the original chestnut poles are still in use and should all be renewed within the next six or eight years. The company replaces the old 30-ft. poles with old 35-ft. poles. The department estimates that the average annual expenditure which should be made for the next few years to maintain the track and overhead structures is about $27,800. The average annual expenditure for the last five years has been $20,539, and expenses for maintenance of equipment in this period have averaged $14,729.

Proposed Change in Fares

There seems to be no reasonable prospect of an increase in net earnings through a reduction in operating expenses, except so far as the new contract results in saving in the cost of power. This will be relatively small, for the total net cost of power in 1915 was only $21,114. The company proposes, in brief, to increase the cash fare from 5 to 6 cents, to increase the ticket fare from 4.17 cents to a flat 5 cents, and to raise the rate for school children from 2.5 to 3 cents. In each case the increase would amount to 20 per cent. Under this arrangement the cash fare from the Fairhaven line to Monument Beach would be 48 cents, or about 2.18 cents per mile, while the ticket fare would be 40 cents, or about 1.82 cents per mile. From Middleborough to Monument Beach the cash fare would be 42 cents, or about 1.69 cents per mile, and the ticket fare 35 cents, or about 1.41 cents per mile. Undoubtedly the through cash fare on the main line would be high, as street railway fares go in the State. Under the new schedule recently allowed in the Blue Hill case the through cash fare on the main line is at the rate of about 1.67 cents per mile. The similar cash rate on the Norfolk & Bristol line is about 1.75 cents per mile.

What additional revenue the increase will produce is problematical. Last year the revenue passengers were divided into the following classes, according to the character of the fare paid:

Class	Number	Per Cent of Total
Cash fares	1,890,022	69.44
Ordinary tickets	678,811	24.94
School tickets	128,610	4.72
Excursion tickets	24,433	0.90
Total	2,721,876	100.00

With no decrease in traffic and the same relation between the classes of traffic, the increased fares would produce about $25,000 additional revenue. There is a decided possibility, however, that a decrease in traffic may result, and it seems probable that a larger percentage of passengers will use the reduced rate tickets. In the board's opinion the revenue realized from the increase will not exceed $20,000, and if jitney competition should be stimulated the results might be unfavorable.

Disposition of Possible Increase

The net divisible income for 1915 was $7,385, while the average net divisible income for the last five years was $15,111. If the company should secure $20,000 additional revenue from a fare increase, and should be able to save $5,000 on the cost of power (assumptions of doubtful certainty), its net divisible income would be $32,285 on the basis of last year's figures, or about 5.8 per cent on the capital stock without allowing for any depreciation or other necessary charges to the profit and loss account. Upon the basis of the average figures for the last five years, the net divisible income would be $40,111, or about 7.3 per cent on the capital stock, without depreciation and other allowances. Upon neither basis, the board is satisfied, would the company actually earn 6 per cent upon its capital stock if it made proper provision for the upkeep of its property.

Conclusion

In a proceeding like this the commission has no arbitrary power and it can refuse to allow a company to increase its rates only where the weight of evidence clearly indicates that the increase is likely to prove

unjust and unreasonable. If results prove more favorable than anticipated and earnings become excessive, the opportunity to secure a reduction in rates under the statutes is always open. In view of the high mileage rate represented by the 6-cent cash fare, the board is of the opinion that every effort should be made to make the reduced rate tickets available to the regular patrons of the road and to facilitate their use. The tickets should be sold by conductors on the cars or at convenient points in each of the towns, and the fact that they are thus sold should be advertised in a conspicuous place in each car. It is also recommended that the company consider carefully the advisability of installing a system of collecting and registering fares whereby it will be possible to collect in one operation the fares of through passengers in two or more zones, so that the annoyance of paying additional fares at frequent intervals may be avoided.

Dynamite Explosion Causes New Subway Cave-In in New York

Subway Structure in the New Seventh Avenue Tube Is Weakened by Heavy Blast—Surface Car Filled with Passengers Drops into 30-Ft. Trench

Seven persons were killed at 8 a. m. on Sept. 22 in an extensive cave-in of the new Seventh Avenue subway in New York, between Twenty-fourth and Twenty-fifth Streets, when a dynamite blast weakened the temporary wooden roadway over the subway excavation, and precipitated the whole structure into a 30-ft. deep cut. More than twenty people were seriously injured, and about 100 were hurt in various ways.

As the roadway timbers for a distance of about 400 ft. collapsed a closed street car of the New York Railways, which was loaded with passengers, a large brewery wagon, and a few other small wagons and push carts were carried with it. A large number of employees who were on their way to work in the National Cloak & Suit Company, the building of which was located adjacent to the disaster, were also carried down. Beneath were about fifty workmen, some of whom were caught and killed by the débris.

For almost two blocks the excavation was a mass of splintered timbers, twisted water pipes, gas mains and trackage. The extent of the cave-in was remarkably well defined. The entire street section for a block and a half had fallen into the deep 30-ft. trench below, yet not any portion of the sidewalk pavement or of any buildings had collapsed owing to their solid rock foundations. Moreover, the caved-in section of the subway, which was composed of only the temporary wooden beam framing, was bounded at each end by sections which already had steel framing installed.

The ill-fated street car, the remains of which are shown in an accompanying photograph taken especially for the ELECTRIC RAILWAY JOURNAL, contained at the time of the accident about fifty passengers. When the street buckled under, the surface car tracks together with the intervening asphalt pavement and conduit contact rails and framing sagged down to the bottom of the great pit, but even then remained mostly intact. Notwithstanding this fallen position, the maximum-traction trucks of the fallen car continued to remain on the tracks, but the wooden body was ripped off in a distinct line just above its underframe, and bent over sideways. Its roof was flattened out. The wreckage of the street car was full of injured persons and two dead.

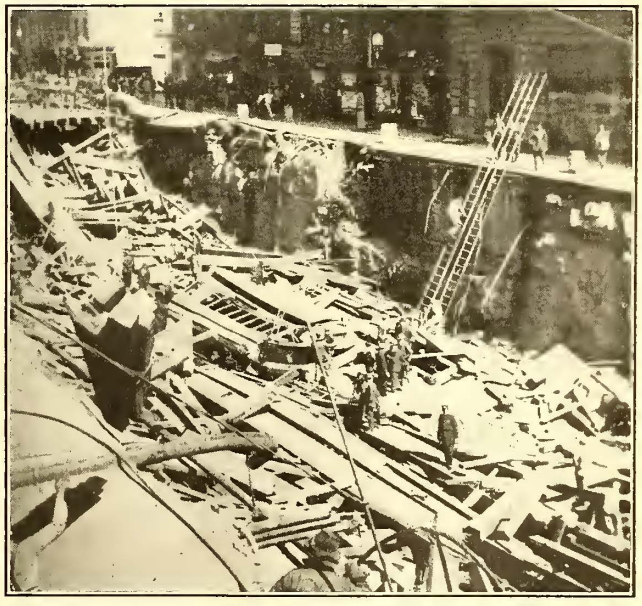
John Mayne, motorman of the car, who was taken to a hospital with a leg crushed, stated that the car sank just where he stopped it, when warned by a flagman. In substantiation of Mayne's story, an investigation showed that the brakes of the wrecked car were set and that the controller was off.

Immediately after the accident, all available ambulances, police reserves and fire apparatus were summoned. A smoldering fire which had started in the wreckage was quickly extinguished. Steps were taken to shut off all electric wire circuits and all leaking gas and water mains. The fire apparatus was put to work pumping out water from the excavation. As fast as bodies were released from the mass of wreckage they were carried up ladders to the street. Wrecking companies were soon on the spot with derricks, which were employed in lifting the masses of débris.

Shortly after the accident seven independent investigations to place the blame were under way. These inquiries were started by District Attorney Perkins, the Fire Department, the Public Service Commission, Coroner Feinberg, the contracting company, the State industrial commission, and the street railway company.

The following description of what took place immediately before the street deck dropped into the subway ditch was given by Augusto Mezzanotte, or August Midnight as he is known, the boss blaster who placed the fatal charge and ran away temporarily in a panic of fright after the accident.

NEW YORK SUBWAY CAVE-IN—VIEW OF TRENCH CAUSED BY EXPLOSION



NEW YORK SUBWAY CAVE-IN—VIEW SHOWING STREET CAR WHICH FELL 30 FT. INTO TRENCH

"I went to work at 7 o'clock in the morning with six drillers, a powder monkey and an assistant," Midnight stated in part. "We went to the magazine at Seventh Avenue and Twenty-third Street and got twenty-five 9-oz. sticks of 40 per cent dynamite, and before setting off any of it we prepared three blasts.

"The first blast was in only one hole at the bottom of the excavation, and I put three-quarters of a stick of dynamite into it. It was fired at about 7.50 o'clock and cracked the stone above slightly.

"The second blast was the one that preceded the cave-in. It was on the face of the rock, about 13 ft. from the bottom of the excavation, and for it four holes about 9 ft. deep were used. These holes included an area of about 13 ft. Three of the 9-oz. sticks were put into each hole. The third blast, which was never fired, consisted of two holes with three-quarters of a stick in each. Before we began to blast, after all of the holes had been loaded, the 'monkey' took the remaining dynamite and detonators back to the magazine.

"Before the second blast I sent two drill men down toward the Twenty-fourth Street end of the excavation to warn the men working there, and sent five men up with flags to stop street traffic. When I reached the street surface I saw the street car in Seventh Avenue. It is the custom to stop the cars and other traffic about 100 ft. away. I saw one of the flagmen stop this car at about that distance, or perhaps only 90 ft. away, and so I signaled the 'monkey' to fire the charge." The cave-in, according to Midnight, occurred immediately after the explosion of this charge.

When asked if any covering had been placed over the rock previous to the second blast, to keep the debris from flying out and striking the wooden structure, Midnight said it was not customary to cover the rock when such deep holes were used. It is the generally accepted theory that the blast hurled rock against the near-by structure and knocked several beams out of place, and that the others, interdependent upon one another for support went down like a row of dominoes.

By the terms of the contract with the constructing company the city is relieved from any burden of damages for injury to life or property by reason of the accident in the subway. The United States Realty & Improvement Company, which is constructing the subway under Seventh Avenue between Sixteenth and Thirtieth Streets, took the contract for $2,401,306.75 on Dec. 31, 1913. The work is now about 65 per cent completed. The contract provided that the company give a bond for $75,000 to insure the faithful performance of the contract, the terms of which protect the city from all liability for damages to persons or property.

The disaster, ghastly enough in its details, undoubtedly created an even more widespread apprehension as to the safety of persons possibly involved in it than the truth of the facts of the occurrence would warrant. Shortly after the accident newspaper extras were circulated, bearing reference in bold but intentionally ambiguous headlines to the "Subway Cave-in." Many readers of the extras believed that an accident had taken place in the present operating subway, rather than the new subway under construction. The misleading headlines naturally produced an epidemic of anxiety among thousands of friends and relatives of those accustomed to travel daily in the operating subway during the morning rush hour.

Ground was recently broken and tunnel work begun on a projected electric mountain railway from the city of Bergen, Norway, to the summit of Mt. Floien. The construction of this railway is estimated to cost $151,125.

Traffic Count on Chicago Streets

Bureau of Streets Takes Traffic Census of the Loop District in Waste Collection and Pavement Choice Study

To ascertain the effect of traffic density on street cleaning, and for its value in determining the kind of pavement which should be laid on certain streets, Chicago's bureau of streets made a traffic count of all vehicles passing through specified blocks in each direction. This count was made between July 13 and Aug. 17.

The field force used in making the count consisted of twelve men divided into six groups of two each, five squads being for actual service and one for relief. The men were all section foremen from the various city wards. Previous to commencing the work, they were cautioned as to the necessity of accuracy. A team of men was assigned to a block, one on each side of the street, to count the traffic in one direction only. Observations were made in forty-three different blocks, between the hours of 8 a. m. and 12 noon and 1 p. m. and 6 p. m., in rain or shine. On Saturdays the men worked from 8 a. m. to 2 p. m. This afforded a means of counting the noon-hour traffic.

Each traffic counter had a board on which were fastened pads of hourly counter sheets, one being to record rubber-tired vehicles and the other for iron-tired conveyances.

The following traffic statistics at different points in the downtown business and commercial districts were compiled for comparative purposes and show the variations in conditions encountered as well as the congestion at points.

The Densest Traffic in Chicago

The census taken at the Rush Street bridge revealed the fact that at this point traffic is heavier than at any other point in the city. For the eight hours in which the census was taken, figures show that an average of 1700 vehicles per hour cross the bridge during the day, or a vehicle every 2.12 seconds. Between 5 and 6 p. m. the traffic reached the peak point, 2384 vehicles crossing the bridge; an average of a vehicle every 1.9 seconds. The trend of traffic during this hour is north-bound, 1872 conveyances passing over the bridge from the south. The difficulty which a pedestrian encounters in trying to cross the bridge during the rush hour can be imagined with a vehicle of some kind passing every 1.5 seconds. Traffic across the bridge was distributed as follows: Horse-drawn vehicles, 19 per cent; auto trucks of all kinds, 6.31 per cent; automobiles, 74.69 per cent.

The Busiest Street Intersection

The intersection of State and Madison Streets was found to be the busiest crossing within the loop, an average of 1548 vehicles passing per hour, or one every 2.4 seconds. Street cars were found to run 11.8 seconds apart. Traffic was distributed as follows: Horse-drawn vehicles, 43.2 per cent; auto trucks of all kinds, 7.4 per cent; automobiles, 29.7 per cent, and street cars 19.7 per cent.

Of this traffic 75.7 per cent was on State Street and 24.3 per cent on Madison Street. Traffic north bound in the block between Madison and Washington Streets was 35 per cent heavier than that south bound, this despite the fact that there were 245 more street cars south bound than in any other direction. Figures taken at eleven different points on streets west of State Street show traffic to average 254 vehicles per hour. At eleven different points on streets east of State Street, the average per hour was 192 vehicles.

Between Lake and Adams Streets on State Street an average of 442 vehicles of all descriptions per hour were counted.

To ascertain the length of time spent by vehicles standing backed up to the curb in loading and unloading on South Water Street, and streets in the immediate vicinity, eighty vehicles of outside dealers were timed. These were found to stand at the curb an average of one hour and twenty-seven minutes, while ten other vehicles remained for an average of four hours and nine minutes. The vehicles used for hauling fruit and produce to the commission houses averaged fifteen to thirty minutes in unloading and departing, while a number owned by parties who do a cartage business, after unloading, remained backed up to the curb for an indefinite time.

Street Cars 14.4 Per Cent of All Traffic

That the new style heavy double-truck street car is an important factor in traffic census as it is in street cleaning may be seen when it is considered that of all the conveyances counted, there were 26,995 street cars or 14.4 per cent of all traffic, and on the streets upon which there are trucks the street cars amounted to 21.1 per cent of the traffic. Of the streets upon which there are regularly routed street cars, Dearborn Street south of Monroe Street had the lightest amount of street car traffic. The greatest amount was found on the three-track State Street line, between Lake and Madison Streets, the street cars being nearly 26 per cent of the total traffic. At the intersection of State and Madison Streets there is an average of one car every 11.8 seconds in all four directions.

Elevated Trains

All elevated trains entering the loop run in the same direction around the loop. The trains were counted on Wabash Avenue at two points and at one point on Fifth Avenue. Trains were counted according to the part of the city to which they were destined. An idea of the volume of this traffic may be obtained from the tabulation made at the corner of Randolph Street and Wabash Avenue given below.

Table Showing Trains on Aug. 23, 1915, as Counted at Corner of Randolph Street and Wabash Avenue

Time	Northwestern and South Side El. Rys	Metropolitan All Branches	Oak Park	Totals
7 to 8 a. m.....	44	39	16	99
8 to 9 a. m.....	52	44	24	120
9 to 10 a. m.....	56	41	15	112
10 to 11 a. m.....	42	38	2*	82
11 to 12 a. m.....	48	44	11	103
1 to 2 p. m.....	44	40	12	96
2 to 3 p. m.....	44	42	10	96
3 to 4 p. m.....	44	41	10	95
4 to 5 p. m.....	49	40	13	102
5 to 6 p. m.....	54	47	18	119
Totals for day..	477	416	131	1024

*Between 10 and 11 a. m. Chicago and Oak Park trains were delayed fifty-five minutes.

A factor affecting street cleaning is the litter and newspapers thrown by careless passengers from the car windows of the elevated trains, constantly passing through the Loop district each day. This is a violation of the clean street ordinance, but is a condition hard to correct.

Classes of Street Vehicles

Of the 100,727 vehicles used for commercial purposes in the cartage of freight and other commodities, 82.2 per cent were horse drawn and 17.8 per cent were auto trucks of all descriptions. Of the 59,950 carriages, buggies and automobiles used for carrying passengers, 0.9 per cent were carriages, 2.2 per cent were buggies, 19.2 per cent were two-seated automobiles and 77.7 were automobiles with four or more seats. This gives the percentage of horse-drawn vehicles to automobiles, 3.1 per cent to 96.9 per cent.

The total count showed that all traffic counted in the loop was distributed as follows: Horse-drawn vehicles, 45.1 per cent; motor-driven vehicles other than street cars, 40.5 per cent, and street cars, 14.4 per cent. The average number of vehicles per hour was 258, and the total hours counted was 728.

The estimated tonnage used for each class of vehicle is the same as that adopted by the bureau of highways, Brooklyn, N. Y., which is as follows:

Rubber Tired Vehicles	
Large auto trucks—loaded	8 tons
Large auto trucks—empty	4 tons
Small auto trucks—loaded	3 tons
Small auto trucks—empty	1¼ tons
Automobiles	1¾ tons
Wagons and carriages	1½ tons
Iron Tired Vehicles	
Three-horse trucks—loaded	7½ tons
Three-horse trucks—empty	3½ tons
Two-horse wagons—loaded	4 tons
Two-horse wagons—empty	2 tons
One-horse wagons—loaded	2 tons
One-horse wagons—empty	1 ton

The entire count was under the direct supervision of Charles Smith and W. J. Galligan, first and second assistant superintendent of streets reporting to Walter Leminger, superintendent of streets.

The Kansas City Viaduct

In a paper presented before the American Society of Civil Engineers on Sept. 1, E. E. Howard presented a description of the new Twelfth Street Trafficway Viaduct in Kansas City, Mo., which is unique in that it is one of the highest reinforced concrete structures of this type that has been built. The viaduct extends across the river bottom between the principal residential and business districts of the city and has a maximum height of 120 ft. With the earth embankment at the ends, it provides a street 60 ft. wide that is on a continuous grade of about 5.5 per cent for a distance of 3500 ft. To accommodate traffic desiring a less steep grade and willing, for such advantage, to travel by a less direct route, a roadway is provided on a lower deck with a grade of about 2.5 per cent.

The upper deck is separated into a roadway 30 ft. wide that is paved with creosoted blocks, a sidewalk 5 ft. wide and a street car space 22 ft. wide. The roadway is separated from the street car space by a concrete curb, and on each side of the structure there is a concrete hand rail. The two electric railway tracks are built with the usual wooden cross-ties set in ballast, so that no other traffic can use the area which they occupy. This arrangement, which is somewhat uneconomical from a highway standpoint, was specified by the city authorities. Iron trolley poles on each side of the street car space support the usual overhead wires. The lower deck provides a single roadway 30 ft. wide that is paved with creosoted block, the longitudinal girders that support this deck extending far enough above the roadway to form side barriers.

The upper deck comprises forty-five deck-girder spans of two girders each, these varying in length from 33 ft. to about 56 ft. There are also the arch spans and two earth-filled approaches. The lower deck comprises twenty-seven through-girder spans of two girders each supported on the same columns as carry the upper deck, a suspended deck under the arch span and earth-filled approaches. The floor slabs are supported on cross-girders and cantilever beams. Both upper and lower roadways are lighted with incandescent electric lights placed above the hand rail for the upper deck of the bridge and on brackets on the columns for the lower deck.

ANNUAL CONVENTION SAN FRANCISCO OCTOBER 4 to 8, 1915

American Association News

ANNUAL CONVENTION SAN FRANCISCO OCTOBER 4 TO 8, 1915

The San Francisco Committee on Entertainment Announces Program—Personnel of the Southern California Entertainment Committees—Denver Tramway and Public Service Company Sections Resume Meetings

"WHITE SPECIAL"

The office of H. G. McConnaughy, director of transportation, closed on Sept. 23 and will not open again until Oct. 23. All information from now on regarding the "White Special" must be secured from L. E. Gould, Old Colony Building, Chicago, Ill., who is in charge of the train. This train will leave Chicago at 6.30 p. m. on Oct. 1, over the Chicago Great Western Railroad, arriving at San Francisco at 10.25 a. m., Oct. 4.

"RED SPECIAL"

The "Red Special" pulled out of New York on Thursday with an enthusiastic company of well wishers in attendance. The decorations throughout the train were in red, and each lady was presented with a bouquet of orchids and lilies-of-the-valley. One end of the baggage car had been floored and equipped with a Victrola for dancing. Provision had been made to furnish souvenir postals en route ready stamped for mailing.

