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### ARE DARK CAR CURTAINS NECESSARY?

One of the changes which have been made a part of the finish of the modern car is the use of whitish enamels or compositions in place of dark light-absorbing veneers and finishes. When such interiors are used in a car with a large number of bare tungsten lamps, the effect is often somewhat dazzling because so many bright spots strike the eye, but where semi-indirect and indirect lighting fixtures are used these light interiors are not only very efficient but most agreeable as they permit the illumination to be well diffused. Since this is the case, is it not time that experiments should be made with curtains which have been manufactured with a light color on the inner side? It is possible that in the daytime the reflections from sunlight on lowered curtains might prove disagreeable, but this is problematical. It may also be urged that a light-colored curtain would become soiled too easily. However, this possibility could readily be avoided if a darker strip of material was used along the lower part of the curtain.

### PROGRESS IN RAILWAY ELECTRIFICATION

It is with great pleasure that we chronicle this week two more orders for railway electrification and the announcement of the adoption of electricity by two other large railroads. We refer to the orders of the Canadian Pacific Railway for its Rossland division and of the Canadian Northern Railway at Montreal and the announcement that the Pennsylvania Railroad will install single-phase on its suburban division from Philadelphia to Paoli and that the Chicago, Milwaukee & St. Paul Railroad will use 2400-volt direct current on 440 miles of track. It is very interesting, in considering these orders, to find that the Pennsylvania Railroad has adopted single-phase for suburban motor-car service, whereas direct current is

the choice for the long stretches of transcontinental service in Montana and in the Canadian Rockies. This, at first thought, seems to be opposed to the generally held opinions of the special field of each system and proves that the deciding factors in each case go beyond merely the car equipment and include also the question of power distribution and power supply. In fact, it is safe to lay down the general rule that unless all of these factors are considered, it is impossible to reach a proper decision. We do not intend to touch here upon the relative merits of the different systems as that is considered in another editorial in this issue, but we wish to congratulate the industry that the smoke arising from the battle of the systems is not able to obscure the fundamental merits of electricity as a motive power.

### ESSENTIALS FOR PUBLIC SERVICE ACCOUNTING

Character, capability, confidence—mentioned by A. F. Elkins before the Central Electric Railway Accountants' Association—these might be termed the three "C's" of public service accounting. They are ultra-important assets to the public service accountant, beyond all doubt, and deserve the emphatic position given them in the list of required characteristics. Inasmuch as they are necessary, however, to the successful practice of any profession, they are not so peculiarly indicative of a high-class public service accountant as some other characteristics mentioned by Mr. Elkins, such as the power to observe and analyze, the desire for uniformity and the love of detail. However excellent may be a man's moral character, however broad his capability, however sure his confidence, he is not fitted for accounting work unless he possesses these other essentials. As Mr. Elkins says, the public little values the preliminary work in assembling and collating a mass of data in order to make an annual report, but the accounting department must spend at least a third of its time on such seemingly laborious detail. The power of observation of the officials of a large corporation is limited, and they must have some artificial means of transcending limits, such as that furnished by financial statements and accompanying statistical data. To supply these the accountant must have a knowledge of more than the mere books employed; he must understand their classifications, the philosophy of accounting, the relation of accounting to allied subjects such as economics, law and finance, and the effects of various economic and legal types of organization upon accounting technic. And, last but not least, he must know the requirements of public utility laws and should not only keep his accounts in accordance therewith but also discourage all loose use of accounting terms and principles. In no other way can the ideal system of accounts for which accountants' associations have worked so industrially ever become realized.

### MAIN-LINE ELECTRIFICATION

It will be strange indeed if Mr. Armstrong's paper on "The Engineering Problems of Electrification" at Montreal this week does not arouse considerable controversy as well as rejoinders other than those presented at the meeting. It early dismisses the single-phase from the possibilities of further consideration for trunk-line service, and in a study of the relative advantages of the split-phase and high-tension direct-current systems the latter is found preferable. It is not surprising that this severe arraignment of the straight single-phase system should have brought forth equally vigorous replies, which would undoubtedly have been larger in number if the meeting had been held in New York. It also elicited the important statement that the Pennsylvania Railroad had adopted the single-phase system with motor-car operation for its suburban lines out of Philadelphia.

We agree with Mr. Gibbs that this decision by the Pennsylvania Railroad is sufficient answer, if any were needed, to the claim that single-phase can no longer be considered a factor in future trunk-line service, and the high regard with which the system is held on the continent of Europe and its service on the New Haven road show that it is able to meet the requirements of the heaviest passenger and freight operation. Undoubtedly the high-tension direct-current system has undergone a notable development within the past few years, and Mr. Armstrong holds out hope that the limit in voltage has not yet been reached. But we do not consider the number of interurban roads changed from single-phase to high-tension direct-current operation, as shown in Mr. Armstrong's Table I, a criterion of the possibilities of single-phase for trunk-line operation. The early interurban single-phase lines were installed before the development of the high-tension direct-current commutating-pole motor, and in most instances had to run for considerable distances over direct-current city lines. This required such a complicated system of control and such a hybrid electrical equipment that it is not surprising that many of them, though not all, should have been converted to high-tension d.c. On the other hand, on lines operated exclusively with the single-phase system the same troubles have not been found, and their records for maintenance have been correspondingly low.

We believe that it would be to the best interests of the industry if a thorough study and report should be made of the present status of each of the principal systems by some railway engineer, or preferably a committee of railway engineers who have not been so closely allied with either camp as to be considered partisans. Such a report should consider the question of first cost for all parts of the equipment and should include a carefully compiled record of maintenance costs obtained from all of the different systems now in operation. It should also include a study of the question of interferences with telephone and telegraph lines, mentioned by Mr. Armstrong, the means which have been adopted for preventing these troubles and the cost and practical value of these remedial measures. We do not suggest this with the idea that any one system as at present developed will be found to be so far superior to the others that it could be adopted as a standard for this

country. We do not see any great necessity for a standard system, even for any one road, provided only one system is used on the same locomotive division. But from such a study it should be possible to determine the conditions under which each system would be the most efficient for the work to be accomplished. A more general agreement upon this point among electrical engineers would certainly be followed by a rapid advance in railroad electrification.

### FEDERAL INCOME TAX LAW

Elsewhere in this issue are abstracted two papers which were presented before the Central Electric Railway Accountants' Association on the subject of the federal income tax as related to electric railways. In the absence of specific instructions and report forms from the Treasury Department, the papers should not be looked upon as technical digests of the new law, but they do present a broad practical view of the requirements with which electric railway managers should acquaint themselves. One of the interesting points discussed by Mr. Cavanaugh is whether the "gross revenue" return should include accrued earnings as well as cash earnings. It must be admitted that the largest part of the gross receipts of a railway comes from cash sources, but the accrued amounts are not at all negligible. By no means the least advance made by modern accounting is the substitution of the accrued basis for the old cash basis. This has been applied particularly to expenses and is shown by the allocation of expenses to the accounting or fiscal period to which they are properly applicable.

Consistency in the treatment of an accounting period, however, demands that all earnings applicable to that period, whether already paid in cash or of an established future cash value, should be also taken into the accounting of that period. If accrued earnings cannot be included in a corporation's return of gross income, then expenses not paid in cash must be excluded from operating expenses. Such a treatment, however, would be a lamentable retrogression in accounting practice. The gross income should be that shown by the records of the corporation and its reports to the stockholders and not that indicated by a separate record based on antiquated accounting methods. This situation was thoroughly analyzed under the excise tax law of 1909, and there is no ground for any divergence from the opinion of Secretary MacVeagh at that time, to the effect that a cash basis of accounting would result "in inextricable confusion, uncertainty and inaccuracy."

The paper by Mr. Hixson contains an admirable résumé of the points involved in the collection of the tax at the source, and it suggests the procedure to be followed in determining the net taxable income. Undoubtedly some points will be affected by subsequent rulings of the Treasury Department, but the outline presents an advantageous working basis. It will be well for electric railway officials to bear in mind that the initiatory step in obtaining the required forms must be undertaken by them and that in case of the absence or illness of the officials who have power to make the returns a delay of thirty days is granted only when application therefor is made before the date when the

return is due. It must also be remembered that although the income tax dates only from March 1, 1913, the re-enactment of the old excise tax law makes it cover for all practical purposes the two preceding months.

#### LOW SUBURBAN PASSENGER FARES IN OAKLAND

The hearing which was conducted recently by the California Railroad Commission into the question of the suburban fares on the Southern Pacific electrical lines in Oakland, Alameda and Berkeley elicited some testimony which, unless thoroughly understood, might be misinterpreted in regard to the satisfaction given by the electrical equipment there. The hearing was held because of a petition for lower fares from certain stations on the system, and the company's defense was that it was losing money on the present service. In support of these figures it presented statistics to show a property investment of some \$46,000,000, with annual receipts from operation of \$1,354,303 and operating expenses of \$1,832,437. In other words, the electric service on this suburban division is not even paying operating expenses.

The railway system under consideration, as many of our readers may know, consists of a series of short electric lines spread out like a fan, serving the prosperous cities on the east side of San Francisco Bay and carrying a very large commuter traffic to San Francisco. At the point where the lines converge they pass on to a pier, at the end of which the passengers are transferred by ferry to San Francisco. The service supplied is excellent, and we doubt if there is anywhere an equal frequency of trains for an equivalent number of passengers. Since the conversion from steam to electricity the number of trains run has about doubled. The average cash fare between San Francisco and a large part of the district served is 10 cents, and the average fare, including commutation tickets, is less than 1 cent a mile. Practically the same fares are charged by the San Francisco-Oakland Terminal Railways, which also operates electric trains in largely the same territory and has a separate ferry between Oakland and San Francisco.

As the lines in question have recently been converted from steam to electricity, the adverse financial figures presented at this hearing naturally created considerable comment and some dismay among electrical engineers. An analysis of the situation, however, shows that it is not unfavorable to electrical operation *per se*. This is made evident by the report of the operating expenses of the Oakland, Alameda & Berkeley lines for twelve months, based upon operation during May, 1912, published on page 1258 of the issue of this paper for Dec. 13.

This table, for instance, shows that, out of a total expense for maintenance of way and structures of \$447,000, less than \$50,000 was due to the electrical apparatus. Under maintenance of equipment, of \$135,000 expense, only approximately \$46,000 was due to the electrical equipment. Under transportation, out of \$700,000, \$246,300 was due to the electrical equipment and the men required to operate the electric cars, and this is the figure which would be compared with the cost of locomotive engineers and firemen. All of the other expenses, it appears, would not be affected by the character of the power used. Thus, out of

a total expense of \$1,832,000, only about \$335,000 is of such a character as to involve a comparison between electric and steam operation. In this connection it should be remembered that a considerable portion of the trackage of the electric system is also used by through trains of the Southern Pacific from and to the East. The division of expenses between the through and the suburban traffic is not apparent from the table, but it is certain that a large part of the maintenance of way and structures and some of the transportation charges, such as for crossing flagging and interlockers, would undoubtedly have to be defrayed to accommodate this steam service, even if there were no electric suburban trains. Finally, of the reproduction cost of \$46,209,560 quoted by the company, the entire amount to be charged against electrical equipment, including power plants and transmission systems, is less than \$5,000,000. Unfortunately, no data are available on the cost of operation of the suburban lines when the motive power was steam, but to anyone familiar with the cost of steam operation it is apparent that electrification was in no way accountable for the final deficit. We might add that at the time of the change public opinion was very strongly in favor of electric trains, and had this sentiment been ignored traffic undoubtedly would have suffered. The only conclusion to be reached from this consideration of the subject, then, is that the deficit is due to two causes: First, the rates of transportation are too low to afford a profit on the capital invested; second, the cities in and between which the lines operate are overbuilt with rapid transit lines.

So far as the Oakland situation is concerned, we might stop here, but we believe that in the interest of a broad survey of the situation of suburban fares on trunk lines we should go slightly further. Steam railroad companies have nearly always maintained that their passenger suburban traffic was unprofitable. Indeed, one steam railroad manager in the East said some time ago that his road would be better off if it had no commuter traffic at all. We agree to this proposition in general if the suburban business is charged with the same proportional amount per passenger of overhead expenses as the through traffic, but in most cases this would be an improper method of accounting. The usual elaborate station arrangements, with waiting rooms, facilities for handling baggage, etc., are not needed by the average commuter to anything like the extent to which they are required for the through passenger traffic, and with the possibility which electric power presents of reducing the expense and area required for switching at terminals, the overhead expenses properly to be charged against suburban traffic conducted by electricity are still further greatly reduced. This situation does not apply with so great force in Oakland as in most other places because of the necessity there of ferry transportation. But the Brooklyn Rapid Transit Company has shown at the Brooklyn Bridge that it can handle with electric trains a terminal traffic greatly exceeding that on most steam railroad lines without difficulty on two main tracks, four platform tracks and two stub tracks. This fact and many other similar instances which could be cited prove that any greater trackage in a combined through line and suburban terminal must be charged to some other account than the purely suburban business.

# Recent Improvements on Berkshire Street Railway

This Article Concludes the Account of Improvements Made by the Berkshire Street Railway by Descriptions of a New Low-Cost Carhouse at Sheffield, Mass., of a Carhouse Extension at Pittsfield, Mass., and of New Track Work and Bridges

The new inspection carhouse of the Berkshire Street Railway at Sheffield, Mass., was designed to provide storage facilities and pit layouts at a cost not exceeding \$600 per car. It has a low roof, which reduces the weight to be carried upon the columns. Part of the rear was built without a floor to save further in cost. The carhouse is adjacent to the Sheffield substation and is 301 ft.



Berkshire Improvements—Sheffield Carhouse and Incoming 33,000-Volt Line

long over all and 75 ft. in extreme width. The storage section, however, is only 57 ft. wide and contains four through tracks located 13 ft. apart on centers. The capacity of the house is twenty-four double-track cars seating forty-four passengers each. It is of brick construction with concrete flooring throughout 210 ft. of its length. The roof is of five-ply tar and gravel construction, supported on 6-in. x 6-in. yellow pine posts, the foundations being of concrete. The posts divide the storage and inspection area into 10-ft. x 13-ft. bays.

Two tracks have pits 150 ft. long and 4 ft. 3 in. wide, each equipped with sixty 23-watt lamps set in niches which are staggered in the pit walls every 5 ft. The pits have concrete walls, are 4 ft. 6 in. deep and, in each instance, are drained to two points one-fourth of the distance in from the ends. The lamp circuits are carried in 1-in. conduit and are controlled from wall switches along the side

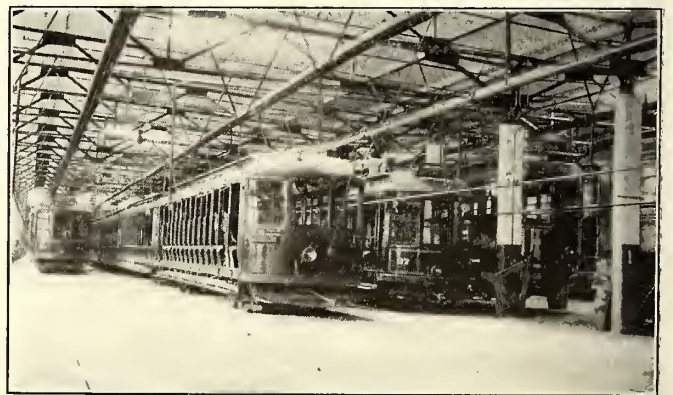


Berkshire Improvements—East Street Carhouse

of the carhouse. The lamp recesses have bottoms inclined about 45 deg. from the horizontal to get good drainage and reflecting conditions. The pit bottoms are of concrete slab and granolithic finish, and the tracks are of 55-lb. T-rail anchored by bolts as illustrated to the pit shoulders. A passageway 3 ft. wide has been left between the pits at their middle point. The carhouse is heated by low-pressure steam supplied to pipe coils installed along the walls from a Smith boiler with a shell 5 ft. 4 in. in diameter and 5 ft.

10 in. long. The latter is housed in a boiler room outside the carhouse proper and with a floor somewhat below the pit level. Ashes are removed by a hand-operated hoist, and a coal pocket of 30 tons capacity is provided with facilities for gravity delivery of fuel from passing cars. At the side of the carhouse proper is a brick and concrete extension 151 ft. long and 18 ft. wide, which contains in addition to the boiler and coal rooms an inspector's office, trainmen's lobby, toilets, sand and oil rooms, machine-shop space and pump room. A small stockroom is also provided.

The interior lighting of the carhouse is cared for by 150 23-watt series lamps hung from the ceiling and controlled in groups of thirty from wall switches. In place of the usual copper trolley wire a 3-in. x 1/2-in. steel bar supported by insulated clips was attached to the underside of the usual inverted U-trough. The cost of this arrangement was less than with a copper trolley wire over each track. The oil room has a concrete threshold rising 8 in. above the floor at the doorway leading into the carhouse proper, to prevent the flow of oil into the latter in case of leakage. The walls of the oil room are also carried



Berkshire Improvements—East Street Carhouse Interior

upward to a point 42 in. above the roof walls, to insure additional fire protection.

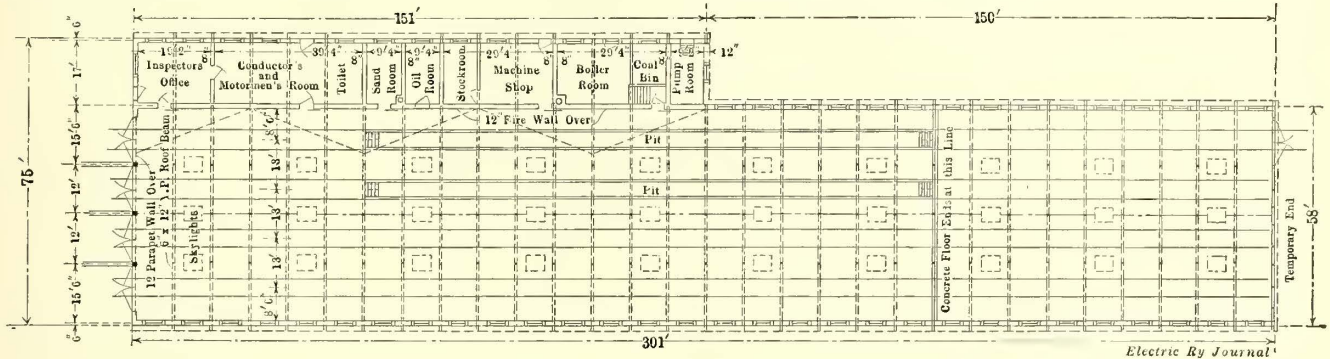
#### FIRE PROTECTION

The carhouse is equipped with the Rockwood dry-pipe system of sprinklers. Water is taken from the Housatonic River through an 8-in. pipe into a 15-in. Worthington centrifugal pump directly driven by a 50-hp, 600-volt d.c. Allis-Chalmers motor located in a pump well outside the main carhouse, and it is forced from this point through a 6-in. pipe into a tank of 15,000-gal. capacity mounted on a steel tower 90 ft. above the ground. The pump discharge has also a 6-in. connection with a system of underground lines of this size to supply water to six standpipes within the main carhouse and to three hose houses on the property outside, each of which contains a two-way hydrant and 150 ft. of 2 1/2-in. hose. At each interior standpipe 50 ft. of hose are provided, with 1 1/2-in. nozzles. A motor-driven compressor which supplies air at 40 lb. pressure to the sprinkler heads is located in a pump well 7 ft. deep, 13 ft. long and 9 ft. wide.

The carhouse ceiling is carried to a maximum height of 15 ft. above the floor. There are thirty 4-ft. x 5-ft. wired-glass skylights in the roof, installed in ten rows of three each. Most of the skylights are 3 1/2 ft. x 4 ft. in size and are sloped to conform to the incline of the roof. Each skylight has two sprinkler heads. In the intermediate

spaces between the skylights and beneath them are groups of ten heads to serve the side wall spaces and the spaces between tracks at the ceiling level. There are 180 heads in the carhouse proper usually installed 10 ft. apart longitudinally and 13 ft. apart laterally, with the exception of the double heads placed at each skylight. No aisle sprinklers are installed. The sprinkler heads are fed from two longitudinal mains running along the wall of the building

for a carpenter shop and a paint shop separated from the storage section of the house by an 18-in. fire wall of brick. The new storage and operating house has an available area of 27,280 sq. ft. and a capacity of forty 45-ft. cars; the carpenter shop has an area of 3550 sq. ft. and houses four cars, and the older portion of the house, which contains the pit and repair shop tracks, houses twenty-four 45-ft. cars in an area of 17,513 sq. ft. A gravel floor sec-



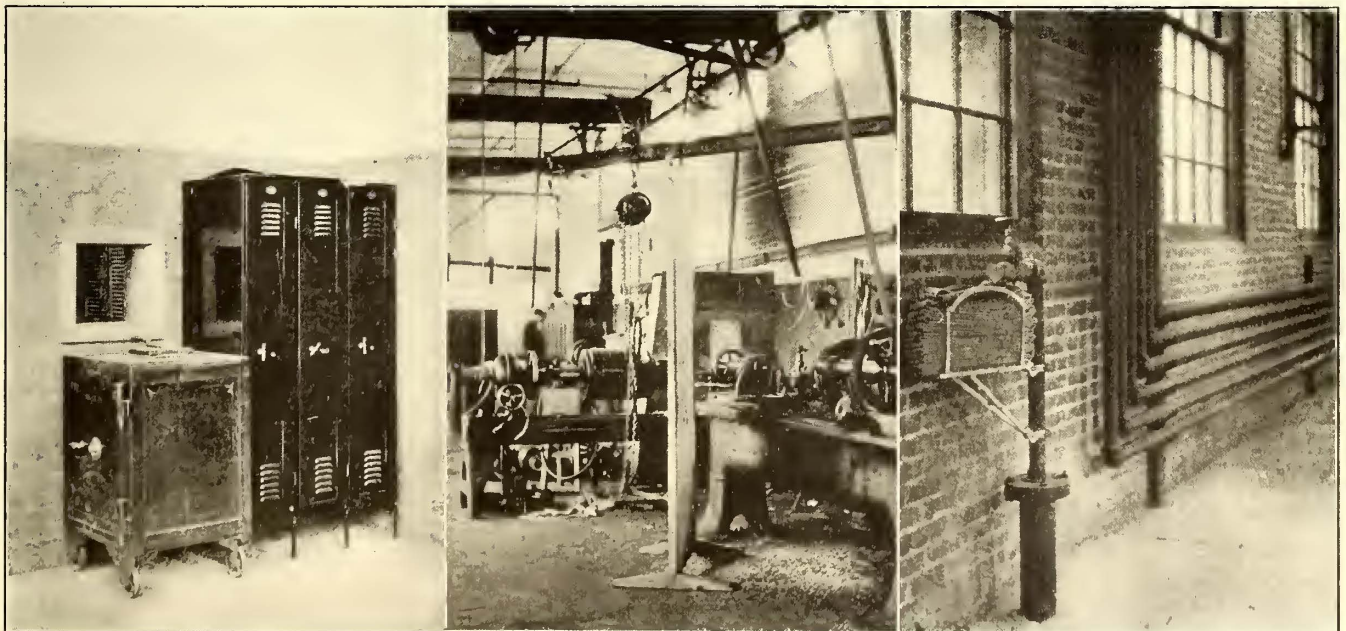
Berkshire Improvements—Plan of First Floor of Car Storage and Inspection Shed at Sheffield, Mass.

on each side parallel to the tracks, the heads between tracks being supported alternately in pairs from each main. The mains on the two sides of the house are tied together by a 5-in. cross-connecting pipe run 9 in. below the roof. Four Pyrene extinguishers and six sand pails are also placed within the house. The heads have a height above the floor of from 13 ft. to 15 ft.

A convenient lamp and headlight rack is used at this carhouse, as illustrated. It consists of a frame 12 ft. long and 4 ft. 8 in. high, of 1-in. x 4-in. wooden stock, the capacity in lanterns being eighteen spaced 8 in. apart on heavy nails driven into the top piece. The lower portion of the frame consists of a shelf of 3/4-in. stock, 16 in. wide,

tion of 4980 sq. ft. at the east end of the house also is in service to hold six cars, so that the total capacity of the plant is now seventy-four cars.

The carhouse extension is a brick structure with tar and gravel roof carried on steel trusses and concrete-sheathed cast-iron columns. Its floor is of concrete. Above the carpenter shop a stockroom for more permanent storage has been provided, and above the present stockroom, machine shop and forge room are an additional stockroom and an armature repair shop of 1720 sq. ft. The shop improvements include the installation of a Wayne oil tank pumping system with storage tanks in a fireproof compartment under the carpenter shop, jib cranes in the



Berkshire Improvements—Receiving Safe for Conductors' Cash at Sheffield Carhouse—Armature Shop at East Street Carhouse—Standpipe at Sheffield Carhouse

carried 6 in. above the ground, and holding eight head-lights. The latter are inscribed with the name of each regular user to insure proper care.

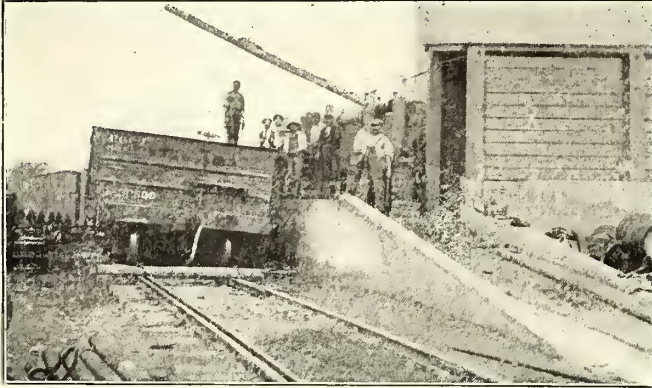
EXTENSION OF PITTSFIELD CARHOUSE

The improvements lately effected at the East Street carhouse in Pittsfield are comprised in an extension 286 ft. long and 102 ft. wide, containing eight tracks placed 13 ft. apart on centers. The north side of the building has space

old carhouse and in the armature room, a traveling crane over one pit track beside the blacksmith shop, concrete and timber scrap bins outside the carhouse and the Merritt metal unit bins and lockers throughout the stock department. The fire protection of the carhouse and shops also includes a Grinnell sprinkler installation with 810 roof heads and 567 aisle heads for car protection.

In the new portion of the carhouse no pits are provided.

Six tracks are carried entirely through the property, permitting entrance and exit of cars at either end, and these connect with the Pittsfield-North Adams interurban line by ladder tracks. A short track for outdoor wheel storage is provided at the forge shop, and connection with the adjacent main line tracks of the Boston & Albany Railroad is obtained by a trestle track which passes the scrap bins and also serves as a coal-discharging track outside the

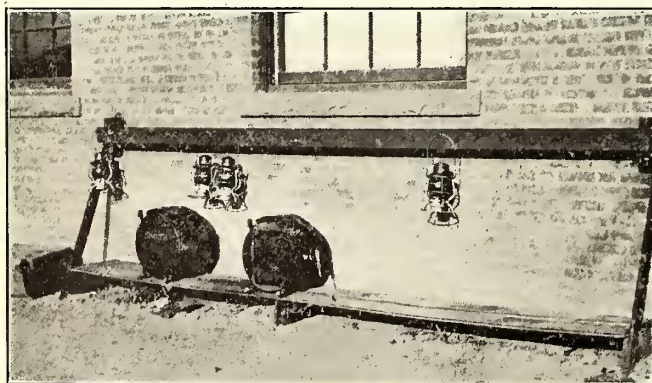


**Berkshire Improvements—Scrap Bin, Ramp and Side Track at East Street Carhouse**

power house. The offices of the general manager, dispatchers' quarters and superintendent's office are located on the second floor on the front of the old carhouse and by extending outward from that building command an unusual view up and down the line.

#### CONSTRUCTION AND EQUIPMENT FEATURES

At the front of the extension Kinnear rolling steel doors are provided, with windows above to amplify the lighting of the carhouse interior. There are ten wired-glass skylights over the building, usually 14 ft. x 15 ft. in size. The rolling doors are 15 ft. high. The bar type of trolley used is  $\frac{3}{8}$ -in. x  $2\frac{1}{2}$ -in. round-edge iron in 12-ft. lengths, which is attached at 6-ft. intervals to wooden trough by means of Anderson hangers and  $\frac{3}{8}$ -in. bolts. Concrete foundations are used for all walls and columns. At intervals of 30 ft. along the side walls Hubbell sockets wired in conduit are brought down to within 4 ft. of the floor to permit the attachment of 110-volt lighting plug circuits to aid inspection work around the cars. The upper portion of the carhouse extension is illuminated at night by seventeen



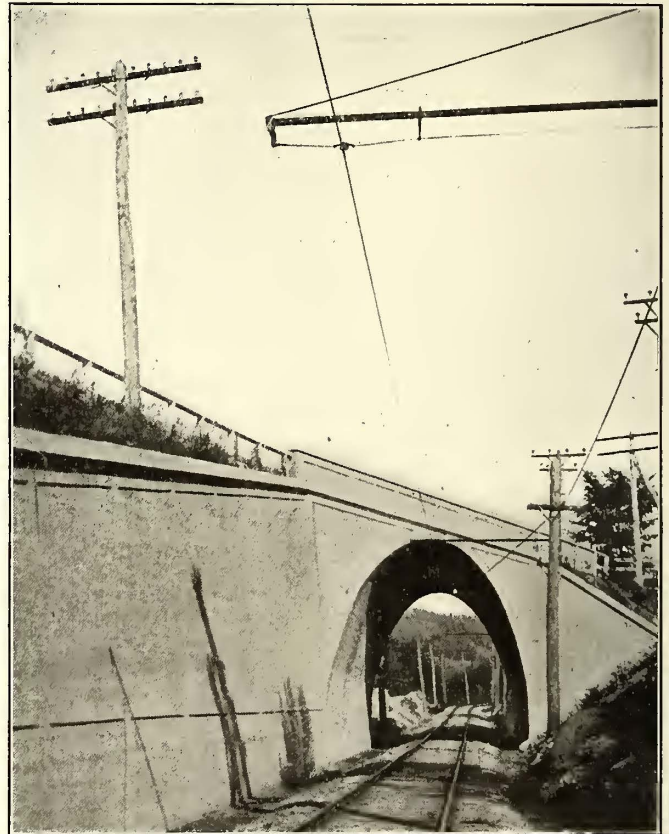
**Berkshire Improvements—Lamp and Lantern Rack at Sheffield Carhouse**

Westinghouse type B 125-volt, d.c. flame arcs hung from condulets on the roof trusses. Four similar lamps are provided in the paint and carpenter shops, with nineteen drop lamps for work near the floor. Incandescent drop lights are used in the stock and winding rooms on the second floor. In the winding room a 10-ft. jib crane equipped with a 1-ton Triplex hoist is now in service between a banding lathe, banding and armature lathe.

This change saves time formerly lost by detaching a hoist from a runway at the east end of the shop and erecting it on an I-beam in the ceiling. To save babbitt turnings and enable them to be used a second time a screen of canvas 3 ft. wide and 7 ft. high, supported by a wooden frame, is used under the lathe. Another useful feature of the shop is a Warsaw electric elevator of 1 ton capacity, with a platform 5 ft. square, which serves the old carhouse, upper and lower stockrooms and armature room by multiple doorways on each floor. A GE commutator slotter lately has been added.

#### OIL SUPPLY AND SCRAP BIN

The oil supply system is piped to adjustable pump stands at one end of the first floor stockroom, and the company maintains the following storage capacities in separate tanks: linseed oil, 220 gal.; signal oil, 100 gal.; air compressor oil, 400 gal.; engine oil, 500 gal.; power house valve oil, 300 gal.; turbine oil, 300 gal.; kerosene, 400 gal.; electric car oil, 800 gal. Gages attached to floats are lo-



**Berkshire Improvements—Skew Arch Bridge at State Highway on Lee-Huntington Extension**

cated in one corner of the stockroom to indicate at all times the quantities on hand.

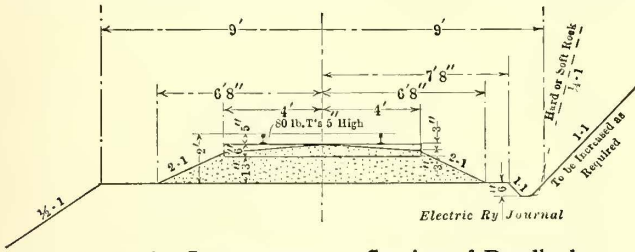
The carpenter shop contains a buzz planer, a speed lathe, a swing saw and two circular saws, group-driven by a 35-hp, 370-volt, three-phase motor of the General Electric induction type.

The scrap bin, 60 ft. long and from 13 ft. to 32 ft. wide, consists of a group of compartments formed by removable 2-in. planking on the top of a concrete floor supported on concrete piers and foundations. The compartments are parallel and front upon a runway 6 ft. wide, which is connected with the ground by a concrete ramp 25 ft. long. Barrows or teams are run up the ramp to the appropriate compartment entrance, and after being discharged the refuse material is kept here until it can be hauled away in a gondola or other car set in front of the bins on the siding shown in the accompanying halftone. A derrick is used to facilitate the handling of heavy material. Below one end of the bin structure is a compartment 10 ft. high

for storing cement and other heavy supplies. The sections provide for seven classifications of scrap material. The concrete flooring is reinforced by I-beams and the compartment sides are attached to 8-in. x 8-in. wooden posts.

SPRINKLERS

The sprinkler system was installed by the General Fire Extinguisher Company, Providence, R. I., and is designed to cover all parts of the old and new carhouse. The dry-pipe system is in service, and the piping features are usual for this class of work. Water is obtained either from the city mains or from the Housatonic River, as described in connection with the condenser installation of the East



Berkshire Improvements—Section of Roadbed

Street station. There is a 1000-gal.-per-minute fire pump of the steam-driven type in the power house, and this supplies water to the standpipe and sprinkler mains of the carhouse and shops as required. The aisle sprinklers in the new carhouse are installed 8 ft. 8 in. above the floor and 24 in. from the side of the nearest car, being 8 ft. apart horizontally. The feeders for the heads are run from dry valves in pits in the usual manner. The head piping is supported by diagonal inclined rods and adjustable straps attached to the roof trusses. Fifty-six heads are provided in the second-story stock room and armature shop, thirty-nine in the offices on this floor, and there are 335 aisle line sprinklers in the new carhouse. In general, a single line of heads is provided between each pair of tracks.

LEE-HUNTINGTON EXTENSION—HEAVY CONSTRUCTION

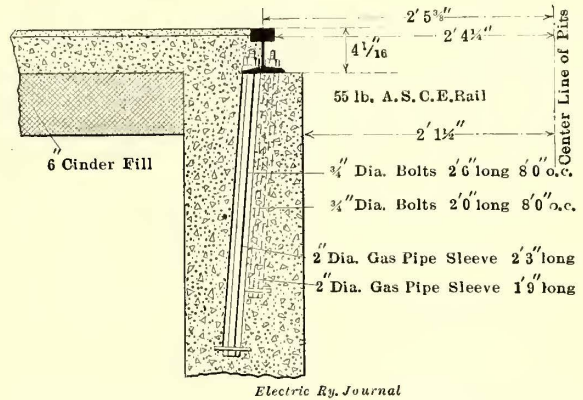
The so-called Lee-Huntington extension now under construction is one of the best examples of heavy electric railway work in New England. From Lee Junction to Blandford, a distance of 18 miles, the line is built upon a private right-of-way 50 ft. to 200 ft. wide, and conforms to steam railroad standards of construction, the maximum grade being 3.4 per cent and the maximum curvature being



Berkshire Improvements—Beginning of Heavy Track and Roadbed Construction on Lee-Huntington Extension

8 deg. Between Blandford and Huntington, a distance of 5.7 miles, a temporary route will be followed in which the alignment and grade will necessarily be less favorable. As the line crosses the Berkshire Hills in their roughest portions, many heavy cuts and fills were necessary, and much reinforced concrete work has been used in connection with bridge and culvert construction. The largest cut on the line, near Blandford, known as Tiffany cut, is ½

mile long, 60 ft. deep, 30 ft. wide at the bottom and 200 ft. wide at the top. More than 200,000 cu. yd. of earth and stone will be removed at this place. At Mud Pond, west of North Blandford and near Algeria Bridge, the direction of the line was changed owing to the expense of filling the pond. A start was made on both sides of the pond by the

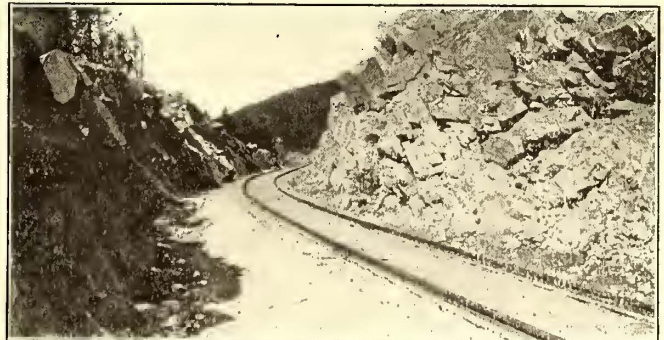


Berkshire Improvements—Detail of Setting of Rails

contractor, but within two rail lengths 60,000 cu. yd. of earth and rock produced no impression upon the bottom.

The line will be single-tracked, using 80-lb. T-rails 33 ft. long, 6-in. x 8-in. x 8-ft. chestnut ties placed fifty-five per 100 ft. and gravel ballast. At each rail joint two copper bonds are used, each of No. 0000 capacity. Reinforced concrete bridge and culvert construction is general throughout the line. Of the several interesting skew arch bridges in place, one is shown in the accompanying half-tone taken beneath the state highway leading toward "Jacob's Ladder" hill near Becket. This bridge carries the highway over the track with a 22-deg. angle between center lines, and one side of the bridge ends before the other begins. The width of the bridge at right angles to the center line of the track is 22.5 ft. and its clear height inside is 20 ft. Five similar bridges are used on the line.

