

Electric Railway Journal

Published by the McGraw Publishing Company, Inc.
Consolidation of STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

Vol. XLVII

NEW YORK, SATURDAY, JUNE 24, 1916

No. 26

"MANUFACTURERS AND OTHERS" Language is made up of words coined to meet the exigencies of the times. One such exigency is created by the new group of company members of the American Electric Railway Association, the "manufacturers and others," especially the others. Of course, there are no distinctions drawn by the association among the company members, but it is and will be often convenient to refer to the non-railway-operating element in the company membership, and a word would be very convenient. The term "manufacturer," for example, is not appropriate for a firm of consulting engineers or for a publishing company, both of which are eligible as members under the present constitution. Who will suggest the proper word?

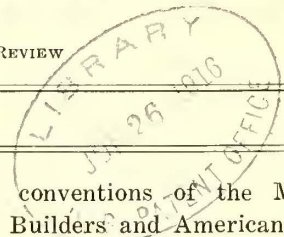
AN EXAMPLE IN STANDARDIZATION The practical conclusion of the work of the Master Car Builders' committee for developing a single standard coupler, as reported last week, offers an example that may well be taken to heart by the electric railway industry. When this committee began its work, the need for a single standard design of coupler was quite comparable to that which exists in many items of electric railway equipment. Operation was perfectly feasible under the old plan of having a score or more of slightly different designs in service, because all of them coupled together. Where conditions were bad, however, lay in the fact that a great number of repair parts had to be carried in stock to provide for the various makes, and at the same time these makes displayed a wide variation in reliability and strength. Naturally, the development of a single standard design offered a definite remedy. But opposed to this was the fact that a number of railroads had standardized on certain couplers, and, of course, each manufacturer considered his own particular design was the best and that he could prove it. Clearly enough, if the master car builders had had a weak organization which received only half-hearted cooperation from the railroads, it is inconceivable that such obstacles to the introduction of a single standard coupler could have been overcome. As a matter of fact, however, the organization has been able to bring all of the roads into line by what may be termed direct compulsion, and has even succeeded in having the manufacturers agree to discard their old patterns in favor of the standard super-design that has resulted from the coupler committee's four years' work. Is there any real reason why the electric railways cannot do as much with their own association standards?

1916 CONVENTION PROSPECTS

The conventions of the Master Car Builders and American Railway Master Mechanics' Associations just closed showed that Atlantic City has lost none of its popularity as a place for large national conventions and exhibitions. The official figures on registration were not available when this paragraph went to press, but the square feet of exhibit space had increased from 70,412 in 1915 to 76,512 in 1916, and the number of exhibits from 222 to 260, and undoubtedly the attendance of railway men, manufacturers and guests was larger than last year. The meetings were also well attended, the discussion was active and spirited and the manufacturers reported that more than the usual attention was given to the exhibits of the railway men in attendance. One reason for this undoubtedly is that the business of the steam roads during the last year has been larger than for a long time and they have done more buying. These facts undoubtedly gave a zest to both the proceedings and exhibits. All of this is interesting in connection with the electric railway convention next October. The last six months have also witnessed large increases in the traffic of the electric roads as well as in the orders placed by them, and these increases should be reflected in the attendance at the October convention, and in the size and number of the exhibits. Another reason why manufacturers should exhibit this year is because there was no exhibit last year. It is the logical year for a good convention and a good exhibit.

TRAIN DETENTION RECORDS

The Master Mechanics' committee on electric rolling stock brought up again this year the subject of train delay records for electrified divisions of steam railroads, and the recommendation to standardize the form for such statistics is decidedly pertinent. At the present time when electrifications are relatively few in number the opportunity for setting up standard records is excellent, and once that such a form is agreed on even by a few companies its permanent establishment is assured. The obvious reason is that as other railroads enter the field of electric operation it is easier for them to adopt a method that is already in general use than to work out something different for themselves. Delay statistics for electric rolling stock offer too many features of importance to be deprived of the ready aid in connection with comparisons that is afforded by a single standard basis, and the recommendations of the committee, repeated



from last year's report, provide for the simplest and most readily understandable form that appears to be available. This is that, for the maintenance department, train detentions for any period should be totaled in the basis of miles per detention, and not on the basis of miles per minute of detention, because the extent of any delay is largely a matter of luck. Reliability is reflected in having a small number of delays and not in having a possibly large number of delays that all happen to be short. The recommended classification of causes of detention as mechanical, electrical and man failures is also important, and electrified divisions would do well to adopt it at once in their maintenance records as well as the use of the basic unit of mileage per detention.

EDUCATIONAL OPPORTUNITY FOR MANUFACTURERS Recent meetings of sectional electric railway associations illustrate splendidly a fact to which attention has been directed before, but which is worthy of consideration by all who are responsible for convention program making. This is that the manufacturers are in a position to present for consideration the latest specialized data in their respective fields. By the nature of their work they are bound to have in their employ technical talent capable of "sizing up" the requirements which they aim to meet. Within limits this talent is available in the preparation of convention papers. Approximately one-third of every local program might profitably be occupied in the presentation and discussion of papers by manufacturers. These papers should be of high quality, in every way on a par with those prepared by railway men. They should be prepared to advance the whole industry and not primarily to promote the commercial interests of the authors or the companies they represent. They should contain accurate data of reference value selected to answer the question, "What does the railway man want to know on this subject?" rather than "What does the manufacturer want to say?" They should be presented in person by officials qualified and authorized to answer any legitimate question raised in discussion. Obviously, such men will be sure of their ground before consenting to present papers of the kind desired, for if they have facts which they wish to conceal a wide-awake meeting is no place for them. The technical press gives wide publicity to meritorious papers presented before the company sections and sectional associations. The manufacturer who speaks well before them thus addresses in effect the entire industry. He has here an exceptional educational opportunity to impart desired information, an opportunity which is worthy of his best effort.