SAN FRANCISCO ENTERTAINMENT PROGRAM

The committee on entertainment for the convention has announced the following program:

Oct. 4, 9 p. m.—Reception and ball, Colonial ballroom, St. Francis Hotel.

Oct. 6, 8 p. m.—Electric scintillator drill and fireworks display. Illuminated flight by a member of the exposition aviation corps.

Oct. 7.—American Electric Railway Association golf tournament, Claremont Country Club, Oakland. Members of the golf committee will board special trains at Portland and Ogden.

Oct. 8, 10.45 a. m.—Delegates and ladies will leave Native Sons' Building for the exposition grounds in special buses.

11.30 a. m.—Presentation of bronze plaque by C. C. Moore, president Panama-Pacific International Exposition, to C. Loomis Allen, president American Electric Railway Association, followed by an address on "The Development of the Electric Railway," by James H. McGraw, president McGraw Publishing Company, Inc.

12.40 p. m.—San Francisco Bay trip and sight-seeing tour of Oakland and Berkeley.

In addition to the above a special sight-seeing car and local club privileges can be arranged for by the entertainment committee.

SOUTHERN CALIFORNIA ENTERTAINMENT

The personnel of the southern California committees of entertainment is as follows:

J. McMillan, general chairman, Pacific Electric Railway Company.
K. E. Van Kuran, secretary-treasurer, Westinghouse Electric & Manufacturing Company.
Committee Chairmen:
Finance committee—Paul Shoup, Pacific Electric Railway.
San Diego committee—B. M. Warner, San Diego Electric Railway.
Reception committee—Seymour Swarts, Great Western Smelting & Refining Company.
Publicity committee—D. W. Pontius, Pacific Electric Railway Company.
Program committee—R. H. Husbands, Pierson-Roeding Company.
Club courtesies—C. A. Henderson, Los Angeles Railway.
Transportation committee—A. W. Arlin, General Electric Company.
Barbecue and music—L. O. Lieber, Los Angeles Railway.
Evening entertainment—S. I. Wailes, manufacturers' agent.
Catalina trip—F. F. Small, Pacific Electric Railway.
San Francisco registration—H. H. Hale, Galena Signal Oil Company.

DENVER TRAMWAY COMPANY SECTION

The season of the Denver Tramway Section was opened with the twenty-eighth monthly meeting on Sept. 16. J. L. Adams resigned from the program committee and his place will not be filled for the present. A nominating committee consisting of R. W. Toll, chief engineer; W. M. Casey, superintendent of transportation, and W. H. McAloney, superintendent of rolling stock, was appointed to nominate new officers for the section. The election is to be held next month. The principal speaker was J. S. McGinnis, secretary and commissioner of immigration, who delivered an illustrated lecture on "Let's Know Our City and State."

PUBLIC SERVICE SECTION

The first regular meeting for the season of company section No. 2 was held in Newark, N. J., on Sept. 23. The general program on "Public Service Economics," announced in the issue of the Electric Railway Journal for Feb. 13, 1915, page 337, was departed from to permit a discussion of the jitney.

Two carefully-prepared and exhaustive papers formed the basis of the discussion, one on "The Jitney—Its Coming and Shortcomings," by A. T. Warner, traffic investigator transportation department and secretary of the section, the other on "Jitney Operating Costs," by R. H. Harrison, executive clerk mechanical department. The first paper traced the history of the jitney in the country as a whole and in New Jersey in particular, detailed statistics for a number of cities being given. Pictures of several types of jitney were thrown upon the screen. The speaker showed very clearly that, as the jitney lessens rather than increases the wealth of the community, whereas the contrary is true with railways, it is economically unsound.

Mr. Harrison gave additional statistics and the results of computations which demonstrated the impracticability of permanent jitney competition. Taking the statement of a member of the local board of public works to the effect that in ten years the jitney would put the railway out of business, he gave the results of calculations to show what this would mean in Newark in the way of street congestion alone. Mr. Harrison also illustrated his talk with views of jitneys and trolley cars.

The papers were discussed by W. B. Graham and J. J. Geddings, division superintendents, who gave additional jitney traffic data. The discussion brought out the fact that while the individual operator does not stay long in the business there is "a fool born every minute" so that the supply is kept up, each operator pocketing his loss as he retires.

A. J. Van Brunt, of the claim department, then showed two new safety motion picture reels staged by the Edison Company and Public Service Company acting jointly. Their purpose is to teach safety lessons by showing the foolishness of many practices of persons using the streets, and the lessons are impressed by touches of heroism and romance.

The topic for the October meeting of the section will be "The Design and Construction of Carhouses and Shops," and the annual election will also be hold at this meeting.

COMMUNICATIONS

Cars at Less Than Cost

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA., Sept. 20, 1915.

To the Editors:

We have read with keen interest the communication by Ernest Gonzenbach in your issue of Sept. 11. The article is written in Mr. Gonzenbach's usual forceful style, and, as we have come to expect from his letters, it contains points that are worthy of renewed interest by the electric railways, car builders and electrical manufacturers.

The rapid increase in the number of automobiles, auto buses and auto trucks which has taken place in the last few years is undoubtedly responsible for the great uneasiness that prevails among electric railway operators and brings out more clearly than ever the necessity for the most rigid economies in every line. Mr. Gonzenbach is undoubtedly quite right in his statement that the adoption of standard cars, including car bodies, trucks, electrical equipment and air-brake equipment, would effect enormous reductions in the cost of equipments to the operating companies, but he is wrong if he assumes that the automobile manufacturers are the ones who have discovered the economies of manufacturing standard articles in large quantities.

This principle was well established long before automobiles were ever conceived. It has been drilled into railway men, both operators and manufacturers, for many years, and from personal knowledge extending well over the life of electric railroads, I know that it has been the ideal toward which all of us have worked. However, the best that can be hoped for, in the line of standards in the electrical equipment for cars, seems to be a life of two or three years. The difficulty lies in the fact that there are other ideals that must be considered—ideals which conflict with that of standard design and which concern the cost of equipments just as much.

To be more specific, the question of standardization cannot be allowed to block the wheels of progress, and until the field for improvement is more nearly exhausted, or until competition ceases, I can see but small prospect for the standard car. It is more than probable —it is almost certain—that if in the present state of the art Mr. Gonzenbach were offered a car that represented the best of its kind two years ago, he would undoubtedly insist on many changes before he would accept it. In fact, if he were to overlook all of the improvements that have been made in cars and equipments in the last two years, he would run the risk of being declared obsolete himself.

Another reason why it has been so difficult for manufacturers to standardize their equipments actually lies in the efforts of so many operating companies to standardize. This may seem paradoxical, but it is none the less true. For instance, practically every large city railway has certain standards that are peculiar to that line. Self-interest prevents them from adopting standards that are common to other railways, consequently the manufacturers have to keep on making special apparatus for the simple reason that they must make what their customers want. Of course, it costs a great deal more. Manufacturers must keep on developing new apparatus, not only to keep up with the ideas of their own engineers but to meet the improvements that are suggested by operating engineers and at the same time to adhere to many of the standards of the old lines.

It must be recognized that the manufacture of a standard automobile is an entirely different matter from that of electric car equipments because the vast majority of automobiles go to individuals who have no other cars, or at least have no standards to maintain, and so are perfectly willing to take what is offered, provided it is good. There are probably more than 1000 customers for the automobile companies to one for an electric car equipment, and there is absolutely no reason why the automobile makers should not standardize except for the necessity for keeping up with the improvements. Even then it is possible to manufacture a single car for at least one season and the numbers are so enormous that the cost of tools is relatively small. But do not forget the tombstones marking the resting place of the unfortunate companies who fell or guessed wrong in manufacturing automobiles.

What is the remedy? I believe it lies entirely in the hands of the operating companies. Certainly nothing would please the manufacturers more than to have the American Electric Railway Association exercise its influence so as to make it possible for standard cars to be manufactured. N. W. STORER, General Engineer.

Who Should Keep Way Department Time?

CHICAGO, ILL., Sept. 15, 1915.

To the Editors:

In last week's issue of the ELECTRIC RAILWAY JOURNAL an article on "Time Keeping and Cost Records of the Way Department," by S. Gausmann, Brooklyn, N. Y., appeared. In introducing his subject Mr. Gausmann emphasized the two salient points of any accurate time-keeping method, namely, careful selection of time-keepers and a thorough system for checking the men. This is particularly important during the spring, summer and fall months when large construction forces are employed, and the entire way department clerical force is working under pressure. At that time the engineer in charge is too busily engaged in directing the work to devote much time to clerical details, therefore it is important that the clerical work should be carefully planned and well kept up so that information can be secured on short notice if necessary.

Aside from the time-keeping system a phase of this subject presents itself which is important to the way department head because of its relation to the accurate distribution of way costs, namely, shall the way department keep the time and make the distribution, or shall the work be done by the auditing department? Any discussion of this subject will apply to the electrical and mechanical departments as well.

It needs no argument to show that the department head and his assistants are more competent to check the accuracy of the distribution than a clerk in some other department unacquainted with the details of the work in progress. Furthermore, since the time-keepers on the various jobs must of necessity report to the way engineer, if he expects to control the wages of his men, it scarcely appears necessary to take the preparation of the payrolls out of the department. On the other hand, if the supervision of this clerical work is removed and the way department is permitted to devote all its time to the supervision of work under way, the duty of the department head becomes largely an executive one. Moreover, when the payrolls are prepared in the auditing department the work is handled by a force which specializes in accounting matters.

To reach a conclusion in this particular is as difficult as that pertaining to some of the problems involved in the proper distribution of departmental costs. Doubtless there is considerable advantage in having the distribution of costs made by accountants who are unbiased as to the result, but familiarity with the details

of the work under way also appears equally important to obtain accurate distribution. Still another advantage of the latter plan is the fixing of the entire departmental responsibility in one man, and in my judgment this is a controlling consideration.

Way Department Engineer.

Daily Work-Train Report

The Northern Ohio Traction & Light Company
Akron, Ohio, Sept. 13, 1915.

To the Editors:

Referring to an article on "Way Department Report Forms" in the Sept. 4 number of the Electric Railway Journal, I send herewith a form of report for daily work-train service, which I have found very valuable for office records and ready reference to various work orders, covering construction and repair work. This report has been tried out, and after numerous changes was brought down to the present form, the object being to save time and trouble, causing as little work on the part of the crew as possible and yet giving all the information desired. This form is made out in triplicate, white, pink and yellow sheets being used, and is forwarded promptly to the roadmaster's office at the end of each day's work for his inspection and signature and also for the timekeeper's signature. The yellow sheet is kept in the roadmaster's office, and the other two sheets are forwarded to the general office, one copy being kept in the maintenance of way department, the other is sent to the distribution clerk.

This report traces the work of the crew and movement of each work train from the time the men report for work until they quit for the day. A space is shown for the names of the conductor, motorman and brakeman, with date of report, as well as the time and place at which the crew reported for work and received the train, with the number of the car. This is necessary as they receive the train at different yards on the system; also, they may have reported for work but had to delay on account of repairs to cars. There is a column for each single trip, with the name of the starting place and loading point, also for the time of arrival, delay, if any, and departure at that point, description and amount of material carried, delivery point with time of arrival, delay, if any, and departure from that point. There are also columns for use as to repairs or construction. This is important to the distribution clerk, so that he can charge out for capital or operating accounts. The blank also has spaces for the total time, mileage and number of extra men and of regular men carried on each trip.

Under remarks or delays, the crew is required to give causes of all delays and any other information of use either to the operating department or to the maintenance of way department.

In explanation of the column on transferring of cars, switching, etc., it might be explained that the work trains on the Northern Ohio Traction & Light Company's system are required to switch the cars containing material for stock, repairs or construction, from the railroad transfer switch to the company's yard. These cars must be returned, and a record is kept of the movement and dates of transfer, so that demurrage can be checked, if there is any to be accounted for.

The time of the work-train crew and extra or regular men is also made out in the blanks, showing names of each, together with the time begun and quit, also extra time allowed, total time and rate, and lastly the amount. Then, for the use of the clerks for the distribution of various jobs chargeable to various accounts coming under proper work orders, we have columns to be filled out in the office, as shown in the lower left-hand corner. Finally, the timekeeper and roadmaster, after carefully checking and looking over the sheet, sign their names and forward the two sheets, pink and white, to the engineer of maintenance of way and the general office.

Possibly this may be of interest to the readers of the Electric Railway Journal.

Thomas W. Blinn,
Assistant Engineer Maintenance of Way.

Form 152...4 7-1915...3000...O.B.C.

THE NORTHERN OHIO TRACTION & LIGHT COMPANY
DAILY WORK TRAIN REPORT

................, Conductor ...., Motorman ...., Brakeman Date ....191....

REPORTED FOR WORK Time .... Place .... RECEIVED TRAIN Time .... Place .... Work Car No. ....

Starting Time of Trip	Loading Point	Time			Material		Delivery Point	Time			Use		Single Trip				No. of Regular Men
		Arrival	Delay	Departure	Description	Quantity		Arrival	Delay	Departure	Repairs	Construction	Hrs.	Min.	Miles	Ex. Men	

Car Initial	Car Number	Contents	Date of Transfer			Purpose Used For
			Received on Transfer	Taken to N.O.T. Yard	Returned to Transfer	

Remarks and Causes for Delay:—

Names of Train Crew	Time Begun		Time Quit		Extra Time	Total Time	Rate	Amount
	Hrs.	Min.	Hrs.	Min.				
M.								
C.								
B.								

DISTRIBUTION FOR OFFICE USE ONLY

Acct. No.	W.O.No.	Amount	Acct. No.	W.O.No.	Amount	Acct. No.	W.O.No.	Amount

Report to be made in triplicate and turned into the Roadmasters' office promptly at the end of each day's work. Then forwarded to Engr. M. of W. Gen. Office.

................, Timekeeper.

................, Roadmaster.

DAILY WORK-TRAIN REPORT USED BY THE NORTHERN OHIO TRACTION & LIGHT COMPANY

Horizontal vs. "Festooned" Contact Wires

THE CONNECTICUT COMPANY
NEW HAVEN, CONN., Sept. 22, 1915.

To the Editors:

Referring to Dr. Ing. E. E. Seefehlner's letter of July 31 in the issue of the ELECTRIC RAILWAY JOURNAL for Sept. 18, I would state that I have not seen the articles there referred to but shall make it a point to follow up the references.

I am very much interested to know if Dr. Seefehlner has really had experience with operation on a festooned trolley, or whether he is basing his statement simply on the good behavior of the horizontal line.

The life of the collector is a function of so many variables that unless all of the facts are at hand it is not entirely safe to credit the good to any one cause. Dr. Seefehlner will doubtless be interested to note the article in the convention issue of the JOURNAL on the maintenance of the Southern Pacific Company's cars and the life of their trolleys, which, according to Mr. Sears, is expected to be 50,000 miles or 80,000 km., against the 42,000 km. of the Vienna-Pressburg bows.

CHARLES RUFUS HARTE,
Construction Engineer.

Starting Resistance of Electric Cars

PURDUE UNIVERSITY
WEST LAFAYETTE, IND., Sept. 16, 1915.

To the Editors:

In the editorial on the above subject which appeared in your issue for Aug. 14, you make the following statements: "There are numerous formulas, with curves based thereon, which indicate a minimum resistance at zero speed, although this condition is known not to exist. * * * It is misleading, therefore, to plot curves from these formulas down to zero speed." I heartily agree with you in this conclusion. Train resistance formulas are usually derived from curves plotted from actual test data. However, such formulas are capable of much broader interpretation than the curves from which they were derived, and curves plotted from such formulas may indicate values which are beyond the limitations of the test results which formed the primary bases of the formulas. For example, most train resistance data have been taken between speeds of 10 m.p.h. and 70 m.p.h., yet curves plotted from formulas derived from such data may be read at any speed.

Most train resistance formulas are of the form:

$$R = A + BS + CS^2$$

where S is the speed and A, B and C are constants.

A study of existing train resistance data leads to the conclusion that, for a given set of conditions, such an equation may be made to represent the relation between train resistance and speed with a fair degree of accuracy for all speeds above the speed at which the train resistance is a minimum. With existing equipments this minimum value obtains somewhere between 5 m.p.h. and 10 m.p.h. The curves of Wellington, Aspinwall, Dennis and others of the earlier investigators plotted, not from their formulas but from their actual test results, indicate that the starting resistance is much higher than the minimum resistance. However, the formulas which have been derived from their results contain no indications of this condition. C. O. Mailloux has pointed out that "the curve of train resistance plotted as a function of speed is really a 'two-branch' curve." (A. I. E. E. *Transactions*, Vol. 23, page 734.) As already noted, that branch of the curve which shows the relation between train resistance and speed for speeds above the one which gives minimum resistance may be represented by the above equation, but a satisfactory equation has not yet been developed for that branch of the curve which has to do with the lower speeds. We may conclude, therefore, that it is unsafe to use either train resistance formulas of the form $R = A + BS + CS^2$, or curves plotted from them below 10 m.p.h.

The custom of expressing train resistance by an equation of this form without stating explicitly the limits between which the formula is approximately correct is to be condemned. Such custom is certainly not in accord with true engineering ideals of accuracy and good practice, and is apt to be misleading to a large number of engineers who are occasionally required to solve problems in which train resistance is one of the involved factors, but who could hardly be expected to make train resistance specialists out of themselves before attempting the solution of their problem. The curve (ELECTRIC RAILWAY JOURNAL, Aug. 7, page 239) to which your editorial refers is an example of a correctly-drawn train resistance-speed curve.

Referring to the abstract from the sixth annual report of the Board of Supervising Engineers, Chicago Traction, contained in your editorial: As I understand the report, two distinct considerations are recognized. One has to do with the "friction of rest." Data pertaining to this consideration for a particular car and set of track conditions are given in my article published in your issue for Aug. 14. Also such data for heavy trains equipped with plain and with ball bearings respectively are given in your issue for Aug. 7, page 239. The second consideration deals with the increase in train resistance during acceleration over that which obtains during free running at the same speed. The data available here are hardly sufficient for even an approximate analysis.

In a communication on the subject which forms the caption of these notes published in your issue for Sept. 4, it was pointed out that it is customary in making calculations where train resistance is an involved factor to assume that during the notching-up period, the train resistance is constant at the value which obtains at the speed corresponding to full voltage and accelerating current, and that the results so obtained had checked very satisfactorily with results of tests. For the purpose of simplifying calculations, it is, of course, common practice with engineers to make certain assumptions, particularly where the use of such assumptions ordinarily does not involve serious error. However, it would seem to be better practice to found assumptions on factors, the values of which are known with a fair degree of accuracy, rather than simply to make an assumption and later to check its accuracy by tests.

As is so well set forth in the communication referred to, it is quite true that "the instances where it (train resistance at starting) is a determining factor in equipment selection, locomotive weight determination or energy consumption are relatively few." That in some instances it is worth considering, Fig. 4, page 239, of your issue for Aug. 7, bears evidence.

Also it might be pointed out that for a given average rate of acceleration that equipment which has the lowest starting resistance will have the lowest peak current during acceleration, other things, of course, being equal. From the standpoint, therefore, of operation and maintenance of electrical equipment of rolling stock, distribution system and substations rolling stock which has low starting resistance seems desirable.

In conclusion, therefore, it seems to me that more data and information on the subject of train resistance at starting and train resistance during the accelerating period are highly desirable.

D. D. EWING,
Assistant Professor of Electrical Engineering.

Equipment and Its Maintenance

Short Descriptions of Labor, Mechanical and Electrical Practices in Every Department of Electric Railroading

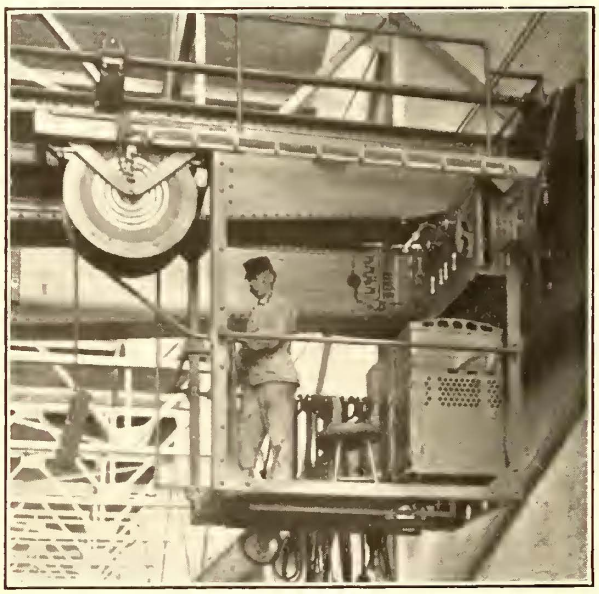
(Contributions from the Men in the Field Are Solicited and Will be Paid for at Special Rates.)

Use of Current for Operating Crane to Remove Trucks from Under Car Bodies

BY R. E. HEWITT, MASTER MECHANIC, SOUTHERN PACIFIC COMPANY ELECTRIC LINES, WEST ALAMEDA, CAL.