As in other new construction, the company uses as its standard a No. 0000 grooved trolley wire. The poles are of chestnut, 48 ft. long and spaced 100 ft. apart on tangent track, the spacing on curves reaching a minimum of 42 ft. Poles are set 7 ft. 6 in. away from the nearest rail. Bracket construction is used throughout, and strain plates are employed in the trolley construction at the beginning

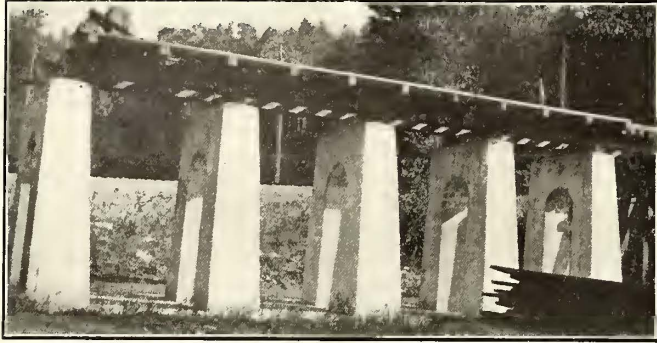


Berkshire Improvements—Carter Cut Near West Becket on Lee-Huntington Extension

and end of every curve and at points 1000 ft. apart on tangent track. The brackets vary in length from 12.5 ft. to 14.5 ft., and the trolley has a minimum clearance of 18 ft. above the rail. The poles are designed to carry a feeder cross-arm with four insulators and two cross-arms for high-tension lines at the top, the lines being carried in 36-in. equilateral triangular spacing. The poles are set from 6.5 ft. deep in rock to 7 ft. in fills and cuts. On the

high-tension lines Locke No. 315 insulators and No. 84 pins will be used. The local telephone circuit will be carried on insulators at the side of the pole and transposed every fifth pole.

A noteworthy feature of the line is the permanence of its construction, as indicated, for example, in the view of a siding built over a coal yard for the East Lee plant of the American Writing Paper Company. Here the track

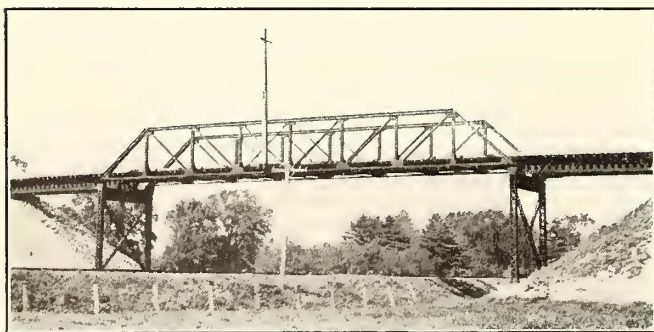


**Berkshire Improvements—Reinforced Concrete Trestle Track at East Lee, Mass.**

is carried on a wooden trestle supported on reinforced concrete piers 13 ft. apart on centers, 20 ft. high, 3 ft. x 8 ft. at the top and 4 ft. 6 in. x 10 ft. 6 in. at the ground level. A bumping post and plank walk are provided at the track level. The use of reinforced concrete increases the capacity of the yard on account of the reduced space occupied by the piers. The trestle is designed to carry a 100,000-lb. capacity steel coal car at any portion of its length.

#### OTHER EXTENSIONS

The Canaan and Egremont extensions are not of unusual design, but represent a good standard of trolley line construction. They occupy private right-of-way so far as practicable. The representative bridge illustrated has three spans of 168 ft. total length over the New York, New Haven & Hartford Railroad near Great Barrington, Mass. The central span is a pony riveted Pratt truss 100 ft. long and the approach spans are of the deck plate girder type. The clearance above the track is 22 ft., and the deck



**Berkshire Improvements—Bridge Over New York, New Haven & Hartford Railroad in Egremont Extension**

is of Southern pine construction, with 8-in. x 8-in. ties spaced 8 in. apart in the clear. Seventy-pound T-rails are used on the line, and two steel trestle bents in the bridge are carried on pile concrete foundations.

#### SUBWAY IN BUENOS AIRES

The first city passenger subway to be built in South America was officially opened in Buenos Aires on Dec. 2. The line is about 2 miles in length and is double-tracked, making 4 miles of track. It extends between the Plaza Mayo and the Plaza Once, and it was officially opened by the President of the Argentine Republic. Prior to this

opening ceremony, the line had been in operation for five days, during which no fares were charged but admission was by complimentary ticket.

The subway is owned by the Anglo-Argentine Tramways Company, whose headquarters are in London. This company also owns a large amount of surface railway mileage in Buenos Aires. Free transfers are not given between the surface lines and the subway, but a transfer ticket is sold from the one to the other for 2 cents.

#### ANNUAL MEETING OF EXECUTIVE COMMITTEE OF MANUFACTURERS' ASSOCIATION

The annual meeting of the executive committee of the American Electric Railway Manufacturers' Association was held in the offices of the association, 165 Broadway, New York City, on Dec. 11, 1913. William H. Heulings, Jr., president during the past year, was chairman of the meeting, and there were present S. K. Colby, Edwin H. Baker, James H. McGraw, W. L. Conwell, Charles R. Ellicott, Henry C. Evans, Cornell S. Hawley, B. A. Hegeman, Jr., Charles J. Mayer and Daniel W. Smith.

Mr. Colby, vice-president in charge of entertainment during the past year, made his report covering the entertainment at the Atlantic City convention, and in the absence of Mr. Blewett, vice-president in charge of finance, the secretary of the association, H. G. McConnaughy, read a report for him covering the registration at the convention. Mr. Baker, vice-president in charge of exhibits, then read a report covering the exhibit conditions and facilities at Atlantic City. Mr. Heulings then presented a report in which he outlined the general condition of the association as well as the work accomplished during the year and submitted a number of suggestions for the future conduct of the affairs of the association. Mr. McConnaughy then read a summary of the financial report, a detailed statement on finances having been handed to each member of the committee present. A report covering the membership was also presented by Secretary McConnaughy, which showed that the association had a membership roll of 342 members, the largest number of members it has ever had when the conventions were held in Atlantic City. The secretary-treasurer's report covering the *Aera* Publicity Fund showed that the sum of \$5,570 had been subscribed and had been turned over to the parent association together with a list of the fund subscribers.

There being no further business before the retiring committee, Mr. Heulings escorted the new president, Cornell S. Hawley, to the chair and requested that he assume it for the unexpired term, or until Jan. 1, 1914. President Hawley accepted the honor with a few appropriate remarks and then asked for a report from the committee on resolutions. B. A. Hegeman, chairman of the committee, reading a resolution which his committee had prepared in recognition of the services of the retiring president.

In this the committee expressed its appreciation of the fact that the advance made by the association during the past year and the increased scope of its work were due to the zeal, executive skill and close attention paid to important detail attendant upon the administration of its affairs by William H. Heulings, Jr., the retiring president, and presented a resolution thanking him for his untiring labor and conscientious devotion to the interests and aims of the association. The resolution was unanimously adopted. A copy from the minutes of the association regarding this action was ordered sent to Mr. Heulings in recognition of his services. A rising vote of thanks from the committee members present was also extended to the retiring president.

President Hawley then appointed Mr. Baker as chairman of a committee on membership and Mr. Colby as chairman of a committee on efficiency, after which the meeting adjourned.



# Meeting of C. E. R. A. Association

Proceedings of Annual Meeting, Held on Dec. 12 and 13 at Cleveland, Ohio—Papers on Essentials of Public Service Accounting and Federal Income Tax Were Presented

The annual meeting of the Central Electric Railway Accountants' Association was called to order at the Hollenden Hotel, Cleveland, Ohio, on Dec. 12. About twenty-five auditors and accounting representatives were present. After the routine business had been disposed of, President Kasemeier reviewed the work done by the association during the year and expressed his appreciation for the co-operation of the individual members.

The report of the executive committee was then read by F. T. Loftus, auditor Indianapolis & Cincinnati Traction Company, Rushville, Ind., and secretary of the association. It recommended that the membership in the association, instead of being restricted to the chief accounting officer, be open to other accounting officials upon the recommendation of the chief accounting officer, only the latter or his designated representative, however, having the right to vote. The executive committee also recommended that in the event of a railway company dropping from the membership of the Central Electric Railway Association the chief accounting officer be continued in the membership of the Accountants' Association, subject to the provisions of the constitution and by-laws. The point was brought out also that the admission of a railway into the membership of the Central Electric Railway Association did not make its chief accounting officer a member of the Accountants' Association, but that such an officer must make application in the regular manner. After a general discussion, the report of the executive committee was adopted.

The report of the standing freight committee was then presented by the chairman, L. T. Hixson, auditor Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind. The report recommended the adoption of certain additions and changes in the agreement now in effect, as well as the adoption of certain rate schedules. After discussion it was decided that the part of the committee's report basing the forms on particular rates for the exchange of equipment be referred back to the committee, and that after taking the matter up with the Central Electric Railway Association the committee include proper basing rates in a further report to be submitted at the next meeting.

The report of the Query Box committee was next read by the chairman, Albert F. Elkins. In the discussion the question of sinking funds came up and Mr. Elkins stated that if the question could be held over until the next day a blackboard demonstration would be given as to the proper entries necessary to handle the sinking fund recommendations in the report.

W. H. Forse, secretary-treasurer Union Traction Company of Indiana, then presented an address on "Proposed Changes in the Classification of Accounts of Electric Railways." T. P. Kilfoyle, auditor Cleveland (Ohio) Railway, stated that the importance of the changes in the present classification made it necessary for the accountants to take some immediate action in order that a careful review of the tentative classification might be made when it was received. Mr. Kilfoyle said that the matter was of added importance because the Interstate Commerce Commission would welcome all suggestions made from every interested source. Mr. Elkins moved that the association, through its president, call a special meeting as soon as possible after the receipt by the auditors of the tentative draft of the new classification, and that invitations be sent to the Interstate Commerce Commission and the American Electric Railway Accountants' Association urging the attend-

ance of their respective accounting officials at this meeting. In the discussion following this motion, H. J. Davies, secretary and treasurer Cleveland Railway, invited the association to meet again in Cleveland, where the first meeting of the Street Railway Accountants' Association was held in 1897. Mr. Elkins' motion was adopted, and Cleveland was selected as the place of the special meeting, subject to the call of the president.

Before adjournment, the president appointed a nominating committee, consisting of the following members: A. F. Elkins, chairman; H. W. Bradtmiller, secretary and auditor Fort Wayne & Northwestern Railway, Kendallville, Ind., and J. N. Tabb, treasurer Parkersburg, Marietta & Interurban Railway, Parkersburg, W. Va.

A letter from M. W. Glover, auditor Mobile Light & Railroad Company, Mobile, Ala., who was first president of the Central Electric Railway Accountants' Association and is now president of the American Accountants' Association, was read by the secretary. Mr. Glover expressed his deep regret at not being permitted to be present and his hope that closer relations between the National and the Central associations might be realized. There being no further business, the convention adjourned to meet again the following morning at 8:30 o'clock.

The first report taken up on Dec. 13 was that of the Query Box committee, accompanied by a blackboard demonstration of sinking fund entries by Mr. Elkins. F. K. Young, auditor Scioto Valley Traction Company, Columbus, Ohio, stated that he did not look with favor upon the plan of treating sinking fund accounts as deductions from income and agreed with Mr. Elkins that entries should be made on the books so as to show the true condition of the company without this deduction. Mr. Hixson thought a plan should be outlined to set up monthly sinking fund accruals and close these at the end of the fiscal year.

After the adoption of the report of the Query Box committee, Mr. Hixson and Mr. Cavanaugh gave their papers on the new federal income tax law, which are abstracted elsewhere. Mr. Davies said it was evident that many of the features of this new law, relating in particular to public service corporations, were not clearly understood, and he suggested that the president appoint a committee of three members whose duty it would be to draft a letter to the Secretary of the Treasury, to be signed by the association through its secretary, requesting an early construction of the provisions of the income tax law that relate to accruals, collections and payments of expenses, income, taxes and interest. This suggestion was put in the form of a motion by Mr. Hixson and carried. The committee will be named by the incoming president.

Mr. Elkins then presented his paper on "Some Essentials of Public Service Accounting," an abstract of which will be found elsewhere in this issue.

The election of officers was the next order of business, and the nominating committee presented the names of two candidates for each office. The ballot resulted in the election of the following:

President—L. T. Hixson, auditor Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.

First vice-president—H. B. Cavanaugh, auditor Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio.

Second vice-president—J. B. Hooper, auditor of freight accounts, Detroit United Railway.

Secretary—F. T. Loftus, auditor Indianapolis & Cincinnati Traction Company, Rushville, Ind.

Executive Committee—T. P. Kilfoyle, auditor Cleveland Railway; F. K. Young, auditor Scioto Valley Traction Company, Columbus, Ohio; J. H. Tabb, treasurer Parkersburgh, Marietta & Interurban Railway, Parkersburg, W. Va.; C. B. Baker, auditor Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio; C. B. Kleinhans, auditor Toledo & Indiana Railway, Toledo, Ohio.

At the conclusion of the election of officers, the new president, Mr. Hixson, assumed the chair and announced that the date of the next meeting of the association would be determined by the executive committee. After a vote of thanks to the hotel management, the Cleveland Railway and the Cleveland, Southwestern & Columbus Railway for courtesies extended, the convention adjourned.

### SOME ESSENTIALS OF PUBLIC SERVICE ACCOUNTING

BY A. F. ELKINS, AUDITOR COLUMBUS, DELAWARE & MARION RAILWAY

The most necessary and primary qualifications for public service accounting may be stated in just three words—character, capability and confidence. Character, says Erskine, "is the slow-spreading influence of opinion arising from the deportment of a man in society." The formation of character is our chief asset, and it ranks at the head of the list. To-day we have men of high moral character in every department of the electric railway field, all striving to perfect a complete unit of service to the public in strict conformity with federal and state regulations. The men who are filling the highest accounting positions are those who have carefully prepared themselves and who show character in every test.

I am glad to see independent accounting schools being established in many of our cities in which a very high standard of accounting is set up. These schools increase the capability of men for public service accounting. The demand for trained accountants in this work is ever insistent, and the way is always open for the man who is really capable of doing better work and not merely desirous of a change of employment.

Character and capability are always necessary, but confidence must form the groundwork around them. In our line of work confidence is very important. We must first decide whether a thing is worth doing, and then as to the manner of doing it. Having once decided, we must approach the thing with confidence and complete it, and the responsibility for the manner and effect of its completion will rest upon us alone, for it is entirely obvious that we who complete the record may best interpret it.

Another important essential is the power to observe. We should secure copies of all acts placed upon the statute books, both state and federal, and familiarize ourselves with those which have a direct bearing upon the railroads. All of them directly affect the accounting departments. Our supreme law-making bodies have forced the auditor to the front of the rank. Instead of the old self-centered book-keeper, we have the trained accountant, the analyst, who must exhaust every means at his command to become thoroughly familiar with every detail of the operation of the property, in order that he may not only record the figures but also know and understand the reasons therefor. For instance, the auditor must be in position to see that no additions are made to capital account, under expenditures for road and equipment, except such as properly and legally belong there and are properly authorized, and only then after such additions are passed upon by a higher official. There is a marked distinction between new works, or betterments, and mere replacements, and for the protection of all concerned it is the auditor's business to show a clear balance sheet in this regard.

Another essential is that of uniformity. It would seem quite impossible to fix a set of hard and fast rules to govern the accounting of public service corporations, but we are well on the way toward an ideal uniform system, and a goodly share of the credit for this may be entered to the account of the Central Electric Railway Accountants' Association. As early as March, 1897, in Cleveland, C. N. Duffy, then secretary and treasurer of the Citizens' Street Railway of St. Louis, read a paper entitled "Suggestions for a Standard System of Accounts, Classification of Operating Expense Accounts and Form of Report That Will Admit of Comparison and Diffuse Information Between Companies." At the next convention, held in Boston in 1898, the revised form was adopted and came into general use. Then when Circular No. 20 was sent out to all railroads by the Interstate Commerce Commission, our accountants assisted the commission with suggestions for a uniform system of accounts. The alphabetical list of items of expense in the operation of electric railways, which is now in general use all over the United States, was prepared by the members of this association.

Another essential in accounting that might be mentioned is a feeling of responsibility. With an almost ideal uniform accounting system in operation, the auditor still must feel a responsibility for local conditions. In particular a watchfulness must be exercised in perfecting the system so as to make it quite impossible for agents and others to become careless in making reports. Carelessness on the part of anyone in the matter of accounting for the company's money or property should be vigorously discouraged. The auditor should feel a responsibility and exercise that carefully without assuming too much authority. I find from experience that better results may be had by a close personal connection with the operating officials, and whenever they are advised of carelessness or inattention on the part of employees my experience is that they will stand firm for the auditing department.

Detail in accounting is another essential worthy of mention. The successful auditor of to-day must be practically wedded to detail. At least one-third of our time is spent in our offices going over and assembling a mass of data, day after day, month after month, until finally we come to the end of the fiscal year. Then we see the net result of our work within the covers of an annual report. None but ourselves may comprehend the labor and worry necessary to bring before the managers of our companies and the public this result.

I would make brief mention of the journal in public service accounting. This book forms one of the most important essentials in our work. Journal entries will always demand complete investigation and verification in an audit by certified public accountants. Auditors spend much time and thought setting up complete facts in vouchers, involving the payment of money, but they are very liable to overlook the importance of writing a complete explanation of extraordinary journal entries. Every journal entry should be supported by all of the facts necessary to make the entry clear to anyone. Complete explanatory detail in support of the mere debit and credit framework of the entry may some time mean personal protection.

The power to analyze should become a fixed asset with all auditors and accountants. A knowledge of the underlying principles involved in a proposition of accounting not only completes the end sought, but is sure to create confidence in us and our work. It is the duty of auditors to study and analyze the conditions, and to be always ready to furnish operating facts to the managers that may help them to solve the problems daily confronting them. It is due to the wisdom and action of these managers as much as to the governing statutes that we are witnessing a new dawn of corporate publicity, and it is within the power of the auditor to be of immeasurable assistance in the furnishing of operating and financial data.

## THE FEDERAL INCOME TAX LAW AS APPLICABLE TO ELECTRIC RAILROAD CORPORATIONS

BY H. B. CAVANAUGH, AUDITOR CLEVELAND SOUTHWESTERN & COLUMBUS RAILWAY

The present income tax law applies to net income accruing after March 1, 1913, but the excise tax law of 1909 was re-enacted to cover the months of January and February, 1913, on the same conditions as the present law, so that corporations in making returns under the present law for the fiscal year ended Dec. 31, 1913, will include the full year, and such report must be filed on or before March 1, 1914. A corporation whose fiscal year ends on the last day of some month other than December may make its report as of its fiscal year but is required to notify the collector of internal revenue of its district within thirty days from the day it designates as the close of its fiscal year of its intention to make returns as of its fiscal year, stating the date on which its year ends. Such a corporation is then required to file its report within sixty days after the date of the closing of its fiscal year.

For 1913 nearly all corporations will be required to make report as of the calendar year for the reason that they have not had sufficient time in which to notify the collector of internal revenue of their intentions. For instance, a corporation whose fiscal year ended June 30, 1913, would have been required to notify the collector of internal revenue before July 1, 1913; but a corporation whose fiscal year ends June 30, 1914, may notify the collector of internal revenue of such fact prior to July 1, 1914. Such a corporation may make its return for the six months of 1914 and can then make its return at the close of the fiscal year as of June 30, 1915.

Each corporation is required to see that the proper forms for making returns are received by application to the collector of internal revenue for its district. It will not be considered the duty of the collector of internal revenue to forward blanks and a corporation cannot plead this as an excuse for not filing a report. In case of sickness or absence on the part of an officer of a corporation, the time limit in which reports are required to be filed may be extended thirty days by application to the collector of internal revenue for its district, but such a request must be made prior to the date upon which the return is made.

### PENALTY

For neglecting or refusing to file returns within the time limit a corporation will be liable to an addition of 50 per cent to the amount of the tax and will also be subject to a fine of not more than \$10,000. Any officer of a corporation required to make a return under this law who knowingly signs a return which is not correct with the intention of evading the tax will be guilty of a misdemeanor and will be liable to a fine of not more than \$2,000 or to imprisonment of not more than one year, or both. Furthermore, the tax due from such corporation will be subject to a fine of 100 per cent.

The failure of a corporation to pay the tax when due as assessed by the collector of internal revenue and ten days after notice and demand by the collector of internal revenue will be subject to an addition of 5 per cent to the amount of tax unpaid and interest at the rate of 1 per cent per month from the time such tax was due until paid.

### FORMS OF RETURN

The returns are required to show:

1. The total amount of paid-up capital stock outstanding at the close of the year for which returns are made.
2. The total amount of bonded and interest-bearing indebtedness at the close of the year for which returns are made.
3. The gross amount of income received from all sources during the year.

4. The total amount of operating and maintenance expenses paid within the year, all rentals or other payments required to be made as a condition of operating or holding property being stated separately.

5. The total amount of losses actually sustained during the year not compensated by insurance or otherwise and including depreciation.

6. The amount of interest accrued and paid during the year.

7. Taxes paid.

8. Net income.

The first two requirements are easily understood and will not be discussed.

### GROSS AMOUNT OF INCOME RECEIVED FROM ALL SOURCES DURING THE YEAR

In the case of personal returns the law refers to gross income as gains, profits and income derived from salaries, wages, etc., and from any source whatever; while in returns for corporations the law refers to gross income as income arising or accruing from all sources during the preceding calendar year. The gross income of a corporation as shown by the report to its stockholders doubtless includes accrued earnings as well as cash receipts, but the fact that cash or its equivalent will be received in the future for these accruals makes such a gross income a proper return. It seems evident that the gross income to be returned by a corporation should be the same as shown on its books and by its reports. This appears to be borne out by the analysis of the law by L. F. Speer, deputy commissioner of internal revenue, wherein he states that "with responsible corporations the books are supposed to show the facts," and, again, that "the government will not be likely to accept a return of annual net income of a corporation showing a statement of facts at variance with its report to its stockholders or at variance with books of record unless it shall be shown that such reports and records are erroneous." A. H. Walker, attorney of New York City, however, claims that accruals are not intended to be used in connection with gross income and that a corporation cannot be taxed on income not actually received during the year for which return is made.

This question was thoroughly analyzed by accountants for the purpose of making returns under the excise tax law of 1909, and it was generally understood that gross income and net income were to be as shown by a corporation's books and reports. This view of the case is borne out by instructions issued by Secretary MacVeagh regarding the return to be made under the excise tax law of 1909, in which he states in part as follows:

"An impression has obtained in some quarters that no items should be considered in making up the account of the corporation, either as income or a deduction, unless its receipt or disbursement was evidenced by an actual cash transaction. When we contemplate the complications and intricacies of the business affairs of a great corporation, with its many dealings with other corporations and individuals, which are never settled in cash but on somewhat the clearing-house plan, any attempt to follow each of these transactions out into the cash book would result in inextricable confusion, uncertainty and inaccuracy. It will appear, therefore, that the return is to be made from the ledger and not the cash book, and that entry on the ledger from Jan. 1 to Dec. 31 of the year for which return is made is the evidence which will determine whether or not an item is to be considered in making the return."

### OPERATING AND MAINTENANCE EXPENSES

Operating expenses would seem to be understood to be the same as shown by the books and records of a corporation. Rentals seem to mean the fixed sum paid for a property taken over from another company and operated, but not charges for offices, buildings or small pieces of land which the company may be renting and using in its operation of property. They are included in operating expenses.

LOSSES SUSTAINED DURING THE YEAR NOT COMPENSATED BY  
INSURANCE AND INCLUDING DEPRECIATION

The deductions allowed in this item would seem to be from loss of property or accounts not compensated by insurance and charged off on the books of the corporation. An allowance is also made of a reasonable amount for depreciation, provided that this account is recognized by the corporation, in which case it will, of course, appear in its reports.

INTEREST AND TAXES

It would appear that items of interest and taxes should be treated in the same manner as gross income; that is, the amount to be deducted would be the amount accrued and not the amount actually paid, with the exception that a corporation will not be allowed to deduct interest on an amount of its bonded and other indebtedness in excess of one-half of the amount of its outstanding capital stock and bonded and other indebtedness.

Taxes on real and personal property, on gross earnings and on net income imposed by the state or federal governments are allowed to be deducted, with this exception—that taxes imposed by a municipality for local benefits, such as paving, sewer, etc., cannot be included. The normal tax of 1 per cent paid by a corporation on bond interest, where the provision of the mortgage guarantees the payment of interest free of tax, cannot be included in the deduction of taxes. No provision is made in the foregoing items of deductions for amounts received by a corporation from securities of another corporation held by it, whether in the form of interest or dividends. It would appear to be the intent of the law to compel a corporation receiving such amounts to report them as gross income on which it must pay the normal tax of 1 per cent, although the corporation paying these amounts has included them in its report of net income.

NET INCOME

The law defines net income as the amount derived after deducting from the gross income received from all sources during the year the specific deductions heretofore enumerated.

THE NEW FEDERAL INCOME TAX LAW

BY L. T. HINSON, AUDITOR TERRE HAUTE, INDIANAPOLIS &  
EASTERN TRACTION COMPANY

That portion of the tariff act approved Oct. 3, 1913, which provides for an income tax will no doubt be read by a greater number of people than any other section of the act. While it may appear that the exemption of \$3,000 or \$4,000, as the case may be, will relieve a great many of the necessity of giving this law any consideration, it will be found, on close examination, that a large number of people will be affected in that they will be required to make various reports and certificates, although they will finally be tax-exempt if such reports and certificates are properly prepared.

Officers of corporations will also have to be on the alert and to keep abreast of the rulings promulgated by the Treasury Department not only as to taxes to be assessed against the corporation but as to deductions which such corporation is required to make from certain payments to individuals.

The provisions of the old excise tax law (commonly called the corporation tax law), which is superseded by the income tax law, are considerably changed by the new statute. For example, the specific exemption of \$5,000 allowed corporations under the old law is not allowed; neither is it specifically stated that the amount of dividend received from stocks of corporations subject to the tax may be deducted, although the law may be construed as allowing this deduction. There is also a different basis for

arriving at the amount of interest which may be deducted.

The law might be subdivided into two parts—that principally affecting individuals and that which affects corporations mainly.

CORPORATIONS

The old corporation tax law was re-enacted and covers the period Jan. 1 to Feb. 28, 1913, at which time the income tax law took effect. The re-enacted corporation tax law provides that the amount of tax to be assessed against a corporation for January and February shall be ascertained in accordance with the provisions of the income tax law, and provides further that a corporation shall be required to make one return only for the full year of 1913. Therefore, to all intents and purposes, the old corporation tax law is a dead letter from Dec. 31, 1912, so far as returns are concerned.

COLLECTION AT THE SOURCE

The most complicated portion of the act seems to be that pertaining to collection of the tax at the source.

The law provides that all persons, firms, corporations, etc., having the control, receipt, disposal or payment of fixed or determinable annual or periodical gains, profits and income of another person subject to tax, shall, in behalf of such person, deduct and withhold from the payment an amount equivalent to the normal income tax upon the same and make and render a separate and distinct return of the income of each person; provided that no portion of such tax shall be withheld prior to Nov. 1, 1913; provided, further, that no return of income as above shall be required, if such income for any taxable year, exclusive of dividends on capital stock of corporations, etc., subject to the tax, is not in excess of \$3,000, except that the tax of 1 per cent shall be deducted from interest on bonds, etc., regardless of the fact that the amount of interest may be less than \$3,000.

The provisions of the law for collection at the source refer to the normal tax of 1 per cent only.

Owing to difference of opinion as to the interpretation of the law, especially that part pertaining to collection at the source, the Treasury Department has at this writing issued two pamphlets covering regulations regarding the deduction of income at the source—one covering bond interest and similar income, the other covering income other than bond interest, etc. A ruling regarding the tax on bond interest provides that, for the purpose of collecting the tax, the "source" shall be the debtor or its agent in the United States. On the debtor or agent, therefore, falls the duty of withholding the tax, and such tax shall be withheld by no other bank, trust company or individual taking coupons or interest orders for collection; provided that the owner makes a certificate of ownership showing whether exempt or not and delivers said certificate with the coupons. If, however, the coupons are not accompanied by such certificate of ownership, the bank or trust company first receiving the coupons is required to fill out a form of certificate acknowledging responsibility for the collection of the tax. This certificate accompanies the coupons to the debtor or his agent, and the tax is not again withheld, but the certificate is filed by the debtor or his agent with the government.

There are several forms of certificates authorized by the Treasury Department for use in connection with collection of bond interest.

All certificates of ownership of bonds, etc., received by the debtor or agent must be filed by either of them with the collector not later than the twentieth of the following month. While, according to the law, the trustee under a mortgage is authorized to file these certificates, it would probably be more satisfactory for the debtor to make all reports to the collector, thereby retaining all records of transactions as well as saving considerable expense in the way of fees to the trustee. This item of filing reports of bond interest paid, listing certificates, etc., will be found

to be no small matter. There will also be required changes in, or additions to, ledger accounts to provide a complete record of these transactions, so that they will be clear at all times and that the representative of the Treasury Department may readily audit them if he so desires.

The law provides that the normal tax on individuals to be withheld at the source shall not be construed to require any of such tax to be withheld prior to Nov. 1, 1913. The question then arises as to whether the entire amount of interest which matures Dec. 1 is to be taxed or only that portion accruing after Nov. 1. For example, six months' interest, amounting to \$25, might be due Dec. 1. Would the tax be collected on \$25, the full amount, or on \$4.16, the amount accruing since Nov. 1? One ruling by the Treasury Department provides that "the tax shall not be withheld on coupons or registered interest maturing and payable before March 1, 1913, although presented for payment at a later date." This ruling is probably made for the reason that the proclamation of the Secretary of State stating that the proposed amendment to the constitution had been ratified by the proper number of states was not issued until Feb. 27, 1913.

This brings up the questions: What shall be considered income, the amount actually received or the amount accruing to a certain period? Will the individual include in his returns the amount of interest received between March 1, 1913, and Jan. 1, 1914, regardless of the fact that a portion of this interest accrued prior to March 1, 1913? It would seem that the Treasury officials would have an endless task if they were to apply the "accrual" basis to individuals, and that they will very likely consider the amount as income during the period in which it was actually received. With corporations, however, the reports and collections will probably be made in the same manner as the books of account are kept—usually on the "accrual" basis. Therefore, the ruling mentioned above probably refers to the contract date of payment, and any interest due March 1, 1913, or thereafter would be taxable on the full amount paid and not the proportion accruing after March 1, at least so far as individuals are concerned.

There are a number of mortgages which provide for payment of both principal and interest without deduction for any tax which the company may be required to retain. In such cases the debtor would pay the tax in full. However, when the owner of the bond makes his return he must list as a part of his income the interest received on such guaranteed tax-free bonds, and if he is not exempt from taxation he will pay on such interest. This would make double taxation—the debtor paying tax and also the bond owner. In such cases would the owner not have the right to show such amount on his return as a deduction under item 8—"the amount of income the tax upon which has been paid or withheld for payment at the source"?

The law does not specify that the tax on such bond interest must be finally paid by the bond owner to entitle him to claim the deduction, but it does very clearly state that no credit as a deduction shall be made to a company for taxes paid on bonds issued with a guaranty that they are free from taxation.

In addition to bond interest or similar income, the income arising from other interest, such as ordinary notes and open accounts, rents, salaries, wages, etc., is taxable at the source. Such tax shall not be withheld, however, until such time as the rents, salaries, etc., shall have reached an aggregate amount in excess of \$3,000. When such amount has been reached the withholding agent (source) shall withhold the normal tax on the entire amount (\$3,000 and excess) unless the person entitled to the income files with such withholding agent a notice, the form of which is prescribed by the Treasury Department, claiming exemption under paragraph C of Section 2 of the act, in which case the withholding agent shall withhold tax on the income in excess of the exemption (\$3,000 or \$4,000) only.

POINTS AFFECTING INDIVIDUALS NOT CLEARLY SET FORTH,  
WHICH WILL DOUBTLESS REQUIRE SPECIAL RULING  
UNTIL DECIDED BY THE COURTS

The law provides very clearly that \$3,000 or \$4,000 of the net income is exempt from the normal tax, but is very indefinite as to whether this applies to the additional tax.

The law allows as a deduction from income, so far as the normal tax is concerned, under item 7, the amount of dividend received from corporations, etc., subject to the tax, and under item 8, the amount of other income the tax on which has been paid or is to be paid at the source. Does this also apply to the additional tax?

Under the law the additional tax is assessed upon the net income in excess of \$20,000. Paragraph C of Section 2 provides "that there shall be deducted from the net income of each of said persons, ascertained as provided herein, the sum of \$3,000," etc. If this is to be a deduction from income in computing the additional as well as the normal tax, it would seem that the wording of the law should be "income exemptions," or "deductions from gross income," instead of deductions from net income. Paragraph A, Subdivision 1, reads, "that there shall be levied, assessed, collected and paid annually upon the entire net income arising or accruing from all sources . . . a tax of 1 per cent per annum upon such income, except as hereinafter provided . . ." Paragraph D of Section 2 exempts individuals from the normal tax as far as dividends are concerned, in the following words: "Persons liable for the normal income tax only . . . shall not be required to make return on dividends on the capital stock or from the net earnings of corporations . . . taxable on their net income as hereinafter provided."

Subdivision 2 of paragraph A reads: "All the provisions of this section relating to individuals who are chargeable with the normal income tax, so far as they are applicable and not inconsistent with this subdivision of paragraph A, shall apply to the levy, assessment and collection of the additional tax imposed under this section." Therefore it would appear that it was the intent of the law that neither the \$3,000 or \$4,000 items, dividends or other income on which the normal tax was paid at the source, should be exempt from the additional tax.

POINTS NOT CLEAR AFFECTING CORPORATIONS

The principal point on which there seems to be doubt is as to whether credit may be taken for the payment of tax at the source on income which a corporation may receive from dividends. While that portion of the law relating especially to corporations (paragraphs G to I inclusive) does not make any mention of this item, it is certainly proper to claim credit for such payment at the source, if it is allowable to individuals, or if it is proper to assume that the individual is to pay the additional tax on such items, and the \$3,000 or \$4,000 exemption item.

The Treasury Department has not at this writing issued blank forms for making out the reports, but these would be made substantially as shown in the accompanying table.

INDIVIDUALS (ENGAGED IN BUSINESS)

Gross income from all sources.....	\$275,000
Less gross income exempt from taxation (interest on United States bonds, etc.).....	5,000
	\$270,000
Deductions from gross income:	
1. Necessary expenses actually paid in carrying on business (not including personal, living or family expense).....	\$120,000
2. Interest paid on indebtedness within the year....	2,000
3. Taxes (not including those assessed against local benefits).....	1,000
4. Losses actually sustained during the year, not compensated for by insurance or otherwise.....	500
5. Debts actually found to be worthless and charged off within the year.....	1,000
6. Depreciation of property during the year.....	500
	125,000
Net income.....	\$145,000
Less net income exempt from normal tax (assumed in this case \$4,000).....	4,000
Balance net income, on which normal tax is assessed .....	\$141,000

Normal tax:			
1 per cent on \$141,000.....			\$1,410
Additional tax (\$20,000 to \$145,000)			
1 per cent on \$30,000 (20,000 to 50,000)	\$300		
2 per cent on 25,000 (50,000 to 75,000)	500		
3 per cent on 25,000 (75,000 to 100,000)	750		
4 per cent on 45,000 (100,000 to 145,000)	1,800		3,350
Total tax .....			\$4,760
Less normal tax paid at the source:			
7. Dividends from corporation, \$20,000 at 1 per cent	\$200		
8. Bond interest, salary, etc., \$7,000 at 1 per cent	70		270
Balance tax payable by individual.....			\$4,490

INDIVIDUALS (NOT ENGAGED IN BUSINESS)

Gross income, all sources.....			\$4,500
Deductions from gross income:			
2. Interest paid.....	\$200		
3. Taxes paid.....	100		300
Net income.....			\$4,200
Exempt from normal tax.....			4,000
Normal tax assessed on balance.....			\$200
1 per cent of \$200, which is the amount of tax payable .....			\$2

CORPORATIONS

Gross income from all sources.....	\$1,000,000		
(If any portion of this gross income is exempt, such exemption will be deducted as shown on sample for individual engaged in business.)			
Deductions from gross income:			
1. Ordinary and necessary expenses paid within the year in the maintenance and operation of business and properties including rentals and other payments required to be made as a condition to the continued use or possession of property....	\$500,000		
2. Losses actually sustained within the year and not compensated for by insurance or otherwise, including depreciation.....	5,000		
3. Interest accrued within the year on indebtedness not exceeding one-half of the sum of interest-bearing indebtedness and paid-up capital stock outstanding at the close of the year.....	250,000		
4. Taxes paid within the year (not including income tax paid on guaranteed tax-free bonds).....	35,000		790,000
Net income on which tax is assessed.....			\$210,000
Tax, 1 per cent on \$210,000.....			\$2,100
Less tax paid at source:			
Dividends received, 1 per cent on \$5,000.....			50
Balance tax payable.....			\$2,050

PROBLEMS IN THE LAW

In conclusion, I wish to put the following questions before you:

1. When the interest falls due at a date different from that closing the year for which report is made, what amount shall be reported—the amount accrued during the year, or the amount paid? The wording of the law is “accrued and paid.”

2. When taxes are assessed one year and are not due until the following year (in Indiana, first Monday in May and first Monday in November), although they become a liability accruing to the year in which assessed, shall the amount shown on the income tax report be the amount paid during the year (previous year's tax) or the tax assessed during the year and accrued on the books? The law states “paid within the year.”

3. Do individuals pay the additional tax on (a) \$3,000 or \$4,000 exemption? (b) Dividends received? (c) Other income on which the normal tax has been paid at the source?