MUNICIPAL OWNERSHIP FIASCO The response of Superintendent Valentine to the request of the Seattle Council for some real information about the local municipal lines ought to be interesting reading to citizens of the city if they are desirous of finding out exactly where their insane desire for municipal ownership has led them. As our abstract shows, Mr. Valentine believes that Division "A" as now

operated will not earn its operating expenses and interest prior to 1936, and Division "C" will not earn its operating expenses prior to 1926. Moreover, even with an extension to Ballard, Division "A" will not become a paying utility for twenty-three years, to say nothing of the time required to wipe out the total deficit of \$668,000 that will have accrued by the end of this period. This is a showing at which the city might well be disturbed, but it would be much worse if all proper charges were figured in so as to permit a just comparison with privately-owned utilities. For example, the State Bureau of Accountancy calculates depreciation for 1915 at \$8,233, but this is not covered by a reserve but by a deduction from the investment so as to lessen the taxable value. Moreover, comparative taxes, though calculated for 1915, are evidently not considered in determining future results, while charges for accounting, supervision, legal advice and financial work done by other city departments are not mentioned. Nor is any more attention being paid to reserves for injuries and damages, insurance, etc. Were all these to be fully considered in estimating the prospects of the municipal lines, we imagine that Mr. Valentine's time limits would be found highly conservative. It is undoubtedly true, as he says, that the electric railway business is far from satisfactory from the point of view of the operator, but poor results in Seattle have been brought about far less by general railway conditions than by the inevitable attributes of municipal ownership. The folly of municipal ownership is well shown by the Seattle figures, and the lesson to be derived therefrom should be apparent to all.

PREPAREDNESS FOR PEACE CONDITIONS

The business situation at the end of the war has worried electric railway operators just as it has the owners of other industries. When the war was declared, all sorts of predictions were made as to the effect upon business in this country. For some six months the New York Stock Exchange was closed for fear that American securities held abroad would be sold at low prices here and thus disarrange the security market. The forecasts made at that time included those of high interest rates because of the demand for capital abroad and low interest rates because our principal customers could not take our manufactured products. About the only prediction upon which most forecasters agreed was that the war could not last long because the finances of the several countries could not stand it. Nevertheless, it has been going on for nearly two years at a cost of nearly \$100,000,000 a day, and none of the countries yet has shown signs of being obliged to stop simply because of lack of funds.

One of the most illuminating discussions on the general business situation which we have seen is an address presented by George E. Roberts of the National City Bank on June 13 before the Michigan Bankers Association at Flint, Mich. While guarded as to definite predictions of the situation after the war, Mr. Roberts corrects some popular misconceptions as to existing conditions and so furnishes an outline of what may be expected at the close of the war.

The first point made is that the amount of productive property already destroyed, as compared with the total amount of property in existence, is comparatively small, even in the countries at war. Most of the destruction has been in equipment and supplies of current production, such as munitions and other war supplies, but production in these lines has been greatly stimulated, and higher prices have acted as a restraint upon the consumption of supplies of other kinds. Another point made is that the capital of the future is not being consumed because it cannot be. Enormous debts are being contracted by the nations involved, but this represents a redistribution of wealth, not an expenditure of capital before it is created, although, of course, the waste which is now going on is an economic loss. The critical period will be at the end of the war when the armies are dissolved and millions of men must find their places in civil life. The problem will then be to integrate the industries, not only at home but throughout the world and get them on a mutually supporting basis, so that those at work can purchase the products of others.

As regards the United States, when the war is over we shall owe less abroad, but we shall be in an abnormal condition as regards wages, prices and industrial conditions to which we must become adjusted. This can be done only by realizing now that the present situation is temporary and that the need of the hour in preparing for the close of the war is higher efficiency in organization, in management and at the work bench so that the disturbance of industrial conditions at the close of the war will be as small as possible. If this is done, it will still be possible to pay higher wages here than are paid in other countries and yet sell goods abroad if we can lead the world in methods of production. This, then, is the lesson to electric railways. They should so improve their fundamental conditions that when the time for adjustment comes they will be able to take care of the situation as it is then presented.

PROFITABLE ENERGY SAVING

It requires on the average about 125 watt-hours per ton-mile to operate a car in city service. Translated into a more comprehensible unit, this is 166 foot-tons. That is, the same amount of energy is required to move the car 1 mile on the level as would raise it vertically 166 ft. All of this energy goes into heat, part of the loss being preventable, the balance otherwise.

So desirous of cutting down expenses is the present-day railway manager that he is willing to entertain any promising proposition in that direction. This explains the growing popularity of devices designed to save energy and increase service capacity of equipment. The questions to be answered in considering equipment charges are: Will they pay? and, Is this the best way in which the required capital can be invested? Correct affirmative or negative answers to these questions are necessary to the permanent good of the manufacturer as well as to the railway. In arriving at correct answers it is helpful first to visualize the present energy losses and then to consider the possibilities in the way of saving.