As our standard motor truck is exceedingly heavy the work of pinching it out from under a car body with pinch bars, after the car had been raised and placed on standees, was slow and tedious work. As a consequence we conceived the idea of utilizing the current that operates the shop crane for moving the trucks electrically. The method used can be understood from a study of the accompanying illustration.

Overhead and directly in front of the crane operator is a drum from which hangs a four-conductor cable. To the cable is attached a block in which are inserted four standard motor-lead couplers. On the side of the



DEVICE FOR REMOVING TRUCK FROM UNDER CAR BODY BY THE USE OF ELECTRICITY

drum are four metal rings that give sliding contacts at the terminals of four wires that can be traced to a double-throw switch at the extreme right of the crane-operating cradle.

When it is necessary to remove the trucks from under a car the crane is moved to the point on the floor where the car is standing, the cable is unreeled from the drum and attached to the armature and field leads of one of the motors in the truck, and the double-throw switch at the right in the operator's cradle is reversed cutting off the current from the crane motors and transferring it to the drum. The operator then utilizes the same controlling levers, resistance, etc., that he previously used in manipulating the crane in controlling the motor on the truck, moving the truck forward or backward as desired. As the crane operates on 220 volts, direct current, the power supply is well adapted for the above purpose.

From the description it will be evident that time and labor are saved by this method of utilizing the electric crane outfit.

Trolley Wire and Pantograph Shoe Wear on Annapolis Short Line

BY D. E. CROUSE, ENGINEER

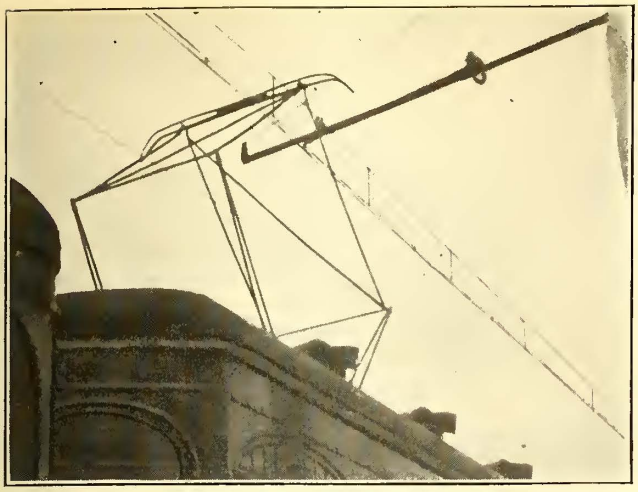
The Annapolis Short Line since 1908 has used various types of pantograph shoes of the sliding type for the collection of both a.c and d.c. power. From 1908 to 1914 the trolley pressure was 6600 volts a.c., single-phase, 25 cycles. The weight of the car was 50 tons, but since the voltage was high, the current collected was small, in fact, less than 100 amp. The overhead line was of the single catenary type with bracket suspension and with a messenger of 7/16-in. Siemens-Martin strand from which a No. 000 grooved copper contact wire was suspended by means of rigid-pipe hangers. The contact wire wore rapidly, due in part, undoubtedly, to the lack of flexibility in this type of construction.

The pantograph shoe used at this time was of 1/16-in. mild steel, 6 in. wide and 4 ft. long. Its average life was 1000 miles and its cost 26 cents. It was provided with aluminum horns which were altered (as described in the issue of the Electric Railway Journal for March 20, 1915, page 550) to permit greater contact area where the effects of oscillations were severe. The pantograph was controlled by standard Westinghouse electro-pneumatic equipment, and the shoes were lubricated with graphite grease. The life and operation of pantograph shoes of this type were satisfactory, but the wear on the No. 000 trolley wire was abnormal. In five and one-half years, during which there were 120,451 train movements, the copper trolley wire was one-half worn away.

On Jan. 4, 1914, the voltage on the contact wire was changed from 6600 a.c. to 1200 d.c. and the problem of collecting a larger current was introduced. It was desired to retain the operating features which are inherent to the pantograph but at the same time to eliminate the rapid trolley wear. A steel, grooved contact wire of No. 0000 section was therefore erected immediately under the worn No. 000 copper wire, and both were suspended from the messenger by means of full-loop hangers spaced 15 ft. apart. These loop hangers, which were also described in the March 20 issue of this paper, introduced the needed flexibility.

The weight of the 15 ft. of worn wire copper plus that of the new No. 0000 steel wire, when added to the weight of one hanger, gave a total of 16 lb. per point of hanger suspension. As the vertical pressure of the pantograph is maintained at from 12 lb. to 18 lb. the pantograph tension and the weight contact wire and hangers are so nearly balanced that there is little tendency toward the forming of waves in the contact wire between points of support.

Some doubt was felt at first as to the ability of the steel contact shoe to collect from a steel trolley wire the accelerating current of the new 40-ton cars, about 350 amp. The operation demonstrated, however, that there

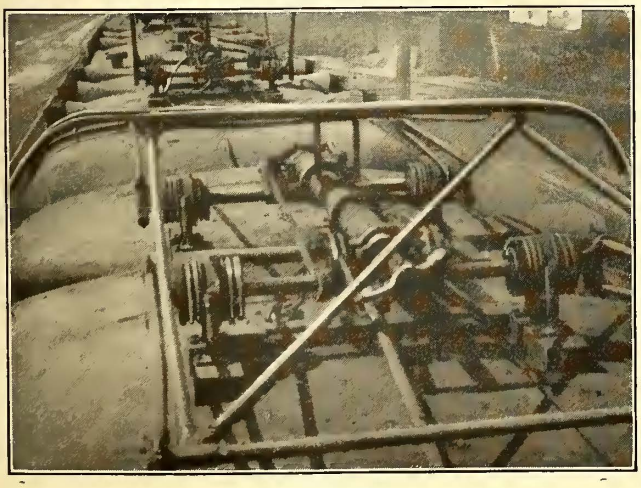


ANNAPOLIS SHORT LINE—OVERHEAD CONSTRUCTION SHOWING NEW SHOE IN OPERATION

was ample margin for collecting as high as 700 amp. with no burning of the wire or the shoe. The use of the old-style shoes soon developed the fact that the wear had been transferred to a large extent from the contact wire to the pantograph shoes, as the former mileage of 1000 was reduced to 400. To overcome this the style of shoe and horns was radically changed, with the limitation in mind that the greatest weight which the pantograph springs would permit in the horns, shoe and fixtures was 15 lb.

The ease with which the maximum current per car, 350 amp., could be collected suggested cutting down the width of the shoe and increasing its thickness. It was observed further that when the high accelerating current was being collected, the wire was usually in the center of the shoe; for the reason that extreme oscillations did not exist until high speeds were reached. Since the current density was greatest at the center of the shoe it was decided to cut a "dovetail" in both ends of the shoe and thus save weight.

The reduction in width from 6 in. to 4½ in. and the cutting of the "V" in the end of the shoe permitted a ⅛-in. mild steel shoe to be substituted for the 1/16-in. shoe. In addition, the costly aluminum horns were replaced by ¾-in. x ¾-in. x ⅛-in. angle-iron horns. The result of all of these changes was a shoe which costs $1 and gives an average life of 25,000 miles. The former cost of 26 cents per 1000 miles was reduced to 4 cents, and at the same time the labor charge for replacing shoes was greatly cut down. The shoes are lubricated, as before, with graphite grease. The control of the pantograph was changed on Jan. 4, 1914, from electro-pneumatic to straight air, as was described in the article referred to. The first mile of steel trolley wire erected on the Annapolis Short Line has been in service for three years and after 72,270 train movements shows a wear of 12 mils.



ANNAPOLIS SHORT LINE—PANTOGRAPH FRAME IN RETRACTED POSITION, SHOWING DETAILS OF NEW SHOE

Practical Views of Special Work—I—The Tongue Switch

BY R. P. WILLIAMS, INSPECTOR OF SPECIAL WORK BROOKLYN RAPID TRANSIT SYSTEM

With the present design of special work the waste is enormous. In nearly thirty years, or since the introduction of the "guaranteed" type, there has been practically no change. Heavier rails were first introduced, and next came the harder rail. With these changes the price of special work has gone steadily upward.

When it was found that, with the use of the built-up type of special work, the intersections of frogs and crossings laminated so quickly as to compel renewal of the individual piece before even the minimum amount of wear was obtained from the abutting arms, the renewable center was introduced to overcome the deficiency in wear. Solid manganese is recommended now for the same purpose. While it is true that layouts will last longer than formerly, comparatively the same condition now obtains as was found to exist with the old style of built-up Bessemer steel construction.

We have an illustration of this fact in Brooklyn at the Park Row loops. This layout was of solid manganese, and, while the frogs lasted five times as long as the guaranteed type, yet when thrown away on account of the dished condition of the intersection, the surface wear in the balance of the piece was scarcely noticeable. Counting the increased cost of the material and the amount of good material thrown away there is no saving. Evidently the fault is in the design, for there can be no economy in throwing away 8¾ in. of a 9-in. manganese rail, even if it does last longer than the open-hearth rail.

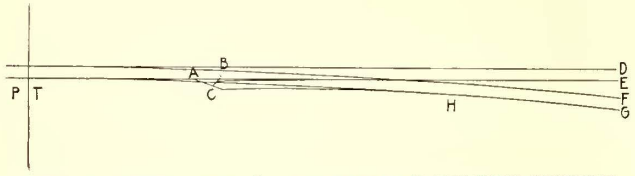
The writer has had thirty years of experience, divided almost evenly among building, installing and maintaining special work, and offers the following findings and suggestions as his view of a way out of the difficulty. By considering the tongue switch and the crossing the entire ground will be covered.

The tongue switch will be taken up first and the crossing will be discussed in a subsequent article. The objectionable features of the tongue switch are as follows: First, the manganese bed; second, the shape of pocket; third, the uneven wear; fourth, the shape of heel and fastening, and, fifth, the drainage.

The manganese bed was introduced for the same reason as the renewable center. The original built-up tongue switch was made with the tongue level with the head to give smooth riding on the straight run, the high guard appearing only near the heel of the tongue where the wheel tread would not touch it. As a consequence the wheel tread on the straight run wore a groove in the head of the curve rail parallel to the straight gage line. The manganese bed and manganese tongue have evened up the life of the switch, so that under even travel on straight track and curves the three abutting pieces of open-hearth steel rail are about worn out when the parallel ridge appears in the manganese bed. Now consider the switch to have been made of solid manganese and we are back to the original proposition. Obviously, then, this manganese bed must be renewable,

and the abutting rails must be of the same degree of hardness. As made at present this bed is not renewable without removing the switch and turning it upside down. We have had to resort to this extreme measure when it becomes necessary to tighten the loosened bed. With the introduction of this bed came the distortion of the tongue pocket.

Fig. 1 is a diagram showing the natural formation of the tongue pocket, the line *E* representing the straight gage line, *G* the curve line. The width of tongue point having been determined, say 7/8 in., at a point where the natural deflection of the curve line from the straight track amounts to one-half of this distance,



SPECIAL WORK—FIG. 1—DIAGRAM OF TONGUE SWITCH LAYOUT

or 7/16 in., the other half of the full thickness is projected beyond the curve line toward the side *C*. The required width of heel is then determined. The curve line (100 ft. radius in this instance) is then carried from the guard side of the tongue heel, across the curve line at *H* to the required width of point at *C*. This forms the curve side of the pocket, and in the old built-up tongue switch worked out perfectly. With the manganese-bed type of switch the short piece of rail cast in at the point end between *A* and the point of tangency, *PT*, is left straight. Consequently the straight gage line is carried full to *A*, offering undue resistance to the flange entering the curve, also leaving a gap in the straight gage line between *A* and *B*. This amounts to the same condition as is produced by a very bad joint, and causing a dish to appear in the mate just opposite. Instead of this the curve gage should be carried naturally, and a slight clearance planned from the point of the tongue, as shown at *B*, to prevent the straight-bound flange from picking or straddling the tongue point. The line *F* represents the curve guard, the line *D* the straight guard; the width of groove shown is 1½ in. By following the lines *F* and *D* back to *A* it will be seen that with the curve lines set naturally 1 1/16 in. of room is left for straight-flange travel, and for the curve the natural condition of entering as obtained in the plain curve of the same radius is obtained.

As to the tongue heel and fastening, Fig. 2 shows a rough plan view of a tongue switch with a 6½-in. round heel. But, in the writer's opinion, the excessively wide heel is costly in maintenance, the very large area demanding a condition of perfection almost impossible to maintain in a dirty street. Tongues will warp and work loose, and a small amount of dirt under a too-wide heel sets up a rocking motion which soon destroys the tongue and bed. A greater proportion of dished heels are developing in the excessively wide heels rather than in the narrower ones. The all-downward heel fastening helps this condition, for loosening of the device allows the tongue to rise and admit dirt. In the side elevation shown in Fig. 9 a suggestion is offered in the line of overcoming this tendency to rise. The heel of tongue is provided with a projection as in the old armored heel and prior types, but bent downward at an angle of 45 deg. so as to admit of a backward pressure, the tongue hinging, as it were, at the point where it disappears under the manganese bed, tending to hold the point of tongue down at the same time. With the present devices one is told, "Just a slight turn of the nut will tighten the tongue," to which might be added "and you cannot move it." That is just the trouble, too much friction requires too much care. The pressure device shown has been worked out in full size and seems good, its principal feature being that it swings with the tongue. An idea of its principle will be obtained by a study of the dotted plan view, Fig. 2, and the side elevation, Fig. 9. The device consists of two links with one end open, and two closed links, the pin shown directly under the curve groove going through the case *K*. The case *K* extends back into a box on the straight side where pressure is exerted by a bolt or screw in the end of the case, the two half-open end links set against the loose pin *I*. The opposite ends of the now doubled links are set in a recess in the loose lug *J*, and when pressure is exerted in the end of case *K*, the heel of the tongue is forced backward and the point of the tongue downward. The only friction is at the heel of the tongue, and on the pin *I*. This pin should be removable and set entirely in the bottom casting. It should be placed directly under the center of the round heel of the tongue for accurate pivotal motion.

Figs. 2, 4, 5 and 6 show the shape of the tongue and the drainage system. It will be noticed that the canals

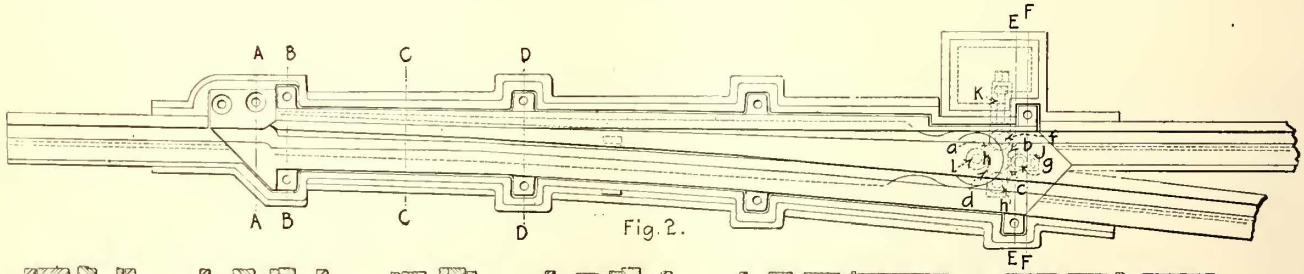
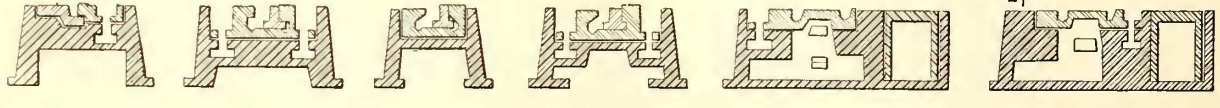
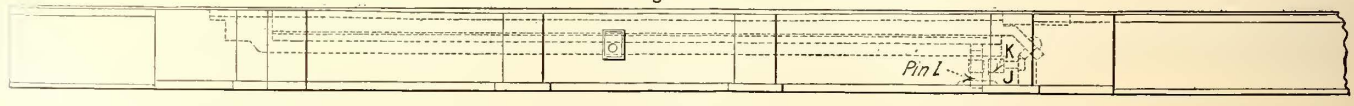


Fig. 2.



Section A-A Fig. 3 | Section B-B Fig. 4 | Section C-C Fig. 5. | Section D-D Fig. 6. | Section E-E Fig. 7. | Section F-F Fig. 8.

Fig. 9



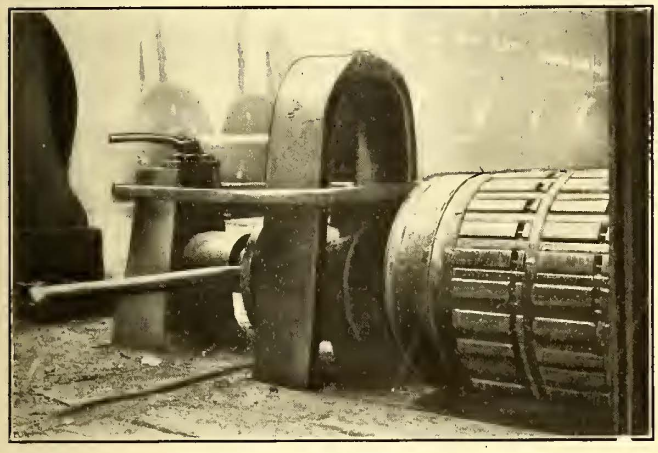
SPECIAL WORK—FIGS. 2 TO 9—PLAN, ELEVATION AND SECTIONS OF IMPROVED TONGUE SWITCH

are so designed as to permit of being easily ground out with a small emery or other grinding wheel. Fig. 3 shows a renewable piece at a vital point, for on the keeping up of this guard edge depends the safe facing operation, as well as lengthening the life of the switch as a trailer. Figs. 7 and 8 are cross-sections at the heel showing the amount of metal under the supporting heel portion. It will also be noticed that the arrangements for fastening are all easy of access. The method and principle will be shown in a later article in connection with the crossing.

Home-Made Pinion Puller

BY C. M. FEIST, MASTER MECHANIC SIOUX CITY (IOWA) SERVICE COMPANY

An even distribution of the pressure on both the pinion and the armature shaft while removing pinions is the principle which evolved the pinion puller used by the mechanical department of the Sioux City (Iowa) Service Company. This device consists of four prin-



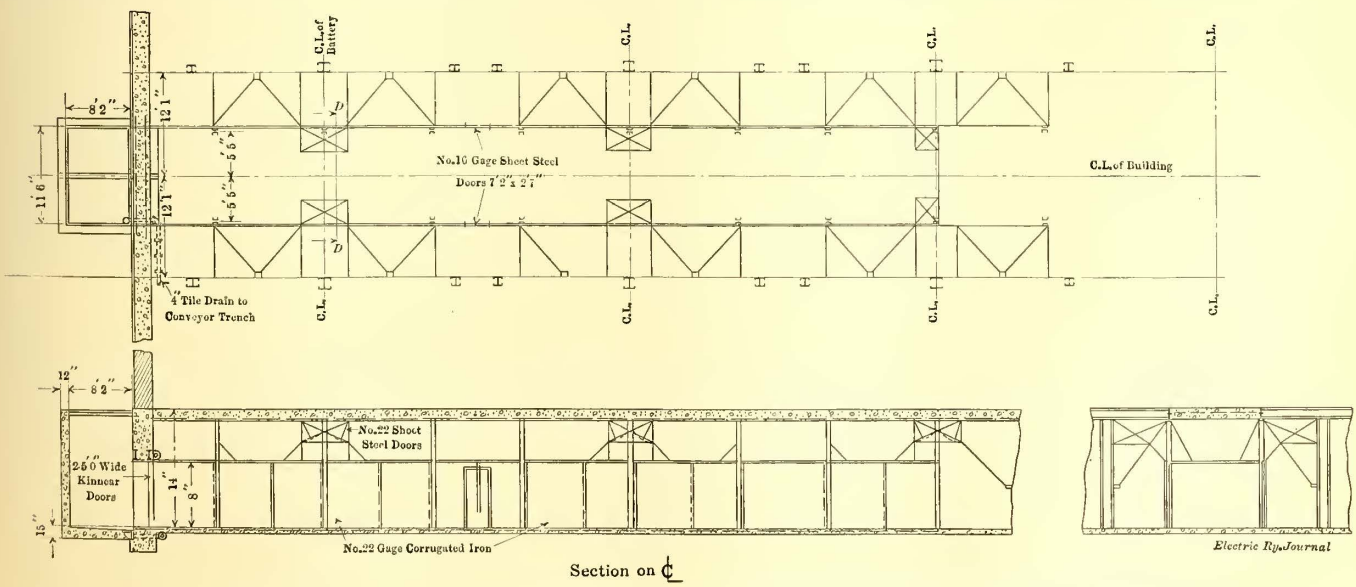
SIOUX CITY PINION PULLER

cipal parts—a bolted flanged collar, a heavy yoke, a stationary screw jack and a link. These parts assembled for removing a pinion are shown in an accompanying illustration. The screw jack is made adjustable vertically so that it may be centered to fit any size of armature. The head of the screw jack presses against the end of the armature shaft, while the pressure tending to withdraw the pinion is brought to bear on the flanged collar by the yoke, which in turn is attached to the jack by the link. The lower ends of the yoke are held secure in slots in the floor. After the jack head is brought up tight against the end of the armature shaft, the yoke is struck a blow with the sledge. As a rule one blow is sufficient to loosen the pinion. From the foregoing it will be seen that the pressure employed in removing the pinion is distributed on both the armature shaft and the pinion with the result that neither is injured in the operation.