4. Do corporations pay tax on income derived from dividends that are received from corporations subject to the tax?

5. In withholding tax at the “source” is the withholding agent responsible for the collection of taxes on: (a) Income paid Nov. 1, 1913, and thereafter regardless of the date due? (b) Income paid Nov. 1, 1913, and thereafter if due prior to March 1, 1913? or (c) Income accruing from Nov. 1, 1913, although the payment may include a portion accruing between March 1, 1913, and Nov. 1, 1913? (Treasury ruling states that interest maturing before March 1, 1913, shall not be withheld, although the law is not clear on this point.)

6. Should individuals use the “cash basis” in arriving at their net income?

7. Should corporations use the accrual basis for income reports, provided their books are kept in that manner?

8. May individuals deduce as “paid at the source” the amount of normal tax on bond interest which the debtor is required to pay under terms of mortgage which provides that the principal and interest shall be paid without deduction for any tax which the debtor may be required by any present or future law to make payment of or retain therefrom?

In the final working out of the system, these perplexing points, as well as many others, will be cleared away by the Treasury Department, and all unnecessary reports will, no doubt, be abolished, so that the federal income tax law of 1913 will operate as smoothly as other federal revenue laws have done.

ERRORS IN STATISTICAL ARTICLE

The ELECTRIC RAILWAY JOURNAL greatly regrets that a number of errors have been found in the figures in the article entitled “Statistics of Electric Railway Properties,” published in the issue of Oct. 25, page 925. These figures were not prepared by a regular member of the staff but were purchased and published in good faith in the belief that they furnished interesting information for readers. It was stated at the time the article was published that in view of the complexity of the statistics the correctness of the data was not guaranteed. Reference is made again to this statement, in order that the figures may not be put to any use for which they are not intended.

Attention has been called to certain errors in connection with the figures published for the Ohio Electric Railway. The correct figures of this company for the year ended June 30, 1912, are: Gross earnings, \$3,692,316; net earnings, \$1,744,276; interest and rentals, \$1,269,712; surplus before dividends, \$314,049; operating ratio, 55.35. The statistics of the Ohio Electric Railway, as published, did not include the earnings and expenses of the light, power and steam heat departments and the miscellaneous earnings of the company. The article showed a deficit of \$6,910 without payment of dividends on the company's stock, but the company did pay dividends as rental on the preferred stock of five underlying companies and on the common stock of two underlying companies, and of its surplus \$27,518 was invested in bond sinking funds of underlying companies. The article showed the per cent of surplus to gross as zero, although the actual figure was 8.61 per cent. It showed gross revenue per \$1 of interest and rentals as \$2.19, while the actual figure was \$2.90. It showed miles of track operated as 670. The correct figure is 617.42. It included in trackage the sidings and double track, making a gross revenue per mile of track of \$5,002. With the figures for the sidings and double track excluded, the figures would be \$5,980. A large amount of the capital stock and funded debt of the lessor companies in the system is owned by the Ohio Electric Railway. The article also included the securities of the Columbus Interurban Terminal Company as part of the system. This company is a separate corporation, and while it is controlled by the railway, the funded debt is secured by the terminal property.

The gross receipts quoted for the Winnipeg Electric Railway are from all sources and not from its railway operations only. The miles of track of the Cincinnati Traction Company were published as 442 instead of 227. Errors in mileage have also been pointed out in the case of the International Traction Company, the Puget Sound Electric Railway, the Seattle Electric Company and the Kansas City Railway & Light Company. Changes in these figures would of necessity change the comparative standing of the different roads in the different tables.

Exception has also been taken to the method adopted in determining the extent of the population served, although that method was fully explained in the article and the population assumed was given in every case.

# Chicago City Railway's New Cars

These 100 New Cars Are the First Double-End, Inclosed-Vestibule Motor Cars Purchased for Chicago—  
Several New Features Are Included in the Steel-Frame Design and General Arrangement

The new cars purchased recently by the Chicago City Railway Company, Chicago, Ill., will be the first inclosed double-end motor cars to be placed in service in Chicago. While the near-side cars purchased by this company more than a year ago were entirely inclosed, they were a radical departure from the standard cars of both the surface rail-ways. The new cars in general conform to the old-type standard cars and to the over-all dimensions laid down by the Board of Supervising Engineers. They have arched roofs, however, and provide a seating space for fifty-four passengers, equivalent to that of the near-side cars.

The general dimensions of these new cars are as follows:

Length of car over body corner posts.....	32 ft. 8 in.
Length of car over bumper.....	48 ft. 0 in.
Width of car over all.....	8 ft. 6 in.
Width of car over posts at belt rail.....	8 ft. 5 in.
Height of top rail to top of trolley board.....	11 ft. 7 $\frac{7}{8}$ in.
Truck centers.....	22 ft. 0 in.
Diameter of driving wheels.....	34 in.
Diameter of pony wheels.....	22 in.
Wheel base of truck.....	4 ft. 10 in.
Height of first step above top rail.....	13 $\frac{1}{2}$ in.
Height from first step to platform.....	12 in.
Height from platform to body floor.....	10 in.
Total seating capacity, including vestibules.....	54
Estimated weight complete.....	40,000 lb.

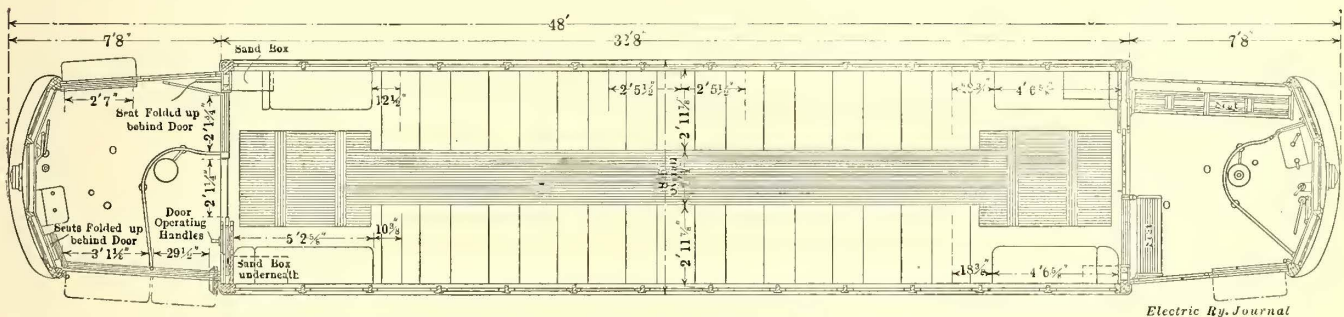
### BODY FRAMING

The design of the bottom framing of these semi-steel cars includes departures from the usual designs employed

### GENERAL ARRANGEMENT

The car body is fitted with thirteen window openings on each side, the upper sashes of which are stationary and arranged in a continuous frame. All lower sashes are arranged to raise vertically to the level of the continuous bottom rail of the upper sash. In addition to these, storm sashes are provided at all side windows of the car for use in extremely low temperatures. The sashes are single, two-light, and conform in shape to the body sashes, being held in place by three brackets and locks mounted on each post.

Each bulkhead of the car contains one swinging door and one sliding door as is now standard for all surface cars in Chicago. The location of these doors, however, is somewhat different from the present standard, in that the stationary portions of the bulkhead are at the sides of the car instead of in the center. By this arrangement it is possible to obtain additional length to the four longitudinal seats in the four corners of the car body. In conformity with the general practice in surface railway car design in Chicago, one side of the vestibule is equipped with a sliding door, fitted with manually operated mechanism, which also raises and lowers the step. The opposite side of the vestibule, however, represents a departure for



Chicago City Railway—1913 Double-End Car

in former Chicago cars. Probably the most marked of these are the side sills, which are inverted fish-belly type girders built of 3/16-in. steel plate and angles and over-trussed. The top is reinforced by a 2-in. x 5/16-in. flat bar and the bottom by a 2-in. x 2-in. x 1/4-in. angle. Three openings, 6 in. x 4 in., cut in the three center panels of these side sills, provide for air-duct connections to the cross-seat heaters in the car. In addition to the plate-girder side sills, the sides of the car are over-trussed by 2 1/4-in. x 3/8-in. steel bars applied on the angle-iron posts 2 ft. 10 3/4 in. above the base of the side sills and anchored at the girder ends.

Another unusual feature in the design of the bottom framing is in the five cross sills. These are arched trusses formed of two 1 1/4-in. x 1 3/4-in. x 1/4-in. steel angles, the upper one being horizontal and conforming to the car floor and the bottom one being in an arch from the bottoms of the side sills to the level of the upper member at the center of the car body. These angles are fastened together at the center and the side sills with 1/4-in. steel plates. This particular design of cross sill is employed because it gives maximum clearance for electrical conduits and other car equipment underneath the center of the car body, and bending tests demonstrate that they are equal in strength to a cross sill of a uniform section carried between the side sills.

Chicago in that it is fitted with folding doors and steps divided into two groups. The two exit doors are hinged to the body corner posts and the two entrance doors are hinged to the vestibule corner posts. Each pair of doors is equipped with hand-operating devices, which also raise and lower the steps. In order to make the operation of these folding doors and steps as easy as possible, the operating mechanism is fully equipped with ball bearings.

Other innovations in the vestibule equipment on the new cars include a light signal system connected with the platform folding doors, which indicates to the motorman that the doors are either in the open or the closed position. In the former designs the motorman's and conductor's seats have been separate from the hand rail dividing the entrance from the exit aisles. The specifications for the new cars provide that these seats are to be fastened to the platform railings by pivotal brackets and made adjustable for height. When the seats are not required they may be folded and swung over to one side clear of both aisles.

Each car is fitted with eighteen cross seats of the "Reversible Walkover" type furnished by Hale & Kilburn. As mentioned earlier in the article, the arrangement of the doors in the bulkhead provides additional length to the four longitudinal corner seats, but in order that the aisles may be clear at the rear end of the car, all four of these longitudinal seats contain collapsible sections adjoining

the bulkheads. Two collapsible wooden seats are also installed in each of the vestibules. One of these seats provides for four persons and occupies the space along the closed folding doors in the front end of the car, and the second seat is for two persons and occupies the space made by the closed and locked swing door in the bulkhead.

#### EQUIPMENT AND FIXTURES

Perhaps no railway company in the country has investigated more thoroughly the question of heating and ventilation than the Chicago City Railway. Practically every known type of ventilator and ventilating system has been tested in order that this company might conform to the ventilating requirements set forth in the Chicago city ordinances and at the same time meet the heating specification also provided by ordinance. The method of ventilation adopted for the new cars appears to conform to the ordinance requirements and embraces a combination of the Cook system, with exhaust ventilators in the vestibules. This system consists of a direct-connected fan motor set in a housing with connection to an exhaust chamber pro-

trance and exit doors, as well as additional lamps installed over each exit door platform. These lamps are equipped with reflectors and arranged to light only on the operating side of the car.

As a result of the exhaustive tests made on maximum traction trucks more than two years ago, they have been adopted as standard by both the Chicago City Railway and the Chicago Railways Company. These trucks are equipped with fully ventilated, field-tap-controlled GE-242 motors, and the control is the GE type K-51. This type of motor was adopted, aside from its other advantages, because of its special adaptability to Chicago operation. It permits of a change in speed without a change in the gear ratio. Other special equipment includes General Electric air-brake type CP-27 with 60-ft. compressors, consolidated Car Heating Company's signal bells and automatic light signal system, and International fare registers. The new cars are being manufactured by The J. G. Brill Company, Philadelphia, Pa.

### THE ILLUMINATION OF STREET RAILWAY CARS

At the regular monthly meeting of the Massachusetts Street Railway Association at Young's Hotel, Boston, on Dec. 10, G. H. Stickney, General Electric Company, Harrison, N. J., presented a paper upon car lighting. President H. H. Crapo, of New Bedford, Mass., occupied the chair, and at the conclusion of the paper a short discussion took place.

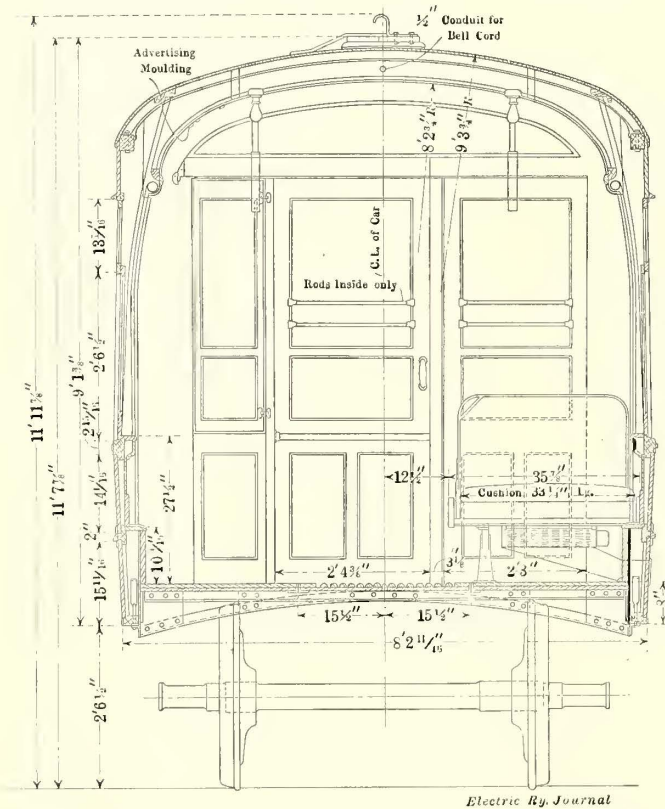
The author pointed out that until within the past two or three years no scientific study had been given to street car lighting, although in other fields enormous economies had resulted from the introduction of tungsten lamps and by the more careful placing of such equipment and selection of reflectors. From the first, the 4-watt-per-candle carbon incandescent lamp of 16 cp was employed in street railway service. Metallized-filament and tantalum lamps were later tried in a few cases, but did not prove effective. The appearance of the wire-drawn filament finally opened the way for successful tungsten lighting on electric cars.

The simplest and most direct method of applying tungsten lamps was the replacement, lamp for lamp, of the carbon units already in use. To meet this service there was developed a lamp consuming 23 watts and giving about 17 cp, which meant an increase of 7 per cent in light flux along with the reduction of 64 per cent in power consumption. While this current saving was large, it was often offset by the cost of renewals, especially under rough service conditions.

#### DESIRABLE FEATURES OF CAR ILLUMINATION

The minimum intensity with which reading may be comfortably carried on under ordinary artificial lighting varies from 2 to 3 ft.-candles, although much lower intensities were used in the past. Lower intensities will suffice for other parts of the car, as long as there is sufficient light to make the car appear bright and comfortable. In distributing the light it is desirable that the lower part of the car be more brightly lighted than the upper portion. Incandescent lamps project their highest intensity in a horizontal plane if run with a vertical axis. By prismatic or translucent glass reflectors properly applied, a large part of the light can be directed downward at such angles as to insure an even distribution. Opaque reflectors above the lamps make the ceilings too dark, and inverted reflectors, while eliminating glare, are less economical and more subject to loss of efficiency through accumulation of dust.

It has been found generally advisable to modify the light from small, brilliant sources by means of reflectors or globes so as to increase the apparent size of the light sources and introduce cross rays of light which tend to minimize contrast and the harshness of shadows. Passengers in electric cars enjoy the dual protection of eyebrows



Chicago City Railway—Section of Body 1913 Closed Car

vided with ceiling registers under the roof. Intake ducts are provided through holes in the side girders and connect to the cross-seat heaters. The fan is arranged for two capacities and is controlled by two three-point indicating snap switches mounted on the bulkhead, one in each vestibule. The fan motors and housing are suspended from the hoods in the car vestibules. A sufficient number of "Utility" exhaust ventilators are installed in each vestibule to meet the requirements of the Board of Health of the city of Chicago.

The heater equipment includes eighteen Gold cross-seat heaters, nine on each side of the car, four panel car heaters, one in each longitudinal corner seat frame, and one heater on each platform, mounted inside the end-sill channels. These electric heaters are equipped with the Railway Utility Company's thermostat control, which provides for automatic regulation of all the heaters in the car body. Other improvements in the design of the cars include sanitary hand straps and additional glass panels in the en-



and hats, so that brilliant light projected downward at steep angles is not nearly so objectionable as the same light projected in a horizontal direction. High location of lights in cars is therefore desirable. Better lighting of platforms and steps is also a field which has been but little studied. Again, sign and headlight lighting deserves more study.

The author then described the pioneer installation of tungsten lamps on the cars of the Bay State Street Railway which was made in 1912 and which was described in the *ELECTRIC RAILWAY JOURNAL* for Sept. 28, 1912. The work was done under the joint direction of the author and E. W. Holst, superintendent of equipment, neither of whom favored a lamp-for-lamp replacement on the basis of tungsten for carbon. A new method of lighting was devised by which the illumination of the car body could be effected by a single row of lamps equipped with reflectors and mounted at the middle of the center deck. Calculations indicated that the entire lighting of the 28-ft. and 34-ft. cars used could be obtained, excluding headlight power, with two circuits per car of 60-watt tungsten lamps, or 600 watts total. It was seen that the advantages over the lamp-for-lamp scheme would be: (a) reduced cost of lamp renewals, on account of the greater strength of the filaments and the lower cost of lamps per candle-power; (b) reduction of glare through the shading effect of reflectors; (c) more effective distribution of light by reflectors so as to direct a high intensity on reading matter in the hands of the passengers. The chief objections to this method were that if the reflectors were not firmly secured they

Probably the most extensive test now under way is on the New York Municipal Railway, where indirect lighting with totally concealed lamps and semi-indirect lighting with translucent shades beneath the lamps are being tried along with the reflector method.

To overcome the extinguishment of all light in the car body by the failure of one lamp a so-called selector switch has been provided by which, on turning the dial, an extra lamp is bridged across each of the lamps in turn until the defective lamp is reached, when the circuit is lighted through the bridged lamp. On account of the wider spacing of units, the illumination is not so even as with the 56-watt method and shadows are more pronounced. The wiring is more complicated and there seems no advantage in economy.

To secure the highest benefit from the reflector method, it is necessary to arrange the equipment in accord with the car construction. The spacing of 56-watt lamps in a single row down the center of the car body should not exceed 6 ft. or 7 ft., preferably the former, and the end lamps should not be more than half this distance from the ends of the car body. A 6-ft. spacing represents an energy consumption of 9 watts per foot of car length and, in a car 8 ft. wide, 1.17 watts per sq. ft. of floor area. A wider spacing tends to make the light distribution uneven and the shadows conspicuous. Care should be taken to secure lamps of the right voltage. If the rated voltage is too high the illumination will be low, which may be objectionable during rush hours or on outlying parts of the system. If too low a rated

CARBON AND TUNGSTEN LAMP INSTALLATIONS

Company	Length Car Body, ft.	Lamps in Body	Reflector	Watts per Sq. Ft.	Ft.-Candles in Body	Lumens per Watt
Bay State Street Railway.....	28	14 64-watt carbon	None	4.09	2.1	0.66
Bay State Street Railway.....	28	4 60-watt tungsten	Holophane I-60	1.29	3.6	2.76
Bay State Street Railway.....	34	15 64-watt carbon	None	3.52	1.45	0.41
Bay State Street Railway.....	34	6 56-watt tungsten	XI-40 clear holophane	1.23	2.93	2.37
Capital Traction Company.....	28	11 54-watt metallized	Flat-steel porcelain enamel	2.65	3.17	1.20
Capital Traction Company.....	28	11 36-watt tungsten	Flat-steel porcelain enamel	1.77	5.13	2.90
Capital Traction Company.....	28	8 36-watt tungsten	XI-40 clear holophane	1.28	5.20	4.04
Massachusetts & Northern.....	24	10 64-watt carbon	None	3.34	4.08	1.22
Massachusetts & Northern.....	24	5 60-watt tungsten	I-60 clear holophane	1.56	4.08	2.62

might work loose and, falling, possibly injure passengers, and that an initial expense would be required in re-wiring and equipping old cars. Steam railroad experience indicated that a proper and safe holder could be made, and it was believed that in new cars the new method would be reasonable in cost, and in old cars the economies of operation and improved service would warrant the expense.

Three separate sets of installations and tests were made on the Bay State system. The lamps used in the final tests and now standard were clear 56-watt "Mazda" straight-side type units with screw bases, the lamps being 5½ in. long x 2½ in. in diameter and having a specific consumption of 1.2 watts per mean horizontal candle-power, the total candle-power being 46.7. The rated voltage of the lamps was selected as one-fifth of the rated voltage of the circuit. The holders were the Safety Car Heating & Lighting Company's 2¼-in. units, and the reflectors were Holophane, XI-40, of clear glass. Adjacent lamps in the car body were placed on alternate circuits to minimize the effects of failure in a lamp on one circuit. Only the holders leave something to be desired with regard to convenience in wiring installation, and some means of making it impossible to insert reflectors without properly securing them would be advantageous. No cases of falling or loose reflectors, however, have occurred in more than eighteen months' operation. A summary of the results obtained is reprinted in the table at the close, which also contains data from other roads at present available.

L. C. Porter, assistant to the author, has co-operated with a number of other street railways for lighting of new equipment. Among these companies are the Massachusetts & Northern, whose Athol and Orange cars are equipped, and the Capital Traction Company, of Washington, D. C.

voltage is selected, the burn-outs may be excessive. Railway lamps are rated lower than those for commercial service, both on account of the voltage variation and the low cost of power.

The headlinings of the Bay State cars are dark yellow, those of the Capital Traction Company being green, and those of the Massachusetts & Northern light yellow.

DISCUSSION

H. F. Wallace, General Electric Company, Boston, said that forty street railways in New England are now using tungsten lamps, and that more than 100,000 of these are in service in this section alone.

John W. Corning, electrical engineer Boston Elevated Railway, said that his system is changing to tungsten lamps, using 23-watt units in place of the 64-watt carbons. No shades are employed. On the Boston system there are few places where low voltage is a factor in car lighting.

Paul Winsor, chief engineer motive power and rolling stock Boston Elevated Railway, cited the economical service furnished by tungsten lamps on the rapid transit lines and Cambridge subway platforms. In the latter case the demand charge of the Cambridge Electric Light Company for emergency service is reduced by the use of tungstens, which decrease the connected load.

E. W. Holst, superintendent of equipment Bay State Street Railway, Boston, emphasized the importance of designing shades so that they cannot be loosened by car cleaners. Experience on the Bay State lines shows more than 35 per cent longer life in the 56-watt lamp as compared with the 23-watt size. In closing, Mr. Stickney said that constant improvements are being brought forward in lamp design and manufacture and that the lamps now on the market are much stronger than those made a year ago.

# The Engineering Problem of Electrification\*

The Author Presents Lists of All American Electrifications of High-Tension A. C. and D. C. Roads, and Offers Comparative Data to Prove the Superiority of High-Voltage D. C. Systems to A. C. Systems of Split-Phase or Other Types

BY A. H. ARMSTRONG, RAILWAY DEPARTMENT, GENERAL ELECTRIC COMPANY

The broad question of whether electrification will show an attractive return upon the large capital investment required can best be determined by a detailed investigation of the local conditions obtaining in any given case. Any estimate of a general character is at best more or less misleading when applied to a specific problem. The electric locomotive possesses many operating characteristics not shared by the steam engine, and its introduction opens up possibilities in operating methods that may make it desirable to effect sweeping changes in train operation as now carried on with steam engines. Until one or more engine divisions are electrically operated, what it means to the railway operator to be relieved of many of the limitations of the steam locomotive perhaps may not be fully appreciated.

For example, given an electric locomotive capable of hauling an 800-ton passenger train at 60 m.p.h. on level track and, without assisting locomotives, able to haul the same train up grades of 2 per cent at a speed of 25 m.p.h., it is possible to make radical improvements in schedule. When it is considered furthermore that such an electric locomotive requires no stops for fuel and water and can operate 1200 miles or more between inspections, it is evident that electrification calls for considerable readjustment of steam railroad traditions.

Failure to grasp fully the possibilities of electrical operation may result in running up the first cost of proposed electrification to an extravagant total upon which no adequate return is possible. So much local color is required to discuss intelligently the question of "Will it pay to electrify?" that no attempt will be made in this paper to discuss the financial aspect of the matter. The several important installations now under construction and the even larger projects upon which favorable decision has been reached all point to the fact that electrification must be attractive in some instances at least. There are, however, certain fundamental data governing the operation of all electric locomotives, and it is the purpose of this paper to discuss some of the engineering questions involved.

At the outset, it is found that the electrical engineer has perfected several types of locomotives and different methods of distributing electric power to them, thus giving rise to what are known as several different "systems of operation." The term "system" is generally applied to the combination of locomotive and trolley or third-rail distribution, as the question of power generation and transmission is common to all. While it is true that the single-phase and split-phase locomotives call for a supply of single-phase, 25-cycle or lower power, it is only in isolated instances that this kind of electric power can be economically generated and used exclusively by the railway company. Large power installations are now so well equipped to give attractive power rates over extended areas, and economical electric power production is so completely an industry in itself, that local conditions must be very favorable to justify the installation of a separate power house devoted exclusively to railway load. Even should such a separate installation be made, it may be considered sound engineering to look to future possibilities and install apparatus similar to that in neighboring systems where the frequency and voltage are

standardized. Different frequencies are not as serious as conflicting track gages, but they do involve the burden of expense and loss in efficiency of frequency changing sets which it may some day be found expedient to install in order to tie the two systems together. Hence the statement is again made that the generation and transmission of power offer the same problem without regard to the system of electrification favored.

It is proposed to replace the steam engine with a type of motive power that offers superior advantages in the hauling of heavy trains. In other words, the electric locomotive itself constitutes the main argument in favor of electrification, and no marked excellence of distribution system can offset the failure of the electric motive power. The steam locomotive it is proposed to replace is a highly developed machine of great reliability and the result of the experience born of a great many failures. It cannot be too strongly emphasized, therefore, that the electric motive power is the controlling factor in main-line electrification, a point of view that is sometimes overlooked.

The three electric systems considered for main-line electrification are as follows: Single-phase, alternating; split-phase, alternating, and high-voltage, direct current.

The single-phase commutating motor has been in operation upon interurban electric railways for some years, and a study of the history of these installations reveals some of the fundamental reasons why this type of motive power has not been more generally adopted. It has been found that the initial expense and cost of upkeep of rolling stock equipped with single-phase commutating motors is fully double that of cars having the same seating capacity and equipped with direct-current motors. No new installations have been made for the past two years, and the several single-phase roads are being changed over to direct current as fast as financial conditions will permit. Table I is a list of the single-phase installations, and on those roads starred the single-phase motors have been replaced with the d.c. type.

TABLE I—SINGLE-PHASE RAILWAY INSTALLATIONS IN UNITED STATES AND CANADA

Name of Railway	Year
Indianapolis & Cincinnati Traction Company	1904
*Atlanta Northern Railway	1905
*Illinois Traction System	1905
Long Island Railroad—Sea Cliff division	1905
San Francisco, Vallejo & Napa Valley, California	1905
*Warren & Jamestown Street Railway	1905
Westmoreland County Traction, Derby to Latrobe, Pa.	1905
Spokane & Inland Empire Railroad	1906
*Toledo & Chicago Railway	1906
*Anderson Traction Company, S. C.	1907
Erie Railroad	1907
Fort Wayne & Springfield Railway	1907
*Milwaukee Electric Railway (interurban division)	1907
New York, New Haven & Hartford Railroad	1907
*Pittsburgh & Butler Street Railway	1907
Richmond & Chesapeake Bay Railway	1907
Windsor, Essex & Lake Shore Electric Railway	1907
*Baltimore & Annapolis, Short Line	1908
Chicago, Lake Shore & South Bend Railway	1908
Colorado & Southern: Denver & Interurban Railroad	1908
Grand Trunk Railway: Sarnia-Port Huron tunnel	1908
Hanover & York Railway, Pa.	1908
Shawinigan Railway, Quebec	1908
Visalia Electric Railway, California	1908
*Washington, Baltimore & Annapolis Electric Railway	1908
Rock Island Southern: Rock Island to Monmouth	1910
New York, Westchester & Boston Railway	1911
Boston & Maine: Hoosac Tunnel	1911

The introduction of the single-phase system was a result of the success of suburban and interurban electric railway operation and the extension of these lines over large areas, thus bringing into prominence the question of economical

\*A paper read at Montreal, Que., before the Canadian Society of Civil Engineers, Dec. 18, 1913.

power distribution. It was recognized that a voltage higher than the commonly accepted standard of 600 volts was desirable upon the trolley in order to minimize the cost of installing feeder copper and substations. While the single-phase motor was being developed and installed upon interurban railways, careful attention was also being given to the question of the possibility of using d.c. motor equipments at higher voltages, and this resulted in the installation of the first 1200-volt road, the Indianapolis & Louisville Traction Railway, operated in 1907. The success attending this operation led to other similar installations at both 1200 volts and 1500 volts until it is now generally recognized that the high-voltage d.c. system is without a competitor for all classes of suburban and interurban electric railways. It is a safe prediction to make that no more single-phase motor equipments will be placed in operation in this country on new roads unless these roads virtually form an extension of existing systems.

Table II is a list of the several high-voltage d.c. installations in the United States and Canada.

TABLE II—HIGH-VOLTAGE DIRECT-CURRENT RAILWAY INSTALLATIONS IN UNITED STATES AND CANADA

Road	Voltage	No. of Equipments	Date
Indianapolis & Louisville Traction Railway Company, Scottsburg, Ind.	1200	13	October, 1907
Central California Traction Company, Stockton, Cal.	1200	22	June, 1908
Pittsburgh, Harmony, Butler & New Castle Railway, Eidenau, Pa.	1200	30	July, 1908
Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md.	1200	47	February, 1910
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.	1200	32	March, 1910
Aroostook Valley Railway Company, Presque Isle, Me.	1200	6	July, 1910
Oakland, Antioch & Eastern Railway, San Francisco, Cal.	1200	25	1910
Southern Cambria Railway Company, Johnstown, Pa.	1200	10	1910
Shore Line Electric Railway Company, Saybrook, Conn.	1200	22	September, 1910
Southern Pacific Railway (Oakland, Alameda & Berkeley division), Cal.	1200	82	April, 1911
Fort Dodge, Des Moines & Southern Railway, Boone, Ia.	1200	29	September, 1911
Southwestern Traction & Power Company, New Iberia, La.	1200	3	May, 1912
Oregon Electric Railway, Portland, Ore.	1200	72	July, 1912
Davenport & Muscatine Railway Company, Davenport, Ia.	1200	7	August, 1912
Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo.	1500	22	June, 1913
Piedmont Traction Company, Charlotte, N. C.	1500	43	1913
Nashville-Gallatin Interurban Railway, Nashville, Tenn.	1200	6	April, 1913
Butte, Anaconda & Pacific Railway, Butte, Mont.	2400	17	June, 1913
United Railways Company, Portland, Ore.	1200	8	June, 1913
Southern Traction Company, Dallas, Tex.	1200	30	October, 1913
Pittsburgh & Butler Railway, Pittsburgh, Pa.	1200	13	1913
Pacific Electric (San Bernardino division), Los Angeles, Cal.	1200	54	Building
Tidewater Southern Railroad, Stockton, Cal.	1200	4	1913
Portland, Eugene & Eastern Railway, Portland, Ore.	1500	38	Building
Southern Illinois Railway & Power Company, Harrisburg, Ill.	1200	5	September, 1913
Jefferson County Traction Company (Eastern Texas Electric Company), Beaumont, Tex.	1200	7	Building
St. Paul Southern Electric Railway, St. Paul, Minn.	1200	5	Building
Michigan United Traction Company, Jackson, Mich.	2400	20	Building
Canadian Northern Railway, Montreal, Canada	1200	40	Building
Canadian Northern Railway, Montreal, Canada	2400	14	Building
Canadian Pacific Railway, Rossland, B. C.	2400	4	Building

All of the foregoing roads are operating with the highest degree of success and no change of type of equipment has been made or any such contemplated.

The history of the battle of the systems and the elimination of the single-phase motor as being unsuitable for the equipment of light electric railways has an important bearing upon the selection of systems for main-line electrification. The limitations of the single-phase motor that lead to its failure in the interurban railway field do not appear to be lessened when considering it for locomotive equipment, with the result that it is in use but on three of the twelve roads that are truly representative of electrified steam roads operating large electric locomotives.

TABLE III—MAIN-LINE ELECTRIFICATION—UNITED STATES AND CANADA

Installation	Year	Type Locomotive	System	Voltage
St. Clair Tunnel	1908	Gearless	Single-phase alternating	3,300
N. Y., N. H. & H.	1907	Gearless	Single-phase alternating	11,000
Hoosac Tunnel	1911	Gearless	Single-phase alternating	11,000
Cascade Tunnel	1909	Gearless	Three-phase alternating	6,600
*Norfolk & Western	1914	Gearless side rod	Split-phase alternating	16,500
Baltimore & Ohio Tunnel	1895	Gearless	Direct current	600
New York Central	1906	Gearless	Direct current	600
Detroit Tunnel	1910	Gearless	Direct current	600
Pennsylvania Terminal	1910	Side rod	Direct current	600
Butte, Anaconda & Pacific	1913	Gearless	Direct current	2,400
*Canadian Northern	1914	Gearless	Direct current	2,400
*Canadian Pacific	1914	Gearless	Direct current	2,400

\*Under construction.

There are other electrified steam lines, but the service on them more nearly approaches that of high-class electric interurban railways. Also there are interurban systems where electric locomotives of considerable capacity are operated, but the class of service does not approach the exacting demands of main line passenger and freight operation.

Table III, however, comprises converted steam lines where the service consists of hauling main-line passenger and freight trains behind electric locomotives of large capacity.

It is a noteworthy fact that the use of the single-phase motor has not extended beyond the two original roads installing this type of equipment, the Grand Trunk and the New York, New Haven & Hartford (including the Hoosac Tunnel installation), whereas d.c. motors have been universally adopted in all the more recent electrifications with the single exception of the proposed split-phase installation on the Norfolk & Western Railway.

The so-called "split-phase" system is comparatively a newcomer in the electric traction field and it has not yet been subjected to the test of actual operation. The proposed system offers many attractive features, however, and it is worthy of careful study in order to understand its fitness for heavy electric railway service. From experimental tests made, it seems reasonably certain that the split-phase locomotive can meet the demands of commercial operation with satisfactory reliability.

(A description of the split-phase locomotive appeared in the ELECTRIC RAILWAY JOURNAL for Oct. 11, 1913, page 678.—EDS.)

Confronted with the problem of main-line electrification and the demand for a distributing system which would provide for the economical distribution of large units of power over an extended area, the need of higher d.c. voltage was appreciated and resulted in the first installation of 2400 volts direct current upon the Butte, Anaconda & Pacific Railway, first operated May 28, 1913. This installation marks an epoch in electric railway progress, as its success offers substantial proof that d.c. motor equipments can be constructed at a reasonable cost and operated in an efficient and reliable manner with trolley potentials as high as 2400 volts.

It has been characteristic of the installations operating at 1200 and 1500 volts that the reliability of the d.c. motive power has been in no way impaired by reason of using a higher trolley voltage; in fact, the maintenance of 1200-volt motor equipments shows no increase over that of 600-volt equipments. A brush life of over 150,000 miles gives evidence of good commutator performance with practically no wear and the increased insulation provided has been ample to insure reliability and low cost of maintenance.

The transition from 1200 volts to 2400 volts direct current has also resulted in completely successful operation at this potential. The operating record of the Butte, Anaconda & Pacific 2400-volt d.c. system has been truly remarkable and can best be expressed by the following quotation from a letter published in the ELECTRIC RAILWAY JOURNAL by H. A. Gallwey, general manager:

"To the Editors:—

"In reply to your inquiry I would say that on Oct. 1, 1913, the Butte, Anaconda & Pacific Railway established regular electric passenger service between Butte and Anaconda. For approximately four months previous to this the freight service between the East Anaconda yards and the smelter had been handled electrically. During this period electric locomotives have made approximately 55,000 miles

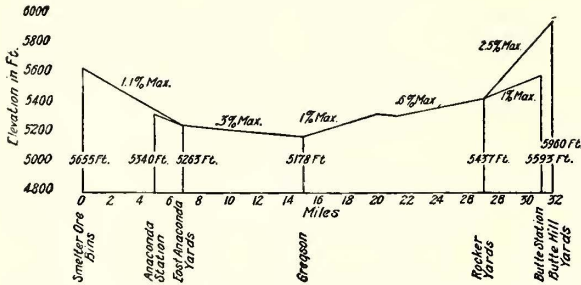


Fig. 1—Profile of Butte, Anaconda & Pacific Railway

and have delivered to the smelter about 1,500,000 tons of ore. Since starting the electric service there has been no failure of any of the electric apparatus and no delay in any way attributable to electric operation.

"The substation at Anaconda has been in continual service twenty-four hours a day with no more than ordinary care and without replacement of any parts. The locomotives have been operated by the steam locomotive engineers and have been maintained by the regular shop force with the addition of one man experienced in electric operation. They have met every requirement and there has been no failure or replacement of locomotive parts.

"The overhead contact system has been highly successful, and there have been no failures and no accidents. The wear of the contact wire is inappreciable. The original pantograph rollers on the locomotives are still in use and show very slight wear notwithstanding the severe conditions imposed by the smoke and soot deposited on the wire from the steam locomotives during the several months of construction. Our experience up to the present time indicates the complete success of our electrification and justifies the existing optimism and enthusiasm for heavy railroad electrification.

"H. A. GALLWEY, General Manager."

The success of high-voltage d.c. installations has not been marred by a single instance of failure due to fundamental defects in the type of apparatus used, and justifies the conclusion that the 2400-volt, 1200-volt and 600-volt d.c. equipments are all part of the same general d.c. system, and that the only difference is the need of more insulation in one case than in the other. The 2400-volt d.c. installation of the Butte, Anaconda & Pacific Railway cannot be looked upon, therefore, as in any way constituting a new "system" of electrification, but rather as a natural development along the lines of higher voltage of the same well-known d.c. system which has rendered such excellent account of itself in the past on all our city and practically all of our suburban and interurban electric lines. This has an important bearing upon the general electrification of the steam roads, as it places the status of the direct-current system as applied to such service.