There are several elements in a car equipment the purpose of which is to produce or induce energy saving. Field control apparatus, anti-friction bearings, meters, coasting-time recorders, etc., are of this nature. These affect directly the rheostatic losses, car friction losses and brakeshoe friction losses, respectively, and produce indirect savings as well. That equipment is most profitable from the present viewpoint in which the investment in energy saving extras produces the largest net profit, everything considered.

Electrical engineers have evolved a formula which they have named Kelvin's law. This they sometimes use in calculating the size of wire for transmission lines. Divested of its attendant complications this formula states essentially that "The most economical size of wire is that for which the annual cost of energy wasted is equal to the interest on that portion of the investment which is proportional to the weight of copper used." A commonsense way of putting a principle of wide application, we must admit, a principle also that is sometimes overlooked. It can be applied in connection with the many plans which are being offered for saving energy in car operation, not mathematically, perhaps, but at least in a general way. The conclusion of the preceding paragraph is essentially a rewording of Kelvin's law for the more complicated case in hand.

At first glance it would appear that if we had a frictionless car to which the air offered no resistance we should be able to move it between two points on a level track without expenditure of energy. This would be the case if a uniform velocity could be maintained during the run. But if the car is to be brought up to speed from rest, energy must be stored due to the mass of the car, and this energy must be dissipated if the car is stopped. Hence, there would be a waste of energy even with a frictionless car. In ordinary city service the frictionless car would require at the wheel tread a third, more or less, of the usual actual energy. This "inertia" loss, which must be charged to the necessity for starting, will always be with us. It is dissipated in brakeshoe friction, and is less as the speed at the point of brakeshoe application is lower. Coasting conduces to saving in this direction. Another third of the energy consumption of the car goes into friction loss, in motors, gears, car journals and wheel flanges. From a third to a half of this is preventable by the use of bearings practically frictionless.

The remaining third of the energy consumption is in rheostatic resistance, motor core and copper losses, brush friction, air resistance, etc. It would not be far amiss to say that one-half of this third is lost in the starting grids, about a third in the motor items mentioned, and the remaining sixth in everything else. The principal chance to save here is in the first item, the magnitude of which may be reduced one-half or more by field control.

Of the three main schemes for saving energy the following may be said. They are all inherently good. In general they can all produce energy savings. Whether any or all are applicable in a given case is a matter for careful calculation.

A New Low-Floor, End-Entrance Car

The Wilmington & Philadelphia Traction Company Has Placed in Service a Number of Small-Wheel, Low-Floor Cars with Drop Platforms at the Ends—The Scale Weight Fully Equipped Is 30,540 Lb.

AN order for thirty-one low-floor, end-entrance prepayment cars has recently been completed for the Wilmington & Philadelphia Traction Company, Wilmington, Del., in which the features of design are 26-in. wheels, 25-hp. motors, and an unusually light weight of 30,540 lb. The new cars have been placed in city and suburban operation in Wilmington, Del., and Chester, Pa., and in both cities they met with instantaneous and universal approval of the public and received complimentary descriptions in articles published in the local newspapers. The general dimensions are as follows:

Length over vestibules.....40 ft.	Height, rail to sills.....26½ in.
Length over body.....29 ft.	Height, sill to trolley base.....
Width over sills.....8 ft. 2 in.	.....9 ft. 1¾ in.
Width over all.....8 ft. 6 in.	Bolster centers.....17 ft. 4 in.

The principal points which the company had in mind in designing the new equipments were as follows: (1) Lightness; (2) suitability for use on both city and suburban lines; (3) convenience of passengers while boarding and alighting; (4) semi-convertible feature for all-year operation. The actual weight of the car, complete with motors, trucks, air brakes and all other accessories, is only 30,540 lb. This is apportioned among the parts of the car approximately as follows, the figures being estimated but checked against the actual total scale weight.

Car body.....15,250 lb.	Trucks.....9,557 lb.
Electrical equipment, excluding motors.....1,220 lb.	Motors.....3,497 lb.
Air brake equipment.....1,016 lb.	Known weight of car complete.....30,540 lb.

The unusually low total weight for a unit of this size, was made possible by adopting the Baldwin class 62/18/C arch bar type of truck with 26-in. wheels and a 5-ft., 2-in. wheelbase, and by installing a new type of General Electric motor, No. 258, which is of the ventilated type, and has a rated capacity of 25 hp. Four motors are used, one on each axle, thus securing the maximum possible adhesion which is necessary on account of heavy grades and rapid rates of acceleration.

The car body is made of light, all-steel construction. The length of the platforms, 5 ft. 6 in., was selected so

as to reduce the length of the car and still provide sufficient room for the pay-within system of fare collection. The length of the body was also kept down by the adoption of a side-post spacing and seat centers of only 29 in. The light weight of the cars has already effected a gratifying economy of power, and in this connection it may be said that the company is now engaged in making a test to ascertain how much power the new cars take under various operating conditions. From the preliminary results obtained the electrical department estimates that the energy consumption will be low enough to effect a material saving.