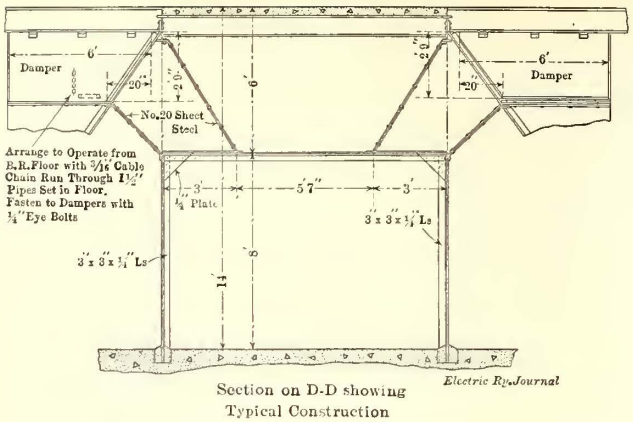
Air Intakes Increase Furnace Capacity

In the 58,500-kw. generating station of the Minneapolis (Minn.) Street Railway Company, an installation of cold-air intakes has increased the furnace capacity from 10 per cent to 15 per cent, and has improved boiler-room economy about 3 per cent. The steam-generating station capacity has been more than doubled during the last few years by the installation of large turbo-generators, new chain grates under the boilers and four new high-capacity stacks. The arrangement of the boiler room conforms to the usual standard, there being fourteen B. & W. 550-hp. boilers installed on each side of a 24-ft. firing aisle. Overhead steel coal bunkers supply coal to these boilers through hoppers and stokers. The boilers have grate surfaces approximately 10 ft. x 11½ ft. in size, and four 14-ft. x 265-ft. stacks furnish a total average draft of 1.6 in. A brief resumé of the growth of this plant was given in the issue of the ELECTRIC RAILWAY JOURNAL for Dec. 13, 1913, page 1250.

When the capacity of the plant was less than 20,000 kw., no difficulty was experienced in getting a sufficient unrestrained supply of air to the grates by way of louvers above the coal bunkers and from the aisle, but when the capacity reached 40,000 kw. and more, the air pressure in the center of the boiler room was from ⅜ in. to ½ in. less than outside, due to resistance of entrance, and to the updraft of the warm air in the room. This occurred particularly during the winter, when the large end doors of the boiler room had to be closed to prevent freezing of pipes and severe discomfort to the fire-room attendants. The large amount of cold air coming through the louvers above the coal bunkers froze the moist coal and necessitated the use of steam jets to thaw it out so that the coal would flow through the chutes to the stokers. This also caused excessive corrosion of the steel bunkers.



MINNEAPOLIS AIR INTAKE—CROSS-SECTION OF HORIZONTAL DUCT SHOWING TYPICAL CONSTRUCTION

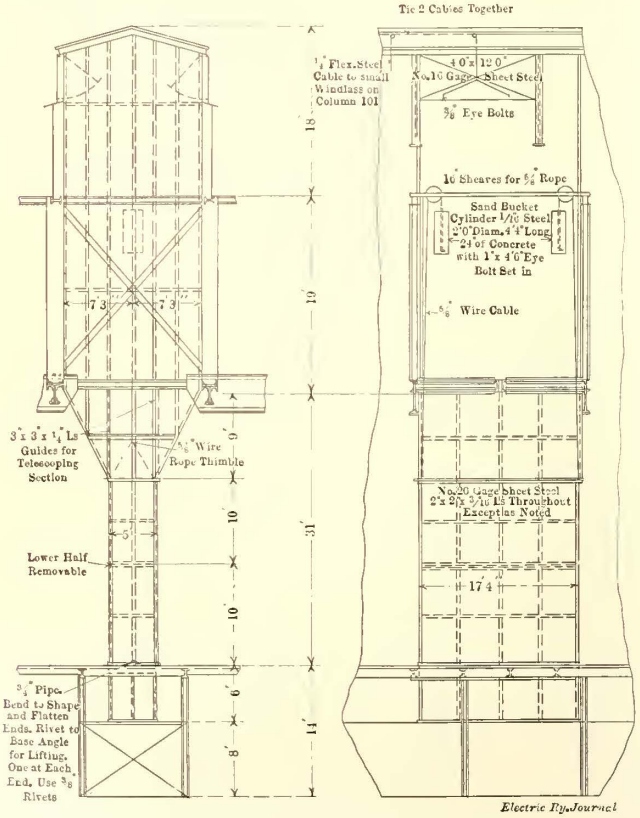


Section on D-D showing Typical Construction

MINNEAPOLIS AIR INTAKE—DETAILS OF HORIZONTAL DUCT
(See section line on preceding illustration)

To remedy this condition two air ducts, each supplying air for fourteen 550-hp. boilers, were built to convey the cold air direct under the stokers. Reference to the illustrations will show that two methods were necessary. At one end of the boilers the intake supplies air from the outside at the boiler-room level and conveys it under the floor to the seven boilers on each side of the firing aisle. At the other end of the boiler room this could not be done and a vertical duct was dropped from the roof to the boiler-room floor and the air duct supplying the boilers direct was also under the floor. The bottom section of the vertical duct was counterweighted so that it could be lifted out of the way and the opening in the floor was covered with a grating. Dampers at the entrances to the intakes and at ducts leading to the grates control the air supply.

The construction, sizes and material used are clearly shown in the illustrations. The cross-section of the ducts was proportioned so that the velocity of air would be maintained at a reasonable figure when all of the boilers were operating at 200 per cent rating, thus allowing 50 per cent excess air over that theoretically necessary.

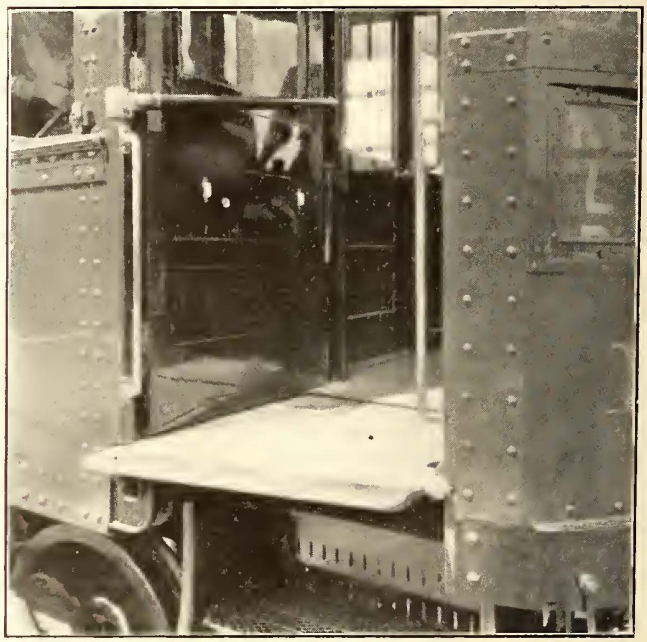


MINNEAPOLIS AIR INTAKE—DETAILS OF VERTICAL DUCT

As a result of this installation the boiler room was made comfortable for the men with no apppreciable air currents, the boiler capacity was increased due to better draft, and the economy was appreciably improved.

Extensible Trapdoor

In the Electric Railway Journal for Sept. 4 a description of a new extensible vestibule trapdoor made by the O. M. Edwards Company, Syracuse, N. Y., was published in connection with a description of the new cars for the Chicago & Milwaukee Railway. In that description no view was shown of the trapdoor in extended position owing to the fact that no photographs were available at the time, and the view that is reproduced in the accompanying cut shows the extended trapdoor as it would appear at a station platform which provided wider clearances than were necessary for the cars. As may be seen from the illustration, the trapdoor in this position will fill up quite a large space that may exist between the side of the car and the platform.



EXTENSIBLE VESTIBULE TRAPDOOR

The extension or retraction of the trapdoor is effected by the folding handle which can be seen just inside of the vestibule door. At the right-hand side of the trapdoor may be seen also the vestibule door stop, this consisting of a rubber button on the floor plate which interferes with the operation of the vestibule door whenever the trapdoor is extended. It is obvious from the illustration that the vestibule door could not be closed when the trapdoor is in the position shown in the illustration, and this would naturally prevent trainmen from leaving the trapdoor sticking out beyond the side of the car while the train was in motion.

The rail-less electric cars that were placed on the streets of Shanghai several months ago by the Shanghai Tramways and subsequently withdrawn on account of the imperfect roadbed have now been restored, the roads having been rebuilt with concrete foundation and surface so as to be able to bear the weight of the cars. Five cars are being placed in service on one road. A number of improvements have been made in the cars since they were first placed in the service. It is expected that the rail-less system will receive a thorough test, and if successful other routes will be established.

News of Electric Railways

SEEKING TO INITIATE TOLEDO FRANCHISE

Effort Being Made to Put Toledo Grant Before the Voters—Summary of Principal Terms of Grant

Petitions for the initiation of the franchise agreed upon by the Toledo Railways & Light Company and the franchise committee of the City Council of Toledo, Ohio, were put into circulation by the Toledo Franchise Association on Sept. 15. The statement was made that 2000 names were secured in one day. Plans were also made for a number of public meetings. At these meetings it is intended to have speakers explain the provisions of the franchise and reply to those in attendance who desire to ask questions.

The first of this series of meetings was held at Zenobia Hall on the evening of Sept. 17. President Frank Mulholland of the Franchise Association acted as chairman. A feature of the meeting was the indorsement of the franchise by Attorney W. W. Campbell, president of the Municipal Ownership League. Mr. Campbell said that he favored the public ownership of all public utilities, but that he believed the franchise was the best that could be secured at this time.

Councilman M. F. Dotson, chairman of the Council franchise committee and author of the greater part of the franchise, discussed Section 9, which gives the city the right to regulate the operation of cars, to supervise the construction and maintenance of tracks, to decide on the number and kind of cars and to dictate as to the construction of extensions, the building of new tracks and the laying down of crosstown lines.

David A. Merritt, president of the Toledo Taxpayers' League, said he represents home owners and other small taxpayers. What they wanted more than anything else was service. This was demonstrated by the fact that many people used the jitneys and paid a 5-cent fare. Mr. Merritt expressed himself in favor of the franchise.

A vote showed that about 90 per cent of those present had signed the petitions. The most pronounced objection to the franchise, perhaps, was on the provision that the Federal Judge should appoint the third member of the boards of arbitration selected to pass on all matters of difference between the city and the company.

The franchise declares at the outset that the city may acquire the property of the company and operate it under municipal ownership at an appraised value fixed by a board of arbitrators. The securities outstanding at the time of the purchase and the franchise are not to be taken into consideration in determining the value of the property. Only such property is to be purchased as is useful in the operation of the railway.

The road is to be so rearranged by commissioners appointed by the city as to provide the most efficient service. A cross-town line is to be constructed to serve the many workmen employed in the west end of the city. The entire road is to be equipped with pay-as-you-enter or pay-as-you-leave cars within ten months from the date the ordinance becomes effective. Ten months after the ordinance goes into effect, and after the system has been rearranged and provided with cars of the types mentioned, a try-out period of twelve months is to begin. During this period passengers are to be permitted to ride at any hour of the day at the rate of five rides for 15 cents. The city is to have complete control for the twelve months.

While the try-out is being made, a board of arbitration is to value the property used and useful in the operation of a street railway in order that the city may be able to fix a rate of fare to be charged for a period of five years immediately succeeding the try-out period. This rate is to be fixed by Council at least thirty days before the expiration of the period and it is to be sufficient to pay the costs of operation, maintenance including depreciation, taxes and governmental charges and in addition yield a return of 6 per cent on the valuation. This means that the fare is to be based on the actual cost of operation plus 6 per cent on the valuation.

The commissioners appointed by the city are to fix a standard of efficiency, below which no line in the city is to be operated. If the return at the rate of fare fixed by the city for the first five-year period yields a sum any year in excess of the amount necessary for the payment of the items named above, the excess is to be paid into the general fund of the city unless the road has been operated at an efficiency above the standard fixed by the commissioners. In the latter case, the company is to receive one-half of the excess earnings and the other half is to be paid into the general fund of the city. This is the only manner in which the company can receive a return greater than 6 per cent on the valuation of the property as fixed by the arbitrators.

All disputes are to be settled by arbitration. Section 7 contains provisions for taking over the property and its operation as a municipal road. The ordinance does not conflict with the municipal ownership ordinance passed on Aug. 4, 1914. Full and complete control over the operation of the interurban lines within the city limits is provided.

The City Council of Toledo, Ohio, received the report of the special franchise committee on the evening of Sept. 13. The committee filed the ordinance with City Clerk McDonall, as required by law, and preparations were begun for a referendum vote on it. The names of 10 per cent of the voters must be secured to petitions to submit the franchise at a general election and 20 per cent for a special election. The association will endeavor to secure 7000 names. Council merely received and placed on file the report of the franchise committee on Sept. 13. It was signed by Members Hassenzahl, Dotson, Fraser and Redd. Councilman Ruppel, a member of the committee who had never taken any part in the negotiations, opposed the receipt of the report by Council. Members Brown and Hein did not attend the later sessions of the committee and Mr. Brown refused to attach his signature when the opportunity was presented. The report contained no recommendation as to what Council should do with the draft of the franchise prepared. The vote to receive the report stood twelve to six in favor of it. The committee was dismissed.

MARKET STREET, SAN FRANCISCO, CONTROVERSY RESULTS IN CONTEMPT FINDING

Holding Thomas A. Cashin, superintendent of the San Francisco (Cal.) Municipal Railway, alone for trial on contempt charges, Superior Judge Crothers in that city on Sept. 14 rendered a decision purging Mayor Rolph and the three members of the Board of Public Works of charges of contempt of court in directing the operation of the "C" and "D" lines of the municipal railway over lower Market Street, in violation of an injunction which had been issued by the court.

Judge Crothers held that Mr. Cashin, as superintendent of the city lines, was the only man in control of their operations or suspension. He held that neither the operation nor the suspension of municipal street cars was within the scope of the duties to be performed by the Mayor or the Board of Public Works. The Court further held that Judge Sturtevant's injunction was mandatory rather than prohibitive, and that therefore under the law the appeal taken to the State Supreme Court can in effect stay the operation of the restraining order and permit the continued operation of "G" and "D" line cars pending the outcome of the appeal.

The decision handed down by Judge Crothers deals only with the case between the city and the United Railroads. The decision in the cases brought by the Sutter Street Railway is held in reserve.

Following the exoneration of Mayor Rolph from contempt charges, Mr. Cashin was sentenced to pay a fine of $250 or serve two days in jail for running cars on lower Market Street tracks in disobedience to the injunction issued by Judge Sturtevant. Mr. Cashin obtained a twenty-four-hour stay of execution and on the expiration of this time the fine was paid.

AMALGAMATED ASSOCIATION AGAINST REPEAL OF ARBITRATION CLAUSE

President Mahon Raps Practice of Putting Attorneys on Boards of Arbitration

The feature of the closing sessions of the convention of the Amalgamated Association of Street & Electric Railway Employees of America at Rochester, N. Y., was the overwhelming vote against the proposal to repeal the arbitration clause in the constitution of the association. The proposal came before the convention on a recommendation by the law committee that the arbitration provision be retained. A motion to non-concur in the committee's recommendation was made. Outside of the delegates from the Bay State Street Railway, Boston, the opposition to arbitration found little support.

President William D. Mahon had declared in favor of the arbitration clause in his annual report, read early in the week. One account of the passage at arms over the arbitration proposal said:

"In a characteristic address, President Mahon declaimed against the proposal to strike the arbitration clause from the constitution of the association. He declared that in two-thirds of the cases of disagreement with employers, street-car men would find that public sentiment would force arbitration of the questions at issue, regardless of whether the constitution provided for it. Going into the history of arbitration in recent New England troubles of the street railway employees and their employers, President Mahon rapped the practice of putting attorneys on boards of arbitration. He said that in virtually every case the results of arbitration depended upon the selection of the arbitrators, and under the laws of the association the railway workers can say what questions will be submitted to arbitration, how long the arbitrators can sit and when their decision must be given. Addressing his remarks to the insurgent Massachusetts delegates, President Mahon told them they had had arbitration and under the laws of their organization they would have to live up to the awards of the arbitrators. He warned them, when next a similar situation arose, not to choose attorneys as arbitrators, and intimated that if they handled the situation in the right way they would have no complaint to make at the result."

A resolution which was adopted called for an investigation of the Cleveland 3-cent car lines.

LEHIGH VALLEY TRANSIT SPENDING $375,000

The Lehigh Valley Transit Company, Allentown, Pa., is spending $375,000 this year in improvements. The changes that are being made extend to practically every department of activity of the company. The east-bound track between Allentown and Bethlehem has been rebuilt to Sixth and Hamilton Streets, Allentown, and it has been determined to build a double track at West Bethlehem, where there are 1600 ft. of single track. The laying of the track will be begun in a short time. The track on Main Street, Slatington, will be rebuilt from the Lehigh Valley station to Trout Creek Bridge. The track on North Fourth Street, Allentown, is being rebuilt from Greenleaf to Steckel's Bridge and the street is being paved with brick on a concrete base. The stretch from Washington to Greenleaf Street was rebuilt last year on the supposition that the city would at that time pave this street. The company will do is share of paving on Seventeenth Street from Turner to Gordon, and as soon as the city is ready will reconstruct the tracks on Hamilton from Sixth to Seventh. On the Nazareth line a stretch of 1500 ft. has been reconstructed on private right-of-way, and some sharp curves eliminated.

Six new bridges have been constructed and six rebuilt. The new bridges span the Jordan at Steckel's, the Perkiomen on the Emaus line, Jones's on the Chestnut Hill division, the Philadelphia & Reading Railway tracks at Ambler and the Jordan at Iron Bridge on the Slatington division. Underfeed stokers are being installed beneath six of the boilers at the Front Street power house. The company is also installing transformers and regulators in the various municipalities through which its lines run.

There are some notable improvements on the Philadelphia division. The track is being ballasted between Quakertown and Perkasie. On the Chestnut Hill division the adjustment has been changed, curves eliminated and the track raised where necessary.

In line with recommendations by the safety-first committee, a special point has been made over the entire system, with the consent of adjoining property owners, of trimming all trees, shrubbery and underbrush, to provide a clear view at crossings. A number of new automatic signal bells and several hundred additional warning signs have been placed at crossings, and approach signs have been erected 300 ft. from crossings, to caution autoists, teams and pedestrians. When this work is completed there will be 600 warning signs along the line.

To take care of the increasing business on the Philadelphia division the company is arranging to increase the power facilities, it being planned in 1916 to run two and three-car trains the entire distance from Philadelphia to Allentown. During the heavy traffic of the present summer two-car trains were run daily between the cities, leaving Allentown for Philadelphia at 8 a. m. and returning from Sixty-ninth Street, Philadelphia, at 5 p. m. Saturdays, Sundays and holidays two-car trains were run every hour.

H. R. Fehr, president of the company, has been giving a great deal of attention to getting the Easton division into shape by the elimination of curves and the rebuilding of portions of the line. These improvements on the line to Easton will lessen the running time between the two cities ten minutes.

For the betterment of the limited service between Allentown and Easton the company has had The J. G. Brill Company build a number of all-steel cars. The first of these cars, No. 214, was placed in service on Aug. 12.

All tracks in South Easton have been rebuilt with 105-lb. T-rails on creosoted ties. Adjoining the carhouse at Seventeenth and Washington Street, Easton, the company has purchased a tract for the enlargement of the carhouse and shops.

The expenditures on the Easton division will amount to $110,000. As previously stated the expenditures for the improvement on the entire system will amount this season to upwards of $375,000.

I. R. T. BASEBALL SEASON CLOSED

The baseball season among the employees of the Interborough Rapid Transit Company, New York, N. Y., was brought to a close on Saturday, Sept. 11, with a game of ball between the car equipment division of the company and a team representing the Erie Railroad, and a shore dinner at the Brighton Beach Casino. On the Interborough system there is a league of eight clubs from various divisions of the service, and for the second time in succession the honors have been won by the men from the car equipment department. They won fourteen out of sixteen games, and then with apparently little respect for their guests at Hedley Field on Sept. 11 they smothered the Erie team. More than 400 invitations to both the game and the clambake were sent to officials of the State and city administrations, members and officials of the Public Service Commission, the executive officials of all the prominent electrical transportation systems in the East and to many trunk line officials east of the Mississippi River. The pennant was presented to the car equipment team at the dinner, gold medals were pinned on the individual members of the team and a cup donated by Harry M. Hempstead, president of the New York Giants, was awarded to the league player with the best all-around record. Among the speakers were Frank Hedley, vice-president and general manager of the Interborough Company; Supreme Court Justice Luke D. Stapleton, ex-Corporation Counsel John Whalen of New York and H. H. Vreeland, director of welfare of the Interborough Company.