Fully appreciating the grave responsibility of selecting a type of motive power for a proposed electrification that holds promise of special fitness for the immediate service contemplated and also is capable of meeting the demands of unlimited future extensions, this paper will briefly touch upon the comparative characteristics of the split-phase and 2400-volt d.c. systems of operation. The choice seems to lie between split-phase and direct current inasmuch as the history of the single-phase motor equipment does not seem

to justify its further consideration for heavy electric railroading.

A general scheme of distribution to the split-phase locomotive is shown in Fig. 5 which has special application to Western railways where sixty-cycle energy supply is universally standardized. A corresponding diagram of the 2400-volt d.c. system is shown in Fig. 6, this also being adapted to sixty-cycle supply.

Starting first with a comparison of the two types of locomotives, it is necessary to make some general assumption as regards service conditions in order to draw conclusions as to relative locomotive characteristics. The electric locomotive is capable of being constructed in very large units, but convenience in shopping and simplicity in construction both point to a unit of approximately 100 tons total weight on drivers. These 100-ton units can be coupled together and operated as a single locomotive of any desired capacity, though probably a two-unit locomotive weighing 200 tons and giving a starting tractive effort of 120,000 lb. is as large as the draft gear will stand.

Experience with steam locomotive practice seems to point to a locomotive rating on ruling grade that calls for a tractive effort corresponding to approximately 18 per cent coefficient of adhesion on drivers. Thus the conditions obtaining upon a 2 per cent ruling grade will be as follows:

Tractive effort due to 2 per cent grade.....	40 lb.
Tractive effort due to train resistance.....	6 lb.
Tractive effort due to curve resistance.....	2 lb.
Total per ton.....	48 lb.
Total weight on drivers.....	200,000 lb.
Rating at 18 per cent coefficient of adhesion.....	36,000 lb.
Gross train weight.....	750 tons
Trailing train weight.....	650 tons
Speed.....	15 m.p.h.
Net output at drivers.....	1,450 hp.

A maximum load of 50,000 lb. per axle has been assumed as being within acceptance of good practice. The question of speed on ruling grade is one subject to local requirements, but in general a speed of 15 m.p.h. on 2 per cent grade is as high as desirable on roads of moderate tonnage.

As ruling grade generally extends unbroken over comparatively short distances, it is possible to take advantage of this fact in electric locomotive design and proportion the motive power for a continuous capacity of say 16 per cent coefficient of adhesion without danger of exceeding safe temperature limits in operation. The continuous capacity of the 100-ton unit would therefore be 32,000 lb. tractive effort at slightly more than 15 m.p.h., based upon 16

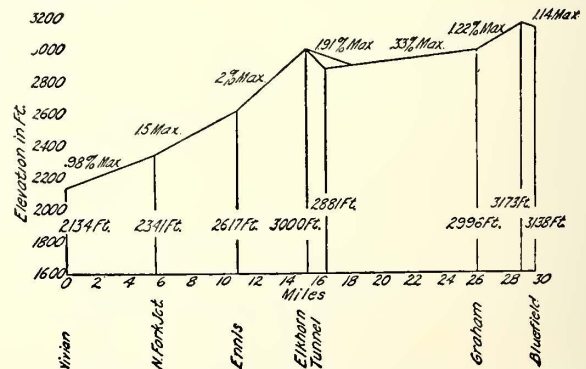


Fig. 2—Profile of Norfolk & Western Railway, Elkhorn Division

per cent coefficient of adhesion of the weight upon the drivers.

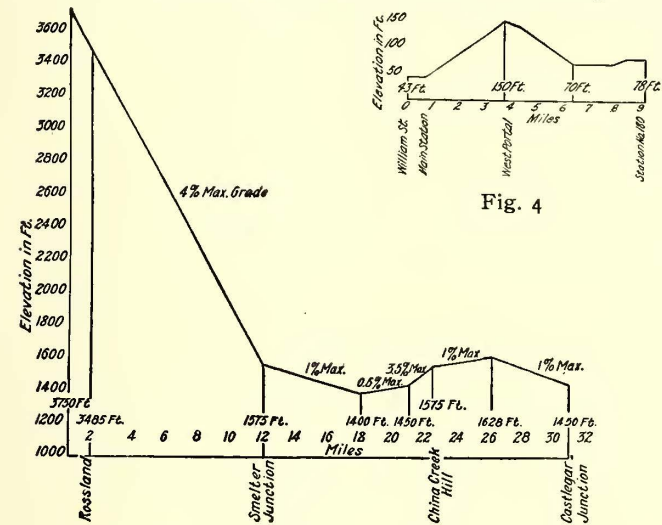
Owing to the moderate speeds at which a freight locomotive will operate, it is entirely feasible to consider a construction wherein the motors are geared direct to the driving axles by twin gearing, in this respect following the practice of the Detroit Tunnel, Cascade and Butte locomotive which has proved very successful.

For the purpose of this comparison, it is assumed that both split-phase and d.c. locomotives will be of similar construction and employ twin-g geared motors of equal weight and efficiency. A comparison of weight distribution in the two types of locomotives is presented in Table IV.

TABLE IV—COMPARATIVE WEIGHT OF LOCOMOTIVE—CONTINUOUS CAPACITY 32,000 LB.—15 M.P.H.

	Split-Phase	2400 Volts Direct Current
Four motors .....	44,000 lb.	44,000 lb.
Control apparatus complete.....	17,000 lb.	27,000 lb.
Air compressor.....	4,000 lb.	4,000 lb.
Air brake equipment.....	3,000 lb.	3,000 lb.
Miscellaneous.....	2,000 lb.	2,000 lb.
Phase converter.....	22,000 lb.	.....
Transformer.....	18,000 lb.	.....
Cab and running gear.....	160,000 lb.	120,000 lb.
Total .....	270,000 lb.	200,000 lb.

As the d.c. locomotive of 100 tons carries no ballast, it is evident that the 40,000 lb. comprising the phase converter and transformer of the split-phase locomotive must be carried on idle wheels together with the additional weight of



Figs. 3 and 4—Profiles of Canadian Pacific Railway, Rossland Subdivision, and of Canadian Northern Railway, Montreal Tunnel and Terminal Electrification

cab and running gear required to carry this excess weight. The net result is a split-phase locomotive of fully 35 per cent more weight than a d.c. locomotive of equal capacity and of similar construction. This weight comparison is based upon the assumption that 50,000 lb. per axle constitutes the limit allowable, thus forcing the introduction of guiding axles to carry the excess weight of the split-phase equipment. For locomotive construction of less capacity permitting the split-phase to come within axle weight limits, both types of locomotives would comprise four axles with no guiding wheels and the split-phase locomotive may not total more than 20 per cent more than the direct-current type.

It is evident that the split-phase locomotive is not only considerably heavier for equal capacity but also more complicated and inefficient than the d.c. locomotive. The power from the trolley must in turn pass through transformer, phase converter, control, motors and gears. The efficiency of the complete locomotive in operation will depend upon its output and hence in the following comparison, Table V, efficiency has been computed for operation on both ruling grade and level track. The average efficiency of a day's run will obviously lie somewhere between these values, assuming that portion of the run when the locomotive is taking power.

Motor and gears are assumed to be of equal efficiency for both split-phase and direct current, as the advantage of one type motor over the other will be small at best and will not materially affect the values given.

TABLE V—FREIGHT LOCOMOTIVE EFFICIENCY—DETAILED COMPARISON

	Split-Phase		2400 Volts Direct Current	
	Ruling Grade	Level	Ruling Grade	Level
Motors and gears, per cent.....	89.3	86.0	89.3	86.0
Blower, per cent.....	97.8	95.8	97.9	95.9
Starting resistances, per cent.....	98.6	98.0	99.2	99.4
Phase converter, per cent.....	96.3	94.7	.....	.....
Transformer, per cent.....	98.0	97.0	.....	.....
Wheel correction, per cent.....	98.0	98.0	.....	.....
Weight efficiency, per cent.....	95.0	97.0	.....	.....
Combined efficiency, per cent.....	75.7	70.5	86.6	82.0
Average of grade and level.....	73.1		84.3	

Blower efficiency is based upon the fan blower required to cool the motors and auxiliaries taking 30 kw split-phase and 25 kw direct current.

Starting resistances consume a portion of the power required to start the train, and the efficiency of the locomotive is based upon the assumption that the train is started from rest once in two hours. This starting resistance loss is greater with the split-phase than with the d.c. locomotive, being twice as large up to speeds of 15 m.p.h. on ruling grade and four times as large up to speeds of 30 m.p.h. on level track.

Phase converter efficiency is determined by assuming that the capacity of the converter will approximate 75 per cent of that of the four motors it controls.

Transformer efficiency values given require no comment.

Wheel correction is determined as follows: Induction motors run at nearly synchronous speed, the slip being proportional to the total secondary non-inductive resistance, hence all wheels upon the same locomotive must be very closely of the same diameter in order to insure equal loading of the several motors. When one pair of wheels is turned, all must be turned equally. This would not be a very serious handicap were it not for the fact that several locomotives will operate in the same train, thus necessitating equal wheel diameters on all such locomotives. It is therefore evident that all locomotives must be interchangeable and any group of two or more be capable of running in the same train or the operating department will be seriously handicapped.

The diameter of new and turned wheels may vary fully 4 per cent, an amount sufficient to cause a prohibitive load distribution between motors. Hence it is proposed to install a variable secondary resistance and so adjust this resistance in the several motor secondaries that all wheel peripheral speeds will conform to the average diameter of new and worn wheels. This will entail an average loss of say 2 per cent when operation has continued long enough to require turning wheels to the minimum diameter allowable. D.c. motors have such a variable speed characteristic as to require no adjustment for varying wheel diameters.

Weight efficiency, as given in Table VI, is a relative value based upon comparison with the d.c. locomotives taken at 100 per cent.

TABLE VI—COMPARATIVE WEIGHT EFFICIENCY—FREIGHT LOCOMOTIVES

	Split-Phase	2400 Volts D.C.
Rated tractive effort on ruling grade.....	36,000 lb.	36,000 lb.
Gross train weight.....	750 tons	750 tons
Trailing train weight.....	615 tons	650 tons
Per cent trailing to gross.....	82	86.7
Weight efficiency, per cent.....	94.7	100

On level track it is assumed that pushing locomotives will be dropped and train weight per road locomotive will be double the ruling grade values. On this basis the split-phase locomotive weight efficiency will be 97 per cent for level track runs. Both values of split-phase locomotive weight efficiency are based upon the assumption that locomotives will be loaded to 100 per cent capacity on ruling grades. As such will not always be possible in regular operation, it is evident that the values quoted above will be lower under actual service conditions.

The combined efficiency of the complete locomotive shows

that the split-phase freight locomotive will demand 15 per cent more power input from the trolley than a d.c. locomotive of equal hauling capacity and similar mechanical drive.

For passenger service it is reasonable to expect the locomotive running gear to be so constructed as to permit maximum speeds approaching 75 m.p.h. without danger of derailment or exceeding safe limits of motor and drive

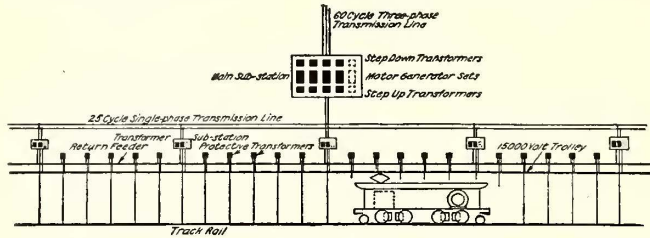


Fig. 5—General Scheme of Split-Phase Alternating-Current System

construction. Neither of the forms of construction in Fig. 7 are well adapted for very high speeds, and to secure good running qualities it is probably necessary to adopt different types of construction for freight and passenger locomotives, however desirable it may be from an operating standpoint to have them interchangeable.

With d.c. motors several forms of construction are available that will all operate successfully at high speeds. Unquestionably the most efficient construction is to mount the motor armatures upon the driving axles and eliminate the losses, weight and complications of any form of mechanical drive. It is assumed in this comparison that gearless construction will be adopted for d.c. high-speed passenger locomotives.

The split-phase locomotive motor is of the multiphase induction type and not adapted to gearless construction except by the introduction of quills and springs. This form of construction has not been so successful in operation as to justify considering its general adoption. It is assumed therefore that in order to get a locomotive of good riding qualities at high speeds, it is necessary to resort to side-rod drive from a jackshaft and house the motors in the cab. In this comparison it is assumed that motors drive the jackshaft through gears rather than by rods as offering a lighter form of construction requiring less space. The same form of drive is equally available with d.c. motors, but gearless construction offers great advantages, such as extreme simplicity, accessibility and high efficiency, so that the comparison in Table VII will be based upon gear side-rod split-phase and gearless d.c. motor locomotives.

TABLE VII—PASSENGER LOCOMOTIVE EFFICIENCY—DETAILED COMPARISON

	Split-Phase		2400 Volts Direct Current	
	Ruling Grade	Level	Ruling Grade	Level
Motors and gears, per cent.....	89.3	83.0	87.5	94.0
Blower, per cent.....	97.8	84.8	97.9	95.5
Starting resistance, per cent.....	98.6	97.8	99.2	99.3
Phase converter, per cent.....	96.3	94.0	.....	.....
Transformer, per cent.....	98.0	96.0	.....	.....
Wheel correction, per cent.....	98.0	98.0	.....	.....
Weight efficiency, per cent.....	92.5	92.5	.....	.....
Jackshaft, per cent.....	97.0	93.0	.....	.....
Side rods, per cent.....	97.0	93.0	.....	.....
Combined efficiency, per cent.....	69.3	54.5	85.0	89.2
Average of grade and level, per cent....	61.9		87.1	

It appears reasonable to expect the efficiency of mixed passenger and freight locomotive operation to approximate 85 per cent for d.c. and not much exceeding 68 per cent to 70 per cent for split-phase locomotives. This efficiency in each case is based upon that portion of the run during which power is delivered to the locomotive. If transformer, phase converter and blower are kept running during coasting periods or when standing, the stand-by

losses thus introduced will seriously reduce the all-day efficiency in commercial operation. It is evident that such stand-by losses are much greater in the split-phase than in the d.c. locomotive and the 20 per cent saving in power for mixed freight and passenger service credited to the d.c. motive power may be materially increased in actual service.

Before concluding the general discussion of the locomotive it is necessary to touch upon the question of braking. One of the strongest arguments advanced for the adoption of the induction motor locomotive is that this type of motor offers an ideal electric brake by reversing its function on down grade and return power to the trolley circuit. A regenerative braking method of control has been perfected for use with the d.c. motor which offers even greater advantages in service operation than induction motor braking. Just as the d.c. locomotive is the more efficient in hauling a given trailing tonnage, so also it will return to the system a larger percentage of the mechanical power given the locomotive by the descending train. Hence whatever claims are advanced for regenerative electric braking with the split-phase locomotives are even more applicable to the d.c. type.

Referring again to Figs. 5 and 6, showing the general plan of distribution respectively for the split-phase and d.c. systems, it is of interest to compare the two in order to see how much of the split-phase locomotive loss is recouped by its more efficient distribution system. The following comparison, Table VIII, is therefore submitted.

TABLE VIII—EFFICIENCY OF DISTRIBUTION SYSTEM—DETAILED COMPARISON

	Split-Phase	2400 Volts D.C.
Step-down transformers, per cent.....	97.5	96.5
Motor generator sets, per cent.....	87.0	81.0
Step-up transformers, per cent.....	97.5	.....
Railway transmission line, per cent.....	96.0	96.0
Line transformers, per cent.....	96.0	.....
Protective transformers, per cent.....	96.0	.....
Trolley, track and feeders, per cent.....	96.0	88.0
Combined efficiency, per cent.....	70.5	66.0

The protective transformers appearing in Table VIII are for the purpose of neutralizing the inductive disturbance caused by single-phase trolley upon neighboring telephone, telegraph and signal circuits. The total efficiency of the two distribution systems and locomotives is shown in Table IX.

TABLE IX—TOTAL EFFICIENCY—DISTRIBUTION SYSTEM AND LOCOMOTIVE

	Split-Phase	2400 Volts D.C.
Freight Service—		
Distribution, per cent.....	70.5	66.0
Locomotives, per cent.....	73.1	84.3
Combined efficiency, per cent.....	51.5	55.7
Passenger Service—		
Distribution, per cent.....	70.5	66.0
Locomotives, per cent.....	61.9	87.1
Combined efficiency, per cent.....	43.6	57.5

There is every reason to expect that the split-phase system will demand fully 15 per cent or more power input

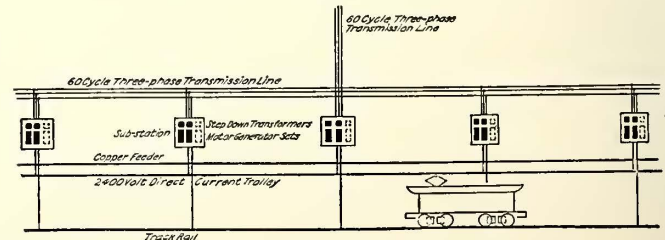


Fig. 6—General Scheme of 2400-Volt Direct-Current System

than the d.c. system of 2400 volts for equal trailing tonnage movement, actual figures depending upon the proportion of freight and passenger tonnage. This figure is based upon sixty-cycle power supply for the reason that many of the immediate electrification projects under construction or contemplated are located in territories where this frequency is firmly established.

Where twenty-five cycles is available, single-phase power may be taken direct from the three-phase supply provided phase and voltage balance is maintained by suitably located substations containing step-down transformers and phase converters. D.c. supply will be more efficiently obtained through rotary converters in place of motor-generating sets. The efficiency of the distribution system, as given in Table IX, will therefore need correction for twenty-five-cycle power supply but will result in no material change in the relative efficiency figures quoted for the two systems.

The installation of a power house to generate single-phase current at twenty-five cycles or less introduces all the serious handicaps encountered in single-phase generation and also raises questions of general expediency and adequate return on the capital invested in a power plant which is devoted to supplying railway load only. Advocates of single-phase trolley distribution have sometimes failed to consider fully the question of energy supply available as having any bearing upon the broad question of electrification. Not every railway is so situated by reason of character of load, cheap fuel or other favoring local conditions as to justify the large expenditure for a gen-

ery are required both on the ground and also in the locomotive cab itself.

The single-phase trolley circuit, irrespective of the type of locomotive it may supply, constitutes in itself a most serious handicap to the adoption of any type of d.c. locomotive. Neighboring circuits of all kinds are practically put out of commission by static and inductive disturbances unless adequate protective measures are introduced. No method of complete protection has as yet been perfected, although many schemes have been proposed that are partially successful. The elaborate and expensive apparatus now being installed upon one of our important single-phase railways will soon be in operation and is expected to give relief from the present serious conditions obtaining. As the inductive interference of the single-phase trolley is proportional to the intensity of the current and distance it is transmitted, it is to be expected that a maximum disturbance will result in the case of mountain grade divisions where the current input to trains approaching 3000 tons gross weight is several times that thus far met with in any single-phase trolley installation now operating. No cost estimate of single-phase trolley systems is, therefore, complete without including a liberal allowance for telephone and telegraph protective devices. This cost will probably not be less than \$2,500 per mile of route and may even greatly exceed this figure. Despite such an expenditure, no assurance is at hand that hazard to employees and interference with service will be entirely eliminated, and until more exact knowledge of this whole situation is available, single-phase trolley interference constitutes a most serious handicap to the adoption of any d.c. locomotive system of operation.

This paper is largely devoted to a comparison of a.c. and d.c. motor locomotives, as lack of appreciation of the fundamental facts involved has perhaps been the basis of the false hopes raised as to the possible advantages resulting from the installation of the single-phase trolley. It surely does look attractive to install a system employing 15,000 volts on the trolley, no feeder copper and no rotating substation apparatus. But investigation and experience disclose the fact that the single-phase trolley is a decided menace to neighboring circuits, feeder copper is required for return circuit, substations are comparable as to first cost and efficiency with d.c. substations and, finally, the a.c. locomotive of the most promising type, the so-called split-phase combination of induction motors, transformer and phase converter, is heavy, expensive, complicated and inefficient to a degree that would not be tolerated in d.c. construction. Assuming that the favorable results of factory experiments are borne out in the success of later commercial operation, there appear to be no controlling advantages of a.c. locomotive traction which cannot be secured at less expense and with greater reliability in operation with d.c. motive power.

Until the adoption of interpole motor construction made it entirely practicable to build d.c. motors for high potentials, there was some justification for considering a.c. trolley systems as offering the best means of changing from steam to electric motive power at a reasonable first cost. The high-voltage d.c. motor has now been developed, built and proved completely successful under the most exacting service conditions. The trolley potential has been raised to 2400 volts, which seems sufficiently high to insure a distribution system of reasonable first cost and not too high to handicap the locomotive as regards its first cost, reliability and operating efficiency. Experimental results already obtained with d.c. apparatus tested at potentials higher than 2400 volts indicate that no construction difficulties apparently exist and the installation of a higher voltage becomes an economic question rather than an engineering problem.

With 2400 volts direct current both protected third-rail construction and multiple-unit car operation are feasible. The third-rail offers advantages in accessibility and low

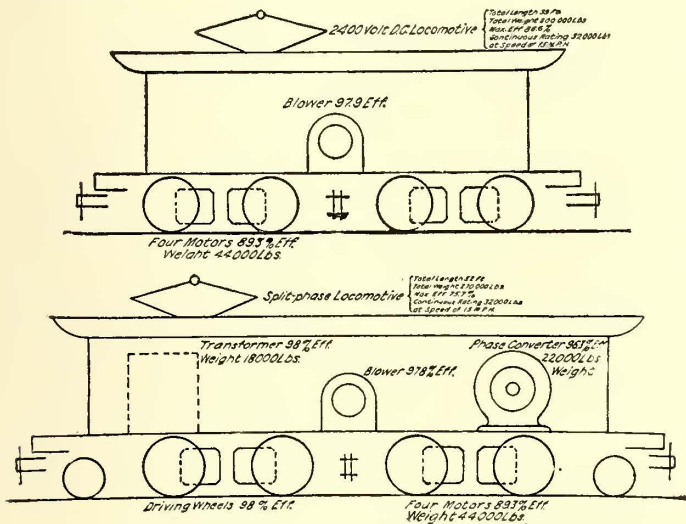


Fig. 7—Comparison of 39-Ft. D. C. and 52-Ft. Split-Phase Locomotive of Equal Capacity

erating station containing ample reserve capacity. The somewhat higher efficiency of the distributing system alone in cases where single-phase power is available is so relatively unimportant that it may be looked upon as a special condition applying only to favored and restricted localities.

A study of the general plan of distribution as given in Figs. 5 and 6 discloses the fact that where sixty-cycle power supply is available at attractive rates the general statement can be safely made that the total amount of electrical apparatus is greater and, therefore, the first cost higher and efficiency lower with the split-phase than with the d.c. locomotive system. Nor is this statement modified to any extent in the event that power supply is obtained from a twenty-five-cycle, three-phase source, as it will be the exception rather than the rule that any power company will be found willing to furnish single-phase power from its balanced three-phase circuit when the pernicious effect upon the general distribution system of a violently fluctuating low-power factor single-phase load is fully understood. Some corrective device like a phase converter must be introduced, and its first cost and efficiency are both comparable to the rotary converters which are permissible with twenty-five-cycle supply to secure direct current. It would seem, therefore, that the complication of the split-phase locomotive system renders it inherently more expensive to install and less efficient to operate. This is due largely to the fact that substations containing moving electrical machin-

cost of maintenance on single-track roads and multiple-unit car operation is without question the proper way to take care of local traffic. Furthermore, 2400-volt equipments can be successfully operated upon the lower voltage terminal zone that local restrictions may make necessary.

It is popularly supposed among electrical engineers that the cause of electric traction is retarded by any openly expressed divergence of views as to the relative merits of different system of electrification. The opinion is advanced, on the contrary, that a free presentation of the facts available, but not always made public, will do much to clarify the situation. No one contributing cause has done more to hurt the electric railway industry than the failure of the single-phase system to make good the too optimistic claims of its early advocates, and no such open presentation of installation and operating costs has ever been made public on any a.c. installation in operation in this country or abroad, as has been published by B. F. Wood in a paper before the American Institute of Electrical Engineers on the West Jersey & Seashore Railway.\*

This paper has been purposely restricted to a discussion of those engineering questions entering into the electrification problem which have a fundamental bearing upon the all-important matter of first cost and cost of operation. Such estimates are readily prepared for any local conditions, provided there is no such serious conflict of engineering opinion regarding engineering details as exist to-day. The d.c. motor is fully able to meet all the requirements of the heaviest passenger and freight train operation, as proved by the entirely successful installations now running and which afford convincing facts upon which statements of costs and operation are based. No such condition exists with any a.c. locomotive system and such operating facts as are obtainable are not of such a nature as to inspire confidence in selecting such a system to meet the exacting requirements of heavy electric railroading. The engineering facts presented herewith are offered with the purpose in view of clearing the engineering atmosphere preparatory to the serious work that seems to lie immediately before us, that is, the problem of where and to what extent it will pay to replace the steam engine by the electric locomotive.

#### DISCUSSION

The meeting of the Canadian Society of Civil Engineers at which this paper was read was the regular monthly meeting of the society. The chairman was H. H. Vaughan, vice-president of the society and assistant to the vice-president Canadian Pacific Railroad.

In the discussion which followed the presentation of the paper, Mr. Vaughan was the first speaker and referred to the adoption of high-tension direct current for a section of the Canadian Pacific Railroad. This installation involved 30 miles of route and 43 miles of track with a long 4 per cent grade, the operation being carried on by four locomotives. The battle of the systems, he said, had deterred steam railroad men from adopting electricity for motive power; but in the case cited both systems were found to be practically alike in first cost and in maintenance, direct current being chosen because it was considered more advantageous to use a system in which the larger part of the investment was involved in the cost of copper for feeders, rather than in locomotives which might soon become obsolete. In addition the development of the gearless locomotive and the improved methods of collecting large currents had helped toward the decision in favor of direct current.

Mr. Vaughan thought that the train-mileage cost basis was more reliable than the ton-mileage basis except in case of mountain grades where the amount of coal consumed per train mile was fairly steady. He said that in the case

stated the cost of steam operation was 40 cents per train mile and that of electric operation was only 25 cents per train mile. Repairs amounted to 5 cents per locomotive mile instead of 7½ cents, and with electric power the cost of coal was cut in half, three electric locomotives doing the work formerly done by four steam locomotives. Reduced to a unit basis there was a saving in operating cost of 15 cents per train-mile and this was balanced against the added investment for electrical equipment. He stated that the operation of at least twenty-two trains per day was required in order to make an electrical installation pay for itself. On the Canadian Pacific electrified line, he said, it had been found desirable to minimize the weight on electric locomotive axles, the pressures being kept down to 50,000 lb.

George Gibbs, of Gibbs & Hill, consulting engineers, New York, contributed the following written discussion in the form of a letter to the secretary of the society:

"Your kind invitation to discuss Mr. Armstrong's paper on 'The Engineering Problem of Electrification' has reached me only to-day, and as your meeting takes place on Thursday of this week it is impossible to prepare anything of a formal nature, but the following general remarks I should like to place on record because I am opposed to the method adopted in this paper of setting forth the railway electrification problem. Practical railway men have been unable until recently to obtain any clear idea of the possibilities of heavy electrification because of the befogging of the whole problem by the controversial attitude of conflicting interests. Each system has been set forth by its promoter as having all the virtues and none of the faults of the other systems, and this has raised doubts in the minds of railway men whether any system is really reliable. During the last year or two, however, there appeared an inclination on all sides to admit that the art is a developing one and that each system had its own particular field of best employment. The present paper, however, appears to have gone back to the old method of special pleading for some particular system, setting forth in an unfavorable light the defects of competing systems while the disadvantages of the system advocated are not even referred to. This, I submit, is not an engineering discussion of the problem of electrification. The engineer should set forth, as completely as his space will permit, the advantages of each system and make his recommendation in accordance with all the facts set forth. The reader, having the balance sheet before him, can then check the conclusions. Unless I am greatly mistaken, the paper in question does not conform to the essentials of its title.

"On pages 1 and 2 reference is made to electric traction in such a way as to lead one to infer that heavy main-line traction is the subject of the discourse. Following this the question of system is taken up, and the single-phase system is promptly dismissed as unsuitable, apparently from unsatisfactory results on a number of interurban traction lines which found it advantageous to change over from single-phase to direct current. Probably these roads never should have used single-phase because their conditions did not suit this form of power, and, in any event, their case is not parallel to that of heavy steam traction.

"On page 4 the following conclusion is advanced: 'It is a safe prediction to make that no more single-phase motor equipments will be placed in operation in this country on new roads unless these roads virtually form an extension of existing systems.' I take it from the context, although the sequence of the argument is not entirely clear, that this means that no more city or suburban roads will be thus operated; otherwise the Pennsylvania Railroad Company's adoption of the single-phase system motor-car operation on its suburban lines out of Philadelphia places the 'safe prediction' above referred to in some jeopardy.

"After thus summarily dismissing the single-phase motor, the writer then proceeds to advocate high-tension direct

\*See ELECTRIC RAILWAY JOURNAL, July 1, 1911, page 19.



current, apparently for all classes of work, and appears to think the split-phase locomotive its only serious competitor. Of course, the fact that single-phase contact and split-phase locomotives were adopted on the Norfolk & Western Railway for the heaviest electric traction work yet undertaken anywhere requires some explaining away, because there are presumably reasons to believe that the adoption of this system was made after some study of the local situation and the conclusion arrived at that the system had preponderating advantages for the work in question.

"I do not wish to be understood as condemning direct current, of either high or low voltage, because as a matter of fact I have been intimately connected with a number of heavy direct-current installations which are in successful operation. I merely wish to point out that each system proposed so far has its limitations and best field of application. Furthermore, in working toward the desirable end of a 'standard system,' we should carefully weigh all features of each individual system with the idea always in mind of obtaining the greatest flexibility of application to different conditions."

A letter was then read from Edwin B. Katté, chief engineer of electric traction New York Central & Hudson River Railroad. An abstract follows:

"In glancing over the paper, on the first page I notice that Mr. Armstrong confines his remarks to an electric locomotive capable of hauling an 800-ton passenger train at 60 m.p.h. Such a locomotive is too small to be seriously considered by steam railroad men operating important trunk lines. The modern electric passenger locomotive must have sufficient capacity to haul a train of cars weighing from 1000 to 1200 tons. Please note I say 'train of cars.' Electric companies frequently confuse railroad men by including the locomotives when they refer to a train of a given weight. Further, such a locomotive should be capable of performing the regular service practically continuously and not after a few hours of operation be laid up in the terminal from one to three hours to allow the motors to cool off. Mr. Armstrong also tells you that the electric locomotive requires no stops for fuel or water. This is true in the summer time, but passenger trains have to be heated in the winter, and the locomotive must be taken out of service every few hundred miles for fuel oil or at least water, even though the locomotive does not have to go in for inspection until it has performed something over 1200 miles. Electric operation is a good thing in the proper place, although it does cost considerable money and has some limitations."

W. S. Murray, consulting engineer, New Haven, then presented a series of lantern slides showing work on the New York, New Haven & Hartford Railroad and also a series of curves for a proposed 120-mile electrification to show at what point single-phase became advantageous and also the effect of voltage drop with given wire sections under increasing tonnages. He then referred to Mr. Armstrong's paper, saying that he believed it was the strongest card yet played in favor of single-phase traction. There had been too much play upon the phrase "motive power equipment." It had clouded the real meaning of what might be termed "steam roadbed electrification." He always had been and would remain a strong advocate of direct-current in the interurban and short railroad field, the field where it belonged. Mr. Armstrong's irrelevant deductions, made from the results on lines which never should have been equipped with alternating current, argued him out of court.

On heavy railroad work in the matter of large power installations he said that attractive rates for extended areas should in many cases make separate railway plants needless. However, he cited a case where sixty-cycle power, delivered to the three-phase lines along the right-of-way of the railroad, was offered at a price of 8 mills, electricity being obtained from water power. Yet it was actually found that twenty-five-cycle current which was better for railway work

could be produced at a cost of 6 mills from cheap coal located near the railway. Railways must, he said, control their own power in many cases.

The actual power required to move a given tonnage when employing direct current was, he said, 22 per cent more than with single-phase. The question of motive power was an important one but a point not to be overlooked was the system behind that motive power. The locomotive as outlined in the paper might be a gold mine metaphorically speaking, but that was no reason for burning 22 per cent more coal to run it. As to single-phase railway installations, Mr. Armstrong had compared a.c.-d.c. trolley experiments without considering a single locomotive. He called attention to the New Haven Railroad which employed 100 locomotives, moved 65,000 cars each month, and used 65 multiple-unit cars in a 33-mile suburban zone. Yet Mr. Armstrong wanted his comparison to be accepted as proof that the single-phase system was not only passing but had actually passed. The Butte, Anaconda & Pacific Railroad was not an interurban property, but because of the short run, 22 miles, and the consequent impossibility of congestion, it was obvious that this low-speed railway ought to operate satisfactorily with high-tension direct current.

Again, he said, Mr. Armstrong's list of main-line electrifications was composed chiefly of short terminal and tunnel lines. No mention had been made of the great single-phase installations on the Spokane & Inland Empire Railroad nor on the New York, Westchester & Boston Railroad, for which steam would have been used had electricity not been at hand. No reference had been made to the wide adoption of single-phase systems on the continent of Europe, nor to the London & Brighton Railway in England, of which the directors had recently voted \$10,000,000 in a recent appropriation to carry the electrification of the line through to Brighton. This was, he said, a good testimonial to the advantages of single-phase current. Mr. Murray referred to the communication from H. A. Gallwey recently published in the *ELECTRIC RAILWAY JOURNAL*. This had announced a mileage of 55,000 for the locomotives on the Butte, Anaconda & Pacific Railroad during four months of operation, but during the same period the New Haven passenger locomotives alone had traveled 574,000 miles. The seventeen Butte locomotives average 22 miles a day, while some of the New Haven locomotives run ten times that distance daily.

Mr. Murray did not wish to dispute any of the data on the split-phase locomotives because hypothetical tables should not be placed in engineering papers. The figures might be announced as approximate, but there were limitations even to such approximations. Mr. Armstrong had said that the split-phase locomotive was 35 per cent heavier than an equally capable direct-current machine. Yet the New Haven had tested commercially a single-phase locomotive with continuous capacity of 1400 hp, the weight being 110 tons, while Mr. Armstrong had announced that the split-phase locomotive, its assumed successor, weighed 135 tons.

Telephone and telegraph disturbances had been eliminated in England by placing the return wires in concentric cables, but on the New Haven this trouble would be removed about Jan. 1 by the completion of the new 22,000-volt system of distribution between the feeders and the contact wires. In conclusion Mr. Murray said that the paper of the evening had the merit of marking plainly the desirability of application of the single-phase system in the field where all engineers who were free from commercial bias had already placed it.

After several members had submitted questions Mr. Armstrong again took the floor. He admitted that the paper advocated one system as universal in application. Direct-current tests at Schenectady had shown that 5000 volts was possible, but the commercial aspect was still somewhat indefinite owing to the matter of first cost. Mr. Katté's question, he said, showed the need for having the American In-

stitute of Electrical Engineers decide upon methods of locomotive rating. The use of purchased power from outside corporations should not be ignored in plans for electrification. Single-phase generation or the use of single-phase current from a three-phase supply was less efficient than transformation to direct current, and in any event it was safer to depend upon great networks of power lines than upon a single private plant. The satisfactory service given upon the Butte, Anaconda & Pacific Railroad had, he announced, led the Chicago, Milwaukee & St. Paul Railway to decide finally upon the use of 2400-volt d.c. for operating its proposed 440-mile electrified line in Dakota and Montana.

Mr. Murray then presented maintenance figures upon the cars of the New York, Westchester & Boston Railway, these being given as follows:

Cents		Cents	
1912 July .....	2.6	1913 February .....	1.9
August .....	3.5	March .....	2.5
September .....	3.5	April .....	2.0
October .....	3.4	May .....	1.2
November .....	2.4	June .....	1.3
December .....	2.7	September .....	1.3
1913 January .....	3.0	October .....	1.1

Since the improved New Haven locomotive repair shops had been built at Van Nest he stated that the running costs obtained for a.c.-d.c. locomotives were very low. After adding the general overhauling charges, the total cost of maintaining the passenger locomotives would be found to be between 5 cents and 6 cents per locomotive mile, and for freight engines of 110 tons, hauling 1500-ton trains and having 40,000 lb. maximum tractive effort, the total cost of maintenance was from 4 to 5 cents. For switching locomotives of equal tractive effort the cost was below 4 cents. Locomotives had given 25,000 miles of service to one detention.

Mr. Armstrong concluded the discussion by the statement that for the last five years the average maintenance cost of forty-seven direct-current locomotives on the New York Central & Hudson River Railroad had been 3.5 cents per locomotive mile. After this the meeting was adjourned.

### RAPID TRANSIT SERVICE ON THE QUEENSBORO BRIDGE IN NEW YORK

To secure proper transportation facilities between the boroughs of Manhattan and Queens in New York City it will be necessary in the immediate future to operate elevated railway, subway and trolley cars across the Queensboro Bridge. This service is essential to the full utilization of the rapid transit construction completed or under way. It will greatly benefit a large number of passengers, increase property values in Queens, and give rapid transit to a district which is now without it.

The initial expense of establishing traffic across the bridge and utilizing the latter to its fullest capacity involves the construction and location of new tracks on the bridge, changing the Queens approach for these tracks, and the construction at the Manhattan end of the bridge of a new trolley terminal to replace the present underground terminal, which must be eliminated to provide for the new subway connections. This work involves an estimated expenditure varying from \$2,513,000 to \$5,510,000 according to the nature of the trolley terminal provided, and exclusive of the subway and elevated railroad connections in Manhattan and the new railway station at the Queens end of the bridge, which are provided for by other contracts now executed.