The use of 26-in. wheels, which is an innovation in both Wilmington and Chester, has met with universal approval by the railway officials and the public. Advantage of the small wheel diameter has been taken in this case by the omission of one step, the passengers stepping directly from the street to the platform, a height of 15 in. By ramping the platform 1½ in. transversely at the end of the car-body floor and by ramping the car-body floor 3 3/16 in. longitudinally, it was possible to reduce the height of the step leading into the car itself to 12 in. This height is between 2 in. and 4 in. less than the second step on the company's old equipment, and is sufficiently low to allow the passengers to move with ease into the car body. Although a 9-in. step from the platform into the car is usual on high level cars, this difference in height is more than compensated for by the fact that every passenger on the new cars saves one step and about 12 in. over the usual type of car, which has a lift of 15½ in. from the ground to the first step, 14½ in. from the first step to the platform and 9 in. from the platform into the car, making a total of 39 in. Of course, these measurements vary, but the figures given are the heights on the new type of car with 33-in. wheels which this railway purchased in 1912. In addition, the low center of gravity has made the riding smooth and easy, and at the same time the coasting has been found to be remarkably good.

Passengers enter the cars at the rear platform and



WILMINGTON CARS—SIDE VIEW SHOWING STEPLESS PLATFORMS

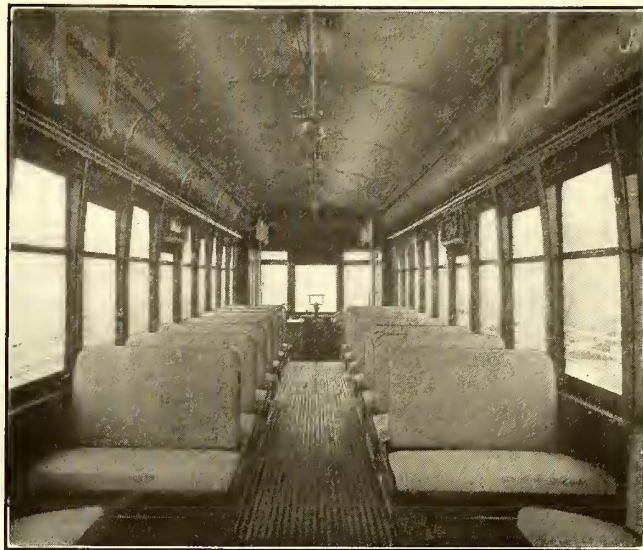
leave by the front platform. However, in cases where the car is crowded, making it difficult for persons in the rear to get through the aisle in order to leave by the front platform, they are permitted to leave by the rear platform. The public instantly adapted itself to this rear-entrance and front-exit plan of operation, and the low-level platforms have greatly facilitated the loading and unloading of the cars. Nearly all of the passengers move off the platform when alighting as if stepping from the sidewalk into the street, without taking hold of the handles. The prepayment method of fare collection, which is new on the system, is simplified by the use of folding doors and the omission of a bulkhead between the platform and the interior of the car. Instead of bulkheads, vertical enameled grab posts are placed on each side of the car at this position. Fare boxes are not used for fare collection, but International registers are employed.

The wheel diameter of 26 in. was adopted instead of the more usual one of 24 in. for several reasons, the principal one being that sufficient clearance between the top of the rail and the under side of the front of the platform, also underneath the car body could not be obtained with 24-in. wheels, as there are a number of sharp vertical curves on the system, where the grade changes from level track to steep ascents. Also, cast-iron wheels were adopted, because the weight of the car, speed and operating conditions did not warrant the use of steel wheels, which would have cost more than twice as much as those that were used, and in addition, it was almost impossible, at the time when the cars were purchased, to get deliveries on rolled steel wheels.

INTERIOR ARRANGEMENT AND CONSTRUCTION

The interior of the car is neatly finished in Agasote, as a necessary adjunct to the Brill semi-convertible arrangement by which the upper and lower sash raise into the arch roof. The ceilings are painted in straw color while the interior trimmings of the car are finished in mahogany and bronze. The seats are of the reversible type, covered with rattan, and they provide a seating capacity of forty-four persons. Outside the cars are painted green, trimmed with cream, according to the standard of the traction company. Striping and numbering and the monogram of the company are in gold.

Steel underframing is used, the side sills being made of 5-in. x 3½-in. x 5/16-in. angles with the long leg