A game is announced to be played at Ebbetts Field, the home of the Brooklyn National team, on Sept. 29 between the champions of the Interborough and an all-star team from the league of clubs on the Brooklyn Rapid Transit System. At Dexter Park, Brooklyn, on Sept. 23, the Brooklyn all-star team defeated a team of the Hudson & Manhattan Railroad by the score of.16 to 0. Deutsch, pitching for Brooklyn, allowed only three hits. One error was made behind him.

COLUMBIA STRIKE SETTLED

The strike of the employees of the Columbia Railway, Gas & Electric Company, Columbia, S. C., in progress about a week, was settled on Sept. 18, mainly through the efforts of Governor Richard I. Manning. With two exceptions the men on strike will all be taken back by the company. In future all differences will be submitted to arbitration. The strike was precipitated by differences between the men and the company over questions of fare accounting. In a statement which the Governor issued following the settlement of the strike he said:

"I am highly gratified at the peaceful and happy solution of the differences between the car men and the street railway company. I feel that the pleasant and prompt settlement of differences was brought about because of the desire for justice, and I am glad that justice has prevailed. One especially pleasing point is that under the agreement all differences will be settled by arbitration and this should totally eliminate all danger of strikes and lockouts in the future."

RHODE ISLAND ARBITRATION HEARINGS

In the wages arbitration hearings of the Rhode Island Company at Providence last week, John P. Farnsworth, a federal trustee of the company, testified that if an increase in pay was granted to the employees by the board, the capital of the company would more than likely be impaired, with possible receivership, and in the event of the latter the city of Providence would probably lose its contract with the company, at a cost of about $150,000 a year. In the last eight years only 15 per cent of the gross earnings had been used in maintenance, although 20 per cent should have been thus applied. The additional 5 per cent in this period amounted to $1,915,148. This ought to have gone into the property.

Mr. Farnsworth stated that since 1912 the receipts from transportation had not shown the normal gain commensurate with the growth of the territory. This should be about 6 per cent yearly, according to the reports of B. J. Arnold and W. J. Lewis. Since 1909 receipts had fallen off, with a deficit for 1915, aggravated by the increased volume of transfers. The witness called attention to the heavy inroads made by the jitney in the Providence district. Such competition was not contemplated by the company in making its contract with the city—an agreement that gave the city 5 per cent of the gross receipts and one-third the cost of widening and improving new streets, while the company also paved between the tracks and 18 in. outside. Mr. Farnsworth also said that the 5 per cent rentals paid on leased lines were not excessive in view of their physical valuation.

It was pointed out that the company must spend $800,000 this year in extensions and improvements. The company's charter and contracts precluded increasing fares unless by consent of the Assembly. The company was economically operated, the cost of power was low, but the cost of labor had increased since 1910 to a point where it is probably larger at present than in any other city under similar conditions. For extensions and improvements in the next five years $10,000,000 was needed, and even with wages as they are it will be difficult to secure this new capital without the inducement of a much larger interest rate.

A. E. Potter, president of the Rhode Island Company, pointed out that official salaries were smaller in the company than on the Boston Elevated Railway and Bay State Street Railway. He stated that if the company could arrange its schedules as it saw fit, within the hours of agreement with the union, it could eliminate about 150 men in summer and 300 in winter, guaranteeing the extra men six hours' work a day at a good wage. He also testified in regard to the fare accounting methods which are in use by the company.

Prof. Albert S. Richey of the Worcester (Mass.) Polytechnic Institute took the stand in rebuttal to the testimony of Arthur Sturgis, Boston, relative to the cost of living. The witness said that Streightoff, John Mitchell and others set the minimum-living wage at $600 to $650 a year instead of at $1,000 as advanced by Mr. Sturgis. The average wage in Providence in 1913, as reported in connection with the Rhode Island workmen's compensation act, was $539. Transportation employees received an average of $740. Professor Richey stated that according to the Wholesale Price Bulletin of the United States Bureau of Labor Statistics, clothing advanced 15.8 per cent from 1900 to 1915 instead of 30 per cent as claimed by Mr. Sturgis. The witness said that according to Streightoff there were at least 5,000,000 industrial workmen in the United States earning $600 or less a year. A chart was introduced showing a decline of 4 per cent in food prices from January to June, 1915, from the average of 1914.

James H. Vahey, counsel for the men, cross-examined the witnesses particularly with respect to the financial history of the company involving the various leases and the intercorporate relations with the New York, New Haven & Hartford Railroad.

PROSPECTS OF NEW DES MOINES GRANT

The Des Moines (Iowa) City Railway will be operating under the proposed new franchise, agreed to by the company and the City Council, by Jan. 1, 1916, unless plans of the company and the city miscarry. The Council will submit to a vote of the people, at a special election, a franchise proposed by the Des Moines Chamber of Commerce and accepted by the city and the company with slight alterations.

Sentiment in the city appears to be overwhelmingly in favor of a final settlement of the franchise question on the basis now offered, and when the franchise is accepted, the company will be sure of its right to operate in Des Moines for the first time since 1900, when litigation involving the validity of the franchise held by the company was begun by the city. This long fight now seems likely to end with a franchise practically the same as the one under which the company then was operating. The new franchise will provide six fares for a quarter, half-fare for school children, a guarantee of service as good as the best in any city of the nation the same size as Des Moines, and a valuation of $5,000,000 as of the present time if the city decides to buy the property within twenty-five years, which is the term of the franchise. No valuation is fixed for the purpose of determining profits. The company guarantees the service and takes its chances on the profits.

Emil G. Schmidt, president of the company, states that $1,500,000 in improvements will be spent as soon as the franchise is in effect. These will include twenty-five new cars, the construction of several new lines, a complete overhauling and rebuilding of the present system, a large amount of paving, and the establishment of loop and crosstown services.

Des Moines is rejoicing at the prospect of the settlement of the long standing controversy. Newspapers express the opinion, editorially, that Des Moines would have been better off had the fifteen years' fight been settled fifteen years ago by arbitration between the city and the company. This opinion is almost unanimously subscribed to by citizens of the city.

Recovering Cars Abandoned on Causeway.—Two interurban cars and a work car have been recovered by the Galveston-Houston Electric Railway from the debris of the Galveston causeway where they were abandoned on Aug. 16. They have been taken to Houston for overhauling. Officials of the railroads entering Galveston have announced that the causeway will be rebuilt at an estimated cost of $1,500,000.

Chicago Surface Lines' Club Has Outing.—The first annual outing of the Surface Lines' Club of Chicago, Ill., was held at Riverview Park Picnic Grove on Sept. 18, 1915. This club was organized last spring and now has a membership of 506. The members are from the departmental offices of the Chicago Surface Lines. In the afternoon there was a baseball game between the electrical and the engineering departments, followed by races and prizes for everybody.

Newport Franchise Matter Still Unsettled.—Another attempt of the Newport Business Men's Club to adjust the rental that the Cincinnati, Newport & Covington Railway shall pay after the expiration of its franchise failed on the evening of Sept. 10. Members of the club suggested several sums between $6,000 and $7,500 as reasonable, but the City Commissioners held out for $12,000 a year. The

company has expressed a willingness to pay $3,000. It is said that the company will enter litigation on the question of its perpetual rights to the use of the streets rather than pay more than it has offered.

Further Transit Loan Urged in Philadelphia.—Mayor Blankenburg of Philadelphia, Pa., has sent a message to Councils urging that every expedient be used in passing the legislation necessary for a new permanent loan of $1,250,000 toward the construction of the Frankford elevated and other rapid transit facilities so that the proposal may be submitted to a vote of the people at the November election. With it the Mayor transmitted a letter on the subject from Transit Director Taylor, in which the latter said that he did not believe the city would be justified, from a business standpoint, in awaiting a special election to be held subsequent to the proposed amendment to the constitution.

Third Annual Engineering Conference in Pennsylvania.—An exhibition is to be held on Nov. 15 to 19 inclusive in Harrisburg, Pa., in connection with the third annual Pennsylvania Industrial & Public Welfare & Engineering Conference. The first two exhibits have been representative of the very best products of the safe, economical and efficient industrial development and also indicative of what the industrial and public service companies are doing to promote the health and welfare of the people. The Department of Labor and Industry and the Public Service Commission will participate in the exhibition. J. W. Reynolds, vice-president of the Pennsylvania Steel Company, is chairman of the exhibit committee.

National Fire-Prevention Day.—Saturday, Oct. 9, the anniversary of the great Chicago fire, has been designated by the Safety First Federation of America as the national fire-prevention day and extensive plans have been formulated for observing this anniversary in a fitting manner in various cities throughout the country. An appeal has been made to the Governor of each State requesting that a proclamation be issued designating Oct. 9 as the national fire-prevention day. In his letters to the Governors, Frederick H. Elliott, executive secretary of the federation, calls attention to the necessity of impressing upon the minds of the people the need of their co-operation to prevent the unnecessary loss of life and property by fire.

New Commonwealth Edison Publication.—The Commonwealth Edison Company, Chicago, Ill., has just issued a booklet of eighty-six pages under the title "Rules and Information Pertaining to Electric Service, Meters, Wiring and Motors." This is issued for the purpose of acquainting customers, contractors, architects and engineers with the requirements of the Commonwealth Edison Company pertaining to the installation of service connections, meters, wiring, motors, and other appliances which are to be supplied with electricity from the company's main. The rules are supplementary to the electrical code of the city of Chicago, and they contain considerable information of technical value. One-half of the booklet is taken up with dimensioned and other diagrams of meter mountings.

Application for Franchise in Cincinnati.—The West End Rapid Transit Company has asked the City Council of Cincinnati, Ohio, for a franchise for the extension of its line from Anderson's Ferry to the corner of Third and Sycamore Streets in the city. The route is the same as mentioned in the Electric Railway Journal of Sept. 11. All fares and charges of the company for carrying passengers and merchandise are to be so fixed that the net revenue shall be sufficient to pay not less than 10 per cent on the total amount invested in the property and equipment. After setting aside all charges for operating, a reasonable amount for depreciation and the 10 per cent return, the remainder of the surplus is to be divided equally between the company and the city. The books are to be open to the city from time to time, so that the amount invested may be ascertained, as well as the earnings and the disposition of the funds. C. E. Hooven is president of the company, and Stanley Shaffer is secretary.

Appeal in Toronto Case Unlikely.—North Toronto residents are not in favor of an appeal against the decision of the Ontario Railway Board, giving the Toronto (Ont.) Railway running rights over that portion of Yonge Street north of the Canadian Pacific Railway tracks up to Farnham Avenue, on which the Toronto & York Radial Railway formerly operated. At a meeting of the Ratepayers' Association on Sept. 17 the recommendation of the Board of Control that the decision be appealed was strongly condemned, and the Aldermen of the Second Ward and Third Ward were urged to oppose the recommendation. One Alderman promised to do so, but the others stated that it was their intention to cast their votes in the interests of the city generally and not in the interests of a particular locality. They were willing to join a deputation to the Toronto Railway to request that company to lay tracks from its present terminus to Farnham Avenue, where passengers from the Toronto & York Radial Railway might transfer to the other system. A petition will be presented to the City Council on Sept. 20 praying against the plan to proceed with the appeal.

Obstacles to Construction of Line Under East River Removed.—The Public Service Commission for the First District of New York has received from Henry Breckenridge, Acting Secretary of War, the modification requested by the commission in the permit from the War Department for the right to construct a rapid transit railroad under the East River from Fourteenth Street, Manhattan, to North Seventh Street, Brooklyn. This is a part of the Fourteenth Street-Eastern line of the dual system. In the permit as originally issued by the War Department responsibility for all damage or loss during the work was laid upon the city of New York. The commission objected to this clause and the government has now modified it so as to make the city assume "all legal liability" for loss or damage due to construction or operation. The modified permit also gives the commission permission to construct a temporary ventilation chamber outside of the bulkhead line at the foot of North Seventh Street, Brooklyn, on condition that all such structures outside the bulkhead line shall be entirely removed when the work is completed. This removes the last obstacle to the beginning of work on the Fourteenth Street-Eastern line and in a few weeks the commission will advertise for bids for the construction of the tunnel section.

PROGRAMS OF ASSOCIATION MEETINGS

Mississippi Electric Association

Owing to objection on the part of some of the members to the dates of Nov. 10 and 11 as the meeting time of the Mississippi Electric Association it has been decided to change the dates to Nov. 12 and 13.

Annual Congress National Safety Council

The fourth annual congress of the National Safety Council will be held at Philadelphia, Pa., on Oct. 19, 20 and 21. Accident prevention in all its phases will be discussed and the particular problems of the various industries will be presented in separate meetings. Dr. E. B. Rosa, acting director bureau of standards, Department of Commerce, Washington, D. C., will be chairman of the public utilities sectional meetings, to be held on Oct. 20, 1915. The program for this session is as follows:

"Linemen and Their Operations," by C. B. Scott, manager bureau of safety, Middle West Utilities Company, Chicago, Ill.

"Danger of Low-Tension Shocks," by H. S. Warren, American Telephone & Telegraph Company, New York.

"Hazards of High-Tension Lines," by Bryce E. Morrow, chief engineer Utilities Mutual Insurance Company, New York.

"Hazards of Gas Works," by J. B. Douglas, manager claim department United Gas Improvement Company, Philadelphia, Pa.

"Hazards of Street Work," by Edward C. Spring, assistant to the president Lehigh Valley Transit Company, Allentown, Pa.

"Education of Street Car Platform Men," by Rex. D. Billings, general claim agent Reading Transit & Light Company, Reading, Pa.

Financial and Corporate

Manila Electric Railroad & Light Corporation

The statement of income, profit and loss of the Manila Electric Railroad & Light Corporation, Manila, P. I., for the calendar year 1914 follows:

Gross earnings	$1,602,001
Operating expenses and taxes	818,415
Net earnings (After allowing for loss of $9,324 in operating Union Truck Company)	$783,586
Fixed charges—interest on bonds	277,716
Surplus over fixed charges	$505,870
Reserves:	
For sinking fund	$28,250
For replacements and renewals	80,000
Total	$108,250
Surplus	$397,620
Dividends	350,000
Net surplus for the year	$47,620
Surplus at beginning of year	1,253,337
Credits:	
Amount carried as reserve for sinking fund transferred to surplus	39,353
Earnings for prior period	2
	$1,340,312
Charges:	
Expenses of ice plant investigation written off	$6,228
Expenses prior period	850
Exposition fire loss	3,645
Surplus Dec. 31, 1914 (excluding reserves)	$1,329,589

The gross earnings for the year showed a decrease from the previous year of $96,582, or 5.62 per cent. The operating expenses and taxes increased $27,628, or 3.49 per cent, so that the net earnings from operation decreased $124,220, or 13.68 per cent. Of the decrease of $96,592 in the total gross earnings, $82,000 occurred in the railway department. Up to June 30, 1914, the decrease was less than 1 per cent, the balance of the loss occurring during the latter part of the year. The electric department earnings fell behind a little more than $9,000, or only a fraction over 1 per cent, the balance of the shrinkage being caused by the closing down of the trucking department.

During August heavy rains caused serious floods in Manila, and during September the city experienced the worst flood in its history. These floods caused a loss of considerable revenue and resulted in additional expense in repairing track, roadway, rolling stock and power plant. The increase in expenses was owing largely to the heavy growth in the number of electric customers, which necessitated an addition to the electric staff. This in itself created enlarged overhead expense, and the natural considerable increase in fuel consumption was emphasized by a larger average cost per ton of coal purchased. The company expended during the year for new construction $129,015; for replacements and renewals, $62,241, and for maintenance, which was included in operating expenses, $158,466.

Business and financial conditions in the Philippine Islands during the year were far from satisfactory. In the beginning of the year the general world-wide depression began to be felt and after the commencement of the European war the situation became gradually worse. The last five months of the year were the dullest period experienced in the history of the company.

Augusta-Aiken Railway & Electric Corporation

According to the annual report of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., for the year ended Dec. 31, 1914, the gross earnings amounted to $738,372 and operating expenses and taxes to $393,886, leaving income from operation of $344,486. Interest and sinking fund charges were $282,962, and the gross surplus for the year was $61,523. The gross electric earnings increased $19,265 or 6.6 per cent, with a decrease in expenses of $11,733 or 10.1 per cent. The gross railway earnings decreased $4,768 or 1.3 per cent, and expenses decreased $46. The gross earnings from other departments decreased $1,197 or 1.8 per cent and expenses decreased $1,409 or 3.6 per cent.

For the first ten months the total gross earnings were approximately $30,000 greater than for the same period of the preceding year; of this increase more than $15,000 ($14,000 in railway department) was lost during the last two months owing to the unprecedented business chaos. The operating expenses for the year showed a saving of $14,225; taxes were $6,000 higher, and the fixed charges increased by more than $75,000. As a result surplus suffered a decrease during the year to the extent of more than $55,000.

During the year $120,000 of additional 5 per cent sinking fund gold bonds were placed in the treasury to cover cost of additions, betterments and extensions, made previous to Nov. 30, 1914. Of these $20,000 were sold. A total of $250,000 of first mortgage 5 per cent sinking fund gold bonds of the Georgia-Carolina Power Company was issued to cover the cost of completing that plant and sold. Two dividends of 1½ per cent each were paid on the cumulative preferred stock, but with the outbreak of the war in Europe and the consequent falling off in earnings, the directors suspended payment of dividends on the preferred stock from July 1, 1914.

A sum of $96,903 was expended for additions and betterments and charged to capital accounts. Of this amount $53,064 was expended for line extensions and the necessary apparatus for connecting new customers; $13,675 was for a new substation at the city plant, and the balance for miscellaneous improvements, including a 2-mile extension of the railway lines to Aumond.

American Public Utilities Company

The combined statement of income, profit and loss of the subsidiaries of the American Public Utilities Company, Grand Rapids, Mich., for the year ended June 30, 1915, follows:

Gross earnings from operation	$2,932,069
Operating expenses	1,618,239
Net earnings from operation	$1,313,830
Miscellaneous income	25,930
Gross income	$1,339,760
Less expenses	$38,101
Net income	$1,301,659
Interest charges	952,108
Remainder	$349,551
Dividend on preferred stock	234,840
Balance	$114,711

The gross earnings from operation increased during the year from $2,319,955 to $2,932,069, net earnings from operation increased from $980,879 to $1,313,830, and expenses decreased from $51,485 to $38,101. The comparative net income for the respective years was $974,696 in 1914 and $1,301,659 in 1915. The increase in fixed charges was from $599,309 to $952,108. These increases in gross and net earnings and in the fixed charges were caused by the acquisition and financing of the properties of the Chippewa Valley Railway, Light & Power Company (merged into the Wisconsin-Minnesota Light & Power Company) and by the large expenditures, approximately $1,500,000, made by the Merchants Heat & Light Company and by the Wisconsin-Minnesota Light & Power Company for extensions and additions to their properties. The net income available for dividends decreased slightly because the fixed charges included interest on investments made during the last year, which did not become remunerative until late in the present fiscal period.

During the year the Capitol Light & Power Company, a competitor of the Jackson Light & Traction Company, Jackson, Miss., retired from business on account of unsatisfactory revenue conditions, and as a result a substantial increase of business accrued to the electric lighting department of this subsidiary. A movement to establish a municipal lighting plant was met by a publicity campaign which assisted in producing an adverse vote of the electors. The street railway income of this subsidiary was unfavorably affected by a jitney service which was established in Jackson during the year. According to the annual report of the holding company, this is a problem which still remains to be dealt with.

TAXES ASSESSED IN VIRGINIA

The total value of the tangible and physical property of electric railways operating in Virginia, as assessed by the State Corporation Commission for the calendar year 1914, was $8,933,873. The State property tax upon this assessed value, the tax on money and the franchise tax assessed upon the annual gross transportation receipts amounted to $83,225. The total State taxes assessed against electric carriers for the preceding year was $81,002, an increase for 1914 of $2,223. During 1914 the total value of the tangible and physical properties of the canals and steam railroads in the State was $122,120,868, and the total State taxes imposed amounted to $1,084,220, an increase for 1914 of $48,903. The assessed property values of light, heat, power, gas and water companies operating in the State totaled $10,114,941 for 1914, upon which the total taxes amounted to $60,237, an increase over 1913 of $4,449. The accompanying table shows the details of the taxable values of electric railway properties in Virginia for 1914 and the taxes assessed thereon, as well as the franchise tax assessed. The tax on money is omitted, the total for all companies for the year being only $768.