Reports from Paris state that the council of administration of the Swiss Federal Railways has voted a sum of \$7,387,200 for the electrification of the St. Gothard Railway. The work, it is expected will occupy about four years.

### OPPORTUNITIES FOR POWER PLANT ECONOMY

BY J. G. SWAIN, SUPERINTENDENT OF POWER AND SHOPS  
CLEVELAND, PAINESVILLE & EASTERN RAILROAD

In the convention issue of the ELECTRIC RAILWAY JOURNAL for Oct. 4, 1913, considerable space was devoted to the operating features of modern electric railway power plants. Along the same general line some observations, based partly upon the experience of the Cleveland, Painesville & Eastern Railroad, may be of interest. This plant was described in the issue of the JOURNAL for July 19, 1913.

In a general way, the generating capacity of a power house determines the extent to which it is profitable to follow the details of power-house operation. In a power plant of, say, 10,000-kw capacity or more, the services of an efficiency engineer will be found of considerable value. His duty should be to analyze fuel, watch the loading and performance of the generating units and of the auxiliaries and give especial attention to the life of those parts of the general equipment which deteriorate rapidly and require frequent renewals and repairs. An efficiency engineer would naturally give most of his time to the performance of the steam equipment because it is here that the greatest savings can be effected. Even when each part of the power-plant equipment has been installed according to the best judgment of the manufacturer of the apparatus and of the supervising engineer in charge of the construction of the station, it is often the case that a slight variation in the adjustment and application of some part of the general equipment will result in a great improvement in the performance of the part so altered. This, in turn, will improve the general operating efficiency of the whole station. For instance, the boilers may be installed as well as the manufacturer knows how, yet it will be found that if the baffling in the boilers is shifted slightly a much higher evaporative efficiency will be produced. The stokers may not be adjusted to yield the proper rate and quality of combustion of the fuel used. The draft in the boilers may not be right, or the feed-water system, including pumps, heaters and regulating valves, may not be maintaining the proper flow of water at the right temperature into the boilers. Where boilers are equipped with arch walls the best method of constructing and maintaining these arches is often quite a problem. The regulation of the cooling water to the condensers, particularly to surface condensers, must also be carefully watched, as considerable power can be wasted if more water is pumped than is absolutely necessary to maintain the proper vacuum on the turbines or engines. All of the above matters and many other details should be followed by an efficiency engineer.

It has been my impression that a technical graduate who is interested in these matters, working directly under the chief engineer of the station, can more than earn his salary by the increased efficiency in the operation of the power station which will result from his efforts. Incidentally, there is no better training for a young engineer than studious attention to a task of this kind.

In smaller power houses the operating force, as a general rule, is so small that it is impracticable to detail a man for this particular work, and the chief engineer must be able to devote considerable of his time to following these details and be capable of intelligently analyzing and removing the sources of inefficiency. To have a cheap man in such a position is poor economy. The chief engineer, also, should personally supervise the general repairs made on the station. There is no doubt that a great many plants are inefficiently operated for no other reason than that the chief engineer is tied down to a regular "turn" and is thus deprived of the opportunity to keep his station in good repair and to watch the details of performance. Obviously, inattention to the condition of a plant, for any reason, will prevent the attainment of the highest efficiency. One of the

most essential elements in the operation of a power house is to keep the equipment in good operating condition and make repairs promptly. The larger plants usually have maintenance crews which look after the general repairs and renewals of equipment. The smaller plants should also have in their organization one or two men who can be taken from the regular operating force to look after this maintenance work under the personal supervision of the chief engineer. This does not work any hardship on the operating force if the repairs are made promptly as required.

All stations, whether large or small, should be equipped for weighing coal and ashes, for metering the water evaporated by the boilers, and for keeping records of the draft on boilers, temperature of flue gases and temperature of feed water. If these observations are made and studied and the changes in adjustment indicated by them are carried out, there will be a decided improvement in the operation of hundreds of power stations in this country. There are many indications, as stated in the convention issue of the *ELECTRIC RAILWAY JOURNAL*, which show that this fact is being increasingly appreciated by power-plant operators. I understand that some of the larger steel plants in this country have installed recording CO<sub>2</sub> meters in their boiler rooms and that they offer a daily bonus to the crew in the boiler room which produces the best CO<sub>2</sub> curve. This is certainly the right principle. There is little use in spending from \$1,000 to \$2,000 in meters, recording thermometers and vacuum, pressure and draft gages if no attention is paid to the records obtained from them. Discrimination must also be used in the expense incurred for instruments, as the expense depends upon the operating conditions of the plant and upon its size.

Where exhaust steam is continuously used for heating or evaporative purposes great refinement of engine economy is not justified and general elaborate measurements are not needed, but the boiler room should have the same careful supervision and measurements of its operation as in any other plant. The same is true also in small stand-by plants. From the standpoint of size no argument is needed to prove that larger stations can and should go into the details of operation more closely than smaller ones as there is greater opportunity for saving and corresponding opportunity for enormous losses. For instance, a small station which has a meter and scales for determining the pounds of water evaporated per pound of coal is not justified in maintaining a recording CO<sub>2</sub> meter. However, in a larger station a CO<sub>2</sub> meter is almost indispensable in obtaining the highest efficiency.

The plant of the Cleveland, Painesville & Eastern Railroad is a small one, of less than 5000-kw capacity, and it contains some equipment which is not of the latest type. It is, however, provided with all measuring apparatus needed for intelligent operation. The interest taken in the operating force in the records of the instruments is very gratifying. The data are assembled daily on a large and comprehensive log sheet, which shows clearly the hourly output of the plant and all component details. The records show not only the performance of boilers, engines, turbines and auxiliaries, hour by hour, but also the names of the men responsible for the human element of the plant operation. Hence it is easy to allot praise and blame for results achieved. Special attention is paid also to the matter of coal receipts, consumption and stock, because in this plant the storage capacity is small and all contingencies require careful watching.

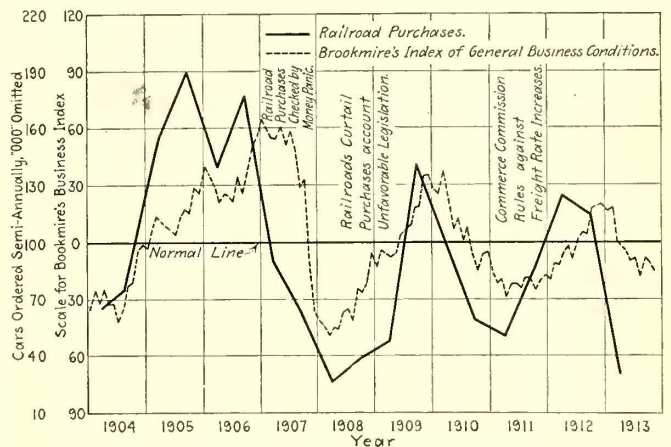
An example of the value of the station records is furnished by an incident which occurred shortly after the starting of the Painesville power plant. We had then the first and to date the only serious interruption to service. This was due to the loss of vacuum. The operating force in the power house attributed the trouble to certain conditions which were not substantiated by the charts. As a matter of fact, the vacuum was lost by the failure of the

engineer in charge to allow enough cooling water to flow through the condenser. According to the charts the temperature of the cooling water discharged from the condensers showed a gradual increase covering a period of three-quarters of an hour previous to the time of shut-down, and the position of the valves admitting the cooling water to the condensers was not altered during this period to overcome this condition. When the engineer's attention was called to the story told by the charts he lost no time in admitting that this was no doubt the cause of the trouble, and he then and there appreciated, as he never had before, that when his instruments were in good operating condition they were something more than ornaments in the power house.

The largest light and power central stations have in their power-plant organizations a man who watches the details of the operation with a view to obtaining a high operating efficiency. This practice, however, is not generally followed even in a modified form by many of the larger as well as the smaller railway companies. If the chief engineer is not interested in the good maintenance and efficient performance of the power plant to the extent of making some effort along the lines suggested above, it is a waste of time and money to endeavor to improve the operating conditions with such a man in charge.

### RAILWAY PURCHASES AND GENERAL BUSINESS PROSPERITY

E. B. Leigh, president Chicago Railway Equipment Company, read a paper at the annual meeting of the Railway Business Association in New York on Dec. 11, in which he discussed the subject of railway purchases as a measure of general business prosperity. Close study of the effect of railway purchases of new equipment upon general busi-



Railroad Purchases and General Business Conditions

ness convinced Mr. Leigh long ago that there was no one more important factor in the development of general business activity than that of the active purchasing of new equipment by the railways. In urging that the advance in rates desired by the railways be granted, Mr. Leigh said that every business man, large and small, and all dependent upon them, are affected by the relation existing between railway purchases and general business prosperity. Mr. Leigh presented the accompanying chart to illustrate his remarks.

The London County Council has under consideration the matter of co-ordinating, as far as possible, the various electric systems in the city and extending them on economical lines. The committee which has this matter in hand was granted \$14,550 for obtaining expert opinion, and though the experts' report is not expected for some time, it is rumored that the proposals will be of a drastic character.

## MEETING OF EXECUTIVE COMMITTEE OF TRANSPORTATION & TRAFFIC ASSOCIATION

A meeting of the executive committee of the American Electric Railway Transportation & Traffic Association was held at the association headquarters, New York, Dec. 12, 1913. In the absence of President Hegarty, First Vice-president M. C. Brush acted as chairman. Those present were: M. C. Brush, H. A. Nicholl, J. K. Choate, E. B. Burritt, J. V. Sullivan, L. H. Palmer, C. E. Learned and W. O. Wood.

It was stated by the secretary that the association had exceeded its appropriation during the past year by \$600, and it was voted that an appropriation of \$2,750 be asked for the ensuing year.

A letter from President Hegarty suggesting certain subjects to be taken up was acted upon as follows: The secretary was instructed to see that the chairmen of committees have their reports in the hands of the association not later than July 15, 1914. A suggestion regarding "get-together" luncheons for city and interurban men for the development of a stronger association spirit was accepted. The executive committee adopted a suggestion that all committeemen be required to discuss the subjects assigned to their committees, giving the experience of their companies and all others known about concerning the practices under discussion; and it was further decided that all subjects assigned the various committees should be in the hands of members in time for them to take up these subjects with other transportation men in their respective companies and report the attitude of their company at the meeting of the committee. President Hegarty's next suggestion was that each man entering the convention room should send up his card to the chair in order that more officials might be called upon for short talks regarding experience and practices on certain points. The committee agreed that President Hegarty's suggestion would tend to bring about more discussion.

It was the attitude of the executive committee that at the convention the reading of committee reports and papers should be abolished and the time used for discussion in cases where the reports had been issued early enough for general advance reading. It was suggested that in printing the committee reports and papers approximately one-half of the left side of the page should be left blank and headed "Space for Comment and Memoranda."

At the afternoon meeting of the executive committee the report of the committee on subjects was presented. Recommendations for committee work for the ensuing year were approved as follows:

Rules: (1) Harmonize diction and construction of interurban code along lines approved by the 1913 convention for the city code; (2) arrange to obtain for the association office a file of rule books of member companies with provision for keeping it up to date; (3) investigate objections against substantial adoption of the two codes; (4) investigate markers and classification signals with reference to use on one-car trains; (5) consider minor revisions in rules following rulings of 1913 convention.

Passenger Traffic: (1) Comprehensive investigation of motor bus and trackless trolley; (2) presentation of paper on functions of passenger agent or traffic manager, regarding (a) development of new business; (b) distribution of traffic, especially peak loads, and (c) improvement of public relations.

Express and Freight Traffic: (1) Compilation and digest of franchise and ordinance requirements; (2) study of systematic promotion of this business; (3) further consideration of Question No. 18 in the committee's report; (4) study of types of organization of freight departments on representative roads.

Construction of Schedules and Timetables: (1) Im-

provement of running time in city operation through skip-stops and limited car service; (2) comprehensive investigation of train dispatching in city operation; (3) consideration of recommendations of last year's committee on uncompleted subjects; (4) study of question of "set-backs"; (5) compilation of list of fundamental factors in timetable construction on representative city and interurban companies, using standard terminology.

Fares and Transfers: (1) Investigation of fare boxes, especially regarding maintenance and increased receipts; (2) study of transfer issuing and collection devices on all types of cars; (3) desirability of bodily transfer of passengers in controlled areas; (4) metal versus paper tickets; (5) accounting for transportation of free passengers.

Training of Transportation Employees: (1) Investigation of "safety-first" movement; (2) up-to-date digest of state and municipal regulations affecting employment; (3) recommended practices for handling bulletin boards; (4) methods of disbursing wages to employees; (5) standardization of training schools, instruction cars and apparatus for different-sized properties.

Uniform Definitions: Work of last year continued.

Block Signals for Electric Railways: (1) Up-to-date revision of: (a) digest of signal laws and rulings on block signals and safety devices; (b) signal installations since the 1913 report, and (c) bibliography since the 1913 report; (2) further consideration of the remaining subjects of 1913 report, including "Signal Rules." (Note: At the meeting of the executive committee of the Engineering Association the subject of "Design of Standard Signal Apparatus" was suggested.)

The committee on train operation (interurban) is to be consolidated with the city committee into a joint committee with the Engineering Association, to be known as the Transportation-Engineering committee, to consider all joint matters except block signals. This new committee is to study car designs from a traffic standpoint.

The executive committee adopted a recommendation that in the future all members of standing committees be chosen for a term of years with rotation so that one member may go out each year. The suggestion was also approved that a syllabus of the subjects that have been investigated and the conclusions arrived at be compiled by the association in loose-leaf form and distributed to the member companies and that each year the work of the convention be thus summarized.

### A. E. R. A. COMMITTEE MEETING

The committee of the American Electric Railway Association on company sections and individual membership met on Friday, Dec. 19, at the association headquarters in New York City. There were present L. S. Storrs, chairman, vice-president Connecticut Company; Martin Schreiber, engineer maintenance of way Public Service Railway; George G. Whitney, chief clerk Washington Railway & Electric Company; W. F. Weh, superintendent claim department Cleveland Railway; R. E. McDougall, claim agent New York State Railways; J. N. Shannahan, vice-president Newport News & Old Point Railway; W. L. Conwell, president Transportation Utilities Company, New York. E. B. Burritt, secretary of the association, was also in attendance at the meeting at which ways and means for increasing the membership of the association was discussed in detail.

The construction of an electric railroad is contemplated between Liebenau and Bomisch Aicha, Bohemia, Austria. The entire proposed construction is only 4½ miles in length, and will be built mainly for the purpose of freight traffic, but will also carry passengers. Correspondence should be directed in the German language to the Bürgermeisteramt, Liebenau, Bohemia, Austria.

COMMUNICATION

PREDETERMINATION OF TRAIN ENERGY

To the Editors:

NEW YORK, Dec. 15, 1913.

I notice the editorial statement in your issue of Dec. 6 that:

"C. T. Hutchinson . . . attempted to do this by substituting for an indefinite number of motor curves a single set of motor curves representing an average for all motors, although it may be noted that recent motors do not all conform with these curves."

Although I cannot say that *all* do conform to my average curve, yet I have not found one that does not conform substantially to it. Moreover, I am told by Dr. Harold Pender, of the Massachusetts Institute of Technology, who has recently investigated this matter elaborately, that he finds substantial agreement between this average curve and all the modern motors which he has investigated. He has, in consequence, used this average curve as the basis of his work.

As an example of the agreement between this average curve and a modern railway motor I give herewith a table comparing the average motor curve sheet given by me (Vol. XXII, *Transactions A. I. E. E.*, 1903, page 660) and a modern motor, taken entirely at random, the General Electric 203, a ventilated commutating-pole railway motor, as given in *Bulletin No. A4172*, October, 1913. The values for the General Electric motor have been reduced to percentages, as shown in Table I.

The table shows an agreement as close as the nature of the data warrants between this General Electric motor of 1913 and the average motor estimated by me in 1903. This is as it should be, since there is no reason to expect any material change in the speed-torque curves of railway motors following the same general lines of design in the magnetic circuit. It is well known to those most familiar with work of this kind that generalized motor curves can be used with sufficient accuracy for all practical purposes.

The method outlined by Messrs. Del Mar and Woodbury seems simple, but it involves three guesses—first, the value of *K*; second, the value of *Q*, and, third, the value of the efficiency. All three of these values are dependent upon initial acceleration, train friction and braking force—as well as the average running speed; they cannot be stated with accuracy in terms of length of run alone.

I gave, in the paper you referred to above, a similar approximation, but, I think, a better one, in that it involves only two guesses. It can be simply restated as follows:

Let

*r* = total resistance, in pounds per ton, except that due to acceleration, including allowance for grades and curves,

*V* = the average running speed, in miles per hour,

*V<sub>b</sub>* = the speed at braking, in miles per hour,

*T* = time from start to stop in seconds,

*n* = the number of runs per mile,

*L* = the length of run in feet,

*l* = the fraction of the total length of run that is traversed after the application of brakes, and

*A* = the "through acceleration."

Then

$$A = V/T = V^2 / \frac{60}{88} L = \frac{60}{88} L / T^2 = nV^2 / 3600 \quad (1)$$

This *A* is the most important quantity in the calculation. All runs with the same value of *A* require the same energy per ton mile, regardless of speed and length of run, for the same accelerations, and require motor capacity proportional to the square root of the length of the run. Further, all values of *A* that are of practical consequence are included between 0.1 and 0.3, and 0.3 is very high.

The watt-hours per ton mile will then be

$$W = 2r(1-l) + \frac{nV_b^2}{36} \quad (2)$$

$$= 2r(1-l) + 100A(V_b/V)^2 \quad (3)$$

Equation (2) is simply a statement of the work done in overcoming friction plus the kinetic energy at braking, allowing about 10 per cent for inertia of rotating parts.

TABLE I—COMPARISON OF MOTOR CURVES OF GE-203 AND C. T. H. AVERAGE

Input	CURVE Tractive Effort		Speed	
	G. E.	C. T. H.	G. E.	C. T. H.
27	12	13	200	200
40	27	27	152	149
53	41	41	130	130
67	58	58	119	116
80	75	74	110	109
100	100	100	100	100
120	128	126	94	93
133	147	145	89	89
160	182	178	84	83

G. E. motor, No. 203, *Bulletin No. A4172*.  
C. T. H. motor, *Trans. A. I. E. E.*, Vol. XXII, 1903, page 660, curve sheet No. 2.

By substituting *A*, the length of run and the speed are introduced. Ordinarily it is sufficiently accurate to omit *l*, as the distance run under brakes is relatively small, and this entire term is small.

If, however, greater accuracy is desired, the value of *l* can be calculated by this equation:

$$l = \frac{V_b^2 / V^2}{2c / A} = \frac{A}{2c} \left( \frac{V_b}{V} \right)^2 \quad (4)$$

where *c* is the retardation after braking, in miles per hour per second, 1 mile per hour per second being equal to 91 lb. per ton.

The application of this equation then depends on two guesses only—first, the ratio *V<sub>b</sub>/V*, and, second, the efficiency—only fewer than that of Messrs. Del Mar and Woodbury.

This ratio *V<sub>b</sub>/V* depends on the several accelerations and upon *A*; it can be tabulated approximately, as is done in Table II.

The values given in Table II are substantially correct for an initial acceleration of 1.25 m.p.h.p.s. and a braking effort

TABLE II—SHOWING RATIO OF SPEED AT BRAKING TO AVERAGE RUNNING SPEED, FOR DIFFERENT SCHEDULES

Through Acceleration ( <i>A</i> )	Ratio ( <i>V<sub>b</sub>/V</i> )
0.10	0.40
0.12	0.51
0.14	0.62
0.15	0.66
0.16	0.71
0.18	0.79
0.20	0.87
0.22	0.95
0.24	1.02
0.25	1.06
0.26	1.10
0.28	1.17
0.30	1.23

of from 140 lb. to 180 lb. per ton. The variation of these values with different braking efforts is not very great, and these values will serve as a sufficient approximation, probably with the same accuracy as those given by Messrs. Del Mar and Woodbury for their ratios *K* and *Q*.

The efficiency of the run may be taken at 70 per cent as an average. In the paper quoted I gave a curve of efficiencies ranging from 55 per cent, with no run on the "motor curve," up to 75 per cent. Hobart ("Electric Trains," page 75) gives the range from 65 per cent to 79 per cent. This, of course, depends on the relative run of the "motor curve."

The run given by Messrs. Del Mar and Woodbury would then be calculated as follows:

$$r = 7 \times 15/12 = 8.7 \text{ lb. (to allow for grades and curves).}$$

$$n = 0.5.$$

$$V = 30 \text{ m.p.h.}$$

Then

$$A = 0.5 \times (30)^2 / 3600 = 0.125$$

and  
 $V_b/V = 0.53$  (from table).

Taking

$$c = 2.$$

$$l = \frac{0.125}{2 \times 2} (0.53)^2 = 0.009$$

and  
 watt-hours per ton mile =  $17.4 (1 - 0.009) + 100 \times \frac{0.125 (0.53)^2}{2}$   
 $= 17.4 (1 - 0.009) + 35$   
 $= 52.2.$

Calling  $l = 0$  would in this case make no appreciable difference.

Messrs. Del Mar and Woodbury get 48.3 watt-hours.

Neither of these methods, however, is of much value, inasmuch as neither leads to a determination of the motor capacity or the best initial acceleration. They are merely rough approximations, little better than educated guesses.

CARY T. HUTCHINSON.

### INVESTIGATION OF STREET RAILWAY SERVICE AT BOSTON

The Massachusetts Public Service Commission and the Boston Transit Commission, sitting as a joint board under Chapter 108 of the Resolves of 1913, gave a series of hearings to the Boston Elevated Railway and the Bay State Street Railway beginning Dec. 11, at which the testimony of these companies was presented in reply to persons desiring modifications in the street railway service of the Boston metropolitan district. Arthur A. Ballantine, of Gaston, Snow & Saltonstall, Boston, appeared as counsel for the Boston Elevated Railway and presented the company's opening statement. He pointed out the limitations existing to further extension of the Boston rapid transit system, which now represents a permanent investment of about \$105,000,000. The company carries 894,000 revenue passengers per day and contends that new and increasing burdens must for the time cease if its capital needs are to be financed. The questions presented to the board at previous hearings are of two general types: first, the proposal to extend the service of the Boston Elevated company into territory not occupied by it at present, and, second, changes and improvements of existing service.

By the terms of its charter the company is required to ask and receive a 5-cent fare for a single continuous ride in the same general direction upon its system as a whole. This agreement between the company and the State does not expire until 1922 and has been construed by Massachusetts attorney-generals as a contract. The territorial limits of the city of Boston have never been the basis upon which the 5-cent fare has been established, there being twelve municipalities in the district served by the company. The Hyde Park district is the only one which has joined the city of Boston since the company received its charter, and the company feels that if a 5-cent fare is granted to residents of this ward of Boston, a disastrous precedent will be established, as other districts equally distant from the down-town section will demand the same rate. Three additional subways are now under construction in Boston which will cost \$15,000,000 in addition to the present investment, and the fixed charges of these must be carried by the company. On account of equipment for these subways, additional power and surface equipment, the total increased fixed charges from these sources will soon amount to over \$1,000,000 a year. About half the company's patrons during the twenty-four-hour period desire to ride inside of a three-hour limit. Through the use of "Car Full" signs the company is endeavoring to improve rush-hour service, and the prospects of reducing overcrowding are attractive.

C. S. Sergeant, vice-president of the Boston Elevated

Railway, gave statistics as to the cost of certain proposed extensions, from most of which little or no additional revenue could be expected. The accompanying interesting analysis of the cost of taking over the Hyde Park service of the Bay State Street Railway by the Boston Elevated Railway was presented by Mr. Sergeant. The lines from this latest suburban addition to the city limits touch the elevated system at two points. If the lines were leased by the company, trips from the Summer Street station in the heart of Boston to points about 9 miles distant would be added to the company's 5-cent fare burdens.

#### ESTIMATED COST OF OPERATING ALL HYDE PARK LINES FOR ONE YEAR

Investment	
Estimated valuation of existing track and overhead construction, based on 35,872 ft. of track, at \$5.376 per ft., or \$28,385.28 per mile.....	\$192,863
Estimated cost of installing five additional turnouts.....	15,500
Estimated valuation of additional equipment required to extend present service, based on seventy-one trips per day to Readville track and seventy trips to Cleary Square; also to operate a fifteen-minute service between Mattapan Square and Dedham line (seventy trips per day); thirteen 25-ft. box cars, at \$3,400; carhouse storage, \$673.75 per car; power capacity, \$3,300; transmission lines, \$495, or an investment charge of \$7,868.75 per car.....	102,293
Thirteen ten-bench open cars at \$1,700 per car and \$577.50 for carhouse storage, or \$2,277.50 per car.....	29,607
Total estimated additional investment to operate all lines....	\$340,264
Operating Expenses and Yearly Charges	
Car mileage per annum, 386,284, at 18.78 cents.....	\$72,544
Rental and taxes.....	16,168
Interest on equipment not leased at 5.14 per cent, the average return on money paid security holders in the Boston system..	6,779
Taxes on equipment not leased at one-half State rate of \$17.93 per \$1,000, or \$8.965 per \$1,000 on \$131,901.25.....	1,182
Total .....	\$96,673

Mr. Sergeant said that there would be no revenue to offset the extension of the 5-cent fare to these lines other than that arising from local travel, which would be without question far below the cost of rendering the service. A suitable service is now rendered in Hyde Park by the Bay State Street Railway. In closing his direct examination, Mr. Sergeant called attention to the point that the figures submitted take no account of the cost of transporting passengers on the present system between the Hyde Park lines and the center of the city.

On cross-examination, Mr. Sergeant stated that, although cars of foreign companies are handled by the Boston Elevated without direct compensation to their owners, the use of such rolling stock is often an extra expense on account of their schedule irregularities. The average distance from the heart of Boston to the terminal points of the company's surface lines is 6.87 miles, the maximum distance being 9.095 miles from the Summer Street station to the Charles River, in West Roxbury. A general understanding exists between the Boston Elevated and Bay State companies as to the territory which each will serve. The shortest line from the center of Boston to an outlying point is 3.18 miles in length. A fare of 1 cent per mile is inadequate compensation for city service. The company hopes to be able to operate at least 150 train units per hour through the East Boston tunnel when the Bowdoin Square loop is completed. The witness stated that in his opinion a rate of 5 cents for a 3-mile ride is equitable.

Robert S. Goff, vice-president Bay State Street Railway, testified that car delays on the company's Boston-Chelsea line are largely due to drawbridge openings over the Charles and Mystic Rivers. Forthcoming improvements will tend to reduce congestion. The company has installed automatic block signals in place of the hand-operated type and the movement of cars has been materially expedited.

The Bay State company believes that the handling of Revere Beach traffic should be by a single operating organization. In Sunday rush service the company sometimes handles sixty-nine cars an hour between Scollay Square and Revere Beach. If a 5-cent fare should be placed in effect between all parts of Boston and Revere Beach, there would be a demand for such a fare from all parts of Revere to Boston.

**THE AMERICAN LOCOMOBILE\***

BY GEORGE S. COOPER, BUCKEYE ENGINE COMPANY

The locomobile, as it is known in Germany and as its name indicates, had its lowly origin in a small portable unit, consisting of a single-cylinder engine mounted on an internal fire-box boiler. The first machines used low-pressure steam in a non-condensing slide valve engine with but indifferent steam and coal economy. In fact, the only trace that we can discover of an attempt to conserve heat is found in the fact that the engine cylinder was built into the steam dome of the boiler. These machines were built in Germany about the year 1862, and as late as 1880 required 4.6 lb. of coal per horse-power. During the sixties and seventies we find but slight improvements in these machines, their average capacity being 11 hp, but in 1883 a locomobile having compound cylinders and operating condensing was built with a resultant improvement in economy to 2.94 lb. of coal. The next ten or twelve years are marked by an increase in the average capacity of these units to about 38 hp. Higher steam pressures were used with still further gains in fuel economy.

About 1895 an attempt was made to adapt the locomobile for the use of superheated steam, and evidently the results were encouraging, since about five years later we find a complete, compound, condensing, superheated steam locomobile operating with a steam pressure of about 175 lb. and producing a horse-power-hour on 1.36 lb. of coal. In this design the engine was carried entirely on the boiler, the compound cylinders being side by side in the steam dome. The boiler-feed pump and vacuum pump were driven from the low-pressure eccentric. A superheater consisting of a single coil of steel tubing was installed in the casing at the end of the internal corrugated furnace boiler where it was continually swept by the hot gases as they emerged from the boiler tubes on their way to the stack. This achievement was quickly followed by the development of the tandem compound machine with both cylinders jacketed by the hot flue gases. The steam was reheated as it passed from the high-pressure to the low-pressure cylinder, and machines of this type in sizes as small as 100 hp used but 1.04 lb. of coal per net delivered horse-power, while machines of a similar type with a very high degree of superheat further reduced the coal consumption to 0.79 lb.

From the foregoing facts it is evident that the locomobile, far from being an experiment, has reached its present high state of mechanical perfection and thermal efficiency through the adoption one at a time of the principles set forth in a preceding paragraph. It is more a design than an invention. It represents the evolution of the complex conventional power plant into its natural and simplest form. This type of power unit has become an accepted standard in most parts of Europe and its dependencies. In fact, it is well known the world over, except in the United States, where the comparatively low cost of fuel has not made the insistent demand for its conservation which we find abroad. Nevertheless, the trend of our fuel costs has been steadily upward, the past few years being marked by sharp advances. American engineers have not been altogether blind to the desirability of power plants with low fuel costs. In the majority of cases, however, this phase of the matter has been completely overshadowed by the imperative necessity for absolute reliability of operation and comparative simplicity in the matters of attendance and maintenance.

About three years ago the Buckeye Engine Company of Salem, Ohio, began to consider the feasibility of placing on the market a locomobile of American construction. A careful investigation followed, and the facts stood out most plainly that here was a steam power plant which was of

comparatively simple construction, which equaled the producer-gas plant in fuel economy, could be operated by American steam engineers, showed low upkeep costs and, owing to the very small number of moving parts, had demonstrated a reliability fully equal to that of any prime mover manufactured. A further advantage was the fact that it operated on any available fuel—coal, lignite, oil or refuse. The economies shown by the small German machines were so startling in view of accepted American practice that before building a machine of our own it was thought best to make some preliminary experiments on standard Buckeye engines to determine the effects of superheat on steam consumption. A series of some sixty tests was at once instituted wherein a simple engine and later a tandem compound engine, each of about 100 hp capacity and of the high-speed type, were operated under superheats varying from 0 deg. up to 225 deg. Fahr. The reduction in steam consumption shown by these tests with increased degrees of superheat was so marked that all doubts of our being able to make record economy with a machine of the locomobile type were dispelled. The first Buckeye locomobile was constructed during the summer of 1912 and put into operation for the first time on Sept. 13 of that year. Its rated capacity was 175 ihp. Since last January it has been in daily operation handling a shop load consisting of cranes, machine tool motors and lights, the load varying from 60 kw to 160 kw. Carefully conducted tests have been run from time to time to determine the efficiency with various grades of coal and with modifications of the furnace and grates. The table presents the average results of seven tests run with Pocahontas coal. Column A is the average of three tests run at about 95 per cent of the rated load. Column B is the average of two tests at 14 per cent overload, and Column C that of two tests at 36 per cent overload, demonstrating the ability of the locomobile to handle large overloads with a scarcely perceptible loss of efficiency. While not shown in this series, other tests show that the same valuable characteristic is possessed at underloads. The three-quarters load fuel consumption is within 5 per cent of that at full rating.

TEST RESULTS OF AMERICAN LOCOMOBILE

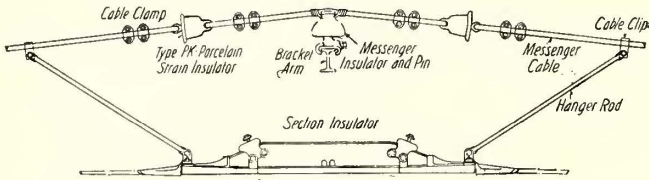
	A	B	C
Load, per cent.....	95	114	136
Indicated horse-power.....	166	199	237
Kilowatts .....	99.4	121.5	146.8
Revolutions per minute.....	206	209	208
Steam pressure, lb.....	209	208	207
Saturation temperature, deg. Fahr.....	391	391	390
Steam temperature at throttle, deg. Fahr.....	638	673	668
Initial superheat, deg. Fahr.....	247	282	278
High-pressure exhaust temperature, deg. Fahr.....	313	353	387
Receiver pressure, lb.....	13	18	27
Low-pressure inlet temperature, deg. Fahr.....	413	432	457
Low-pressure superheat, deg. Fahr.....	169	178	188
Low-pressure exhaust temperature, deg. Fahr.....	146	150	162
Feed-water temperature, deg. Fahr.....	131	132	138
Vacuum (referred to 30 deg. barom.), in. Hg.....	25.6	24.3	24.3
Temperature gases base of stack, deg. Fahr.....	501	558	578
Total steam per hour, lb.....	1,626	1,970	2,420
Steam per ihp-hr., lb.....	9.8	9.9	10.2
Steam per kw-hr., lb.....	16.35	16.3	16.5
Total coal fired per hour, lb.....	192	238	283
Coal per ihp-hr., lb.....	1.16	1.195	1.195
Coal per kw-hr., lb.....	1.94	1.96	1.93
Boiler and superheater efficiency, per cent.....	76.9	76.6	77.0
Thermal efficiency of engine, per cent.....	19.8	19.7	19.5
Thermal efficiency of unit, per cent.....	15.6	15.1	15.0
Heat value of coal, b.t.u.....	14,136	14,099	14,215

In comparing the above results with other power plant data, it should be remembered that the locomobile is essentially a small or moderate-sized plant. Small steam plants are usually quite wasteful of fuel for several reasons. In the first place small engines are almost always of the high-speed, non-condensing type, using 30 lb. to 40 lb. of steam per hp-hr. Radiation losses are relatively greater in small plants than in large ones, owing to the fact that small boilers, cylinders and pipes expose more surface per pound of steam carried than large ones. To equip a small plant with economizers, condensers, superheaters, etc., is not often commercially feasible since small apparatus of this class is usually much more costly per horse-power than that used in large plants.

\*Abstract of a paper read before the Ohio Society of Mechanical, Electrical & Steam Engineers, Nov. 20-22, 1913.

**NEW PORCELAIN STRAIN INSULATORS**

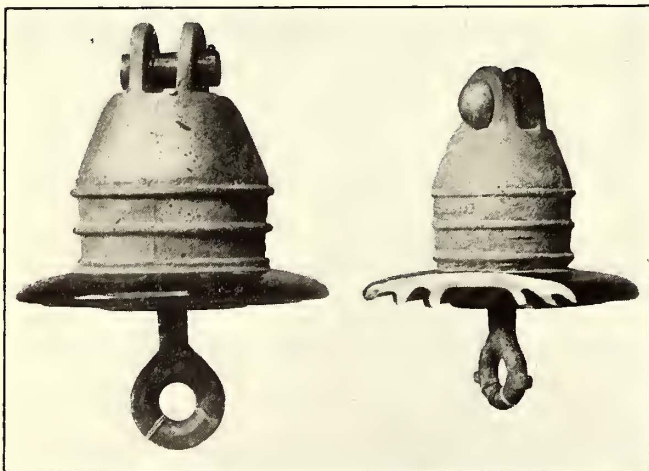
To meet the severe requirements due to the increasing weight of overhead construction two new types of porcelain strain insulators have been developed by the Westinghouse Electric & Manufacturing Company. These are a combination of a metal cap to give the necessary strength and a porcelain skirt to furnish the required dielectric strength. The metal parts of these insulators consist of a malleable-iron cap, a drop-forged steel eye bolt, and a malleable-



**Application of Porcelain Strain Insulators to Section Insulator**

iron sleeve by which the eye bolt is securely fastened. The metal and porcelain parts are cemented together with a high-grade Portland cement. The cemented surfaces are provided with carefully determined corrugations which prevent failure, except by the actual shearing of the cement. The skirt of the porcelain is provided with corrugations on the under side to give additional creepage surface.

Two types of these insulators are made, the PK and the PK-1. The metal parts of the type PK insulator are sherardized and those of the larger size, types PK-1, are hot galvanized. The type PK insulator is especially used for insulating cables when the working load does not exceed 1600 lb. As they are tested at 5000 lb., both types are generally used for heavy service, such as dead-ending high-strength steel mes-



**New Types of Porcelain Strain Insulators**

senger cables, with a working load of 4000 lb. and 8000 lb. respectively. The drop-forged eye bolt of the type PK-1 has side projections so that if two or more insulators are used in series they cannot swing more than a few degrees, thus avoiding the danger of breaking the porcelain skirt because of striking the cap of the adjacent insulator.

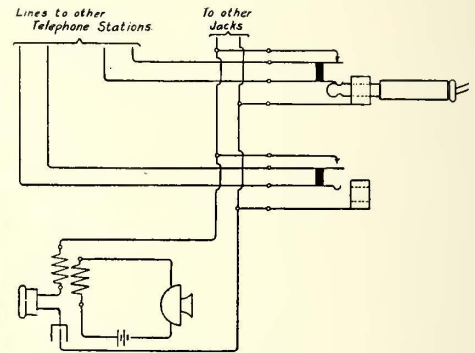
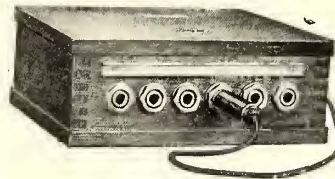
The Board of Public Utility Commissioners of the State of New Jersey recently issued Volume I of its reports for the period from May 1, 1911, to June 2, 1913, in accordance with the provisions of the public utility law. This volume should not be confused with the report which the board is required to make to the Governor annually.