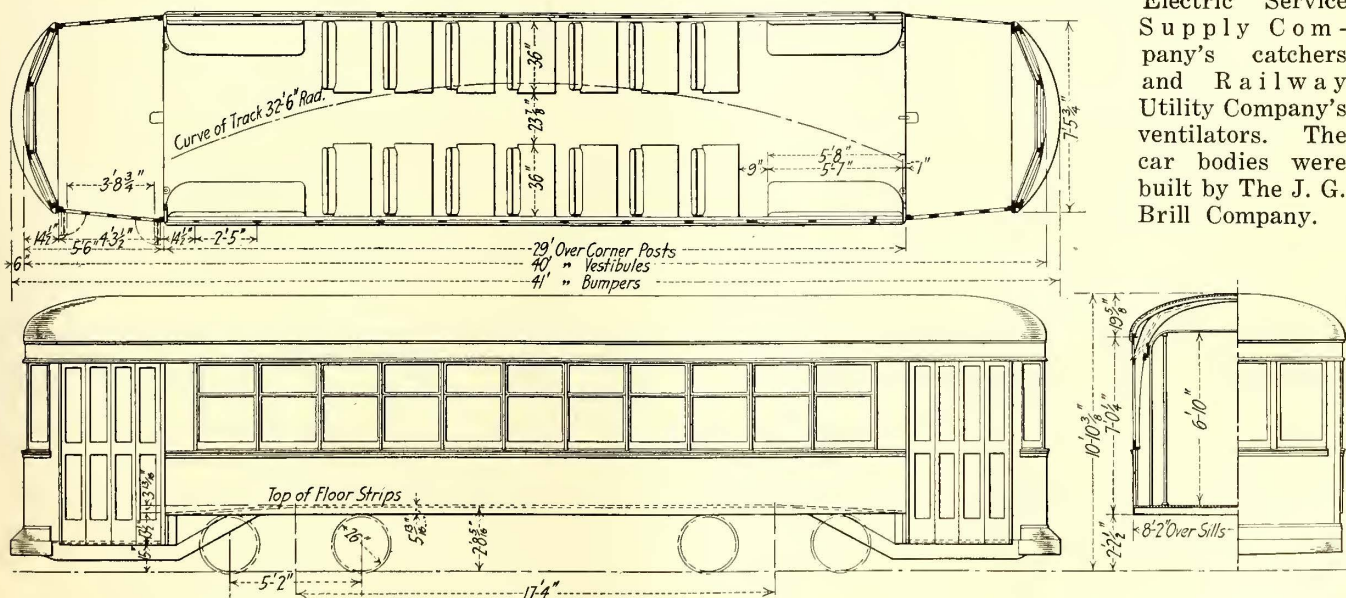


WILMINGTON CARS—INTERIOR VIEW

horizontal. At the bolster this side sill is reinforced with a 6-in. x 3½-in. x 5/16-in. angle about 3 ft. long to relieve the strain on the horizontal leg of the sill angle. The end sills are of 3/16-in. pressed steel, the crossings being of 1/8-in. pressed steel riveted to the side sills. Bolted to the side sills are cast-steel bolsters, and the outside platform knees are of 7-in. x 3½-in. x 3/8-in. angle reinforced with 2-in. x 2-in. x 3/8-in. angles under the end sill. These outside platform knees are suspended from the pressed-steel end sill, the knee bearing directly under the side sill at the rear end. The center platform knees are of 4-in., 5.25-lb. channel, extending from end sill to bumper.

In the body framing of the car the side posts are of 2-in. x 2-in. x 1/4-in. tees extending from the side sills to the top rails. The corner posts are of 3/32-in. steel, and the side sheathing is of the same thickness, being made in three sections. The plain-arch roof runs the full length of the car, supported on U-shaped, pressed-steel rafters.

Other specialties of car equipment includes Curtain Supply Company's curtain fixtures, Fabrikoid curtain material, Keystone destination signs, Parmenter fenders, Brill Dedenda gongs, Peacock staffless hand brakes, Peter Smith electric heaters, Golden Glow headlights, Electric Service Supply Company's catchers and Railway Utility Company's ventilators. The car bodies were built by The J. G. Brill Company.



WILMINGTON CARS—PLAN AND ELEVATION SHOWING GENERAL ARRANGEMENT

Power Generation for Electric Railways*

The Author Considers the Relative Merits of Small, Distributed Power Plants and Large Central Ones, and of Purchased versus Home-Made Power

By HENRY G. STOTT

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THE subject of power generation is a very broad one which must be studied from both the financial and economic viewpoints. A proposition can be perfectly successful from an engineering point of view, but be quite foolish from an economic one.

The first question which arises in any power generation problem is the cost of power, which is made up of two main items, fixed charges and operating charges. These in many cases are very nearly equal for steam plants. Fixed charges comprise interest on capital, amortization of capital, functional depreciation, taxes and a portion of administration expenses or running expenses. Operation and maintenance costs include all costs involved in operating the plant and in maintaining it at original efficiency. Unfortunately the element of fixed charges is often neglected or ignored in computing and comparing the cost of power.

The first item to be determined in fixed charges is what the money will cost, considering interest and providing for the return of the money to the owners. The latter is called an amortization charge and is usually included in with interest, resulting in a total cost for the money of about 6 per cent. Taxes form a larger percentage of the total cost of power than is often realized, amounting to 3.5 per cent on the total investment on the average, and varying between 2 per cent and 5 per cent. When all of the items in fixed charges are included the total cost of the money invested will be found to be not less than 10 per cent and probably 12 per cent or more.

In hydraulic plants the operating charges are so small as to be negligible while the fixed charges are very high.

SOME POWER-COST GRAPHICS

The diagrams reproduced herewith illustrate many points regarding the cost of power. Fig. 7 shows typical railway load curves, the lower one being the summer curve and the upper one the winter curve. Due to the heating load and the heavier schedule run, the winter load goes up to about 100,000 kw., and down, with a corresponding peak in the summer, to about 55,000 kw. The heating load in this particular case is about 20 per cent of the schedule load.

Fig. 1 is based upon Fig. 7, and illustrates the varying cost of power during twenty-four hours, and with varying amounts of power, supplied from a hydraulic plant, and a steam plant respectively. The total load is divided between the hydraulic plant and the steam plant, as indicated by the scales.

Figs. 2 and 3 show the costs with different sources of power. In all cases the cost of power during the small hours of the morning when the load is light, goes up to a high figure. The difference between the cost at 3 a. m. and 9 a. m. is very marked.

The first curve, *A*, is for hydroelectric power only. It shows how the cost is prohibitive at light loads. Curve *B* is for 75 per cent hydroelectric power and 25 per cent steam power, curve *C* is for half of each, and curve *D* is for all steam power. A combination of steam and

hydroelectric power for certain load curves almost invariably provides a lower cost of power for railway work than power from either a straight steam or hydroelectric plant.