TABLE SHOWING THE 1914 TAXABLE VALUES OF ELECTRIC RAILWAY PROPERTIES IN VIRGINIA, AND THE TAXES ASSESSED THEREON, AND THE FRANCHISE TAX ASSESSED UPON THE GROSS TRANSPORTATION RECEIPTS FOR THE YEAR ENDED JUNE 30, 1914

Name of Company	Track Miles	Value	Value of Rolling Stock	Value of All Other Property	Total Property Value	Tax on Property	Franchise Tax	Total Tax
Appalachian Power Company	0.79	$7,364	$494	.....	$7,858	$27	$91	$121
Blue Ridge Light & Power Company	5.30	25,625	4,500	$5,605	35,730	125	152	278
Bristol Traction Company	3.57	12,495	1,488	.....	13,983	49	62	111
Charlottesville & Albemarle Railway	3.48	47,088	24,500	53,030	124,618	436	423	863
Danville Traction & Power Company	5.56	78,660	29,331	48,696	156,687	548	1,359	1,968
Henrico & Chesterfield Railway	2.50	10.000	.....	.....	10,000	35	.....	35
Lynchburg Traction Light Company	14.74	226,200	113,500	116,665	456,365	1,597	2,527	4,137
Mill Mountain Incline, Inc.	0.37	8,372	1,800	13,400	23,572	82	47	132
Newport News & Hampton Railway, Gas & Electric Company	32.54	534,480	99,400	260,310	894,190	3,129	3,154	6,469
Norfolk City & Suburban Railway	4.50	47,250	3,252	1,533	52,035	182	68	251
Norfolk & Ocean View Railway	9.15	91,423	15,700	7,450	114,573	401	672	1,073
Norfolk Railway & Light Company	32.39	513,885	80,750	99,275	693,910	2,429	.....	2,428
Bedford Water Power Company	2.63	10,520	2,400	4,000	16,920	59	103	163
Richmond & Chesapeake Bay Railway	14.76	241,110	27,000	53,640	321,750	1,126	602	1,734
Richmond & Henrico Railway	4.93	254,860	49,500	153,100	457,460	1,601	1,107	2,710
Richmond & Rappahannock River Railway	25.34	70,990	25,090	11,344	107,424	376	399	805
Roanoke Railway & Electric Company	24.17	265,916	100,000	138,903	504,819	1,767	3,285	5,069
Taxewell Street Railway	1.97	5,910	1,250	250	7,410	25	97	125
Virginia Railway & Power Company	138.81	1,976,430	802,440	630,514	3,409,384	11,932	28,833	41,160
Washington & Old Dominion Railway	69.99	763,640	74,750	98,587	936,977	3,279	4,269	7,551
Washington Utilities Company	.....	.....	.....	.....	.....	.....	.....	13
Washington-Virginia Railway	38.39	322,280	120,350	145,578	588,208	2,058	3,935	6,022
Grand total	435.89	$5,514,498	$1,577,495	$1,841,800	$8,933,873	$31,268	$51,188	$83,225

SECURITIES LOST IN EUROPE

It is reported that the Brazilian Traction, Light & Power Company, Ltd., Toronto, Ont., probably will experience considerable difficulty in adjusting the matter of bearer share warrants lost during the European war. There are a large number of stockholders in Belgium who secreted their securities when the German invasion began. Many of these stockholders have been killed and no one knows the hiding place of the securities. The warrants, which bear coupons payable to bearer, are probably lost beyond all chances of recovery. Claims are being made on the company to have duplicate warrants issued, but it is expected that considerable difficulty will arise in proving claims to the lost stock. Other companies will have the same trouble, as substantially all securities held in Belgium and northern France were made to bearer and at the outbreak of war these were secreted for safe keeping. Many complications and much litigation is expected over these lost securities.

Brazilian Traction, Light & Power Company, Ltd., Toronto, Ont.—J. S. Lovell has been elected a director of the Brazilian Traction, Light & Power Company, Ltd., to succeed the late Sir William Van Horne.

Camaguey (Cuba) Company, Ltd.—The Electric Bond & Share Company, New York, which some time ago took a ninety days' option on the $1,000,000 stock of the Camaguey Company, Ltd., at $50 a share, has decided not to exercise the option. Officials of the company state that bank obligations have been nearly all paid off and there is a probability that with the close of the current year there may be funds to pay a small dividend on the stock.

Chicago (Ill.) Surface Lines.—Complaints made to the Illinois Public Utilities Commission by J. B. Hogarth against the Chicago Railways and the Chicago Surface Lines were dismissed on Sept. 14 on motion of Mr. Hogarth. Among the complaints made by Mr. Hogarth were the following: As to the "unjust, unwarranted and unreasonable salary" paid John M. Roach as one of the members of the board of operation of the Chicago Surface Lines and as one of the directors of the Chicago Railways; as to the Chicago Railways carrying items of paving expenditures in the joint capital account with the city; as to the application of the Chicago Railways for authority to issue $3,145,000 of first mortgage bonds, and as to the system of accounting of the Chicago Railways.

Columbus, Delaware & Marion Railway, Columbus, Ohio.—The Common Pleas Court has decided that the Columbus, Delaware & Marion Railway is not liable as guarantor on the $500,000 of first mortgage bonds and the $96,000 interest due thereon of the Columbus, Marion & Bucyrus Railroad. When these bonds were issued, the Columbus, Delaware & Marion Railway guaranteed them by endorsement as to principal and interest. On default by the Columbus, Marion & Bucyrus Railroad, the Troy (N. Y.) Trust Company, as trustee of the bonds, brought suit to enforce the guarantee.

Columbus Railway, Power & Light Company, Columbus, Ohio.—An initial quarterly dividend of 1 per cent has been declared on the prior preference stock of the Columbus Railway, Power & Light Company, in addition to the regular quarterly dividend of 1½ per cent on Series A preferred stock. Both of these dividends are payable on Oct. 1 to stockholders of record on Sept. 15.

Demerara Electric Company, Ltd., Halifax, N. S.—The directors of the Demarara Electric Company, Ltd., which does the entire lighting and tramway business in Demerara, British Guiana, have decided to omit the quarterly dividend of 1 per cent usually paid on Oct. 1. This omission is caused by conditions brought about mainly by the European war, resulting in an increase in the cost of fuel and a decrease in the general traffic.

Kansas City Railway & Light Company, Kansas City, Mo.—The Kansas City Railway & Light Company stockholders, it is stated, have accepted the plan formulated by Federal Judge Hook for the reorganization of the Metropolitan Street Railway and the Kansas City Electric Light Company, as described in the ELECTRIC RAILWAY JOURNAL of Aug. 21. A supplementary plan, not providing for any assessment on Kansas City Railway & Light Company stock, will soon be issued.

Long Island Railroad, New York, N. Y.—Earl T. Shaw, 30 Broad Street, New York, has offered to purchase at 60, less commission of 2½ per cent to be paid by the seller, a block of 25,000 shares of Long Island Railroad stock. The certificates must have been issued not later than 1910 and

proxies must not have been put out against the same in favor of control by the Pennsylvania Railroad management.

New Orleans Railway & Light Company, New Orleans, La.—The gross earnings of the New Orleans Railway & Light Company for the six months ended June 30, 1915, amounted to $3,520,748 as compared to $3,596,463 for the corresponding six months in 1914. Other statistics for the six months' periods follow: Net after taxes—1915, $1,386,821; 1914, $1,482,475; miscellaneous deductions—1915, $18,184; 1914, $14,253; bond and other interest—1915, $870,198; 1914, $854,185; renewals and replacements—1915, $75,166; 1914, $130,871; surplus—1915, $423,273; 1914, $483,166.

Providence & Fall River Street Railway, Swansea Center, Mass.—In the United States District Court in Boston Judge Morton on Sept. 22 declined at present to appoint a receiver for the Providence & Fall River Street Railway, after considering a petition for such appointment brought last week by the Industrial Trust Company, Providence, R. I. The trust company holds the road's bonds to the amount of $165,000. Counsel for the railway opposed the receivership on the ground that no bonds have yet failed to receive interest, the next date when interest is due being Oct. 1. Conditions are beginning to improve on the road and the appointment of a receiver at this time would merely increase the cost of administering the property. This has been economically carried on during the last three years by a noteholders' committee. Several Massachusetts banks and the Rhode Island Company also opposed a receivership.

Public Service Corporation of New Jersey, Newark, N. J.—The monthly financial statement of the Public Service Corporation of New Jersey for August shows a gross increase of $54,473 in total business over August of last year. The percentage of gain was 1.8 per cent. The total gross increase in all business for the eight months' period to Aug. 31 was $806,282, the percentage of gain for the period being 3.5 per cent. The balance available—after payment of operating expenses, fixed charges, sinking fund requirement, etc.—for amortization, dividends and surplus, for August, 1915, was $230,303, while the decrease in surplus available for dividends over the corresponding period of 1914 was $41,363. For the eight months ended Aug. 31, 1915, the balance available for amortization, dividends and surplus was $2,094,947, and the increase in surplus available for dividends was $145,383.

Seattle (Wash.) Municipal Street Railway.—A. L. Valentine, superintendent of public utilities, states in his report to the City Council that Division "A" and Division "C" of the Seattle Municipal Street Railway were operated at a loss of $2,167 during August. Division "C" cost $2,416 to operate, and the revenues amounted to $2,111, making a loss of $305 on that line. Division "A" was operated at a cost of $1,823 and its revenues amounted to $1,554, or a loss of $269. To this should be added an interest charge of $1,593, bringing the total loss for Division "A" to $1,862.

United Light & Railways Company, Grand Rapids, Mich.—N. W. Halsey & Company, New York, are offering at par and interest an additional $750,000 of 6 per cent gold coupon notes of the United Light & Railways Company, dated Jan. 1, 1915, and due on Jan. 1, 1918 and 1920. The notes due on these dates are callable as a whole or in part upon four weeks' published notice at 100 and interest, and 101 and interest respectively. The proceeds of these notes will complete payments on property heretofore acquired and reimburse the treasury for improvement work. The present outstanding $2,250,000 of these notes is secured by $3,000,000 of first and refunding mortgage 5 per cent bonds on a 75 per cent basis.

DIVIDENDS DECLARED

Bangor Railway & Electric Company, Bangor, Me., quarterly, 1¾ per cent, preferred.

Cincinnati & Hamilton Traction Company, Cincinnati, Ohio, quarterly, 1¼ per cent, preferred; quarterly, 1 per cent, common.

Columbus Railway, Power & Light Company, Columbus, Ohio, 1 per cent, prior preference; quarterly, 1½ per cent, preferred, Series A.

Halifax (N. S.) Electric Tramway, Ltd., quarterly, 2 per cent.

New Orleans Railway & Light Company, New Orleans, La., quarterly, 1¼ per cent, preferred.

New York State Railways, Rochester, N. Y., quarterly, 1¼ per cent, preferred; quarterly, 1 per cent, common.

Northern Ohio Traction & Light Company, Akron, Ohio, quarterly, 1½ per cent, preferred.

Philadelphia Company, Pittsburgh, Pa., 3 per cent, cumulative preferred; quarterly, 1½ per cent, common.

Porto Rico Railways, Ltd., San Juan, P. R., quarterly, 1¾ per cent, preferred.

Republic Railway & Light Company, New York, N. Y., quarterly, 1½ per cent, preferred.

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

Toronto (Ont.) Railway, quarterly, 2 per cent.

United Light & Railways Company, Grand Rapids, Mich., quarterly, 1½ per cent, preferred.

Washington Water Power Company, Spokane, Wash., quarterly, 1¼ per cent.

West India Electric Company, Ltd., Kingston, Jamaica, quarterly, 1¼ per cent.

ELECTRIC RAILWAY MONTHLY EARNINGS

ATLANTIC SHORE ELECTRIC RAILWAY, KENNEBUNK, ME.

Period			Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Aug.,		'15	$51,883	$26,893	$24,990	$669	$24,321
1 "	"	'14	53,357	29,733	23,624	650	22,974

AMERICAN RAILWAYS, PHILADELPHIA, PA.

1m., July,		'15	$485,039	.....	.....	.....	.....
1 "	"	'14	522,625	.....	.....	.....	.....
7 "	"	'15	3,060,387	.....	.....	.....	.....
7 "	"	'14	3,195,974	.....	.....	.....	.....

BATON ROUGE (LA.) ELECTRIC COMPANY

1m., July,		'15	$16,016	*$9,114	$6,902	$1,736	$5,166
1 "	"	'14	14,742	*9,260	5,482	1,732	3,750
12 "	"	'15	182,229	*110,676	71,553	20,769	50,784
12 "	"	'14	176,904	*115,621	61,283	21,150	40,133

BROCKTON & PLYMOUTH STREET RAILWAY, PLYMOUTH, MASS.

1m., July,		'15	$15,346	*$8,457	$6,889	$1,185	$5,704
1 "	"	'14	15,694	*9,037	6,657	1,064	5,593
12 "	"	'15	118,618	*98,264	20,354	13,585	6,769
12 "	"	'14	120,543	*101,068	19,475	12,815	6,960

CAPE BRETON ELECTRIC COMPANY, LTD., SYDNEY, N. S.

1m., July,		'15	$31,319	*$17,666	$13,653	$5,355	$8,298
1 "	"	'14	31,466	*19,665	11,801	5,217	6,584
12 "	"	'15	338,023	*206,228	131,795	63,708	68,087
12 "	"	'14	372,570	*209,389	168,181	61,298	101,883

CITIES SERVICE COMPANY, NEW YORK, N. Y.

1m., July,		'15	$297,625	$14,370	$283,255	$40,833	$242,422
1 "	"	'14	271,637	8,962	262,675	40,833	221,842
12 "	"	'15	4,003,721	153,578	3,850,143	490,000	3,360,143
12 "	"	'14	3,543,737	97,269	3,446,468	320,991	3,125,477

COLUMBUS (GA.) ELECTRIC COMPANY

1m., July,		'15	$57,364	*$25,484	$31,880	$25,332	$6,548
1 "	"	'14	53,827	*24,153	29,674	26,250	3,424
12 "	"	'15	700,035	*319,471	380,564	304,953	75,611
12 "	"	'14	651,656	*276,839	374,617	264,651	109,965

DALLAS (TEX.) ELECTRIC COMPANY

1m., July,		'15	$144,101	*$94,002	$50,099	$28,380	$21,719
1 "	"	'14	179,131	*113,181	65,950	30,744	35,206
12 "	"	'15	1,933,274	*1,126,295	806,979	364,243	442,736
12 "	"	'14	2,283,051	*1,354,024	929,027	299,284	629,743

FORT WAYNE & NORTHERN INDIANA TRACTION COMPANY, FORT WAYNE, IND.

1m., June,		'15	$139,113	*$87,586	$51,527	$47,783	‡$4,599
1 "	"	'14	153,207	*96,472	56,735	47,733	‡10,660
6 "	"	'15	846,894	*520,569	326,325	289,662	‡39,117
6 "	"	'14	914,415	*560,711	353,704	281,758	‡74,884

KENTUCKY TRACTION & TERMINAL COMPANY, LEXINGTON, KY.

12m., June,		'15	$811,629	$432,403	$379,526	$237,230	‡$170,284
12 "	"	'14	782,272	412,510	369,762	245,184	‡156,600

PHILADELPHIA RAPID TRANSIT COMPANY, PHILADELPHIA, PA.

1m., Aug.,		'15	$1,897,763	$1,086,744	$811,019	$815,942	†$4,923
1 "	"	'14	1,912,970	1,111,017	801,953	808,764	†6,811
2 "	"	'15	3,837,669	2,182,439	1,655,230	1,632,538	22,692
2 "	"	'14	3,864,236	2,248,719	1,615,517	1,618,129	†2,612

REPUBLIC RAILWAY & LIGHT COMPANY, NEW YORK, N. Y.

1m., July,		'15	$250,908	*$143,991	$106,917	$59,253	‡$47,828
1 "	"	'14	252,217	*146,308	105,909	57,083	‡48,967
7 "	"	'15	1,707,826	*1,060,293	647,533	401,089	‡247,373
7 "	"	'14	1,747,950	*1,075,415	672,535	393,108	‡280,275

VIRGINIA RAILWAY & POWER COMPANY, RICHMOND, VA.

1m., June,		'15	$430,201	$205,490	$224,711	$137,248	‡$94,039
1 "	"	'14	438,461	213,442	225,019	135,829	‡92,923
12 "	"	'15	5,109,622	2,469,074	2,640,548	1,636,418	‡1,085,049
12 "	"	'14	5,156,048	2,465,908	2,690,140	1,615,460	‡1,155,590

*Includes taxes. †Deficit. ‡Includes non-operating income.

Traffic and Transportation

JITNEY JOTTINGS

Further Action Before the Public Service Commission of New York—The Philadelphia Injunction Suits

The International Railway, Buffalo, N. Y., has filed a complaint with the Public Service Commission of the Second District, against Albert G. Gould alleging that he is operating a jitney bus line in Buffalo, known as the Silver Star Line or the Silver Sightseeing Line, in violation of the Thompson jitney bus law, and asking that he be restrained. The company alleges in the complaint that the line is run from East Masten and Utica Streets on Masten to Dodge Street, to Ellicott Street, to Goodrich Street, to Main Street and to Seneca Street in competition with the lines of the International Railway, without a certificate from the Public Service Commission, and carrying passengers for a fare of 5 cents—all of which operation the company alleges is in violation of the law as interpreted in the recent decision of the courts in the case of the commission against Burt C. Hurtgam, Lockport. With regard to the charge of a 5-cent fare the complaint says that the line is "carrying passengers without collecting fare until the fifth passage of such passengers is consummated when a fare of 25 cents is collected for the five passages upon said cars." This, the complaint alleges, is an evasion of the law, which applies specifically only to lines carrying passengers for 15 cents or less.

The first of the two hearings for injunctions against the jitney ordinance passed by the Councils of Philadelphia, Pa., came up recently before Judge Patterson in Common Pleas Court No. 1 and the Judge postponed consideration of the case until Sept. 28, when the original suit for a restraining order will be heard by all the judges of Common Pleas Court No. 1 sitting together. Judge Patterson said the jitneymen had failed to take advantage of an opportunity to get a temporary injunction, afforded to them by Judge Sulzberger, by not filing the $2,500 bond required by the order of the court, and he declared that he saw no reason for reopening the case at this time. City Solicitor Ryan filed an answer to the suit of the jitney association in which they sought an injunction against Councils' ordinance. The answer was a general denial of the claims of the jitneymen that the ordinance was "confiscatory and discriminatory." When the application of the Auto Bus Company for an injunction against the jitney ordinance came before Judge Fineletter in Common Pleas Court No. 4, the judge took the same view as Judge Patterson. He stated that the merits and demerits of the jitney act would be fully threshed out at the final hearing, and declined to interfere at present.

The Mayor of Newark, N. J., has returned to the Board of Works of that city with his veto the jitney regulatory ordinance referred to in the Electric Railway Journal of Sept. 11, page 467. The veto has been overidden.

A very interesting communication on the jitney appeared recently in one of the local papers at San Diego, Cal. It was signed "A Business Woman." It is understood that the letter to the editor was contributed by a member of the staff of the San Diego Electric Railway who has served the company for eleven years. The communication, some 1500 words in length, was concluded as follows:

"We are a queer people. We have spent time, thought and hundreds of thousands of dollars to create commissions to compel public utilities to have due regard for our rights. We are carrying a heavy tax to maintain these commissions. Every time we hear they have rendered a decision in our favor against a public utility, we are filled with complacency that in our great wisdom we have made this thing possible. And now along comes the jitney bus—a new transportation scheme, a common carrier—and because it appeals to a mood, or a sympathetic streak, or satisfies a grudge we have against corporations, we form another flashlight judgment and cheerfully set aside the expensive, extensive regulative machinery we have built and maintain to protect us. We render null the ability to insure reasonable fare, for instance, by encouraging an unregulated system which so cuts into the receipts of the established, governed system that it must increase rates, or decrease service, or do other undesirable things in order to live. Is it mere extravagance on our part? Or the gambling instinct which is always willing to take a chance? Or is it that we have regulated the railroads down to a fine point, got them just where we want them, produced a finished article of the regulated variety, and now we are looking to the future in developing something new in the way of the jitney bus business so that in a few years we shall have fresh material upon which to exercise our talents for minding the other fellow's business?"

The history of the attempt to regulate the jitney in Portland, Ore., is very interesting. The first jitney appeared in Portland in December, 1914. Commissioner Daly promptly prepared a drastic ordinance and presented it to the Council. Hearings were held and the measure was modified by Mr. Daly. After several months of delay the Council adopted the modified measure. The jitney interests then invoked the referendum on the measure as passed, thus submitting it to a vote of the people. The Council's measure was adopted by the voters at the city election on June 2. A jitney inspector was then appointed, and the city started to enforce the ordinance. The jitney interests promptly started litigation and secured a temporary restraining order in the Circuit Court. The State Supreme Court decided against the measure on a technicality. Mayor Albee then urged the Council to pass the measure over again in the identical form adopted by the voters. Commissioner Daly subsequently presented a modified measure, and the Council after killing the Mayor's measure passed Mr. Daly's measure with an emergency clause. The city then started to enforce the new measure, but the jitney interest on September 14 secured a ten-day restraining order from Circuit Judge Bagley.