**CORDLESS JACK BOXES FOR WAY-STATION SERVICE**

A simple switching device for connecting the operator's set in a railroad way station to one or more lines passing through the station is found in the cordless jack box recently perfected by the Western Electric Company's railway engineers. This does away with the unsatisfactory knife-switch method of cutting in the operator's telephone or telegraph set on the train-dispatching lines. The connection is effected by means of a single conductor plug which is inserted in the hole corresponding to the line over which it is desired to talk or telegraph.

The cordless jack boxes are of two kinds, one for telephone dispatching circuits and the other for telegraph lines, a different style of jack being necessary in the latter case on account of the different nature of the telegraph circuit and apparatus. One distinctive feature of the telephone jack boxes is that they may be used to connect two or more lines together and have the operator's set bridged in on all of them merely by using one or more extra switching plugs.

Solid oak is used for the construction of the boxes and the cover is made of three layers to keep it from warping. This cover is hinged so that it may be opened for inspection. The jacks are made with heavy insulation to prevent trou-



**Cordless Jack Box—Circuit Diagram for Telephone Lines**

ble from sudden voltage surges or accidental crosses with power or lighting circuits, with all jack springs widely separated to prevent arcing and burning of insulation. Screw terminals are used for connecting in outside lines, and no soldering is necessary. A tie cord is furnished with the switching plug to keep the latter from being mislaid when not in use.

The cordless jack boxes are manufactured to take three lines, six lines or twelve lines, as desired. Any of the jack boxes can be ordered partially equipped with dummy wood plugs in the unequipped spaces. Jacks can be added at any time by knocking out the wood plugs and screwing in the jacks. Wiring is always furnished for the full equipment.

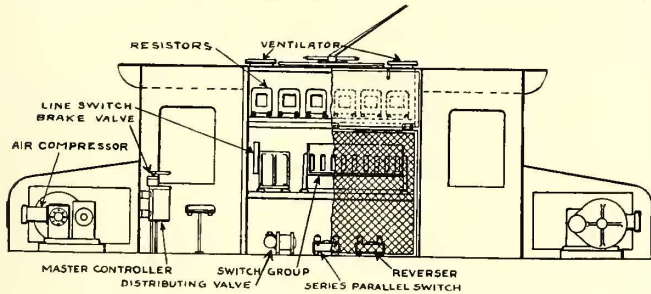
**STANDARD ARRANGEMENT FOR ELECTRIC LOCOMOTIVE EQUIPMENT**

Since the electric locomotive is becoming more and more each day a profitable revenue producer for electric railways, it is important that its equipment should be laid out to the best advantage for providing reliable operation and continuity of service. In the arrangement of a locomotive equipment three essential points should be kept in mind, namely, to mount the apparatus on the locomotive in such a way that each part will operate to the best advantage and with the least chance of trouble, that easy access shall be given to all parts and especially to those parts which are most likely to require attention, and that no unnecessary expense will be required for equipping and maintaining the locomotive.

To accomplish these results the following general principles have been adopted in the standard Baldwin-Westing-



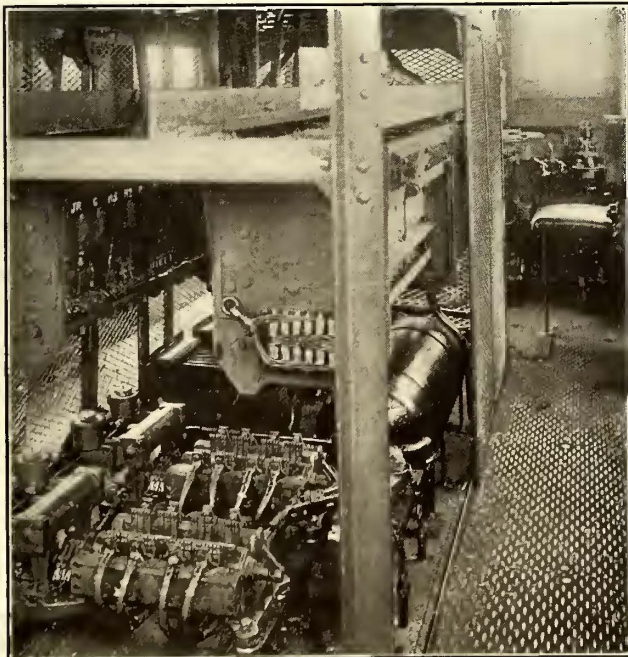
house locomotives. All of the main circuit-control apparatus and the resistors are mounted in the center of the locomotive and surrounded with suitable expanded metal screens as a protection against accidental contact. In the right-hand corners of the cab are mounted the master controllers, engineer's brake valves and the sander valves. The reversers and series-parallel switches are placed next to the floor, the switch groups and line switches directly



Standard Arrangement for Electric Locomotive Equipment

over them, and the resistors directly over the switch groups under the roof. The grid resistors are mounted in the main cab over the switch groups, partly on account of simplified wiring and partly because there is not sufficient room underneath the locomotive between the trucks to accommodate them when considerable capacity is required. The resistors are inclosed in a steel cabinet open at the bottom and provided with hinged doors on each side so as to provide easy access. Ventilators are provided in the roof over the resistance cabinet to give free egress to the heated air.

The space occupied by the apparatus under the resistance is inclosed by grounded, expanded metal screens which are made up in sufficiently small sections so that they can readily be removed for the inspection of apparatus. When forced ventilation is required centrifugal motor-driven



Interior of Standard Locomotive

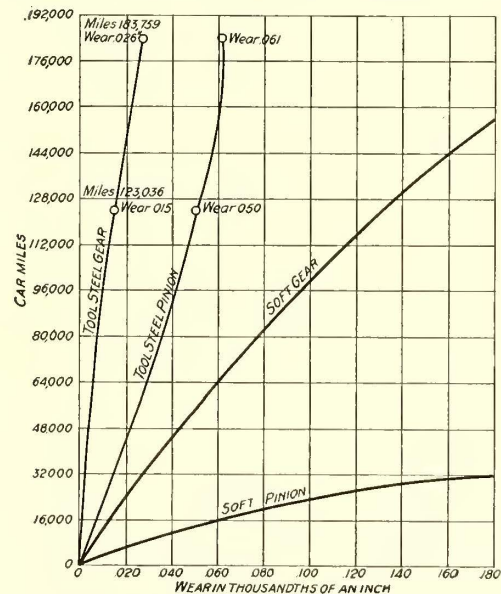
blowers are installed in one or both of the hoods with the air compressor. These blowers force air through a conduit built into the locomotive frame between the center sills, whence it passes to the main motors through flexible canvas connections.

The advantages claimed for this centralized arrangement are numerous. All of the control apparatus is assembled compactly in one part of the locomotive. The switch

groups are located in such a position that they are readily accessible from all sides and they are at such a height that a man can get at them freely without working in a cramped position or inside the hood. As the resistors are located under the roof, just above the switch group, the lengths of the connections between the two pieces of apparatus are reduced to a minimum. At the same time the heat rising from the resistors passes directly out through ventilators in the locomotive roof and very little of it reaches the switch group. The reversers are mounted in a position where they can be readily reached and they are centrally placed relative to the motors and near enough to them so that the amount of cable required is reasonable. The air-brake distributing valve is placed inside the cab, where it will be kept sufficiently warm to prevent freezing and where at the same time it is easily accessible. Finally the location of the compressor and blower motor in the hoods removes the feature of objectionable noise inside of the cab and at the same time puts both pieces of apparatus in a position where they can be easily lifted out.

### EFFECT OF FOUR YEARS' SERVICE ON A GEAR AND PINION

In 1909 the Memphis (Tenn.) Street Railway Company began a test of tool steel gears and pinions. Recently it took measurements on one set which had been installed in that year and found that the gear had hardly become more than polished and that the pinion showed about one-third as much wear as could ultimately be obtained. At the time they were measured the gear and pinion had made 183,759 miles, which virtually doubled the pinion guarantee of 100,000 miles. As the set was one of the first of its kind manufactured, the test was watched with great interest by the company. Prior to this test untreated gears and pinions were used as standard. The pinions gave an average wear life of approximately 32,675 miles and the untreated gears gave 156,000 miles. The Tool Steel Gear & Pinion Company, which furnished this gear and pinion for the test, used the untreated gear and pinion records as a basis and



Gear and Pinion Records

guaranteed the tool steel pinions for 100,000 miles and the gears for 500,000 miles.

The accompanying curves showing wear in one-thousandths of an inch plotted as abscissas and the car miles as ordinates indicate that the guaranteed pinion mileage will be exceeded by more than 300 per cent, and undoubtedly the guaranteed gear mileage will be reached if not exceeded before it is necessary to remove the set.

# News of Electric Railways

## Final Arguments Before Boston Arbitration Board

Before the board of arbitration sitting in the Boston Elevated wage investigation at Ford Hall, Boston, on Dec. 11, Frederic E. Snow, counsel for the company, delivered a final argument against granting the demands of the employees' organization for increased compensation. Prior to the presentation of the argument, the terms of the agreement between the union and the company regarding the hours of labor as published in the *ELECTRIC RAILWAY JOURNAL* of Dec. 13, 1913, page 1254, were read into the record. Chairman Storrow congratulated the parties in appearance upon coming to an agreement upon this important matter during the present proceedings.

Mr. Snow reviewed the main points brought out in the company's testimony, and contended that the company should not be expected to pay more than the market cost for its operating labor. The company is paying the going rate of wages for similar work under similar conditions; it can secure all the help it desires at the present rate of wages and working conditions; it cannot by the terms of its charter increase the price of transportation to meet increases in wages, and its financial condition is such as to jeopardize the present 6 per cent dividend in case any substantial increase in wages is made. A general increase of 5 per cent in wages would add over \$372,500 a year to the company's payroll, which would wipe out the surplus for the twelve months ended Sept. 30, 1913, and the surplus for the last fiscal year before the strike, ended June 30, 1911.

The company feels that the rights of its 9000 employees are not paramount to the rights of the 12,000 stockholders and the 1,500,000 residents of the Greater Boston district. Mr. Snow reiterated the point that the company's employees are receiving an average wage of more than \$760 a year, compared with \$532 for all the industries of Massachusetts, \$594 for the boot and shoe industry of the State and \$700 a year for employees of the New York, New Haven & Hartford Railroad. There is therefore no question of a living wage before the board. The increased cost of living might be made up to the employees of the road by more hearty co-operation on their part with the company in securing the safety of the public and the employees themselves, in the collection of revenue to which the company is entitled, and by creating a friendly attitude on the part of the public toward the company.

## Damage Claims and Other Questions in Cleveland

Councilman Newell, of Cleveland, Ohio, has prepared a resolution to be introduced in the City Council asking that Peter Witt, street railway commissioner, furnish the Council a statement showing the amount of damage claims paid by the Cleveland Railway during the last two months as compared with a similar period a year ago. Mr. Newell contends that the number of accidents has increased since the new schedules, which require greater speed, have been in force.

The East Cleveland Council has under consideration an ordinance giving the Cleveland Railway the right to build a double-track extension of its Superior Avenue line through that village. In case the company's cars make the trip from East Cleveland to the Public Square in the city in twenty-five minutes, the fare is to be 5 cents, but if not it is to be 3 cents. The franchise covers a period of twenty years, ending May 1, 1934. This action was taken to make possible the fulfilment of Mr. Witt's plans to establish an express service on Superior Avenue for East Cleveland and thus lighten the burden of the regular cars, carrying people shorter distances. Objections have been raised to his plan to put four tracks on Superior Avenue for this purpose.

Mr. Witt has suggested that there is sufficient car seating capacity now to limit the number of passengers who should be permitted to ride on each car. He feels that no car should carry passengers in excess of 50 per cent over the seating capacity of the car, and is of the opinion that the conductors and motormen will be able to estimate the number of passengers on their cars and refuse to stop for

passengers when in their opinion the limit of capacity as prescribed has been reached.

In order to ascertain the cost of building underground terminals at the Public Square, city engineers are making borings in the northwest and southwest sections of the square. Mr. Witt has proposed that two loops be constructed under each quarter of the square to care for all the surface cars that reach the down-town district. This would also include the west end of Superior Avenue to West Ninth Street, where the cars would emerge and pass onto the bridge that will be built across the Cuyahoga River at that point.

## Contract for Brooklyn Elevated Extension

The form of contract for the first extension of the Brooklyn elevated railroads under the dual system agreements has been approved by the Public Service Commission for the First District of New York. This is the Liberty Avenue extension of the Fulton Street elevated railroad, which now terminates at the borough line between Brooklyn and Queens. The Fulton Street road is to be third-tracked and an extension built from the present terminus along Liberty Avenue to Lefferts Avenue, Queens Borough. The extension also will be a three-track line. It will be built and owned by the New York Municipal Railway Corporation, but the commission has directed that the company submit the contract to competitive public bidding and advertise for bids in the usual way. The bids are to be opened in public and later submitted for the consideration of the commission. The extension will be a little more than 2 miles long, and the contractor will be required to complete it within twelve months from the delivery of the contract.

Consents of property owners sufficient to legalize the Flatbush Avenue-St. Felix Street-Fulton Street rapid transit route have been obtained by the Public Service Commission for the First District. This is the route which connects the Fourth Avenue subway through St. Felix Street and Flatbush Avenue with the Brighton Beach line of the Brooklyn Rapid Transit system at Malbone Street. Legalization of this route was delayed for some time by failure to get the consents of the Brooklyn Academy of Music and the Long Island Railroad. These two consents have now been obtained. The assessed valuation of the abutting property is \$5,724,900, and the value of the property for which consents have been obtained is \$4,942,300.

Changes in the plans of the DeKalb Avenue station on the Fourth Avenue subway, in Brooklyn, have been ordered by the Public Service Commission for the First District, so that this station will become practically an express station. The changes involve the construction of two cross-overs west of the station at a cost of about \$130,000. These cross-overs will permit trains from the Fourth Avenue subway, as well as those from the St. Felix Street-Flatbush Avenue connection with the Brighton Beach line, to make stops at DeKalb Avenue.

## Decisions Fixing Terms of Joint Use in Milwaukee

On April 14, 1913, the city of Milwaukee passed an ordinance directing The Milwaukee Electric Railway & Light Company to extend its tracks on Wells Street from West Water Street to Fifth Street and from Sixth Street to Eleventh Street, and the company entered into negotiations with the Milwaukee Northern Railway looking toward an agreement for joint use of facilities under which the requirements of the ordinance of April 14 could be fulfilled. The companies failed to agree upon such use and upon the terms and conditions of compensation, and the matter was referred to the Railroad Commission of Wisconsin for adjustment. The commission has decided that The Milwaukee Electric Railway & Light Company may operate cars over the tracks of the Milwaukee Northern Railway between Fifth and Sixth Streets, on Wells. The decision is lengthy, and the subject of liability appeared to be considered of first importance by the commission. The Milwaukee Northern Railway proposed that The Milwaukee Electric Railway

& Light Company indemnify any liability growing directly or indirectly out of the operation of cars or equipment by The Milwaukee Electric Railway & Light Company over its tracks. The commission decides that the Milwaukee Northern Railway is entitled to adequate compensation for the use of its property, but that it cannot be relieved from its "proper responsibilities."

In a somewhat similar case involving the Chicago & Milwaukee Electric Railway and The Milwaukee Electric Railway & Light Company the commission has decided that The Milwaukee Electric Railway & Light Company may operate cars over the tracks of the Chicago & Milwaukee Electric Railway between Second and Fifth Streets on Wells Street. As in the Milwaukee Northern Railway case the commission holds that the Chicago & Milwaukee Electric Railway is entitled to a just and adequate compensation for the use of its property, but that it cannot be relieved from its "proper responsibilities." The compensation is the same as decided in the Milwaukee Northern Railway case for the use of tracks and overhead system.

#### Attitude of Department of Justice Toward New Haven Company

Attorney General McReynolds was quoted in part as follows on Dec. 14 in regard to the probable outcome of the conferences between members of the Department of Justice and officers of the New York, New Haven & Hartford Railroad, held with the end in view of correcting the operations of the company so as to meet the ideas of the Department of Justice with respect to the Sherman anti-trust law:

"The Department of Justice is trying to find a way to correct the troubles with the New York, New Haven & Hartford Railroad so that the people of New England will be most thoroughly protected, and in a manner to inflict as little damage to their interests as possible. We have conducted an investigation of the affairs of the company to determine whether the Sherman anti-trust law has been violated. We have prepared a bill in equity, which is designed to correct the evils resulting from the former management of the railroad. There are two ways of accomplishing this. One is to give the managers of the road a chance to correct these evils themselves by adjusting their affairs so as to comply with the law. The other plan is to compel immediate compliance with the law and compel the company to dispose at once of the interests of the company in trolleys, steamships and other corporations, without regard to what these would bring under forced sale. I believe the management has evidenced its purpose to enforce rigid economy by passing up the dividend on its stock. That is the first step in the right direction. It may be that the management will succeed in its undertaking. There will not be the necessity for a civil suit by the government if the evils are corrected."

#### Howard Elliott on the Massachusetts Trolley Act

Howard Elliott, chairman of the board of directors of the New York, New Haven & Hartford Railroad, has submitted to the Public Service Commission of Massachusetts an estimate by the company of the cost to it of the Berkshire Street Railway stock to be issued to acquire the various electric railways in Massachusetts proposed for such acquisition by the last Massachusetts Legislature. The estimate is \$19,000,000 and would be offset through retirement of securities which the company now guarantees—leaving about \$5,000,000 for new construction over a period of years. In his letter to the commission Mr. Elliott says:

"I transmit herewith the estimate of cost which, under the provisions of Section 9 of the western Massachusetts trolley act, so called, is required to be submitted by this company within six months after the passage of the act. This estimate is filed at this time merely because the statute seems explicitly to require such action on the part of the company, leaving no discretion in the matter to the company.

"It is not to be construed as indicating any intention of the company to file a petition under the act or ultimately to accept the act. The future action of the company in this matter must obviously depend in large measure upon future

developments. The estimate submitted is based in some respects upon opinions which may be altered hereafter by more accurate knowledge. For example, it has not seemed proper to ask the owners of the common stock of the New England Investment & Security Company to fix a value thereon which they would be willing to accept at some indefinite and perhaps distant future date."

#### Comment Upon the Boston Hours of Labor Agreement

Since the beginning of the arbitration hearings at Boston several months ago the onerous features of the so-called "nine-hours-in-eleven" law passed at the 1913 session of the Legislature have frequently been emphasized, and the difficulty of carrying out the act on the Boston elevated system has been discussed. Pending the conclusion of arbitration proceedings, the enforcement of the act by the company has not been demanded by its employees, and the reaching of an agreement which appears in many respects to modify the most burdensome features of the act has been heralded with general satisfaction. Commenting upon the situation editorially, the *Boston Transcript* says:

"The carmen's union has shown itself wiser than the Legislature in voting to forego a test of the privileges supposed to attach to the 'nine-hours-in-eleven' law. It has been a more perplexing problem to deal with than almost any other phase of the controversy, and this action by the employees of the elevated system seems virtually to concede that it is not practical and that there are other and more workable ways of securing the benefits for which they contend. This was an instance of hasty legislation put through without knowledge of what the effects would be. It is now practically repudiated by both sides in the controversy. It was widely criticised when it went through, and the present disposition of it indicates that the criticism was warranted and should have been heeded. Were that the only mistake made by the recent Legislature, it might be forgiven, but it was symptomatic rather than exceptional. We are always hoping for better things from the one yet to be tried."

#### Publicity in Connection with Kansas City Franchises

While it is, of course, still uncertain whether the Metropolitan Street Railway, Kansas City, Mo., will obtain a new franchise, public sentiment has undergone a marked change recently and the prospects for a favorable vote at the special franchise election are considered better than for some time past.

The original franchise ordinance is necessarily a formidable document. Acting on the suggestion of Federal Judge William C. Hook, the company sent a copy of the ordinance to each of the 30,000 voters registered in Kansas City. This in itself was a tremendous task. In addition it was decided by the receivers to digest the ordinance so as to present the salient features and to send the following letter to the voters of Kansas City:

"We will shortly send you a synopsis of the proposed contract now pending in the Council, in order that you may know the general effect thereof. Also the full draft thereof will be attached so that you may read the details. We ask that you study this contract and come to your own conclusion whether the street-car problem should be settled at this time, and, if so, whether the proposed contract is the best that can be devised in justice to both sides. If you think no contract at all should be made, or if you think any part thereof is wrong, or you have any suggestions as to how the situation can be better dealt with, we, as court officers, want to know it. If you think the proposed contract is a fair settlement of the problem we also want to know it. Your opinion is invited."

This circularizing was supplemented by advertising to the public, done, not by the Metropolitan Street Railway, but by the committee appointed by the Kansas City Council to consider the ordinance and report back. The committee held daily sessions and invited expressions of opinion from all sources. All of the three daily papers of Kansas City were utilized for a week's time. The advertisements of the Council committee were small, merely inviting anyone interested to attend the daily hearings at the City Hall. There were many responses to this invitation.

The receivers of the company have heard from many of the voters as the result of the issuance of the condensed drafts of the franchise ordinance. Letters, friendly and unfriendly, have been written, but the majority commended the receivers for their frank dealing with the situation.

#### Missouri Commission Rescinds Order Directing Removal of Manager

The Missouri Public Service Commission has rescinded its order directing the Fort Scott & Nevada Heat, Water & Power Company to remove its manager for alleged oppressive conduct. In changing its attitude, the commission did not admit that it has not the power to remove the officials of public utilities. The opinion merely stated that additional evidence had caused the members of the commission to change their decision.

In its original order the commission held that it had power to remove a manager when in its judgment such removal was for the benefit of the public, and that it also had the right to direct the company to secure the services of competent persons. The company was prepared to take the case to the courts. Its attorney contended that the original order of the commission was in direct conflict with previous decisions of the Supreme Court of Missouri.

#### New Haven Electric Zone Safety Hearing

Before John E. Eustis and J. Sergeant Cram, representing the Public Service Commission for the First District of New York, and James E. Sague, representing the Second District Commission, a rehearing was held on Dec. 11 relative to an application of the New York, New Haven & Hartford Railroad for a change in a recent order directing that road to take certain steps to protect the employees from contact with overhead electric equipment.

Charles M. Sheafe, Jr., counsel for the New Haven, and C. L. Bardo, general manager of the railroad, objected to that part of the order which forbade employees from going on the tops of trains while they were in certain electrical zones. It was absolutely necessary to send men there, they said, in certain emergencies, such as disablement of equipments, accidents to the pantograph, loose car roofings and the like.

John Fitzgibbons, legislative representative of the trainmen, said that there was no objection to a modification of the order to prevent men going on the top of cars to make emergency repairs or to carry word to the engineer when the train was standing still in full clearance on the main line.

#### Chicago Approves Arnold Subway Plan

The sub-committee of the Chicago City Council has approved the subway plan submitted by Bion J. Arnold and described in the *ELECTRIC RAILWAY JOURNAL* for Nov. 8, 1913. Following its approval corporation counsel was requested to draft an ordinance with the assistance of George Weston, the city's representative on the Board of Supervising Engineers. Since Mr. Arnold presented his original subway plan several slight revisions have been made, and the total cost of the proposed subway, including these additions, is now \$27,285,000. In its request to prepare an ordinance covering the Arnold subway plan, the sub-committee outlined the following provisions to be included:

1. That the subways be municipally owned.
2. That the cost of subway system be paid out of the traction fund to the extent it is sufficient, and that the additional capital be furnished by the surface railway companies.
3. The surface line companies occupying the subways shall pay the city a reasonable rental based on the cost of the system.
4. The system of subways shall be operated as a part of the surface lines subject to the provisions of the 1907 and subsequent traction ordinances.
5. The general plans and specifications shall be prepared by, and the subways shall be constructed under, the direction of the Board of Supervising Engineers.
6. The subways shall be constructed under contracts to be let by the city of Chicago.
7. The ordinance shall contain a provision that it shall not become effective unless approved by referendum vote.

8. In case the subway ordinance is accepted by the voters the Board of Supervising Engineers shall immediately complete the preparation of plans and specifications for the subways and advertise for bids. The contract for the subway shall make provision for its completion within a limited period.

9. After the completion of the initial system of subways the companies may be required to join with the city in defraying the cost of extensions and additions made to the system.

10. It shall be provided that the initial system set out in the ordinance shall be placed under operation before any extensions are undertaken.

#### Proposed Akron Franchise Modified

At a conference on the evening of Dec. 11 attended by members of the City Council of Akron, Ohio, City Solicitor Taylor and A. B. du Pont, a number of changes in the proposed franchise for the Northern Ohio Traction & Light Company were tentatively decided upon. The most important, perhaps, related to control of operation by the city. The franchise will be changed to give the City Council power to regulate the service by ordinance. Such regulation, however, must be reasonable. In case any order which is issued is found to be unreasonable, the company is to be compensated for its loss. The company will be subject to a penalty of \$50 a day for failure to carry out any order made by the Council.

Another amendment provides that the company shall maintain a special fund of \$2,000 to be used in making street repairs; that the city shall make the repairs and the expenses be paid from this fund. The company is to pay into this fund every three months such an amount as will bring the fund up to its full amount.

A third amendment requires the construction of 1 mile of track for each increase of 2000 in population, instead of 5000, as in the original draft.

#### Progress of Indianapolis Arbitration

The Public Service Commission of Indiana on Dec. 16 resumed its hearings in the matter of differences between the Indianapolis Traction & Terminal Company and its employees. Witnesses for the employees are still being heard, and their testimony relates in detail to their working conditions, cost of living, their opinions of membership in unions, etc. On Dec. 11 and 12 the wives of some of the employees testified as to the expense of living. The figures submitted showed in most instances that they were buying only the highest priced meats and other table necessities and that they had not saved anything. Mr. Latta, for the company, exhibited photographs of various markets and stores in the city at which cheap food products were available. Chairman Duncan of the commission took issue with the employees' attorney when he objected to the admission of this evidence, and stated that he was glad to have this information and would look into the matter, as everybody would be better off if prudence was exercised in such matters.

One man's ideas as to union and non-union men working together caused Commissioner Clark to question him. The witness took the position that while union men are without the right to prevent non-union men from taking positions, it was not right for a non-union man to come in and work if a union was established. His plea was for recognition of the union. When questioned by the commissioners as to whether he would treat non-union employees civilly if the commission did not recognize the union, he stated that if his motorman was non-union he "guessed" he would treat him right "if he would tend to his own business."

Attorneys representing the employees attempted to show that the increases in the wages of employees have not been proportionate to the increase in cost of living. They then read from a report of the federal Bureau of Labor to show the percentage of increase in the prices of fifteen articles of food in Indianapolis. The percentages of increase from February, 1912, to February, 1913, were as follows: Sirloin steak, 19.3; round steak, 12.3; rib roast, 18.1; pork chops, 16.4; smoked bacon, 11.7; smoked ham, 10.3; pure lard, 16.7; hams, 11.8; flour, 3.6; cornmeal, 2.4; creamery butter, 9.4;

granulated sugar, 15. The same report showed a decrease in the price of fresh eggs of 18.5 per cent, and of potatoes, 37.3 per cent, while the price of milk had remained unchanged.

During the hearing, Dec. 16, Chairman Duncan questioned one of the witnesses about drinking among street-car men. Mr. Duncan called the witness's attention to the fact that his testimony showed he had money to buy drinks, and that he had to pay cash for them. The commissioner said: "The instalment business comes when men buy things for their families. Men always have money to pay for their drinks. Do you think a crowd of men can properly ask for an increase in wages when they have money to spend for liquor?"

A prominent labor man testified as an expert in labor unions. His theory of one of the advantages of a union to employers was that it prevented a cessation of work at short notice. The attorney for the company called the attention of the witness to the recent controversy between bricklayers and marble workers in Indianapolis, when 800 men quit work because of differences between their respective unions which did not in any way involve the employers.

The local secretary-treasurer of the Amalgamated Association took the stand on Dec. 17 and read a mass of figures showing the number of fares collected on his car while working as a conductor for the company. His figures showed that his wages in 1906 were \$699.57 for the year. In 1912 he earned \$762.45 and was off duty sixty-three days. He argued for recognition of the union, changes in working conditions and a rearrangement of schedules so that at least 70 per cent of the runs would be straight "earlies and lates." When asked by the commissioners as to how the latter might be accomplished, he stated he had not been able to figure it out, but that the company had experts for that kind of work. The witness thought that the employees should not be required to work more than nine hours a day, six days a week. Chairman Duncan asked the witness if he would be willing that the company should be permitted to earn a reasonable return on its investment, and whether the increased wage scale asked for would result in any increase in street-car fares charged the public. The witness assented to the first question and said he did not think that the increased wages asked for would make it necessary to increase the rate of fare charged.

Chairman Duncan informed the attorneys for the employees that the Public Service Commission had decided the employees must complete all their evidence this week, so that the company could begin its side of the case the week of Dec. 22. The commission is overloaded with other matters which must be adjusted after the differences between the Indianapolis Traction & Terminal Company and its employees are settled. Included among these are the adjustment of the wage scale of the Indianapolis & Cincinnati Traction Company and the hearing of the grievances of seven men of the Terre Haute division of the Terre Haute, Indianapolis & Eastern lines.

**New Road Opened in Ohio.**—The Poland Street Railway has placed in operation its line between Poland and Youngstown, Ohio.

**New York Compensation Bill Passed.**—After enacting the entire programme of legislation recommended by Governor Glynn, the extraordinary session of the New York Legislature adjourned on Dec. 12. The feature of the closing day's work was the passage of the workmen's compensation bill and three companion measures in both houses of the Legislature.

**School Transportation System.**—Novel service has just been established at Twin Falls, Idaho, with the opening of I. B. Perrine's storage battery electric railway. The service is part of a centralized school system for Twin Falls and its neighborhood. The line is used to transport children from the country to the city schools. Four miles of line are in operation and a total of 5½ miles will have been completed by the end of December.

**Tramway and Electric Light System in Jerusalem.**—The American consul at Jerusalem advises that companies desiring to compete for the contract for the tramway to be constructed at Jerusalem, and for the establishment of an electric-light system for the same city, in accordance with conditions which have been distributed, will have to present

their bids to the Commission of Adjudication, which will be constituted at the Conak of the government at Jerusalem. The concession will be granted for forty years.

**Safety Appliance Bill Introduced.**—Congressman R. B. Stevens, of New Hampshire, chairman of the House subcommittee in charge of safety appliance legislation, has introduced a bill which vests the Interstate Commerce Commission with drastic plenary powers over the railroads as regards the safety of travelers and employees. The bill authorizes investigations by the commission, empowers the commission to order improvements and repairs and makes carriers liable to a penalty of \$500 for each day that violation of the commission's orders continues.

**Tallulah Falls Development Completed.**—The Tallulah Falls water-power development of the Georgia Railway & Power Company, Atlanta, Ga., now is practically completed. Four of the generators, aggregating 68,000 hp, are in operation and the fifth will be ready for operation soon. These generators have a capacity of more than 17,000 hp each. The plant has been furnishing power to customers since Sept. 24. The Supreme Court of Georgia has handed down a decision affirming the judgment of the lower court in favor of the Georgia Railway & Power Company's title to the Tallulah Falls water-power site.

**Injunction Against Junction Avenue Line, Detroit, Refused.**—Circuit Judge Mandell, on Dec. 4, refused a temporary injunction to Barton L. Peck to prevent the Detroit United Railway from building a track past his house on Larchmont Avenue, a portion of the route of the proposed Junction Avenue cross-town line, according to the terms of the agreement between the company and the Common Council. The only question now to be decided is whether the property is damaged by the road passing it. This was a test case brought in an attempt made by a number of property owners to prevent the construction of the line on the route selected.

**Lexington Arbitrators Decide Against Men.**—The arbitrators selected by the Kentucky Traction & Terminal Company, Lexington, Ky., and the representatives of the men decided unanimously in favor of the company and dismissed the complaint recently made by the men. The representatives of the men insisted that an agreement between them and the company covered employees in the track department. The arbitrators decided that, as foremen cannot be members of the union, the men dismissed were not covered by the agreement. D. L. Thornton, the umpire, or third man, on the committee, was selected, at the request of both parties, by Gov. James B. McCreary.

**Transportation Commission Recommended for Toronto.**—On Dec. 12 the Board of Control of Toronto, Ont., met to consider what further legislation the city shall apply for at the next session of the Ontario Parliament. The board plans to recommend that legislation be sought to enable the city to appoint a commission to take charge of civic transportation. It has been suggested that the commission be composed of three persons, who shall hold office for three years. In the case of the first appointments the period of service of one man would cover four years, one three years and one two years. They are to be eligible for reelection. The members of the commission, it is suggested, should be elected by the City Council and serve without salary. The idea seems to be favored of giving the Council the right to exercise a veto over any recommendation submitted by the commission, while reserving to the commission all initiative power.

**Luncheon to Henry G. Pearce.**—The members of the 1913 entertainment committee of the American Electric Railway Manufacturers' Association tendered a luncheon on Dec. 15 at the Railroad Club in New York to its chairman, Henry G. Pearce, of the Standard Steel Works, Philadelphia. At the close of the luncheon E. R. Mason, in behalf of the entertainment committee, presented Mr. Pearce with a gold watch, suitably engraved. Those in attendance at the luncheon were Allen E. Goodhue, Midvale Steel Company, Philadelphia; W. G. Kaylor, Westinghouse Traction Brake Company, New York; W. A. Lake, the Pantasote Company, New York; E. R. Mason, E. R. Mason Company, New York; James G. Mowry, Patton Paint Company, New York; Henry N. Ransom, Westinghouse Electric & Manufacturing Com-

pany, New York; Robert W. Read, Pennsylvania Steel Company, Philadelphia; W. H. Wilkinson, Pressed Steel Car Company, New York; H. G. McConaughy, Dearborn Chemical Company, New York; Charles R. Ellicott, Westinghouse Traction Brake Company, New York, and L. E. Gould, *ELECTRIC RAILWAY JOURNAL*, New York.

**Agreement Reached in Regard to New Line in Tacoma.**—After a conference with representatives of the Stone & Webster interests recently, the City Council of Tacoma, Wash., decided to call off the special bond election which was to have been held on Dec. 30, and announced that the Tacoma Railway, Light & Power Company had agreed to build the proposed line across the Eleventh Street bridge and the tideflats to the manufacturing district. The voters were to have passed upon a plan to authorize an issue of \$87,000 of bonds to provide funds for the construction of a municipal railway. The Tacoma Railway, Light & Power Company will be granted a twenty-year franchise, and its gross earning tax on all city lines will be reduced from 2 per cent to 1 per cent. The city is to have the right to purchase the line. The terms proposed by John A. Shackelford, president of the company, for the construction of the line were referred to at length in the *ELECTRIC RAILWAY JOURNAL* of Nov. 20, 1913, page 1150. Subsequently the members of the Council reconsidered the matter and decided to put the question of issuing bonds to a vote. If the bond issue is defeated, the offer of the company to build the line will probably be accepted by the city.

**PROGRAMS OF ASSOCIATION MEETINGS**

**Wisconsin Electrical Association**

The annual meeting of the Wisconsin Electrical Association will be held at the Hotel Pfister, Milwaukee, on Jan. 15 and 16, 1914. The entire program has not as yet been completed, but several papers of importance have already been decided upon as follows:

Paper, "The Cost of Supplying Current to Small Consumers and the General Subject of Rates," by S. E. Doane, Cleveland, Ohio.

Paper, "Review of New Laws Affecting Public Utilities in Wisconsin," by John B. Sanborn, Madison, Wis.

Paper, "The Proper Handling of Depreciation Accounts and Some Phases of Rate Making," by Halford Erickson, of the Wisconsin Railroad Commission.

Paper, "Electric Railway Traffic Surveys," by R. W. Harris, Madison, Wis.

Paper, "A Practical Accounting System for the Small Central Station," by H. G. D. Nutting, Milwaukee, Wis.

Paper, "Important Developments in Electricity Meters," by F. A. Vaughn, Milwaukee, Wis.

**Efficiency Society, Inc.**

The first national efficiency exposition and conference will be held under the auspices of the Efficiency Society, Inc., at the New Grand Central Palace, New York, N. Y., April 4 to 11, 1914. The Efficiency Society, Inc., was organized with the prime object of reducing waste through the adoption of right methods, and of acting as a clearing house for the exchange of ideas for improvement. Its work is essentially constructive. Its membership of approximately 1000 is composed of executive and administrative officers of industrial, manufacturing, railroad, public service, municipal, educational and other corporations, engineers, accountants, bankers, lawyers, sales and advertising managers, publishers, clergymen, labor unionists and others. The aim and purpose of the first national efficiency exposition and conference is to give expression to the increasing application of scientific methods to modern conditions and to provide an exchange and meeting place for producer and consumer. The program for the meeting will include an assembly of representative displays of appliances, methods and products in the fields of industrial, mechanical, governmental, educational and household efficiency, a series of mental and manual efficiency contests, conferences and illustrated talks having particular relation to the assembled exhibits and conferences on current phases of the efficiency movement. Walter H. Tallis, 41 Park Row, New York, N. Y., is exposition director for the society.

**Financial and Corporate**

**Stock and Money Markets**

Dec. 18, 1913.

The tone of the trading on the New York Stock Exchange improved materially to-day. There was no considerable advance in values, but there was a steady demand for issues on all recessions. New Haven was in good demand, but ranged moderately under yesterday's final price. Moderate gains were made in Brooklyn Rapid Transit, Third Avenue and Interborough-Metropolitan, all of which were quite active. At the close of trading the leading issues were practically unchanged from the closing range of Tuesday. Rates in the money market to-day were: Call, 3½ @ 4 per cent; thirty days, 5½ @ 6 per cent; sixty days, 5¼ @ 5½ per cent; ninety days, 5 @ 5¼ per cent; four, five and six months, 4¾ @ 5 per cent.

In the Philadelphia market the local group reflected slight interest to-day.

Trading was dull in Chicago to-day, but the tone was firm.

The Boston market opened firm to-day, and except for a few specialties remained quiet.

The principal trading in Baltimore to-day was in United Railways. The demand for bonds was good.