Fig. 4 shows the variation of cost of power with load factor, in a plant costing \$60 per kilowatt. The lower curve plotted below the zero line shows the operating and maintenance costs, and the first curve above the zero line shows the fixed charges or investment costs. The latter curve indicates how important these charges become at light load. As the load factor increases the fixed charges become less, and there is also a decrease in operation and maintenance cost. At any load factor the total cost of power can be obtained by adding the two ordinates, as is done in the upper curve above the zero line. This curve indicates the importance of building up the load factor in any plant. Fig. 5 gives similar data for a plant costing \$80 per kilowatt. Referring to the upper curve it will be seen that at 50 per cent load factor the total cost of power is about one-half of what it is at 20 per cent load factor.

In Fig. 6 the curves of Figs. 4 and 5 are superimposed to emphasize the difference in cost of plants *A* and *B* (see Fig. 8) when operating at 45 per cent and 25 per cent load factors.

DIVERSITY FACTOR OR TIME DIFFERENTIAL

Fig. 8 shows a typical load curve with a load curve of a small plant added for purposes of comparison. Let us assume that a small d.c. station is shut down and that its load is added to that of another plant which already had a fairly large load. This introduces another factor, which is sometimes called the "diversity factor." I do not think that this name describes the factor very well. "Time differential" is a better description. It simply means that if one can find a load to add on to his other load, in which the peak load or high point does not come at the same time as it does in the other load, then the second load can be carried with advantage without adding much to the capacity of the plant. In other words, the fixed charges will not be increased by adding the load in the valleys shown in Fig. 8, as long as it is not added also to the higher peak. The difference between the broken line and combined curve at the peak in this figure represents the time differential, and 5000 kw. in the total capacity of the plant would be saved by having this small load added.

The question of disposing of small plants and installing a new central plant is purely an economic problem. The question arises as to the money borrowed for the old plants, and whether it has been written off in the shape of depreciated capital. It is very important that the new plant with high-tension transmission should make up in higher efficiency for any loss in capital and at the same time show a net gain and superior operation over the previous installation.

In all probability the service from the central plant with long-distance high-tension transmission will not be as reliable as that from the small plant on account of lightning disturbances, which break the insulators and disrupt the transformers. That is, the "reliability factor" will not be as great. However, this objection is at

*Abstract of an address delivered before the Connecticut Company section of the American Electric Railway Association on May 2, 1916.