No decision has been rendered yet on the application of the Public Service Commission of the Second District of New York to Supreme Court Justice Hasbrouck at Kingston for a permanent injunction restraining James E. Adams, Corning, and Elmer G. Booth, Rochester, from operating jitney lines without the consent of the local authorities or a certificate of public convenience and necessity from the commission. The petition was heard on Sept. 4 at Kingston. The bringing of the action was referred to in the Electric Railway Journal of Aug. 14, page 292.

SEEK TO RESTRAIN JITNEY IN TERRE HAUTE

Trustee for Bondholders Applies to the United States District Court for Injunction

A new feature in the jitney situation at Terre Haute, Ind., was introduced on Sept. 14 when a petition for a restraining order against the jitney drivers in that city was filed in the United States District Court at Indianapolis by the Fidelity Trust Company, Philadelphia, Pa., trustee under the mortgage of the Terre Haute Indianapolis & Eastern Traction Company. Sixty persons are named in the suit, which is in the form of a bill of equity, the petition stating that the jitney buses in Terre Haute are being operated by the persons named, and others unknown, instead of by organized companies.

The bill recites the history of the first franchise grants to the street railways in Terre Haute, and the further development of the property and extension of franchises prior to and following the lease to the Terre Haute, Indianapolis & Eastern Traction Company. It is shown that the grant or charter to the company provides that, during the time the privileges were granted to the company, the city of Terre Haute shall not "extend, grant to or confer upon any person or corporation any privilege which will impair or destroy the rights and privileges herein granted to the said company." It is also shown that under the public service commission law no license or franchise shall be granted to any person or corporation to operate any public utility where a similar utility is already engaged in similar service, without securing from the commission, after public hearing, a declaration that the public necessity requires such duplication of service. W. H. Latta, attorney for the company, stated that the company proposed to show that the jitney bus operators had received no grant from either the State or city to operate in Terre Haute, and that they were a menace to the community, operating on uncertain

schedules and, as shown by checkings made during the months of July and August, they have been operated on a losing basis, the latter feature emphasizing their inability to run on a regular schedule.

It is also cited in the appeal for the injunction that the jitney bus drivers of Terre Haute have organized what is known as the Jitney Bus Drivers' Union No. 168, which is a trades union recognized by the Central Labor Union of that city. It is then stated that the Central Labor Union started a boycott against the local street railway lines in Terre Haute in January, 1915, and that since that time the receipts from the operation of the Terre Haute city lines have been very seriously decreased. Mention is made in the bill of the manner in which the jitney bus drivers have been conducting their business, making it a practice to drive between the street cars and the curbs, appearing in crowds awaiting street cars, and being unusually active when transportation is in demand during the rush hours and on holidays, etc.

A hearing has been asked before Judge Arthur B. Anderson on Sept. 24.

SKIP STOPS SAVE TIME

Satisfactory Results Reported From Milwaukee in Experiment With Skip Stops on Three Short Lines

On Sept. 3 The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., gave out a statement showing the time saved on the three lines on which the experiment with skip stops is being made. Commenting on the figures the company said:

"Thus it will be seen that the average saving for each period of the day on the three lines being tested is 11 per cent, or seven minutes every hour. The lines under test are short runs, and but few stops are eliminated to accomplish this improvement in the service, as will be seen by the following:

"On the Farwell-Downer route twelve stops out of a total of fifty-two have been eliminated.

"On the Walnut-Pabst route twenty-three stops out of a total of seventy-one have been eliminated.

"On the Reed-Greenfield-Burnham route twenty-one stops out of a total of seventy-four have been eliminated.

"The report of our engineers shows that for an average day on the Farwell-Downer route formerly 33,198 persons, or 94.6 per cent of the total, boarded and alighted from the cars at designated stops, and 1895 persons, or 5.4 per cent, at the stops which have been cut out.

"On the Walnut-Pabst route formerly 25,367 persons, or 81 per cent of the total, boarded and alighted from the cars at designated stops and 5939 persons, or 19 per cent, at the stops which have been cut out.

"On the Reed-Greenfield-Burnham route formerly 25,895 persons, or 89 per cent of the total, boarded and alighted from the cars at designated stops and 3163 persons, or 11 per cent, at the stops which have been cut out.

"The conclusion, therefore, is:

"All persons using these three lines have been benefited by the improvement in the service to the extent of the saving of one-eighth of their time while riding on the cars. Only a relatively few passengers have been discommoded by being required to walk a short distance. Such inconvenience has been more than compensated for by the benefits derived from the improved service. The success and popularity of the plan so far prompts the belief that further improvement in the running time on these lines may be anticipated before the completion of the test. Similar results may be expected upon all other lines in the city when our patrons give their final approval to the plan."

WELFARE WORK OF THE INTERBOROUGH

In the annual pamphlet report of the Interborough Rapid Transit Company, New York, N. Y., for the year ended June 30, 1915, the following reference is made to the welfare work of the company:

"Considerable space was devoted in last years' report to a description of the efforts which your management is making to promote the welfare of its employees. That these efforts are appreciated is shown by the reduction in the number of men leaving the service over a given period. This reduction is best illustrated by the following comparison for the six months ended June 30, 1912, with the same period for 1914:

	June 30, 1912, Per Cent	June 30, 1914, Per Cent
Number of employees leaving service	35	19.3
Number of motormen leaving service	16	1.1
Number of conductors leaving service	4	2.9
Number of guards leaving service	17.2	5.4

"Your company has had under consideration for some time a plan whereby the hours of ticket agents, gatemen, porters and platform men on the subway and elevated divisions could be reduced to ten hours a day without disarranging the present satisfactory schedule of service. Following a thorough investigation, a way has been found for placing all of the above service classifications on a ten hour a day basis so that approximately 80 per cent of the men will have straight ten-hour shifts. This classification went into effect on July 1, 1915."

Ordinance Against One-Man Cars.—The city of Belleville, Ill., has passed an ordinance requiring the East St. Louis & Suburban Railway to discontinue the one-man cars and to place both conductors and motormen on all street cars operating in that city.

Trial with New Cars in Toronto.—D. M. McIntyre, chairman of the Ontario Railway & Municipal Board, said on Sept. 7 that the new type of street car which the Toronto Railway has had on trial had met with the approval of the board. The new car is equipped partly with longitudinal seats and partly with cross seats, and has an inside aisle instead of an outside running-board.

The Joliet Arbitration.—John W. Downey, an attorney of Joliet, has been selected as the third member of the arbitration board of the Chicago & Joliet Electric Railway. Samuel J. Drew and E. Meers are the other two arbitrators. A new scale was demanded recently, and as the agreement between the company and the men provided for arbitration in case no decision could be reached the men selected Mr. Drew and the company selected Mr. Meers. The men want 33 to 36 cents an hour. The old scale provided for payment of 27 to 30 cents an hour.

First Aid in Brooklyn.—A system of first aid to the injured has been developed by the Brooklyn (N. Y.) Rapid Transit Company to a high state of efficiency. An improved portable first-aid case with equipment for use both by an instructed layman and by a physician has been developed by the physicians of the medical inspection bureau. Sixty-eight of these cases have been installed in the depots, terminals, shops and power houses of the company, and supplied to emergency and other crews required to work out on the lines. Wherever a first-aid case has been installed, a sufficient number of employees have been instructed in approved methods of first-aid to insure the presence of some qualified individual at all hours of the day or night when work is going on.

"Courthouse Advice."—More "courthouse advice" is being given to the trainmen of the Louisville (Ky.) Railway by N. F. Funk of the legal department. This last preachment is devoted to the matter of talking so that the jury can hear what the witness is saying. Mr. Funk said: "Talk loud on the witness stand. I wish we could engrave this sentence in letters of fire on every employee's brain. We have lost more cases through this apparently trivial neglect than because of any other reason. I have seen a man the size of Jess Willard take the witness stand and have a 100-lb. judge roar in fury at him for not talking loud, finally resulting in the judge losing his temper, the jury losing their patience, and the company losing the case. If there is anything more annoying than for a man to try to hear another man talk simply because the party of the second part will not raise his voice I have not discovered it."

Protecting Grade Crossings on the Pacific Electric Railway.—Thirty-two automatic wigwag warning signals will be installed at grade crossings of the Pacific Electric Railway in southern California. After a thorough investigation by the experts of the Railroad Commission, the railway has voluntarily agreed to protect thirty-two more

crossings by these automatic signal devices. This is the largest number of safety installations ever agreed upon at one time by any company in the State. The question of making crossings safer in Los Angeles County, either by departure from grades, over or underneath the tracks, or by flagmen or automatic signals, has been the subject of conferences in Los Angeles between the Railroad Commission, governmental and civic bodies, and the railroads in the last few weeks. The thirty-two crossings which are to be protected are in Los Angeles, Riverside, Orange and San Bernardina Counties, covering the entire territory in which the Pacific Electric Railway operates.

Passenger Traffic on Subway and Elevated in New York.—The Public Service Commission for the First District of New York has issued a statement of the number of passengers carried on the elevated and subway lines of the city in the year ended June 30, 1915. The total for the subway traffic reached 345,585,749, of which 117,585,390 were northbound and 119,080,397 were southbound. The remaining tickets were sold at the "island" stations and could not be separated into directions traveled. The greatest number of tickets was sold at the Atlantic Avenue station in Brooklyn, with a total of 23,000,000. Grand Central station was second with 20,000,000. The increase in the number of passengers for the year was 5,172,646. The statistics for the elevated roads showed a total number of passengers carried of 301,792,517, of which 120,738,879 were northbound and 114,118,237 southbound. The remainder were sold at "island" stations. The years' traffic showed a decrease of 9,681,051.

Boise Transfer Controversy Settled.—W. E. Pierce, president of the Boise (Idaho) Railroad, has announced the position of his company in the Boise tansfer controvesy, mentioned in Electric Railway Journal of Sept. 4. Mr. Pierce says his company is willing to enter into an agreement at any time for the exchange of transfers with the Idaho Traction Company. He has instructed his attorney to notify the Supreme Court and the Public Utilities Commission of the position his company has assumed, with a view to obtaining dismissal of the actions begun before these two bodies to compel the companies to enter into an agreement for a system of universal transfers. Since the property of the two concerns was separated on Aug. 2 transfers have been exchanged by the companies, except between the Soldiers' Home line of the Boise Railroad and the Nineteenth Street line of the Idaho Traction Company. The Idaho Traction Company filed answers before both the Supreme Court and the Utilities Commission expressing its willingness to exchange transfers, but neither action was answered by the Boise Railroad until Mr. Pierce made his announcement.

Brooklyn Rapid Transit Reduces the Amount of Time Lost by Employees.—The system of compulsory medical inspection and free attendance for employees excused on account of illness, which was established by the Brooklyn (N. Y.) Rapid Transit Company on Jan. 1, 1913, for approximately 10,000 men in the operating department, accomplished during the year ended June 30, 1915, a reduction in the amount of time lost by the operating employees on account of sickness of 13,485 days (or nearly 18 per cent) over the time lost in the year ended June 30, 1914. The milder winter of 1915 accounted for about 7000 days of the total reduction. Making due allowance for this, however, there still remains a saving of upwards of 6000 days' work for the year, or a reduction of 8.6 per cent over the sickness record of the year ended June 30, 1914. The system of compulsory medical inspection was accompanied in its first year by a reduction of 24 per cent in the number of days' work lost by operating employees on account of illness. This initial record is still being improved upon as the activities of the medical inspection bureau develop. These activities embrace not only the inspection and attendance of operating department employees reporting sick, but free medical attendance for members of the Employees' Benefit Association outside of the operating department; the care of all employees injured in the performance of their duties and entitled to medical attendance under the compensation act; the examination of candidates for employment and the periodic re-examination of all motormen.

Personal Mention

Mr. H. O. Marler has been appointed traveling passenger agent of the Pacific Electric Railway with headquarters at Los Angeles, Cal., vice Mr. E. L. Taylor, resigned.

Mr. Charles Pierce Burton, publicity director of the Gary & Interurban Railroad, Gary, Ind., has just published, through Henry Holt & Company, New York, his seventh volume, "Camp Bob's Hill," a book for boys, having its setting in the sand dunes of northern Indiana. Mr. Burton is the author of a volume of essays and six books for boys.

Mr. P. P. Crafts, formerly manager of the Mobile Light & Railroad Company, Mobile, Ala., has been appointed general manager of the Kanawha Traction & Electric Company, Parkersburg, W. Va. From 1904 to 1914 Mr. Crafts was connected with the Iowa & Illinois Railway, Davenport, Iowa, first as general manager and later as vice-president and general manager. During part of this time he was also in charge of the Davenport & Muscatine Railway. From 1902 to 1904 he was manager of the Saginaw Valley Traction Company. Mr. Crafts entered the public utility field when he was sixteen years old.

Mr. Percy Farrant, who has been appointed to succeed Mr. J. B. Russell as auditor, assistant secretary and assistant treasurer of the Manila Electric Railroad & Light Company, Manila, P. I., has been in the service of the company as assistant auditor continuously since the company began operations in 1905. Mr. Farrant was born in London in 1880, and was graduated from Ryde House College, Surrey, England, in 1896, at the age of sixteen. He immediately thereafter entered the service of John Henderson & Company, London, as a member of their general office staff, and remained in their employ until 1900, when he resigned to join the Colonial Forces. He proceeded to South Africa and served as staff sergeant until the close of the Boer War, at the conclusion of which he was transferred to the public works department, holding the position of chief clerk and accountant. He resigned from the last-named position in 1904 to enter the service of the Argentine Railways as a member of the administration staff and remained in that position until 1905. He then returned to London and was appointed assistant auditor of the Manila Electric Railroad & Light Company.

Mr. J. B. Russell has resigned as auditor, assistant secretary and assistant treasurer of the Manila Electric Railroad & Light Company, Manila, P. I., on account of ill health, and Mr. Percy Farrant, acting auditor, has been appointed to succeed him. Mr. Russell has been in poor health for some time. In May, 1914, he left Manila to seek rest and a change of climate in Japan, and in March, 1915, he left Manila for a six months' vacation trip, taking a long sea voyage to San Francisco, Panama, Trinidad and thence to New York, cabling his resignation from New York. Mr. Russell was born in Glasgow, Scotland, in 1872. At the age of eighteen he left his birthplace to accept a position as a commercial accountant in Trinidad, where he remained for ten years. He left Trinidad for the United States and entered the service of Stone & Webster, first in Boston and subsequently in Tacoma, Wash., with the Tacoma Railway & Power Company. In 1904 Mr. Russell became associated with The J. G. White Companies as auditor while the construction work of the Manila Electric Railroad & Light Company was in progress. Upon completion of the construction work he was appointed auditor, assistant secretary and assistant treasurer of the company. In the early days of the company at Manila Mr. Russell had a difficult task in organizing the forces of the Manila Electric Railroad & Light Company's accounting department, now numbering 143, only six of whom are not Filipinos.

Mr. David A. Belden, who was elected president of the Massachusetts Street Railway Association at the annual meeting on Sept. 8, was born in Aurora, Ill., in 1867. He was educated at Racine College, Racine, Wis., and from 1892 to 1901 was general manager of the Aurora Street Railway, the Aurora & Geneva Street Railway and the Aurora, Yorkville & Morris Street Railway. Mr. Belden then went to Atlanta, Ga., and was general manager of the Georgia Railway & Electric Company until March, 1903,

when he became general manager of the Birmingham Railway, Light & Power Company, Birmingham, Ala. After about four months service in this capacity Mr. Belden was called to the presidency of the railway and lighting properties occupying the districts centering about Haverhill, Mass., and Portsmouth, N. H., with intermediate lines. With headquarters at Haverhill, Mr. Belden is now president of the New Hampshire Electric Railways, the Massachusetts Northeastern Street Railway, the Dover, Somersworth & Rochester Street Railway, the Rockingham County Light & Power Company, and the Kittery (Me.) Electric Light Company. He has maintained unusually good relations with the public in the territory served by his companies, and his work in securing the establishment of a 6-cent fare unit on certain of these lines in proceedings before the Massachusetts Railroad Commission a few years ago was conspicuous for its clarity and set a new standard in the preparation of street railway rate briefs and exhibits at that time.

OBITUARY

John B. Mitchell, a pioneer street railway man of Louisville, Ky., died at his home in New Albany, Ind., recently at the age of eighty-three. He was superintendent of the Louisville Railway for a number of years before electricity was adopted as motive power.

William C. Dunning died at his home in Greenfield, Ind., on Sept. 16, at the age of fifty-three. With Mr. Francis G. Banker he procured a franchise for an interurban line through Rush, Henry, Hancock and Marion Counties, and constructed and operated the road for several years. The property is now a part of the system of the Terre Haute, Indianapolis & Eastern Traction Company.

Cornelius J. Field, who in recent years had been associated with Thomas A. Edison in the development of the Field-Beach battery-operated passenger bus, died at his home in Brooklyn, N. Y., Sept. 20, at the age of fifty-four. Mr. Field was in the early days general manager of the Edison Illuminating Company of Brooklyn, resigning in 1891 to go into electric-railway construction work. Later he went to Europe and the West Indies and built a number of railway lines and industrial plants.

CLEVELAND ELECTRIFICATION PROBLEM DISCUSSED

Following a statment by City Electrician Smith before a special committee of the Council of Cleveland, Ohio, on Sept. 17, to the effect that operation on electrified Eastern roads cost 5 cents per engine-mile, P. T. White, superintendent of the Cleveland division of the Big Four Railroad, declared that the roads would all substitute electric power for steam if this rate could be guaranteed. He said that the cost of operating switch engines is now 35 cents per engine-mile. Mr. White suggested that if the city would build power stations and overhead equipment and guarantee to operate locomotives at a cost not to exceed 5 cents per engine-mile, the railroads would be glad to purchase the locomotives and operate them. According to him the Big Four Railroad could afford to spend $40,000,000 and pay the interest on the investment if it could secure that rate of cost for operation. Mr. White declared that the figures, of from $26,000,000 to $30,000,000, given by former Smoke Inspector E. P. Roberts as the cost of electrifying the roads within the city were wrong. He said that the expense would probably be more nearly double the amount. He proposed to furnish an estimate of the cost of electrifying the Big Four Railroad, and suggested that the city make an appropriation for a careful study of the question. S. D. Robertson, superintendent of the Pennsylvania Lines west of Pittsburgh, notified the committee that he is having estimates prepared.

The utilities committee of the City Council of Seattle, Wash., has voted to recommend the passage over Mayor Gill's veto of the ordinance for the city to enter into a contract with F. M. Petersen, granting him the right to operate a motor-bus line from the northern terminus of Division "A" of the Seattle Municipal Railway to the north limits of Ballard, on a transfer basis.

Construction News

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

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

RECENT INCORPORATIONS

***Cumberland County Electric Company, Bridgeton, N. J.**—Chartered in New Jersey to operate electric railways. Capital stock, $100,000.

***Charleston-Southern Railway, Darlington, S. C.**—Chartered in South Carolina to construct either a steam or electric railway from Charleston to Hutchinson Island, 86 miles, to connect with the Seaboard Air Line. Headquarters, Darlington. Capital stock, $43,000. Officers: Bright Williamson, president, and George E. Dargan, secretary, both of Darlington.

FRANCHISES

Anniston, Ala.—The Alabama Power Company has asked the Council for a franchise to construct an extension to the Anniston Country Club.

San Jose, Cal.—The San Jose Railroad has asked the Council for a franchise to construct an extension on Alum Rock Avenue. Bids for this franchise will be received until Oct. 4.

South San Francisco, Cal.—The South San Francisco Railroad & Power Company has received a franchise from the Council to operate a single or double-track electric line over the extension of Grand Avenue to the northeasterly line of the Mission Road, or State highway.

Rockford, Ill.—It is reported that the Elgin & Belvidere Electric Company may ask the Council for a franchise to construct an extension on State Street, Rockford.

Salem, N. J.—The Salem-Pennsgrove Traction Company has asked the Council of Salem for a franchise. It is planned to construct a line between Salem and Pennsgrove. [Sept. 4, '15.]

Kenmore, N. Y.—The International Railway has received a franchise from the Council of Kenmore to double-track part of its main line in Kenmore.

Lancaster, N. Y.—The Buffalo & Depew Railway has asked the Council for a franchise to extend its line, with an additional track, necessary switches, etc., from Ellicott Road and Central Avenue to the New York Central Railroad tracks.

Youngstown, Ohio.—It is reported that the Youngstown & Southern Railway will ask for a twenty-five-year extension of its franchise, with permission to double-track Front Street.

Chester, Pa.—The Council is said to be opposed to the ordinance prepared by the Southern Pennsylvania Traction Company for franchises over additional streets between Chester and Eddystone. One of the city commissioners submitted a plan whereby the company could double-track on certain streets it now uses and use single track over additional streets. The company argued that this method would not relieve the situation. The bill was laid over.

Dallas, Tex.—The Northern Texas Traction Company has filed a petition with the Board of Commissioners of Dallas through the union terminal committee of the Chamber of Commerce asking for a franchise to operate a double-track line on Jefferson Street between the Oak Cliff viaduct and Commerce Street. If the franchise is granted the company agrees to begin immediate construction of the new viaduct over the steam railway tracks entering the new union terminal.