Quotations of traction and manufacturing securities as compared with last week follow:

	Dec. 10	Dec. 17
American Brake Shoe & Foundry (common).....	87	87
American Brake Shoe & Foundry (preferred).....	127½	127
American Cities Company (common).....	36	36
American Cities Company (preferred).....	63	63½
American Light & Traction Company (common).....	*334	333
American Light & Traction Company (preferred).....	*106	106
American Railways Company.....	38¾	38¾
Aurora, Elgin & Chicago Railroad (common).....	a42	a42
Aurora, Elgin & Chicago Railroad (preferred).....	a84	*84
Boston Elevated Railway.....	88½	85
Boston Suburban Electric Companies (common).....	7	7
Boston Suburban Electric Companies (preferred).....	60	60
Boston & Worcester Electric Companies (common).....	*6½	*6½
Boston & Worcester Electric Companies (preferred).....	39	37
Brooklyn Rapid Transit Company.....	86¾	86¾
Capital Traction Company, Washington.....	111½	111
Chicago City Railway.....	160	160
Chicago Elevator Railways (common).....	25	25
Chicago Elevator Railways (preferred).....	75	75
Chicago Railways, pteptg., ctf. 1.....	a90	a90
Chicago Railways, pteptg., ctf. 2.....	a27½	28½
Chicago Railways, pteptg., ctf. 3.....	6½	7
Chicago Railways, pteptg., ctf. 4.....	1½	1¾
Cincinnati Street Railway.....	110	110
Cleveland Railway.....	104½	103½
Cleveland, Southwestern & Columbus Ry. (common).....	*5½	*5½
Cleveland, Southwestern & Columbus Ry. (preferred).....	*30	*30
Columbus Railway & Light Company.....	18	18
Columbus Railway (common).....	59½	59½
Columbus Railway (preferred).....	88	88
Denver & Northwestern Railway.....	a80	*80
Detroit & United Railway.....	a80	a80
General Electric Company.....	138¾	135¾
Georgia Railway & Electric Company (common).....	119½	119
Georgia Railway & Electric Company (preferred).....	85	84½
Interborough Metropolitan Company (common).....	14¾	14¾
Interborough Metropolitan Company (preferred).....	59¾	59
International Traction Company (common).....	a30	*30
International Traction Company (preferred).....	90	*90
Kansas City Railway & Light Company (common).....	20	*20
Kansas City Railway & Light Company (preferred).....	30	*30
Lake Shore Electric Railway (common).....	6	6
Lake Shore Electric Railway (1st preferred).....	92	92
Lake Shore Electric Railway (2d preferred).....	24	24
Manhattan Railway.....	130	127
Massachusetts Electric Companies (common).....	10½	10
Massachusetts Electric Companies (preferred).....	65½	64
Milwaukee Electric Railway & Light Co. (preferred).....	95	95
Norfolk Railway & Light Company.....	24¾	24¾
North American Company.....	68	66
Northern Ohio Light & Traction Company (common).....	66¾	70
Northern Ohio Light & Traction Company (preferred).....	97	101
Philadelphia Company, Pittsburgh (common).....	39	39
Philadelphia Company, Pittsburgh (preferred).....	39	39
Philadelphia Rapid Transit Company.....	18¾	18
Portland Railway, Light & Power Company.....	53	53
Public Service Corporation.....	106	105
Third Avenue Railway, New York.....	39¾	39¾
Toledo Traction, Light & Power Company (common).....	15	15
Toledo Traction, Light & Power Company (preferred).....	60	75
Twin City Rapid Transit Co., Minneapolis (common).....	105½	103
Union Traction Company of Indiana (common).....	11½	11½
Union Traction Company of Indiana (1st preferred).....	80	80
Union Traction Company of Indiana (2d preferred).....	14	14
United Rys. & Electric Company (Baltimore).....	*25½	24¾
United Rys. Inv. Company (common).....	17	16
United Rys. Inv. Company (preferred).....	33½	32
Virginia Railway & Power Company (common).....	56	56
Virginia Railway & Power Company (preferred).....	93½	97½
Washington Ry. & Electric Company (common).....	85½	85
Washington Ry. & Electric Company (preferred).....	86¾	86¾
West End Street Railway, Boston (common).....	a67½	67½
West End Street Railway, Boston (preferred).....	90	90
Westinghouse Elec. & Mfg. Company.....	64½	63
Westinghouse Elec. & Mfg. Company (1st preferred).....	112	112

\*Last sale. a Asked.

## ANNUAL REPORTS

## Massachusetts Electric Companies

The Massachusetts Electric Companies, Boston, Mass., presents the following statement of income, profit and loss for the year ended Sept. 30, 1913:

Dividends on stocks owned.....	\$1,133,293	
Interest on notes and bank balances.....	71,433	
Total income.....		\$1,204,726
Expenses:		
Salaries—General officers and executive committee	\$10,292	
Printing and stationery.....	1,324	
Legal and miscellaneous expense.....	20,651	
City of Boston tax.....	184	
Total expenses.....		32,451
Net income.....	\$1,172,275	
Interest on coupon notes.....	171,561	
Net divisible income.....		\$1,000,714
Dividends:		
Jan. 1, 1913—2 per cent.....	\$484,128	
July 1, 1913—2 per cent.....	484,128	
Total dividends.....		968,256
Surplus for the year.....	\$32,458	
Surplus, Sept. 30, 1912.....	2,761,810	
Total.....	\$2,794,268	
Credits:		
Federal tax for 1909 refunded.....	\$158	
Profit on sale of stock.....	19,998	20,156
Total.....		\$2,814,424
Debits:		
Premium on coupon notes purchased.....	\$2,015	
Discount on coupon notes sold.....	65,410	67,425
Surplus Sept. 30, 1913.....		\$2,746,999

The statement of income, profit and loss of the Bay State Street Railway, through which by lease the Massachusetts Electric Companies maintains control over its other companies, is as follows for the year ended June 30, 1913:

Gross income.....	\$9,462,251	
Operating expenses.....	6,109,511	
Gross income less operating expenses.....	\$3,352,740	
Interest, rentals, taxes, etc.....	1,914,902	
Net divisible income.....		\$1,437,838
Dividends:		
First preferred stock.....	\$125,316	
Common stock.....	1,128,446	
Total dividends.....		1,253,762
Surplus for the year.....	\$184,076	
Surplus, June 30, 1912.....	212,861	
Total.....	\$396,937	
Credits:		
Accumulated profit on sales of scrap.....	\$37,330	
Tickets sold and not used.....	32,000	
Total credits.....		69,330
Debits:		\$466,267
Reconstruction.....	\$196,469	
Net losses by fire, etc.....	23,526	
Preliminary engineering, etc.....	9,319	
Premium on bonds called for redemption.....	1,376	
Adjustment of accounts.....	7,648	
Settlement with Boston Elevated Railway for certain terminal charges covering a number of years	15,078	
Total debits.....		253,417
Surplus, June 30, 1913.....		\$212,850

Gordon Abbot, president of the Massachusetts Electric Companies, says in part:

"The business of the Bay State Street Railway and its leased lines showed during the fiscal year ended June 30 an increase of \$346,048. Of this increase \$72,398 was due to additional earnings from the freight and express business.

"In March, 1913, \$660,000 par value of first preferred stock of the Bay State Street Railway was, under the authority of the Railroad Commissioners, issued and sold at \$115 per share. In April, 1913, \$304,000 par value of bonds were issued and sold under the mortgage of the Boston & Northern Street Railway, and \$172,000 par value of bonds were issued and sold under the mortgage of the Old Colony Street Railway; while \$28,000 bonds were issued under the Boston & Northern mortgage in exchange for underlying bonds retired, and are now held in the treasury.

"On July 1, 1913, \$3,700,000 par value 4½ per cent coupon notes of the Massachusetts Electric Companies matured.

The funds for the payment of these notes were received in part from the Bay State Street Railway in payment of its notes, and in part from the sale of \$3,100,000, out of a total authorized issue of \$3,500,000, of two-year 5 per cent coupon notes dated May 1, 1913.

"In the last annual report a statement was made as to the number of preferred shares of the Massachusetts Electric Companies deposited up to Nov. 26, 1912, under the terms of the offer of the trustees in respect to the purchase of arrears of dividends. Between that date and Sept. 30, 1913, 6403 additional shares of stock were deposited, leaving 4872 shares on which arrears of dividends still remain to be adjusted.

"During the past fiscal year the following amounts have been expended on new property and reconstruction: Track construction, \$151,971; track reconstruction, \$782,830; cars and electrical equipment, \$195,519; electric lines and feeders, \$97,356; power stations, \$60,636; land and buildings, \$58,401; sundry equipment, \$37,559, or a total of \$1,384,272. Fifty semi-convertible cars with four-motor equipments have been purchased, but no part of the cost of these is included in the figures given.

"Eight express cars, each with four-motor equipments, were purchased, three of which are now in service, while the remaining five are expected for delivery before the end of the present calendar year. Air-brake equipment was purchased for sixty-one cars, and its installation was completed on twenty-four. New track to the extent of 4.1 miles was built during the fiscal year, and 30.1 miles were reconstructed, while 28.3 miles in addition were electrically welded; 55.28 miles of new overhead feeder and 8.18 miles of underground feeder or transmission cable were installed, together with 28.35 miles of underground duct.

"A new brick carhouse was built on Middlesex Street, Lowell, which will provide additional storage for seventy large cars. A new 600-hp boiler, with the necessary auxiliaries, was installed in an addition made to the power station in Lowell, while a 100-kw turbine unit was purchased for use in the Portsmouth station and is now being there installed."

## Commonwealth Power, Railway &amp; Light Company

The Commonwealth Power, Railway & Light Company, Grand Rapids, Mich., reports for the twelve months ended June 30, 1913, after all charges, \$1,436,234 surplus for its common and preferred stocks. The condensed earnings statement of the company for the fiscal year follows:

	1913	1912
Earnings on stocks owned in subsidiary companies.....	\$1,499,958	\$1,098,930
Miscellaneous earnings.....	155,556	82,238
Gross earnings.....	\$1,655,514	\$1,181,168
Expenses and taxes.....	\$90,186	\$64,865
Interest paid.....	129,094	14,198
Total deductions.....	\$219,280	\$79,063
Net income available for dividends, replacements and depreciation.....	\$1,436,234	\$1,102,105
Dividends on preferred stock.....	*460,000	360,191
Balance.....	\$976,234	\$741,914

\*Includes \$100,000 to cover dividend requirement for the months of May and June, 1913, on the \$10,000,000 of additional preferred stock issued as of May 1, 1913.

The above statement does not include the entire year's earnings from the properties of the Union Railway, Gas & Electric Company, Springfield Light Company and Michigan Railways Company, companies acquired by the Commonwealth Power, Railway & Light Company as noted in the ELECTRIC RAILWAY JOURNAL of May 10, 1913. A. G. Hodenpyl, president of the company, says in part in referring to the operations of the company:

"In accordance with authority conferred by the stockholders at a meeting held May 15, 1913, the company has acquired over 99 per cent of the preferred and common capital stocks of these companies. Earnings for only the months of May and June on the additional stocks acquired, however, are included in the statement, it being considered that such stocks were taken over as of May 1, from which date the dividends began to accrue on the increased amounts of stock of this company issued to acquire the additional securities of the companies mentioned."

### Cities Service Company Takes Over Two Public Utilities

At special meetings of the directors of the Cities Service Company, the Consolidated Cities Light, Power & Traction Company and Utilities Improvement Company, held on Dec. 11, a plan providing for the absorption of the last two mentioned companies by the Cities Service Company was adopted. It provides that stockholders of the Utilities Improvement Company may surrender their preferred stock and receive Cities Service Company preferred stock share for share. They may also surrender their common stock and receive one share of common stock of the Cities Service Company for each two shares of the Utilities Improvement Company common. As the Consolidated Cities Light, Power & Traction Company has no preferred stock, the basis of exchange will be one share of Cities Service Company common for two shares of its stock. The 5 per cent bonds, of which there are \$4,000,000 outstanding of the Consolidated Cities Light, Power & Traction Company, are to remain outstanding.

The Cities Service Company was organized in September, 1910, with an authorized capital of \$30,000,000 of 6 per cent cumulative preferred and \$20,000,000 of common stock. When the exchange of its preferred and common is made for stocks of the other two companies its outstanding stocks will be \$27,368,423 preferred and \$15,718,389 common. The three companies are under the management of H. L. Doherty & Company.

### Massachusetts Street Railways Paying 5 Per Cent

The Public Service Commission of Massachusetts has sent to the Bank Commissioners of that State a list of the street railways that have earned and paid dividends of 5 per cent during the past five years. The list follows: Bay State Railway, Boston & Revere Electric Railway, Fitchburg & Leominster Street Railway, Holyoke Street Railway, Nahant & Lynn Street Railway, Springfield Street Railway, Union Street Railway, West End Street Railway, Worcester Consolidated Street Railway. The Bay State Railway and the Worcester Consolidated Street Railway were added to the list this year.

**Albany (Ga.) Transit Company.**—An increase from \$52,000 to \$80,000 in the capital stock of the Albany Transit Company was recently authorized at a meeting of stockholders of that company. The increase will be used in purchasing additional equipment. Directors were re-elected as follows: F. F. Putney, J. R. Wetherbee, S. B. Brown, A. P. Vason, J. C. Fulford, W. B. Haley, W. J. Peed and J. Rosenberg.

**American Public Utilities Company, Grand Rapids, Mich.**—The directors of the American Public Utilities Company have increased the quarterly dividend on the common stock from one-half of 1 per cent to three-quarters of 1 per cent, placing the issue on a 3 per cent per annum basis. The usual quarterly dividend of 1½ per cent also has been declared on the preferred stock.

**American Water Works & Guarantee Company, Pittsburgh, Pa.**—The stockholders' protective committee of the American Water Works & Guarantee Company has just issued a circular to preferred and common stockholders of the company which suggests that they should deposit their stock at once with the Bankers' Trust Company, depository for the committee, in order to receive the benefit of any plan of reorganization. The committee expects to submit at an early date a plan of reorganization, but the details are not yet entirely determined. It is the intention to raise such new money as may be needed by the issuance of new securities which will be offered for subscription to the stockholders who have deposited with the committee. The circular says: "The committee will promptly advise its depositors as soon as a definite plan has been agreed upon; in the meantime stockholders will probably find it to their advantage to consult the secretary of the committee before accepting offers that may be made for the purchase of their stock."

**Babylon (N. Y.) Railroad.**—On a motion of Attorney Ralph J. Hawkins Judge Chatfield, of the United States District Court in Brooklyn, has modified the order of Feb.

15, 1913, which appointed Mr. Hawkins as receiver of the Babylon Railroad, and has restored the operation of the road to its officials.

**Boston (Mass.) Elevated Railway.**—The Massachusetts Public Service Commission has been asked to sanction the issuance of \$600,000 of thirty-year bonds and \$350,000 of capital stock of the West End Street Railway to provide for floating debt due to the Boston Elevated Railway on account of additions and betterments. The capital stock as thus increased would be \$13,080,150.

**California Railway & Power Company, San Francisco, Cal.**—The directors of the California Railway & Power Company will redeem 1000 shares of the prior preference stock of the company on Jan. 2. The shares to be called for redemption are to be determined by lot and a drawing will be made by the Bankers' Trust Company from the list of the holders of record Dec. 31.

**Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis.**—The Chippewa Valley Railway, Light & Power Company has acquired the property of the Eau Claire Gas Light Company. The company is making surveys for the construction of a new dam and hydroelectric plant on the Chippewa River, at Paint Creek, Wis.

**Ephrata & Lebanon Street Railway, Ephrata, Pa.**—H. P. Taylor & Company, New York, N. Y., and Pittsburgh, Pa., are offering at 95 and interest \$200,000 of first mortgage 5 per cent bonds of the Ephrata & Lebanon Street Railway. The bonds are dated Oct. 1, 1912, and are due Oct. 1, 1942, but are callable after Oct. 1, 1917, at 105 and interest.

**Federal Light & Traction Company, New York, N. Y.**—At a special meeting of the stockholders of the Federal Light & Traction Company, called for Dec. 12, as noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 6, 1913, an issue of \$10,000,000 of 7 per cent ten-year notes previously authorized by the board of directors was approved. Of this amount \$725,000 will be offered to stockholders at par and interest. The stockholders also approved an underwriting agreement between the directors and firms with which the directors are identified to take up such notes as are not subscribed for by the stockholders.

**Grand Valley Railway, Brantford, Ont.**—The Appellate Division at Osgoode Hall heard on Dec. 11 the appeals of the Grand Valley Railway against the order for the cancellation of its franchise in Brantford, Ont., and against a judgment authorizing the municipality to seize the property of the company to recover \$7,500 for taxes said to be in arrears. The hearing will be resumed.

**Idaho Railway, Light & Power Company, Boise, Idaho.**—The committee of bondholders of the Idaho-Oregon Light & Power Company at Chicago has sent notices to the bondholders of the appointment of W. J. Ferris as receiver and also that the New York committee has abandoned its plan as noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 13, 1913, page 1259. The Chicago committee says: "The way is clear for you to take over and reorganize your property. We already hold a substantial majority of the bona fide bonds. Our depositaries have been directed to resume acceptance of deposits and those who hold New York certificates may send them to our depositaries. We will make necessary payments to the New York committee for account of bondholders and recover the bonds." The sale of the property has been postponed until March 16, 1914, subject to further postponement if necessary. The Idaho-Oregon Light & Power Company is controlled by the Idaho Railway, Light & Power Company.

**International Railway, Buffalo, N. Y.**—An order has been issued by the Public Service Commission of the Second District of New York authorizing the International Railway to execute a supplemental mortgage amending the one approved in the latter part of 1912 so as to require it to expend for maintenance or to reserve in a fund for that purpose not less than 16½ per cent of its gross operating revenue. It is also provided in this amendment that no bonds shall be issued in the future except when the earnings available for bond interest are one and one-half times the amount of interest on the bonds then outstanding and those which it is proposed to issue.

**Joliet & Southern Traction Company, Joliet, Ill.**—Judge Slusser, of the Kane County Circuit Court at Geneva, Ill.,



has fixed Jan. 28, 1914, as the date for the sale of the property of the Joliet & Southern Traction Company and the Joliet, Plainfield & Aurora Railroad. The court refused previously to pass on the values of certain property of one of the companies as determined by the master in chancery, and the sale set originally for Nov. 17 was postponed.

**Los Angeles (Cal.) Railway.**—The Los Angeles Railway, which has been incorporated to consolidate the Los Angeles Railway Corporation and the City Railway by amalgamation, has organized temporarily as follows: W. E. Dunn, president; S. M. Haskins, vice-president; C. A. Henderson, secretary and treasurer. The officers and G. C. Ward, Albert Crutcher, Frank Griffith and J. E. Brown are the directors. It is said that when the company organizes permanently H. E. Huntington and Howard Huntington will be elected directors and that H. E. Huntington will be made president, W. E. Dunn vice-president, and Howard Huntington vice-president and general manager. The company has applied to the Railroad Commission of California for authority to issue \$20,000,000 of stock to take over \$25,000,000 of stock of the Los Angeles Railway Corporation and to issue \$23,544,000 of bonds to refund a like amount of bonds of the Los Angeles Railway Corporation.

**Milwaukee Electric Railway & Light Company, Milwaukee, Wis.**—Harris, Forbes & Company, New York, N. Y.; N. W. Halsey & Company, Boston, Mass.; Harris Trust & Savings Bank, Chicago, Ill.; Spencer Trask & Company, New York, N. Y., and Perry, Coffin & Burr, Boston, Mass., are offering for sale at 90 and interest a block of \$807,000 of Milwaukee Electric Railway & Light Company general and refunding mortgage 5 per cent gold bonds of 1911. These bankers have previously placed the remainder of the now outstanding issue of \$5,305,000. Bonds to the extent of \$13,228,000 are reserved to retire underlying bonds.

**National Properties Company, Pittsburgh, Pa.**—The National Properties Company has purchased for cash the entire capital stock, mortgages and floating indebtedness of the Chester County Light Company, which was capitalized for \$50,000 stock, \$25,000 first mortgage bonds and \$50,000 second mortgage bonds. In addition the company has outstanding accounts amounting to several thousand dollars.

**New Orleans Railway & Light Company, New Orleans, La.**—A dividend of one-half of 1 per cent has been declared on the \$20,000,000 of common stock of the New Orleans Railway & Light Company. This compares with 1 per cent on June 30, 1913, one-half of 1 per cent on Dec. 31, 1912, and an initial payment of 1 per cent on July 1, 1912.

**New York (N. Y.) Railways.**—The New York Railways, which took over the old Metropolitan Street Railway, has petitioned the Public Service Commission for the First District of New York for a modification of the order of November, 1912, permitting the company to issue bonds for the purchase of new stepless cars only to the extent of \$2,800 per car—the difference between the cost of the old cars and the cost of the new cars at \$6,000 apiece to replace the old ones. On Dec. 12 before the commission Robert Reid Rogers, attorney for the company, contended that the New York Railways is a new company, and that it cannot be required to make up the depreciation on the old cars which accrued under the old Metropolitan management, but that it is willing to make up the depreciation from the time the new company took hold, namely, Jan. 1, 1912, to the present time. Mr. Rogers urged that the amount to be deducted from the cost of each new car should be only the scrap value of an old car, \$300, or, at the very most, the value which the commission's own engineers placed on the old cars when they were taken over by the New York Railways, \$800 a car. He laid stress on the fact that the New York Railways is an entirely separate concern from the old Metropolitan Street Railway. The contention of the commission was that the new company had capitalized on a basis of \$3,200 per car when it took hold.

**Northern Ohio Traction & Light Company, Akron, Ohio.**—The State Public Utilities Commission has been notified by the Northern Ohio Traction & Light Company that it is unable to sell its issue of \$360,000 of preferred stock at par and the company has asked the commission to be allowed to dispose of the securities at 95.

**Pacific Gas & Electric Company, San Francisco, Cal.**—Harris, Forbes & Company and N. W. Halsey & Company, New York, have sold at 99½ and interest \$500,000 of additional 6 per cent gold notes of the Pacific Gas & Electric Company, dated 1913 and due June 25, 1914, but callable at 100½ and interest. These bonds are part of an authorized issue of \$7,000,000, noted in the *ELECTRIC RAILWAY JOURNAL* of Sept. 20, 1913. Bonds to the extent of \$4,500,000 from this issue have previously been sold.

**Public Service Investment Company, Boston, Mass.**—Stone & Webster, Boston, Mass., are placing at 97, yielding 6.2 per cent, \$500,000 of the authorized issue of \$30,000,000 of 6 per cent cumulative preferred stock of the Public Service Investment Company, which owns the securities of eleven Stone & Webster properties. This issue makes an amount of \$2,500,000 outstanding. The proceeds of the sale of \$500,000 of preferred stock and the proceeds of the sale of a like amount of common stock at par for cash will be invested in dividend-paying securities of companies managed by the Stone & Webster Management Association. It is expected that the income from these securities will be more than twice the dividend requirements on the preferred stock now offered.

**Puget Sound Traction, Light & Power Company, Seattle, Wash.**—The shareholders of the Puget Sound Traction, Light & Power Company have subscribed for a substantial amount of the new issue of \$2,686,200 of 6 per cent cumulative preferred stock, mention of which was made in the *ELECTRIC RAILWAY JOURNAL* of Nov. 15, 1913. A syndicate headed by Stone & Webster, Boston, Mass., is offering the remainder of the issue at par. The amount of preferred stock now outstanding is \$13,676,900.

**Quebec Railway, Light & Power Company, Quebec, Que.**—The coupons on the bonds of the Quebec Railway, Light & Power Company due Dec. 1 have not been paid, but it is expected that the interest will be met within the ninety days of grace mentioned in the mortgage, as was done with the interest due last June.

**Scranton & Wilkes-Barre Traction Corporation, Scranton, Pa.**—Brooks & Company, Scranton, Pa., are offering at 99 and interest Lackawanna & Wyoming Valley Rapid Transit Company collateral trust 5 per cent bonds of 1901, due Aug. 1, 1951. These bonds are now equivalent to the closed underlying first mortgage through collateral deposited. The reorganization of the Lackawanna & Wyoming Valley Rapid Transit Company, which was consummated under the title of the Scranton & Wilkes-Barre Traction Corporation, was outlined in the *ELECTRIC RAILWAY JOURNAL* of June 21, 1913.

**Springfield & Xenia Railway, Xenia, Ohio.**—The Springfield & Xenia Railway has declared an initial dividend of 2 per cent on its common stock, in addition to the regular payment of 3¼ per cent on its preferred shares. All of the back dividends on the preferred shares are now paid up.

**Sunbury & Susquehanna Railway, Sunbury, Pa.**—Judge Cummings has appointed Frederick Byrod, Harry Davis and Charles Grant receivers for the Sunbury & Susquehanna Railway, which on May 15, 1912, took over the property of the North Cumberland County Traction Company and the Sunbury & Selinsgrove Electric Railway.

**Twin City Rapid Transit Company, Minneapolis, Minn.**—William A. Read & Company are offering at par and interest \$350,000 of the Minneapolis Street Railway and the St. Paul City Railway joint consolidated mortgage 5 per cent gold bonds, due Oct. 1, 1928, guaranteed principal and interest by indorsement by the Twin City Rapid Transit Company. The total issue authorized and outstanding is \$10,000,000.

**United Railways & Electric Company, Baltimore, Md.**—The United Railways & Electric Company has sold to Baltimore banking interests \$348,000 of first consolidated mortgage 4 per cent bonds, the proceeds of which will be used to pay for sixty cars costing \$300,000.

**Washington Water Power Company, Spokane, Wash.**—Walter C. Sivyser, president of the Big Bend Light & Power Company, has announced the sale of the franchises and distributing systems of the company to the Washington Water Power Company.

## Dividends Declared

Asheville Power & Light Company, Asheville, N. C., quarterly,  $1\frac{3}{4}$  per cent, preferred.

Bangor Railway & Electric Company, Bangor, Me., quarterly,  $1\frac{3}{4}$  per cent, preferred.

Boston & Worcester Electric Companies, Boston, Mass., \$1, preferred.

Capital Traction Company, Washington, D. C., quarterly,  $1\frac{1}{2}$  per cent.

Carolina Power & Light Company, Raleigh, N. C., quarterly,  $1\frac{3}{4}$  per cent, preferred.

Chicago (Ill.), City Railway, quarterly,  $2\frac{1}{2}$  per cent, extra one-half of 1 per cent.

Cincinnati (Ohio) Street Railway, quarterly,  $1\frac{1}{2}$  per cent.

Cleveland (Ohio) Railway, quarterly,  $1\frac{1}{2}$  per cent.

Duluth-Superior Traction Company, Duluth, Minn., quarterly, 1 per cent, preferred; quarterly, 1 per cent, common.

Mohawk Valley Company, New York, N. Y., quarterly,  $1\frac{1}{2}$  per cent.

New Orleans Railway & Light Company, New Orleans, La., quarterly,  $1\frac{1}{4}$  per cent; 50 cents common.

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

United Light & Railways, Grand Rapids, Mich., quarterly,  $1\frac{1}{2}$  per cent, first preferred; quarterly, three-quarters of 1 per cent, second preferred; quarterly, 1 per cent, common.

Washington, Baltimore & Annapolis Electric Railroad, Baltimore, Md., quarterly,  $1\frac{1}{2}$  per cent, preferred.

Washington Water Power Company, Spokane, Wash., quarterly, 2 per cent.

West India Electric Company, Ltd., Kingston, Jamaica, quarterly,  $1\frac{1}{4}$  per cent.

## ELECTRIC RAILWAY MONTHLY EARNINGS

## AMERICAN RAILWAYS, PHILADELPHIA, PA.

Period	Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus
1m., Nov., '13	\$436,509	.....	.....	.....	.....
1 " " '12	404,223	.....	.....	.....	.....
5 " " '12	2,196,393	.....	.....	.....	.....
5 " " '13	2,391,243	.....	.....	.....	.....

## AURORA, ELGIN &amp; CHICAGO RAILROAD, WHEATON, ILL.

1m., Oct., '13	\$170,290	*\$113,834	\$56,456	\$33,974	\$22,482
1 " " '12	166,069	*96,615	69,455	32,083	37,372
4 " " '13	772,564	*458,336	314,227	135,042	179,186
4 " " '12	739,819	*400,938	338,881	128,345	210,535

## CLEVELAND, PAINESVILLE &amp; EASTERN RAILROAD, WILLOUGHBY, OHIO

1m., Oct., '13	\$35,498	*\$19,042	\$16,450	\$10,448	\$6,002
1 " " '12	34,061	*18,535	15,526	9,964	5,562
10 " " '13	362,210	*194,233	167,977	104,200	63,777
10 " " '12	339,663	*190,681	148,982	99,228	49,754

## CLEVELAND, SOUTHWESTERN &amp; COLUMBUS RAILWAY, CLEVELAND, OHIO

1m., Oct., '13	\$111,955	\$65,988	\$45,967	\$32,341	\$13,626
1 " " '12	107,767	*61,539	46,227	31,892	14,335
10 " " '13	1,051,382	627,872	423,509	316,785	106,724
10 " " '12	986,010	574,348	411,662	309,301	102,361

## COMMONWEALTH POWER, RAILWAY &amp; LIGHT COMPANY, SAGINAW, MICH.

1m., Oct., '13	\$249,887	*\$66,230	\$183,657	\$80,000	\$103,657
1 " " '12	128,362	*19,908	108,454	30,000	78,454
12 " " '13	2,070,706	*391,134	1,679,572	660,000	1,019,572
12 " " '12	1,266,762	*126,227	1,140,535	360,000	780,535

## KENTUCKY TRACTION &amp; TERMINAL COMPANY, LEXINGTON, KY.

1m., Oct., '13	\$65,729	\$33,650	\$28,681	\$16,415	\$12,266
1 " " '12	63,037	34,348	26,054	16,632	9,422
4 " " '13	285,579	144,253	126,184	66,210	59,974
4 " " '12	273,447	153,912	109,857	61,448	48,409

## LAKE SHORE ELECTRIC RAILWAY, CLEVELAND, OHIO

1m., Oct., '13	\$117,721	*\$72,689	\$45,031	\$35,119	\$9,912
1 " " '12	110,505	*63,777	46,728	35,083	11,645
10 " " '13	1,193,593	*700,986	492,606	351,325	141,281
10 " " '12	1,109,025	*630,370	478,656	349,501	129,155

## NORTHERN OHIO TRACTION &amp; LIGHT COMPANY, AKRON, OHIO

1m., Oct., '13	\$279,361	*\$174,321	\$105,039	\$48,964	\$56,075
1 " " '12	249,148	*149,092	100,056	43,813	56,244
10 " " '13	2,724,059	*1,645,357	1,078,702	462,161	616,541
10 " " '12	2,497,015	*1,406,663	1,090,351	438,175	652,176

## PHILADELPHIA (PA.) RAPID TRANSIT COMPANY

1m., Nov., '13	\$2,018,497	*\$1,173,980	\$844,517	\$792,251	\$52,266
1 " " '12	2,008,401	*1,196,259	812,142	761,838	50,304
5 " " '13	10,098,016	*5,887,174	4,210,841	3,987,498	223,343
5 " " '12	9,860,294	*5,865,245	3,995,049	3,798,281	196,768

\*Includes taxes.

## Traffic and Transportation

## Resuming Service After Colorado Storm

Four more lines of the Denver (Col.) City Tramway, blockaded by the snowstorm of the previous week, recommenced operations on Dec. 9, and J. A. Beeler, general manager, announced that 110 miles of track were in operation—approximately one-half of the company's system. The lines which resumed service were the East Nineteenth-West Twenty-third Avenue line, the Larimer Street line from Fifteenth to Fortieth Street, the Eleventh Avenue line from the Central loop to the Capitol Hill terminal, and the West Twenty-ninth Avenue line from the Central loop to Sheridan Boulevard. On Dec. 10 the work of reclaiming the right-of-way was carried further with the opening of Larimer Street from Fifteenth west to the county line, with the opening of the West Lawrence Street tracks and by the opening of a double track to Englewood. Mr. Beeler said that the company would place extra conductors on all its cars on Dec. 10 because passengers found it difficult to climb over some of the larger snow piles in getting aboard. Volunteer workers rendered the company valued assistance in clearing a considerable length of track.

The *Rocky Mountain News*, Denver, commenting editorially on the storm, said: "The value of organization, intelligently and systematically applied, was never more strikingly exemplified than in the recent snowstorm. The excellent and unselfish work of the officials of tramway, telephone and gas and electric companies proved that Denver is fortunate in the possession of its utility companies. The hardest task fell to the tramway with its hundreds of miles of track buried under the clinging snows. The company lost no time in mobilizing an army of workers, and in a comparatively short period service was resumed on the main lines. Denver has had a splendid object lesson in the strength and capacity of business organization, as well as patriotic self-sacrifice, it is not likely to forget in many a day. In the last few days the public utility companies have done work to merit the cordial appreciation of Denver's citizens. That is one point upon which there will be unanimous agreement."

While it was impossible for the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., to operate cars on exact schedule time, the service maintained during the storm was sufficient to prevent any considerable inconvenience to the public. Commenting editorially on the work of the company, the *Pueblo Star-Journal* of Dec. 5, 1913, said in part:

"The fact that the street cars have operated in Pueblo has been of untold advantage to the people, as it enabled them to get to the markets and supply themselves with provisions which could not be delivered. Except for the operation of street cars there might have been suffering in the city. Hundreds of people used the street car tracks for sidewalks and tramped to their work over the frozen crust between the rails. Teamsters also used the car tracks for roadways and in this way were able to drive from the wholesale houses to the retail stores. The successful fight which the company has made against the storm has been a benefit to the entire city in more ways than one."

## Coney Island Fare Case to Be Reopened

On the petition of the Van Sicklen Taxpayers' Association, of Coney Island, the Public Service Commission of the First District of New York has decided to reopen Case No. 1375, which was dismissed without prejudice in February, 1912. This proceeding involved the question of fares between Manhattan and Coney Island, and it was discontinued upon the promise of certain Brooklyn Rapid Transit companies to put into effect a commutation plan under which a fare of 5 cents would be available between Sept. 15 and May 15 from Coney Island between 6 a.m. and 9 a.m. and to Coney Island between 4 p.m. and 7 p.m. This plan involved the purchase of a commutation book containing twelve round-trip tickets at \$1.20. These books were placed on sale only at stations south of the second fare points.

The petitioners state this plan has been in operation since March, 1912, and that it is objectionable to the travel-

ing public for several reasons. School children whose parents purchase the commutation books lose the use of the tickets for Saturdays, and as the unused tickets are not redeemable, this entails a loss of one-sixth of the price paid for the books. Persons unable to travel every day lose the value of the tickets for each day they do not make the ride, as do also those whose business compels them to journey between Manhattan and Coney Island outside of the commutation hours. The books can be bought only at stipulated times, thus compelling a family to make a large outlay of money for the number of books required.

The petitioners, therefore, ask that the proceeding be reopened and the plan modified, so that the companies will be required to issue a daily round-trip ticket for 10 cents, good for the day stamped, at any time of the year and during all hours of the day, such tickets to be sold only at stations south of the second fare point.

The proceedings will be started on Dec. 29 before Commissioner George V. S. Williams.

#### Faithful Service of New York Employees Rewarded

The management of the Interborough Rapid Transit Company and the New York (N. Y.) Railways expressed in formal notices dated Dec. 17, 1913, its appreciation of the faithful service of its employees during the year and announced the proposed distribution of five-dollar gold pieces among them. The notices issued by both companies are signed by Theodore P. Shonts, president, and Frank Hedley, vice-president and general manager. The notice of the Interborough Rapid Transit Company follows:

"During the past year unprecedented numbers of passengers have been safely transported on the lines of this company on the subway and elevated divisions. The management wishes to express to its employees its recognition of the services rendered by them and its desire to maintain at all times the highest degree of comfort and convenience to the patrons of this company, realizing that these results have been attained by efficient and intelligent co-operation rendered under exceptional and severe traffic conditions.

"This appreciation of the employees' efforts is heartily concurred in by the directors of this company, and as a further expression of their thanks they have appropriated a sum, and authorized the payment from same, of \$5 in gold to each employee in the service receiving \$115 per month or less who entered this company's employ prior to Jan. 1, 1913."

The notice of the New York Railways, worded somewhat differently, follows:

"The management desires to express to the employees of this company its high appreciation of their faithful and efficient service during the past year, which has resulted in the safe transportation of large numbers of people with comfort and convenience. It is realized that this has been achieved only by untiring, intelligent and co-operative effort with a view at all times to rendering the traveling public the best possible facilities and accommodation.

"The directors of this company are heartily in accord with the management's expression of its thanks to the employees, and as a further expression of their appreciation they have authorized an appropriation, from which sum \$5 in gold will be paid to each employee in the service receiving \$115 per month or less who entered the company's employ prior to Jan. 1, 1913."

It is estimated that 14,000 employees of the companies will receive five-dollar gold pieces as Christmas presents.

#### Ordinance Against Smoking Introduced in Minneapolis.—

An ordinance is before the City Council of Minneapolis to prohibit smoking on the cars of electric railways operated in that city.

**Increase in Wages in West Chester.**—The West Chester (Pa.) Street Railway has increased the wages of its employees 10 per cent. This is the third increase in less than a year and a half which the company has made in the pay of its men.

**'Far-Side' Stop in Rock Island.**—The Tri-City Railway has announced that the practice of stopping cars on the 'far side' of the street will be resumed in Rock Island, Ill.

Labor men in Davenport, Ia., have asked the company to restore the "far-side" stop in that city.

**Cars for the Opera.**—In addition to the regular service the Boston (Mass.) Elevated Railway will run special cars marked "Boston Opera House" to the opera house each Monday, Wednesday, Friday and Saturday night on which performances are given during the winter season.

**New Offices in Lexington.**—The Kentucky Traction & Terminal Company, Lexington, Ky., has removed its offices from the City National Bank Building to the Hughes Building, which is more centrally located. The new building will also be used as a transfer station for city and inter-urban lines.