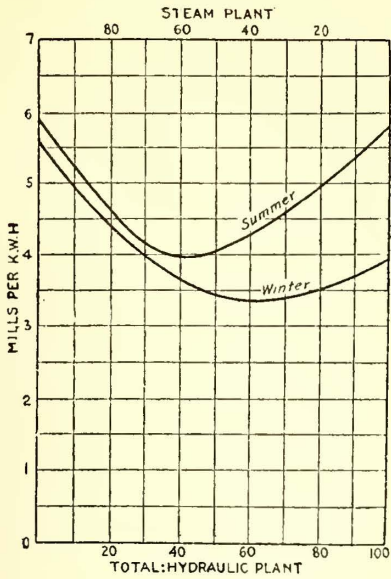


Fig. 1

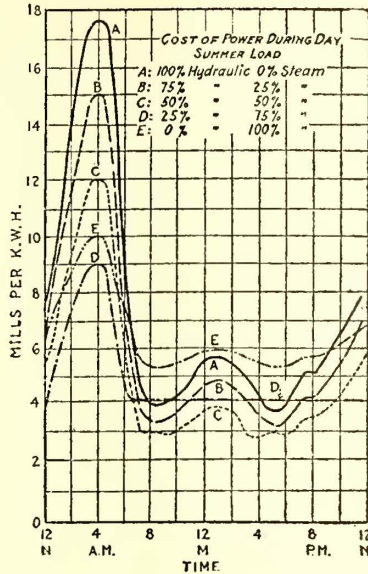


Fig. 2

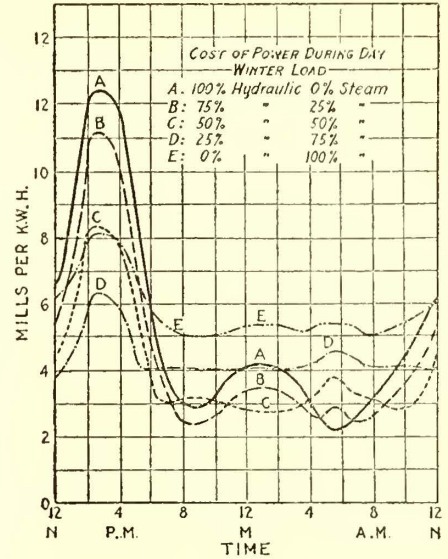


Fig. 3

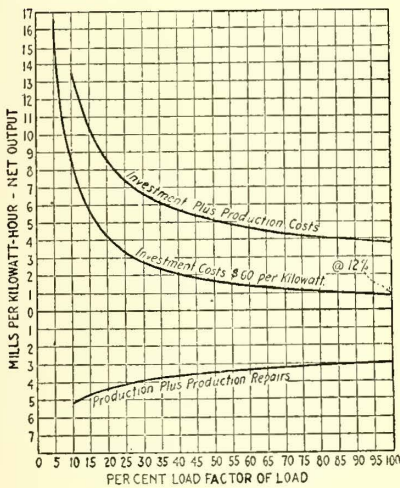


Fig. 4

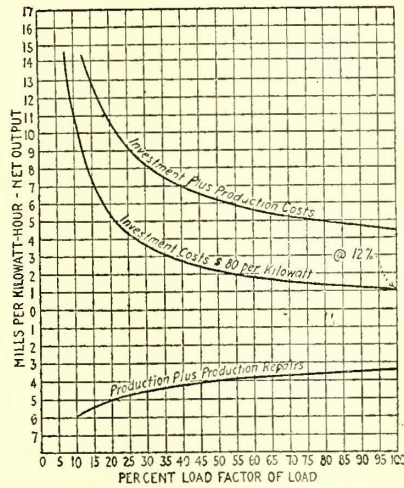


Fig. 5

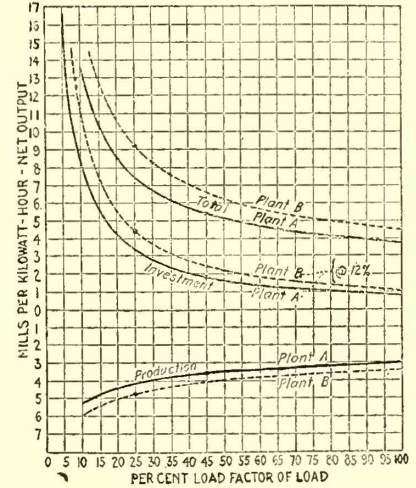


Fig. 6

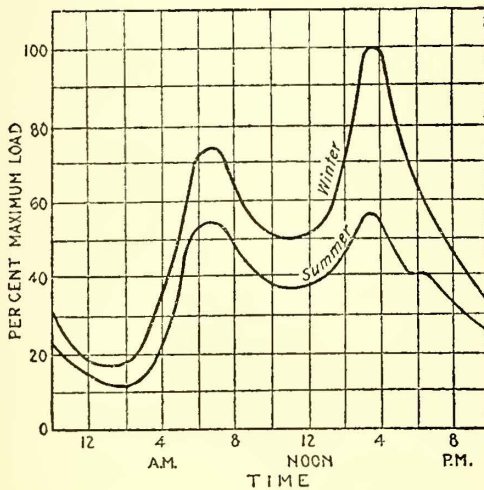


Fig. 7

Fig. 1—Daily average cost of power, steam and hydraulic plant—typical city load; Fig. 2, cost of power during day—summer load; Fig. 3, cost of power during day—winter load; Fig. 4, variation in cost of power with load factor in plant costing \$60 per kilowatt; Fig. 5, variation of cost of power with load factor in plant costing \$80 per kilowatt; Fig. 6, showing curves in Figs. 4 and 5 superimposed; Fig. 7, typical railway load curves; Fig. 8, combined load curves for large and small stations.

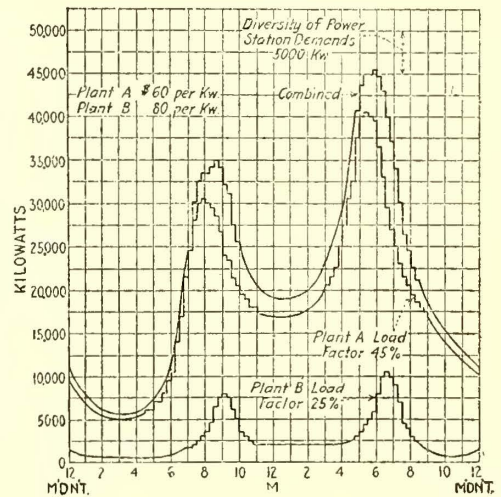


Fig. 8

Graphics of Power Generation for Electric Railways

present not very grave because the apparatus is being improved and made more capable of withstanding lightning shock.

POWER COSTS IN LARGE PLANTS

The size of plant has quite an appreciable effect on the cost of power. Below certain sizes, say below 1000 kw., the efficiency of the steam turbine goes down very rapidly with the size. In plants where such sizes of unit are needed it would be better to buy reciprocating engines, direct-connected to the generators than to put in turbines. As the size goes up, however, the turbine shows considerable improvement over what the reciprocating engine can do, and in units of 30,000-kw. capacity or more there is a very marked improvement. The unit purchased not long ago by the Interborough Rapid Transit Company is going to generate 70,000 kw. on 10.5 lb. of steam per kilowatt-hour.

Further, there must be a certain number of men to operate stations; engineers, firemen, oilers, etc. A man can take charge of a large unit as easily as he can a small one, so that the cost of labor does not go up in proportion to the size of the plant. That is another factor which makes a large plant cheaper proportionately. In a very large plant, however, the cost of these items is almost negligible, whereas the costs of coal and water are very important items, especially the former.

For illustration, when we started developing power for the electrification of the Manhattan Elevated Railroad system in New York, about fifteen years ago, it took almost 3 lb. of coal per kilowatt-hour and to-day we are using but 1.5 lb. with modern turbines. When the older units were put in they were the finest ever built and cost about \$250,000 each. But owing to the progress of the steam turbine it seemed advisable to take out the engines and replace them with turbines, although their scrap value was only about \$10,000 each. The problem of writing off this difference is a real one. It touches the question of what we might call the effect of obsolescence upon the economy of production.

SHALL RAILWAYS GENERATE OR PURCHASE POWER?