Seattle, Wash.—The Seattle, Snohomish & Everett Railway has asked the Council for a two-year extension of time on its franchise to complete its line between Seattle, Snohomish and Everett. The franchise provides for a line beginning at the present terminus of the Ravenna Park line, extending on Thirty-fifth Avenue, N. E., East Fiftieth Street, East Fifty-fifth Street and other streets in that section of the city. David Swank, Seattle, is interested. (Oct. 18, '13.)

Steilacoom, Wash.—The Tacoma Railway & Power Company has asked the Council for a franchise to construct an extension along the Steilacoom Highway from the end of the present tracks of the Pacific Traction Company, near the Fort Steilacoom Asylum, to the city limits. Chairman Sladen, of the Pierce County Commissioners, states that there will be no opposition to the granting of a franchise and that the petition will be advertised at once and a public hearing held Oct. 1.

TRACK AND ROADWAY

Pacific Electric Railway, Los Angeles, Cal.—This company plans to install thirty-two automatic wigwag warning signals at grade crossings. One is to be installed on the Pasadena Short Line at Schützen Park, one on the Altadena line, one on the Alhambra line, eight on the San Bernardino line and the others on the southern and western divisions. It is expected that the city commission will ask this company to construct a line to Brookside Park, Pasadena.

Municipal Railways of San Francisco, San Francisco, Cal.—The Board of Supervisors have been asked to extend the Union Street line through the Presidio reservation to Fort Winfield Scott.

Tidewater Southern Railway, Stockton, Cal.—It is reported that completion of the line into Turlock is assured by Feb. 1. Material has been delivered and work will be begun at once on the construction of a bridge across the Tuolumne River and grading of the right-of-way will soon be begun from the Turlock end of the line.

Denver & Inter-Mountain Railroad, Denver, Col.—A report from this company states that it is in the market for thirty cattle guards.

Connecticut Company, New Haven, Conn.—Plans are being made by this company to extend its double track on Main Street, East Hartford, north from the corner of Linden Street to the corner of Main and King Streets.

Miami (Fla.) Traction Company.—This company's line in Miami is practically completed. Cars have been ordered and the machinery for generating power and charging the storage batteries has been received. It is expected that operation will be begun by October. B. B. Tatum, president. [May 8, '15.]

Jesup, Ga.—Thomas J. Arline reports that, owing to financial conditions, the project to construct a line between Jesup and Doctortown has been abandoned for the present. [Aug. 1, '14.]

Lula-Homer Railroad, Lula, Ga.—This company reports that 75 per cent of the grading on its proposed line from Belton to Homer has been completed. Surveys are also being made from Homer to Clinesville. The company intends to construct a line from Belton, Ga., to Anderson, S. C., 82 miles. The contract for the construction of track has been let to William J. Redmond, Atlanta, and construction will begin Oct. 1. C. J. Hood, Commerce, Ga., president. [March 20, '15.]

Bloomington & Normal Railway & Light Company, Bloomington, Ill.—New rails throughout will be used on Franklin Avenue, where the track is being removed from the west side to the center of the street.

East Side Electric Railway Company, Centralia, Ill.—S. A. Frazier reports that the project to build an electric railway between Centralia and Irvington has been abandoned. [April 12, '13.]

Mason City & Clear Lake Railroad, Mason City, Iowa.—A report from this company states that it expects to reconstruct 2 miles of track in Clear Lake.

Hutchinson (Kan.) Interurban Railway. — This company reports that it is laying new track on Second Avenue, East, leading from Main Street to Poplar Street, also a wye at Main Street and another entering the Arkansas Valley Interurban Railway's terminal station at Second Street, East. All special work is being supplied by the Elliott Frog & Switch Company and the steel ties by the Carnegie Steel Company.

Iola (Kan.) Electric Railroad.—Plans are being considered by this company for the extension of its lines from Iola to Humboldt.

*Newton, Kansas & Nebraska Railway, Newton, Kan.**—A stock and bond issue of $1,500,000 for this company has been approved by the Public Utilities Commission. The new road, which is to be a standard-gage line, will begin at Newton, Kan., and extend north to Albia, near the Nebraska line. The promoters of the road have not decided whether they will build a steam or electric line, but it is to be built through Harvey, Dickinson, Saline, Marion, McPherson, Clay and Washington counties.

Hagerstown & Frederick Railway, Frederick, Md.—Citizens of Emmitsburg have asked this company to build an extension of its lines from Thurmont to Emmitsburg, 7 miles.

Boston (Mass.) Elevated Railway.—A petition signed by West Roxbury citizens has been filed with the Public Service Commission asking for the restoration of the surface car line between Jamaica Plain and the North Station.

Springfield (Mass.) Street Railway.—This company plans to relocate its tracks in Springfield between the North End bridge and the Plainfield Street bridge. The relocation of tracks and removal of poles and wires will cost the company about $20,000.

Armada, Mich.—Work has been begun on the construction of an electric line from Armada to Detroit via Ray, Davis, Macomb and Fraser. The line will enter Detroit on Mack Avenue. Mount Clemens, through which it was at first planned to extend the road, refused to grant the company a franchise for the use of its main streets. Peter Jacobson, Detroit, is interested. [Aug. 7, '15.]

Joplin & Pittsburgh Railway, Kansas City, Mo.—It is reported that J. J. Heim and associates of Kansas City, who own the Joplin & Pittsburgh Railway, are considering the purchase of the Joplin-Parsons line of the Missouri, Oklahoma & Texas Railroad, with the object of converting the road into an electric line. It is said negotiations have been opened and that the prospective purchasers are planning an early visit to Parsons to confer with officials of the Missouri, Oklahoma & Texas Railroad. The purchase seems to be contingent upon the willingness of the city of Parsons to help defray the expenses of building the railroad from Cherokee Junction to Parsons, 5 miles, in order that the line may enter the city of Parsons at a desirable point.

Metropolitan Street Railway, Kansas City, Mo.—The receivers of the Metropolitan Street Railway have awarded a contract to the Columbia Construction Company, Milwaukee, for the building of all new railway extensions required at this time by the terms of the new contract. Work will be begun at once by this company. There are 10 miles of these extensions.

***St. Louis Subway & Elevated Corporation, St. Louis, Mo.**—This company is being organized to construct 4.76 miles of elevated railway and 3.29 miles of subway in St. Louis. The road would connect with interurban railways at the city limits. James D. Houseman and F. E. Niesen, Bank of Commerce Building, St. Louis, are interested.

Manchester (N. H.) Street Railway.—Plans are being made for the construction of a bridge at South Elm Street, Manchester, at a cost of about $76,000, of which $40,000 will be paid by the city of Manchester, $24,000 by the Boston & Maine Railroad and $12,000 by the Manchester Street Railway.

Salem-Pennsgrove Traction Company, Salem, N. J.—This company has asked the county of Salem to construct a new bridge at Penn's Neck. The bridge will cost approximately $30,000 and the company offers to pay half of this sum. It also offers to pay for strengthening the Lower Canal bridge. Rights-of-way have been received from three-fourths of the property owners along the route of this company's proposed line. [Sept. 4. '15.]

Brooklyn (N. Y.) Rapid Transit Company.—Official announcement has been made by the Brooklyn Rapid Transit Company that on Sept. 25 the company will begin operating trains over the Liberty Avenue extension of the new dual subway system improvements. The extension will carry the Fulton Street elevated road, which is being third-tracked to afford express service, from the borough line between Brooklyn and Queens to Lefferts Avenue, Richmond Hill, thus adding many miles of territory to the 5-cent-fare zone. Sections which the new route will serve include Woodhaven, Clarenceville, Morris Park and Richmond Hill.

New York Municipal Railway Corporation, Brooklyn, N. Y.—The Public Service Commission for the First District of New York has authorized the New York Municipal Railway Corporation to award the contract for furnishing structural steel for the third-tracking of the Myrtle Avenue elevated railroad between Broadway and Wyckoff Avenue, Brooklyn, to the Phoenix Bridge Company, the lowest bidder, for $40.50 per net ton.

International Railway, Buffalo, N. Y.—A comprehensive plan of this company for the construction of the new Bailey Avenue line is soon to be laid before the Council. It calls for the construction of a line between Sycamore and William Streets in 1916, between William and Seneca Streets in 1917, between Sycamore and Ferry Streets in 1918 and East Ferry Street and Kensington Avenue in 1919. Approval of the four-year period for the development of this new double-track line is asked by the company. The entire distance is 3 miles.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—Construction has been begun by this company on a loop line on Seventeenth Street from State Street to Peach Street, Erie. The company is completing a double-track system on East Sixth Street.

Cleveland (Ohio) Railway.—The double track on Eucild Avenue between East Twenty-second and East Fortieth Streets is now about complete and cars were scheduled to be in operation on it on Sept. 20. Residents of Prospect Avenue, between the same streets, where Euclid Avenue cars have always run before are to have a shuttle service until Wade Park Avenue cars, now routed over Superior Avenue because of sewer work on East Sixty-fifth Street, again begin operation over that line. A single track will shortly be constructed on Mumford Court between East Fifty-fifth Street and Broadway to make a loop for some of the Fifty-fifth Street cars. Because of much heavier traffic on the northern end of the line than the southern end it has become necessary to turn some of the cars at this point.

Oklahoma & Interstate Railway, Oklahoma City, Okla.—Final surveys are being made of this company's proposed line to connect Columbus, Galena, Baxter Springs, Miami, Centralia, Collinsville and Tulsa. Construction will be begun as soon as several details of right-of-way are settled. John R. Rose, Oklahoma City, president. [Aug. 28, '15.]

Toronto (Ont.) Civic Railway.—Concrete is now being laid under the double tracks on Bloor Street, west of Dundas Street for the new civic car line. Excavation work was done, and two lines of track put down in the center of the roadway as far west as Indian Grove. This portion will be completed before any more track is laid. The present car line is operated on a temporary single track on the north side of the street. Ratepayers of the southern portion of the ward want the line extended north on Quebec Avenue or Pacific Avenue to Annette Street and Jane Street.

Philadelphia, Pa.—Bids will be opened on Oct. 19 for about 25,000 tons of steel for four sections of the proposed Frankford elevated line as follows: Contract 511, Front Street from Callowhill Street to south of Girard Avenue, about 4074 ft. of structure; contract 512, Front Street and Kensington Avenue from south of Girard Avenue to north of York Street, about 7128 ft.; contract 513, Kensington Avenue from north of York Street to North of Ontario Street, about 7769 ft.; contract 514, Kensington and Frankford Avenues from north of Ontario Street and south of Unity Street, Frankford, about 7653 ft. A subway will be built from League Island to Olney and Rising Sun Avenues and an elevated railway from Front and Arch Streets to Bridge Street, Frankford. A subway-elevated line to Roxborough and an elevated railway from Thirtieth and Market Streets to Darby will eventually be built. Work has been begun by James D. Dorney on the Frankford elevated line, and the Keystone Construction Company has begun the first excavation for the Broad Street subway. The total cost of the lines recommended for immediate construction has been approximated at $46,000,000, with an additional $12,000,000 for equipment. A. M. Taylor, director of city transit, is in charge of the work. [Aug. 28, '15.]

Stroudsburg (Pa.) Passenger Railway.—This company reports that it is rebuilding 1 mile of track on Main Street, Stroudsburg.

Rhode Island Company, Providence, R. I.—Work has been begun by this company reconstructing its tracks on Clinton Street, Woonsocket, with 9-in. grooved girder rails.

Greenville Railway & Light Company, Greenville, Tex.—Wesley College has acquired this company's line to the college with the right to operate over the railway from the intersection of the Mineral Heights track to the northwest corner of the square. A car has been purchased by the college and will be placed in operation at once. The track will be repaired and placed in good condition.

Houston, Richmond & Western Traction Company, Houston, Tex.—A meeting was held in Gonzales to consider the proposition of constructing this company's proposed railway between San Antonio and Houston through Gonzales. A committee was appointed to solicit subscriptions and right-of-way through the county. E. Kennedy, president. [Sept. 4, '15.]

Temple & Marlin Interurban Railway, Temple, Tex.—It is reported that construction will soon be begun on the proposed line from Temple to Marlin, about 30 miles. S. D. Hanna, Temple, chief engineer. [Feb. 7, '14.]

Salt Lake & Ogden Railway, Salt Lake City, Utah.—This company reports that it is laying 3 miles of second track between Orchard and Clinton, thus making double track from Ogden to Clinton.

Richmond, Rappahannock & Northern Railway, Richmond, Va.—Surveys have been completed for this company's proposed line from West Point to Urbanna and construction will soon be begun. Warner Moore, president. [Aug. 28, '15.]

Fayette, W. Va.—Surveys have been begun for the proposed electric railway from Fayette Station to Beckley, 35 miles. H. G. Scott, general manager Virginian Power Company, Charleston, W. Va., is interested. [June 12, '15.]

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—This company has presented plans to the Board of Public Utilities for remodeling Hill Street station and trackage. It is estimated that the cost will be about $30,000.

Aurora, Elgin & Chicago Railroad, Wheaton, Ill.—The new terminal building of this company at Main Street and Broadway, Aurora, has been opened. The South Broadway transfer station will be discontinued and all transferring between interurban cars and between interurban and city cars will be done at the new station. The general offices of the company have been moved from Wheaton to the sixth floor of the building. The second, third, fourth and fifth floors have been sublet by the company as office suites.

Union Traction Company, Coffeyville, Kan.—This company has awarded a contract to Clements & Lavery for the construction of a terminal building in Coffeyville. The structure will be 96 ft. x 143 ft., two stories high. The building will be of brick and steel and will cost about $40,000.

New York Municipal Railway Corporation, Brooklyn, N. Y.—The Public Service Commission has approved this company's application for a rearrangement of stations on the Myrtle Avenue elevated line between Broadway and Wyckoff Avenue. The stations as rearranged will be Central Avenue, Knickerbocker Avenue and Wyckoff Avenue.

Ogden, Logan & Idaho Electric Railway, Ogden, Utah.—It is reported that this company plans to move its street railway and interurban carhouse and shops from their present location on Washington Avenue to a new site at the old fair grounds on West Seventeenth Street.

POWER HOUSES AND SUBSTATIONS

Bartlesville (Okla.) Interurban Railway.—This company reports that it is installing a new Westinghouse-Leblanc jet condenser with motor-driven pumps to replace a condenser with turbine-driven pumps. The company is also resetting three 400-hp. Babcock & Wilcox boilers and installing a complete new system of steam piping.

Manufactures and Supplies

ROLLING STOCK

Boise (Idaho) Railroad, W. E. Pierce, president, has made arrangements for the purchase of five new cars.

Wilmington & Philadelphia Traction Company, Wilmington, Del., is about to place an order for twenty-five new cars.

Florida-East Coast Railway, St. Augustine, Fla., has ordered a gasoline electric car from the General Electric Company.

Lula-Homer Railroad, Lula, Ga., a line under construction, is considering the purchase of storage-battery locomotives for operating its new road. D. G. Zeigler is chief engineer.

Brooklyn Rapid Transit Company, New York, N. Y., noted in the Electric Railway Journal of May 22 as preparing designs for an experimental articulated center-entrance car, has ordered the center section of this equipment from the Laconia Car Company. This railway company is now rebuilding two of its single-truck car bodies in its Fresh Pond shops preparatory to attaching them to the center section.

Toronto (Ont.) Civic Railway, noted in the Electric Railway Journal of Sept. 11 as having ordered four semi-convertible prepayment cars from the Preston Car & Coach Company, has specified the following details for this equipment:

Length of body.....21 ft.	Guards.....H. B.
Length over vestibule, 34 ft. 8½ in.	Gears and pinions..tool steel
	Gongs .....Preston
Width over sills..8 ft. 5½ in.	Hand Brakes.....Peacock
Width over all...8 ft. 5¾ in.	Heaters, Consol., coal burning
Height, rail to sills.2 ft. 6 in.	Headlights, Crouse-Hinds "Z"
Height, sill to trolley base, 8 ft. 4 in.	Motors..2 GE-80, inside hung
Body.....wood, steel frame	Paint .....Sherwin-Williams
Interior trim.....oak	Sanders .....Preston
Roof .....arch	Sash fixtures.....Preston
Underframe .....metal	Seats .....Preston
Axles.....Jones & Laughlin	Seating material.....wood
Bumpers .....Hedley	Springs .....Brill
Buzzer system.....Consol.	Trolley-base .....McRae
Control K-10	Trucks.....Brill 21-E
Curtain fixtures, Curtain Supply Co.	Varnish .....Murphy
	Ventilators .....Automatic
Curtain material..Pantasote	Wheels, Dominion Wheel & Foundry
Destination signs, Keystone, four per car	
Fare boxes.....Coleman	

TRADE NOTES

John P. Jay, Jr., vice-president of the Pennsylvania Steel Company, has resigned from that company to become chairman of the board of the Maxwell Motor Company.

United States Electric Signal Company, West Newton, Mass., has received an order from the Massachusetts Consolidated Railways, Greenfield, Mass., for two complete blocks of its Type K registering signals.

Pennsylvania Steel Company, Steelton, Pa., has appointed R. W. Gillespie as general sales manager, with headquarters in Philadelphia. Mr. Gillespie succeeds John C. Jay, Jr., recently resigned. Mr. Gillespie has been identified with this company for many years and for the past several years has been the company's district sales manager in New York.

Electric Service Supplies Company, Philadelphia, Pa., has received an order from the Chicago, Milwaukee & St. Paul Railway for 20,000 "protected" rail bonds, type P-4-P, 250,000 circ. mil capacity, 37 in. long. This is in addition to orders for 25,000 similar bonds placed with this company last May, thus making a total of 45,000 "protected" rail bonds that will be used in this important electrification.

C. L. Oechsner, publicity manager of the British Thomson-Houston Company, Ltd., Rugby, England, who was for many years with the Thomson-Houston Company at Lynn and with the General Electric Company at Schenectady, is on an extended visit to this country. He is planning, before he leaves, to visit the San Francisco exposition. His address, while in this country, will be in care of the *Electrical World*, New York.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has declared a quarterly dividend of 1½ per cent on the common stock, an increase of half of 1 per cent quarterly. This places the stock on a 6 per cent basis. The regular 1¾ per cent quarterly dividend was declared on the preferred stock. The following statement regarding war orders was issued after the meeting of directors: "The company has received firm contracts for the manufacture of war munitions aggregating approximately $60,000,000, the greater proportion of which is a contract for rifles which is to be executed at factories in New England especially acquired for that purpose."

William E. Keily, recently associate editor of the *Electrical World*, has opened an office in the Edison Building, 72 West Adams Street, Chicago. For nearly a year past Mr. Keily has been engaged in literary and consulting work having to do with public-utility problems and relations, and he will continue work of this character, with improved facilities, in his new office. An experienced writing man, Mr. Keily has done journalistic work in both daily newspaper and technical magazine fields. For a number of years he was managing editor of the old *Western Electrician* of Chicago. Mr. Keily is an associate of the American Institute of Electrical Engineers, a class B member of the National Electric Light Association, and a member of the Jovian Order, Electric Club-Jovian League of Chicago, National Geographic Society, and the City Club of Chicago.

ADVERTISING LITERATURE

Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued a list of its second-hand car equipment and railway supplies.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued sheets describing the operation of its Type C controllers for crane service.

NEW PUBLICATIONS

Single-Phase Electric Railways. By Edwin Austin, of the editorial staff of The Engineer, London, published by D. Van Nostrand Company, New York. 303 pages. Cloth, $5 net.

This is a well-illustrated volume of careful descriptions of many single-phase railways, based for the most part upon articles which have appeared in the periodical with which the writer is associated. There are eleven chapters. The first contains a brief for the single-phase railway, which the author states "should be adopted whenever there is a possibility of running heavy electric trains long distances." Each of the other chapters is taken up with descriptions of one or more systems in one country. The list, which will be valuable for reference, is as follows: England, London, Brighton & South Coast Railway and Midland Railway; France, Midi Railway; Germany, Blankenese-Hamburg-Ohlsdorf Railway, Dessau-Bitterfeld Railway, Murnau-Oberammergau Railway, Mittenwald Railway; Austria, St. Polten-Mariazell Railway; Switzerland, Martigny-Orsières Railway, Valle-Maggia Railway, Rhaetian Railway and Lötschberg-Simplon Railway; Holland, Rotterdam-Scheveningen Railway; Norway, Thamshavn-Lokken Railway and Rjukan Railway; Sweden, Swedish State Railways; Italy, Parma Tramways; United States, New York, New Haven & Hartford Railway, New York, Westchester & Boston Railway, Spokane & Inland Empire Railway, Rock Island & Southern Railway, Hoosac Tunnel Railway and St. Clair Tunnel Railway.

Obviously the book contains a wealth of information of a general nature. It does not take up single-phase motors except as a part of the descriptions, and it does not summarize the essential features of the subject. As the author states, progress in this field has been so rapid that he had to stop at some point, and hence was unable to add a description of the new Norfolk & Western electrification in this country.