**Mirrors on Cars of New Albany Lines.**—After having tested mirrors as an aid to motormen in determining whether passengers are alighting or entering at the back platform, the Louisville & Northern Railway & Lighting Company and the Louisville & Southern Indiana Traction Company, New Albany, Ind., have installed mirrors on all of their cars running between Louisville, New Albany and Jeffersonville.

**Tickets Sold at Factory to Employees.**—By an arrangement which has been made by the Detroit (Mich.) United Railway with the Ford Motor Company, employees of that company are enabled to buy street car tickets before boarding the cars. The tickets are sold at the Ford plant from an office which has been established there. The purpose is to facilitate the handling of the employees on the cars and also add to their comfort and convenience in that they will have no bother about getting tickets and making change on the cars.

**Motormen and Conductors Want Stools in Cars.**—Because the City Council of Cleveland has refused to consider their request for seats or stools, the conductors and motormen of the Cleveland Railway are threatening to bring the matter before the next Legislature and have a law enacted requiring all companies to furnish such conveniences for the men. The Cleveland Railway has accepted the amended ordinance granting it permission to operate freight cars over its tracks. The words "in bulk" were eliminated from the original ordinance.

**South Boston Service Order.**—The Massachusetts Public Service Commission has issued an order requiring the Boston Elevated Railway to re-establish a belt-line service between Dorchester Street transfer station in South Boston and Field's Corner, Dorchester, operating upon the routes two lines of cars upon a fifteen-minute headway during hours of normal travel, with additional cars in the rush hours. The company is also ordered to maintain as a separate line the service now existing between the Dorchester Street transfer station and the East Boston ferry.

**Annual Entertainment for Washington Employees.**—The thirteenth annual entertainment and presentation of gifts to all the children of employees of the Washington Railway & Electric Company, Washington, D. C., will be held on Dec. 30 at the New National Theater. Fully 2500 children will be entertained by a varied program, and gifts at a cost of \$1,500 presented. The entire cost will be borne by the company. A new feature this year will be a prize baby show, suggested and handled by President Clarence P. King personally. For this feature there were sixty-eight entries on Dec. 17, and it is expected that before closing the number will have increased to a total of eighty.

**Revision of Express Rates in New York.**—George V. S. Williams of the Public Service Commission of the First District of New York has announced that in all probability a zone system of calculating express rates much like that now used for the parcel post will be adopted in New York State and that it may be drawn up in time to be put in operation by Feb. 1, the date set by the Interstate Commerce Commission for the enforcement of the new interstate rates. The Interstate Commerce Commission has rendered a decision reducing the rates in interstate express service on packages weighing less than 50 lb. so as to make them slightly lower than the postal charges, and the companies represented that unless they were permitted to raise the rates on packages above 50 lb. in weight they could not carry on their business.

## Personal Mention

**Mr. Frank B. Lasher** has been elected treasurer of the Republic Railway & Light Company, New York, N. Y.

**Hon. Adam Beck**, chairman of the Hydro-Electric Power Commission of Ontario, has been appointed chairman of the newly formed railway commission which will electrify and operate the London & Port Stanley Railway, owned by the city of London, Ont.

**Mr. Warren H. Snow**, formerly treasurer of the American Public Utilities Company, Grand Rapids, Mich., has been admitted to partnership in the firm of Howe, Corrigan & Company, Grand Rapids, Mich., which will hereafter be known as Howe, Snow, Corrigan & Berteles.

**Mr. J. H. Libbey**, of the electrical engineering department of the Stone & Webster Engineering Corporation, Boston, Mass., has joined the staff of the Bay State Street Railway, Boston, Mass. Mr. Libbey will be assistant to Mr. George W. Palmer, Jr., the electrical engineer of the company.

**Mr. Samuel Riddle**, superintendent of transportation for the Louisville (Ky.) Railway, was the subject of a complimentary sketch in a recent issue of *Sparks*, published by the Louisville Rotary Club. The club is composed of one representative of each line of business in Louisville, Ky. Mr. Riddle represents the traction interests in the club.

**Mr. Leighton Calkins** has resigned as secretary, general counsel and director of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, effective on Jan. 1, 1914, and Mr. William M. Coleman has been elected as his successor. Mr. Calkins retains his connection with the company under special retainer. The Mahoning & Shenango Railway & Light Company is the principal subsidiary of the Republic Railway & Light Company, New York, N. Y.

**Mr. J. B. Foraker, Jr.**, who has been vice-president of the Cincinnati (Ohio) Traction Company since 1901, has resigned and moved his residence to Montana, where he is largely interested in mining enterprises. Mr. Walter A. Draper, the secretary of the company, has been elected to succeed Mr. Foraker. Mr. Dana Stevens is vice-president of the company as well, and will continue as such, Mr. Draper merely succeeding Mr. Foraker, and also retaining his position as secretary.

**Mr. E. B. Neiswanger**, superintendent of construction of the Texas Power & Light Company, Dallas, Tex., has been appointed construction engineer of the company in charge of all construction to succeed Mr. G. E. Moffat, chief engineer, who has accepted a similar position with the Phoenix Construction Company. For ten years prior to entering the service of the Texas Power & Light Company in January, 1913, as superintendent of construction, Mr. Neiswanger was engaged in plant installation and efficiency work with mining and milling interests in Colorado and with beet-sugar and irrigation projects in Kansas.

**Mr. Walter A. Draper**, secretary of the Cincinnati (Ohio) Traction Company and vice-president of the Ohio Electric Railway, has in addition been elected vice-president of the Cincinnati Traction Company to succeed Mr. J. B. Foraker, Jr. Mr. Draper began his career as a reporter, covering the financial and business districts in Cincinnati. He left newspaper work to become secretary of the Zoological Gardens, in which capacity he came in close contact with Mr. W. Kesley Schoepf and other officials of the Cincinnati Traction Company. Some half dozen years ago Mr. Draper was elected secretary of that corporation. He has been honored by election as president of the Cincinnati Chamber of Commerce. It is understood that Mr. Draper will also be elected to succeed Mr. Foraker as vice-president of both the Ohio Traction Company and the Cincinnati Car Company.

**Mr. W. L. Davis** has recently been elected assistant secretary and assistant treasurer of Texas Power & Light Company, Dallas, Tex., and affiliated companies, including the Paris Transit Company, to succeed Mr. E. E. Reber, resigned. Mr. Davis entered railway service in 1906 with the Indiana, Columbus & Eastern Traction Company, later merged into the Ohio Electric Railway. After holding various positions in the accounting department of this company, he was appointed statistician in 1909. In August,

1912, he accepted the position of traveling auditor of the Texas Power & Light Company, of which, with its affiliated companies, he now becomes assistant secretary and assistant treasurer.

**Mr. Philip Dawson**, consulting engineer of the London, Brighton & South Coast Railway, London, Eng., who had been in this country for about two months, sailed for England on Dec. 11. While here Mr. Dawson visited all of the prominent examples of steam railroad electrification in the country, including those on the Pacific Coast. Before leaving he said that he had been much impressed with the extent of the electrified systems here, their great interest from an engineering standpoint and the kindly hospitality with which he was everywhere received. The officials of the roads visited were most sympathetic and courteous and of great assistance through the manner in which they allowed him to examine their records and thus obtain a correct idea of their technical and operating results.

**Mr. V. W. Berry**, formerly superintendent of the Galveston-Houston Electric Railway, has been appointed general superintendent of the Northern Texas Traction Company and the Fort Worth Southern Traction Company, Fort Worth, Tex. On his departure from Houston Mr. Berry was presented with a handsome diamond stud by the shop employees of the Galveston-Houston Electric Railway, the Galveston Electric Company and the Houston Electric Company. His co-workers in the general offices at Houston gave him a mahogany "chifforobe." Mr. Berry has had eighteen years' experience in handling city and interurban railways. Before he was appointed superintendent of the Galveston-Houston Electric Railway in 1911 Mr. Berry was master mechanic of the Houston (Tex.) Electric Company. He was also district master mechanic for all the Stone & Webster properties in Texas.

**Mr. C. M. Paxton** has resigned from the American Railways, Philadelphia, Pa., effective on Jan. 1, with the intention of retiring from electric railway work. Mr. Paxton began his career in 1895 as a call boy. He served in various capacities on steam railways until January, 1904, when he became auditor of the Dayton & Troy Electric Railway, Dayton, Ohio. After a year as auditor he was made secretary of the company and traffic manager. Two years later he was made general manager, retaining that position for five years. He resigned from the Dayton & Troy Electric Railway to become connected with the American Railways as assistant to Mr. H. J. Crowley, general manager. Mr. Paxton was



C. M. Paxton

an early exponent of limited service on electric railways, of the adoption of standard steam road rules and practices and of electric railways doing freight business at steam freight rates. He was a charter member of the Ohio Electric Railway Association, which was succeeded by the Central Electric Railway Association.

**Mr. Robert M. Searle**, whose election as vice-president of the New York State Railways in charge of public relations was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 13, 1913, was born on March 3, 1869, at Peekskill, N. Y. He received a common-school education in the public schools of the city of New York and in 1884 began in the lighting business as office boy with Mr. Thomas A. Edison. Mr. Searle acquired his engineering knowledge by night study, and he has had twenty-six years of experience in the lighting business in all of its varied branches—from office boy to vice-president. He was in 1907 the recipient of the honor medal awarded by the English Institute of Gas Engineers. Mr. Searle is vice-president and a director of the Rochester Railway & Light Company, a director of the New York State Railways, and early in 1913 was elected to the presidency of the Rochester Chamber of Commerce.

Mr. John B. Gorman, superintendent of divisions 1 and 2 of the Worcester (Mass.) Consolidated Street Railway, was the subject of an illustrated biographical sketch which appeared in the Worcester *Telegram* recently. Mr. Gorman is rounding out twenty-five years of service in street railway work, and the *Telegram* took occasion to point out the qualifications which have made for his advancement and endeared Mr. Gorman to the public and the men who are under him. Mr. Gorman began his street railway career in Attleboro, Mass. In 1890 he became connected with the Leicester & Spencer Street Railway as assistant superintendent. After being instrumental in building up the road, a position as superintendent of the Worcester & Millbury Railway was offered to him. Two years later he took charge of the Leicester & Spencer and the Worcester & Millbury roads. In 1895 the Blackstone Valley line came under his supervision, it having been added to the Millbury line. When the Worcester Consolidated Street Railway took over the lines mentioned in 1900 Mr. Gorman became superintendent of transportation for the Worcester Consolidated Company. Mr. Gorman now has jurisdiction over all of the lines in Worcester proper, and the Bramanville & Jefferson, the Grafton, Westboro & Marlboro, the Worcester & Marlboro and the Spencer lines. In addition to this, he has charge of the Fitchburg & Leominster, the Southbridge & Springfield, the Boston & Worcester and the Blackstone Valley lines within the city limits. He also has charge of the operation of the trolley freight cars.

#### OBITUARY

**Daniel M. Barton**, general purchasing agent of the General Electric Company, died at his home in Schenectady on Dec. 5. Mr. Barton was born in Moriah, N. Y., in 1843. He became a dry goods merchant in Meriden, Conn., following which he removed to Lynn, Mass. In 1886 Mr. Barton entered the employ of the Thomson-Houston Electric Company and became its first production manager. In 1893 he became assistant purchasing agent of the General Electric Company, which had been formed the previous year. With the removal of the department to Schenectady in 1894 Mr. Barton was appointed purchasing agent, this title being changed to general purchasing agent some years later.

**E. Lowndes Rhett**, who since December, 1912, had been second vice-president and a director of the Federal Utilities, Inc., New York, N. Y., is dead. Mr. Rhett entered the banking house of Brown Brothers & Company in April, 1891, as a clerk and remained with that firm for more than ten years, latterly as manager of the stock and bond department. He then engaged in the bond business with his brother, after which he entered the Stock Exchange firm of Dominick & Williams, where he remained for about three years. Mr. Rhett then became manager of the New York office of E. H. Rollins & Sons, and later was elected vice-president and a director of the Smith-Tevis-Hanford Company.

**Mr. Frederick W. Cook**, president of the Evansville Suburban & Newburgh Railway, Evansville, Ind., died after a few days' illness on Dec. 11, 1913. Mr. Cook was one of the original stockholders of the company, having become interested in February, 1888. He was elected a director on April 16, 1889, and on Sept. 9 of the same year was elected president, which position he held continuously until his death. Mr. Cook was born in Washington, D. C., on Feb. 1, 1832, and moved to Evansville with his family at the age of four years. He was identified with several large industries and was considered to be Evansville's foremost citizen. He was president of the F. W. Cook Brewing Company and the Cook Realty Company and a director in the Citizens' National Bank. He was also a large stockholder in a number of steam railroads and was the principal owner of the Evansville Suburban & Newburgh Railway.

In the Common Pleas Court Judge Rathmell, on Dec. 9, sustained the contention of the stockholders of the Columbus Light, Heat & Power Company who oppose consolidation with the other public utility companies in one of five points set forth in their amended petition. This point questions the authority of the Public Utilities Commission to grant authority for the consolidation of all the public utilities companies under the name of the Columbus Railway, Power & Light Company.

## Construction News

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

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

#### RECENT INCORPORATIONS

\***Barclay & Riverton Railroad, Barclay, Ill.**—Incorporated in Illinois to build an electric railway from the Barclay Coal Company's mine east of Barclay to a connection with the Illinois Traction System east of Riverton. Capital stock, \$10,000.

\***Tazewell County Traction Company, Pekin, Ill.**—Incorporated in Illinois to build an electric railway from East Peoria south through Pekin to the south boundary line of the county and from the Illinois River east to the county line. Capital stock, \$2,500. Incorporators: John E. Melick, Springfield; A. C. Sprague, Normal; W. Elliot, Chicago; C. C. Melick and J. Y. Melick, Hampton, N. Y.

\***Interurban Railroad, New Orleans, La.**—Application for a charter has been made by this company to build a 20-mile electric line between New Orleans and Kenner. Capital stock, \$1,000,000. Directors: H. Generes Dufour, T. Garland Tinsley, Charles Janvier, Crawford H. Ellis, Stonewall Jackson and W. C. Dufour.

\***Morgantown & Fairmont Railway, Morgantown, W. Va.**—Chartered in West Virginia to build an electric railway from Morgantown to Fairmont. Capital stock, \$25,000. Incorporators: William E. Glasscock, S. Fuller Glasscock, William H. Brank, Simon L. Wildman, John L. Hatfield, Edward G. Douley, R. E. Arnett and Henry E. Brookover.

\***Gauley & Greenbrier Railroad, Sutton, W. Va.**—Chartered in West Virginia to build an electric or steam railway from a point near the mouth of the Cherry River to Roncerverte, 40 miles. Capital stock, \$50,000. Incorporators: W. E. Haymond, Frederick L. Fox, Lee Raider, E. L. Bland and C. C. Hines, all of Sutton.

#### FRANCHISES

**Birmingham, Ala.**—The Birmingham Railway, Light & Power Company has asked the Council for a franchise on Avenue F, in Birmingham.

**Dixon, Cal.**—The Sacramento Valley West Side Electric Railway has asked the Council for a franchise in Dixon. This 160-mile railway will extend through the west side of the Sacramento Valley. C. L. Donohoe, Willows, president. [E. R. J., Nov. 29, '13.]

**Dixon, Cal.**—The Northern Electric Railway, Chico, has asked the Council for a franchise in Dixon.

**Marion, Ill.**—The St. Louis & Southern Illinois Railway has received a franchise from the Council in Marion.

**Crawfordsville, Ind.**—The Terre Haute, Indianapolis & Eastern Traction Company has received a new franchise from the Council in Crawfordsville.

**Boston, Mass.**—The Boston & Eastern Railroad has asked the Council for an extension of time required for filing its penal bonds for the construction of its tunnel and opening of its line between Post Office Square and Beverly, with branch lines to Peabody, East Boston, Chelsea, Revere, Saugus, Lynn, Salem, Beverly and Peabody. [E. R. J., Feb. 15, '13.]

**Holyoke, Mass.**—The Holyoke Street Railway has received a franchise from the Council for track entrances to its proposed new carhouses from Bridge Street in Holyoke.

**Lynn, Mass.**—The Bay State Street Railway has asked the Council for a franchise for an extension from Lynn to Lynnfield.

**East St. Louis, Mo.**—Louis C. Haynes, representing the East St. Louis Railway, has asked the Council for a franchise on Main Street and on Broadway in East St. Louis.

**Kingston, Mo.**—H. L. Gilbert and David Miller, Kansas City, have received a franchise in Kingston. They have also received a franchise in Hamilton. This is part of a plan to build a 9-mile electric railway between Hamilton and Kingston. [E. R. J., Nov. 29, '13.]

**New York, N. Y.**—The New York, Westchester & Boston Railway has received permission from the Public Service

Commission, Second District, to abandon the proposed Throg's Neck route, which was proposed to extend from a point of connection with the company's main line near East 180th Street, New York, to Throg's Neck.

**Rome, N. Y.**—The New York State Railways, Rochester, has received the approval of the Public Service Commission to extend and double-track some of its lines in Albany.

**\*Elizabeth City, N. C.**—J. K. Wilson, C. W. Stevens and N. S. Leary, Elizabeth City, have asked the Council for a franchise for an electric railway through Elizabeth City.

**East Cleveland, Ohio.**—The Cleveland Railway has asked the Council for a franchise from Superior Avenue and Euclid Avenue to the northwesterly limits of East Cleveland.

**Fremont, Ohio.**—The Lake Shore Electric Railway has received from the Council an extension of eleven years to its franchise in Fremont in return for an agreement to lay double tracks and operate at a reduced fare, together with the payment of \$6,500 back paving assessments. It is said that a referendum vote may be demanded.

**Toledo, Ohio.**—The Toledo Traction, Light & Power Company has received a franchise from the Council on Buckeye Street, between Michigan Street and Ontario Street, in Toledo.

**Barrie, Ont.**—At a special meeting of the Town Council a provisional agreement with the Toronto, Barrie & Orillia Electric Railway was adopted, and a by-law prepared for submission to the qualified ratepayers on Jan. 5. The company gets a twenty-five-year franchise and a fixed assessment of \$15,000 for general taxation.

**Hillsboro, Ore.**—The Portland, Eugene & Eastern Railway has received a two months' extension of time on its franchise from the Council in Hillsboro in which to complete its line in Hillsboro.

**Centralia, Wash.**—The Lewis County Commissioners recently granted two franchises to the Washington-Oregon Corporation to operate electric lines along county roads. One of the lines will leave the present line of the company one mile south of Centralia and extend west, connecting with a line down Washington Avenue, for which a franchise is being sought from the city. The other line will leave the present line at the same point and run north on Grand Avenue, connecting with a proposed line up Gold Street, for which a franchise is being sought by the company in Centralia.

**Wenatchee, Wash.**—Hyman Harris, Wenatchee, has received a fifty-year franchise from the Chelan County Commissioners to build a 35-mile electric railway from Malaga to Leavenworth on the condition that the line be completed and in operation within five years' time. Mr. Harris has asked the City Council for a franchise in Wenatchee. [E. R. J., Nov. 1, '13.]

#### TRACK AND ROADWAY

**Gadsden, Bellevue & Lookout Mountain Railway, Gadsden, Ala.**—An extension from Sixth Street to Randall Street in Gadsden will soon be built by this company.

**\*Ferndale, Cal.**—Plans are being considered to build an electric line from Ferndale to Fernbridge to connect with the Northwestern Pacific Railroad at Fernbridge. W. B. Alford and G. M. Brice, Ferndale, are interested.

**Fresno (Cal.) Traction Company.**—Plans are being made by this company to double-track its line on Tulare Avenue from Angus Street to First Street in Fresno. The company intends to extend its present Arlington Heights line through Arlington Heights, and possibly even farther in the near future.

**Pacific Electric Railway, Los Angeles, Cal.**—Tracklaying on the San Bernardino-Los Angeles trunk line of this company has reached Etiwanda. The company has placed in operation its Riverside-San Bernardino branch.

**San Rafael & San Anselmo Valley Railway, San Rafael, Cal.**—This company has received a certificate of public convenience and necessity to construct and operate an electric railway between San Rafael and San Anselmo, under certain franchises transferred to applicant by S. J. Norton. The company has been authorized to issue its capital stock of the par value of \$55,000 and its bonds of the face value of \$45,000, both stock and bonds to be sold at par, proceeds

to be used for construction purposes, only after a stated amount has been subscribed and paid in. The commission has made a supplemental order permitting applicant to begin the construction work. E. S. Rake, San Rafael, president. [E. R. J., Nov. 29, '13.]

**Honolulu Rapid Transit & Land Company, Honolulu, Hawaii.**—During 1914 this company will award contracts to build 6 miles of new track in Honolulu.

**Hagerman Valley & Twin Falls Traction Company, Boise, Idaho.**—This company has awarded the contract to the C. R. B. Welty Company, Oklahoma City, to build the first section of its line between Tuttle and Hagerman. H. A. Stout, president. [E. R. J., Dec. 13, '13.]

**Idaho Falls (Idaho) Electric Railway.**—This company has petitioned the Public Utilities Commission for a certificate of public convenience and necessity for the company to build 34 miles of interurban lines out of Idaho Falls in two distinct directions in the vicinity of Idaho Falls. James L. Milner, Idaho Falls, president. [E. R. J., Dec. 6, '13.]

**New Orleans-Kenner Electric Railway, New Orleans, La.**—This company has submitted two proposed routes to Mayor Behrman for consideration at a meeting when the Commission Council and the police jury of Jefferson parish will finally consider the interurban electric line in Jefferson parish and in New Orleans with the view of completing the franchise ordinance to be adopted at an early session of the Council.

**Iron River, Stambaugh & Crystal Falls Street Railway, Iron River, Mich.**—Construction on this 30-mile line to connect Iron River, Stambaugh, Crystal Falls, Spring Valley, Amasa and intermediate mining locations was begun in September and two sections of the railway have already been completed—one on Carnegie Avenue, Iron River, and the other between the towns of Stambaugh and Iron River. The company expects to have its Stambaugh-Spring Valley line completed and in operation in June, 1914, this being one of the four lines contemplated, all to radiate from Iron River, to connect with various mining locations. Surveys have been completed between Iron River, Stambaugh and Crystal Falls, including local lines, for a distance of 20 miles. The type of overhead construction will be ordinary trolley suspension, part steel and part cedar poles—part bracket and part cross span suspension. All material for track and overhead construction and equipment needed for 12 to 15 miles of track will soon be purchased. Hydroelectric power will be purchased for the present, and will be furnished by the Peninsula Power Company, Iron Mountain. F. D. Sullivan, 1023 Seventh Avenue, West, Ashland, president. C. A. Hutchinson, Ashland, chief engineer. [E. R. J., Oct. 11, '13.]

**Nebraska Transportation Company, Omaha, Neb.**—This company, formed to build an interurban line from Sioux City to Niobrara and other points in northeastern Nebraska, revived the project at a recent meeting at Lincoln, Neb. The company recently applied for an issue of \$13,000,000 in stocks and bonds. It now wants \$200,000 for immediate work. [E. R. J., June 28, '13.]

**Brooklyn, N. Y.**—The Public Service Commission has procured enough consents of property owners to legalize the Flatbush Avenue-St. Felix Street-Fulton Street route in Brooklyn. This is the route which connects the Fourth Avenue subway through St. Felix Street and Flatbush Avenue with the Brighton Beach line of the Brooklyn Rapid Transit system at Malbone Street.

**International Railway, Buffalo, N. Y.**—The Buffalo, Lockport and Olcott division of this company's line has placed in operation the double track on the section of the line between Lockport and Hinman, 3 miles, and from Pendleton to Dempsey's Crossing, another 3-mile section.

**Hornell (N. Y.) Traction Company.**—This company has completed the extension of its north Hornell line, and will place it in operation by the early part of January, 1914.

**Independence, Caney & Oklahoma Railway, Bartlesville, Okla.**—Plans are being considered by this company to build an electric railway between Caney, Havana, Wayside and Independence, Kan., and Bartlesville, Okla. Land owners along the proposed route have donated one-fourth of the

right-of-way between Caney and Independence. [E. R. J., Dec. 13, '13.]

**Hamilton (Ont.) & Mountain Park Railway.**—An order was issued on Dec. 10 by D. M. McIntyre, chairman of the Ontario Railway and Municipal Board, under the terms of which this company is ordered to prepare and submit for the approval of the board engineers plans and specifications for the reconstruction of the inclined railway at Wentworth Street, in Hamilton. [E. R. J., Feb. 15, '13.]

**\*Sarnia, Ont.**—A new railway through Petrolia to Courtna with radials to Courtright, Bridgen, Arkona and Sarnia is now being projected by London and Petrolia capitalists, in conjunction with the Merchants' Mutual line and other lake package transportation companies. Rights-of-way have been secured in Moore Township. Hydro-electric power will be used, and it is expected that the amount of freight handled will more than compensate the provincial government for operation and equipment.

**Southern Oregon Traction Company, Medford, Ore.**—This company has completed 1 mile of track in Medford and plans to build 3 miles of new track within the next six months. It will purchase power from the California-Oregon Power Company, Medford. This railway will ultimately connect Medford, Siskiyou Heights, Phoenix, Talent, Ashland and Central Point. S. M. Bullis, Medford, president. [E. R. J., June 14, '13.]

**Oregon Short Line Railway, Portland, Ore.**—Plans and right-of-way for the new 80-mile belt line which this company plans to build between Idaho Falls and St. Anthony have been completed. Work will be begun as soon as the weather permits.

**Ephrata & Lebanon Street Railway, Lebanon, Pa.**—Grading has nearly been completed and construction will be begun in the spring on this company's line between Hope-land and Kleinfeltersville.

**Dakota Eastern Railroad, Pierre, S. D.**—Surveys are under way and construction will be begun in the spring by this company on its 47-mile line from Wallace to a point on Clear Lake. H. F. Hart, Webster, S. D., general manager.

**Maryville-Knoxville Interurban Railway, Knoxville, Tenn.**—Preliminary arrangements have been completed and construction will be begun in the spring by this company on its 14-mile line from Maryville to Knoxville, via Rockford, Little River and Vestal. Knox Burger, Maryville, secretary. [E. R. J., Aug. 2, '13.]

**Cumberland Valley Interurban Railway, Nashville, Tenn.**—Surveys have been completed by this company on its line through Alexandria, and they are now under way between Alexandria and Liberty. This company will build an 80-mile line to connect Nashville and Sparta, via Greenvale, Auburn, Liberty and Alexandria. J. H. Cartwright, 410 Union Bank Building, Nashville, president. [E. R. J., Sept. 27, '13.]

**Nashville (Tenn.) Traction Company.**—Bids are being asked by this company for the construction of its projected lines in Nashville. Walter O. Parmer, Nashville, president. [E. R. J., Nov. 15, '13.]

**Shelbyville, Petersburg & Decatur Railroad, Shelbyville, Tenn.**—Surveys are being made to build this 75-mile electric line between Shelbyville, Tenn., and Decatur and Athens, Ala. Among those interested in the project are J. F. Boyd, H. H. Nelson, W. G. Evans and T. G. Cunningham, all of Shelbyville.

**Jefferson County Traction Company, Beaumont, Tex.**—This company plans to place its line between Beaumont and Port Arthur in operation during this month. [E. R. J., Sept. 13, '13.]

**Dallas (Tex.) Consolidated Electric Railway.**—This company plans to double-track several of its lines in Dallas.

**El Paso (Tex.) Electric Railway.**—Work has been begun by this company on its new line from Arizona Street north to Hague Street and east on Hague Street to Kansas Street in El Paso.

**\*Fort Worth, Tex.**—Business men of Fort Worth and Denton have pledged \$500,000 for the construction of a 32-mile electric railway between the two cities. Application for a charter will soon be made. William Capps is one of the promoters.

**Fort Worth & Denton Interurban Railway, Fort Worth, Tex.**—This company is reported to have been organized and will soon apply for a charter to build a 35-mile electric railway to connect Fort Worth and Denton. Capital stock, \$500,000. Directors, E. E. Baldrige, S. Davidson, W. C. Stripling, B. J. Tillar, N. Harding, George T. Reynolds, W. E. Connell, Marion Sansom, John P. King and Benjamin O. Smith, all of Fort Worth; J. H. Paine, B. H. Davenport and J. R. Christal, all of Denton, Tex.

**Morgantown & Fairmont Railway, Morgantown, W. Va.**—This company, the incorporation of which is reported elsewhere in this issue, has completed surveys and located the route for its proposed line between Morgantown and Fairmont. This is supposed to be part of a plan to build a 31-mile line between Weston, W. Va., and Pittsburgh, Pa. William E. Glasscock is interested.

**Beloit, Delavan & Clinton Railway, Beloit, Wis.**—Right-of-way is being secured by this company for its 22-mile line between Beloit and Delavan. Charles F. Lathers, Beloit, is interested. [E. R. J., May 31, '13.]

**Manitowoc & Northern Traction Company, Manitowoc, Wis.**—Plans are being contemplated by this company to build an extension from Two Rivers to Mishicot, and also a connecting line from Sturgeon Bay to Mishicot.

**Wisconsin Electric Railway, Oshkosh, Wis.**—This company has secured options on a right-of-way along Lake Winnebago for an extension from Oshkosh to Neenah and Menasha. Work will be begun in the spring on this branch.

#### SHOPS AND BUILDINGS

**Pacific Electric Railway, Los Angeles, Cal.**—This company's carhouse No. 2 was damaged by fire on Dec. 10 to the extent of about \$25,000.

**Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.**—This company has purchased the old Y. M. C. A. Building at Crawfordsville at a cost of \$18,000, and will proceed to remodel the structure for use as a terminal station.

**Kentucky Traction & Terminal Company, Lexington, Ky.**—This company has moved its offices from the First & City National Bank Building to the building recently occupied by Hughes & Company on West Main Street, in Lexington. The Hughes Building has been entirely remodeled to accommodate the needs of the traction company. The first floor will be used as a waiting room, the second floor for a rest room for the employees, and the third floor for the general offices of the company.

**Bay State Street Railway, Boston, Mass.**—This company has completed its new carhouse on Middlesex Street, in Lowell. The structure is one story in height, 145 ft. x 280 ft., and contains ten tracks and can accommodate about eighty cars.

**Ottawa (Ont.) Electric Railway.**—Plans are being made by this company for a new boiler and engine house on Middle Street, in Ottawa.

**Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.**—Plans are being prepared by this company to build a new passenger and freight station at Niagara-on-the-Lake.

**Lehigh Valley Transit Company, Allentown, Pa.**—Plans are being considered by this company to build new repair shops in Manchester in the near future.

#### POWER HOUSES AND SUBSTATIONS

**Huntsville Railway, Light & Power Company, Huntsville, Ala.**—This company has installed additional equipment at its power plant in Huntsville.

**Geary Street Municipal Railway, San Francisco, Cal.**—Sheppard & Warrack Company, Seattle, has been awarded the contract for the construction of a new substation at Dexter Avenue and Aloha Street, in Seattle.

**Toledo Railways & Light Company, Toledo, Ohio.**—The addition to the central generating station of this company of 16,500-hp capacity was placed in operation on Dec. 13.

**Eastern Pennsylvania Railways, Pottsville, Pa.**—Plans have been completed by this company to begin work in the spring on the construction of a new power house at Palo Alto.

# Manufactures and Supplies

## ROLLING STOCK

**Honolulu Rapid Transit & Land Company, Honolulu, Hawaii,** expects to purchase fifteen passenger cars.

**Salt Lake & Utah Railroad, Salt Lake City, Utah,** has ordered three motor cars from the Hall Scott Motor Car Company.

**Ohio Electric Railway, Cincinnati, Ohio,** has ordered five steel passenger side-entrance cars from the Cincinnati Car Company.

**Port Arthur & Fort William Electric Railway, Port Arthur, Ont.,** expects to purchase at once three or four single-truck cars, fully equipped, Westinghouse equipment and Brill trucks preferred, cross seats, air-brake equipment, storm sash, Peter Smith heaters or electric heaters, and to be painted to suit the purchaser.

**Jamestown, Westfield & Northwestern Railway, Jamestown, N. Y.,** formerly known as the Jamestown, Chautauqua & Lake Erie Railway, a steam road, which will be equipped in the early spring electrically, expects to purchase electric passenger cars, combination passenger and freight, combination passenger and express cars and electric locomotives.

**British Columbia Electric Railway, Vancouver, B. C.,** has purchased three snow sweepers from the Ottawa Car Company for use in Vancouver, Victoria and New Westminster, B. C. The new sweepers, which are equipped with General Electric motors of 50 hp, are specially arranged for left-hand operation, the three cities named being the only ones in Canada where this custom prevails.

**Windsor, Essex & Lake Shore Rapid Railway, Kingville, Ont.,** has ordered two interurban cars from the Tillsonburg Electric Car Company, Ltd. The following details are specified:

Seating capacity	.....62	Roof	.....monitor deck style
Length over body	.....44 ft.	Bottom frame	.....composite
Length over bumpers	...55 ft.	Interior finish	.....oak
Width over all	...9 ft. 1½ in.	Heaters	.....Smith
Interior trim	polished bronze	Couplers	.....radial

## TRADE NOTES

**Wendell & MacDuffie Company, New York, N. Y.,** agent for the Consolidated Car Fender Company, has received an order to equip the entire 100 cars of the Jacksonville (Fla.) Traction Company with H-B lifeguards.

**J. G. White** returned from abroad on Dec. 10 after six months' absence in England and the Continent. Much of his time was spent in London at the home office of J. G. White & Company, Ltd., of which he is president.

**William J. Norton** and **Paul P. Bird** have severed their connection with the Commonwealth Edison Company, Chicago, and will engage in private practice as consulting engineers, with special reference to public service properties, under the firm name of Norton & Bird.

**Hale & Kilburn Company, Philadelphia, Pa.,** has elected S. M. Vauclain, vice-president of the Baldwin Locomotive Works; S. M. Curwen, president of The J. G. Brill Company, and Thomas Newhall, of Edward B. Smith & Company, directors to succeed W. H. Marshall, R. B. Caverly and F. H. Greene, resigned.

**Go'dschmidt Thermit Company, New York, N. Y.,** has issued a catalog describing and illustrating its rail grinders, designed for the purpose of finishing rail joints welded by the thermit process. Special grinders are also made for corrugation or joint grinding in subway or on elevated roads equipped with either a shoe or a trolley.

**Gold Car Heating & Lighting Company, New York, N. Y.,** has appointed Frank A. Purdy sales manager of its New York office. Mr. Purdy will also act as sales manager for the Canadian Gold Car Heating & Lighting Company. The W. W. Butler Company, Ltd., Montreal, Que., will act as selling agents for the Canadian Gold Car Heating & Lighting Company.

## ADVERTISING LITERATURE

**Reagan Grate Bar Company, Philadelphia, Pa.,** has issued a folder describing its new improved grate and stoking device.

**Wallace Supply Company, New York, N. Y.,** has issued a catalog describing its hand-power bending tools, bar cutters, shears and punches.

**W. S. Rockwell Company, New York, N. Y.,** has issued a catalog describing its various types of furnaces for annealing, melting, hardening and other purposes.

**W. N. Matthews & Brother, St. Louis, Mo.,** have issued a folder illustrating the application, under various conditions, of their guy anchors for electric transmission poles.

**Union Switch & Signal Company, Swissvale, Pa.,** has issued a catalog describing in detail its T-2 d.c. and a.c. signals and also its method of mechanism wiring and typical circuit arrangement in connection with automatic block signaling.

**General Railway Signal Company, Rochester, N. Y.,** has issued a catalog describing the G. R. S. selector system, which is equipped for primary battery or motor-generator control and combines the features of ruggedness and simplicity. Illustrations show the selector with cover removed and with the cover locked in place.

**Alexander Milburn Company, Baltimore, Md.,** has issued a catalog describing its acetylene lights. Its handlights of 500 cp for ten hours are invaluable for electric railway emergency departments. The catalog also describes oxy-acetylene welding and cutting plants for repairing broken machine parts, welding boilers, tubes, tanks, etc., reclaiming defective castings and cutting up steelwork.

**Perry, Coffin & Burr, Boston, Mass.,** have issued a pamphlet setting forth the tax clauses from the trust deeds securing various electric railway and other public utility bonds in which that company is interested. The book contains a complete alphabetical bond list, giving the tax clause and other pertinent data. Following this list is a compilation of bond issues with regard to clauses providing for income tax payment and a similar compilation for bond issues without any clause in regard to income tax payment. The last section of the book contains a list of bond issues arranged according to coupon dates. According to a statement accompanying the pamphlet, most of the corporations named in the book are obligated by their mortgage covenants to pay the normal 1 per cent federal income tax.

## NEW PUBLICATION

**American Railroad Economics.** By A. M. Sakolski, Ph. D. New York, N. Y.: Macmillan Company. Size, 5 in. x 7½ in.; 295 pages. Price, \$1.25.

This publication is intended as a text book for investors and students. The author is a staff lecturer in New York University School of Accounts, Commerce and Finance. His purpose was to examine critically facts and figures derived from railroad reports and other publications with a view to assist in the correct judgment of railroad activities and operating results. The book is divided into twelve chapters and takes up in turn railroad rates, railroad securities, railroad systems of the United States, economics of railroad construction, physical factors in economic operation, traffic statistics, the Interstate Commerce Commission's system of railroad accounts, the income account, net income and its distribution, the general balance sheet and railroad capitalization. A vast amount of information is crowded into the twenty-seven pages devoted to the subject of railroad securities. A particularly interesting chapter is the one on the Interstate Commerce Commission's system of railroad accounts. The aims of the commission in prescribing its system of accounts are set forth, and the author has pointed out wherein the system has failed in some of its purposes. The chapter on the general balance sheet is a particularly good one. When studying railroad financial progress the balance sheet as a rule is hurriedly passed over because it is less readily understood than the income account, but the author says that the general balance sheet, when properly interpreted, furnishes a better indication of financial status and of investment value than current earnings, which frequently are the result of temporary conditions. As part of this chapter, he has included the condensed general balance sheet of the Erie Railroad as of June 30, 1912.