The general question as to whether the railway company should manufacture its own power or buy it, is a very interesting one. If we look at the question in its broadest aspect, there is no reason why a railroad company cannot build just as economical plants as any power company can build. The only difference is the one pointed out in Fig. 8, that is in the time differential. Suppose that there was a capacity of 50,000 kw. which the railway required only at certain times. If power could be sold to some consumer who would come in and fill up the "valley" in the railway load, power could be sold for practically nothing but the operating cost. It would, at the same time, cut down the cost to the railway, which would certainly expect to make a profit on what was sold.

The flatter the load curve, the cheaper the power. That is the main incentive for the general power company to get loads from all sources, various kinds of loads, and especially night loads. If the railway can build up a load factor as good as the power company can, then there is no reason why the railroad company should not make the power and sell some of it to some one else. If the power company can build up a better load factor than the railway can, for any reason, then the railway can make power cheaper than the power company can make it.

STEAM VERSUS WATER POWER

In the hydroelectric plant the first cost is probably two to three times what it would be for a first-class

modern steam plant. The average installation of hydroelectric plants at the present time in first cost will amount to not less than \$150 per kilowatt of capacity. A first-class steam plant can be put up to-day for an amount varying from about \$55 to \$75 per kilowatt of capacity depending on the size. If a big dam must be built for a large water storage, then the hydroelectric plant may run from \$200 to \$250 per kilowatt of capacity.

Another difficulty with the hydroelectric plant is that there are usually certain dry seasons when the hydroelectric power will be cut down largely, if not stopped altogether. The water supply is very uncertain unless enormous expense for dams and storage is incurred.

The financial question exists even in such water supplies as that furnished by the Niagara River. Some months ago in a consulting capacity I came in contact with a case where a large company, not very far from the Falls, was confronted by two conditions. First of all, it was not allowed to get any more power from the Falls. The governments of the United States and Canada had established a certain maximum number of cubic feet per second which they would allow to be diverted from the Falls, in order to preserve its scenic beauty. That point has now been reached. After making a thorough investigation of the shape of the load curve, and an analysis of the whole situation, and taking into consideration what power is costing now, it developed that the company could afford to put in a large steam plant of its own and make power at least as cheaply as it could buy power at Niagara Falls. That, of course, is conditioned on the load factor. If the full load would continue more than twelve hours a day the hydroelectric power would be cheaper. This company is now building a plant which will cost \$4,000,000 so as to make the greater part of its own power.

If such a condition exists at Niagara Falls, one can imagine what the condition is in the average water-power plant, which runs dry half the time. When we talk of cheap hydroelectric power, there is a string attached to it. It is cheap, of course, when you consider only the cost of operating the water-power plant. But, as pointed out before, the money spent in building the plant must be paid for. Instead of paying for coal or other supplies as in a steam power plant, interest, etc., must be paid for the money in this case. For practically all cases where the load is that of a lighting or railway company, which means that its load factor is not more than 50 per cent at the very outside and in some case it goes down to 30 per cent, water power is a very questionable investment.

In connection with the operation of combined water-power and steam plants the following point should be noted. In order to make a hydroelectric proposition pay, and at the same time sell power at a low cost, the power must be used for a considerable number of hours in a day, or otherwise it must be sold at a high price or it will not be a paying proposition. The steam power plant, with its low fixed charges for a short number of hours per day (ten or twelve as the case may be), and for even a shorter time over the peak load, helps out by cutting down the fixed charges on the hydroelectric power, and in allowing these fixed charges to be distributed over twenty-four hours instead of six or seven.

DIRECT OR ALTERNATING CURRENT

Among other questions involved in the subject of power for electric railways is that as to whether it is better to operate a number of isolated plants, or to give up the d.c. system and extend with the a.c. generation system, in turn, converting the alternating current by means of rotary converters into direct current. The

answer to that question, it seems to me, would necessarily depend to a very large extent on the size of the plant and the amount of load. This comes back again to the question of cost of power production.

The high-tension alternating current is cheaper to make, as a rule, but if the location of an existing power plant is far away and the load is small, then in all probability d.c. power is as cheap as a.c. power. When new units are to be put in, however, it would in general be a mistake to buy any more d.c. units, unless it may be simply a small addition, the reason being that it is necessary in practically every case to have engine-driven units for the small sizes. As already pointed out, if the units are small, better economy will be obtained from the engine, for in small sizes the economy of the steam turbine is poor. Again, the turbine requires a large amount of condensing water in order to get a good vacuum, and in some cases this may not be obtainable. On the other hand, if a new plant is being built then undoubtedly, where the transmission distance is not too great, it will probably pay to put in one central power plant to generate alternating current, and transmit it at the required high tension.

Electric Locomotive Drive

Discussed by Committee on Electric Rolling Stock at Convention of American Railway Master Mechanics This Week

AT the annual convention of the American Railway Master Mechanics' Association, which was held in Atlantic City on June 19-21, the feature of most interest to the electric railway industry was the report of the standing committee on the design, maintenance and operation of electric rolling stock, a large part of this being devoted to the subject of electric locomotive drives. The report included descriptions of all means for transmitting power between the motors and the driving wheels that are in use on electric locomotives in this country. In connection with the gearless motors used on the New York Central Railroad, the report stated that, contrary to general opinion, the lack of spring support in this design did not appear to be hard on the track. There was, in fact, no track distortion whatever, nor undue wear on the rails. The opinion of the track foremen on the electrified district is that the rail wear from motor cars is greater than that produced by the locomotive, but in this connection it should be mentioned that 100-lb. rails are used within the electrified zone.

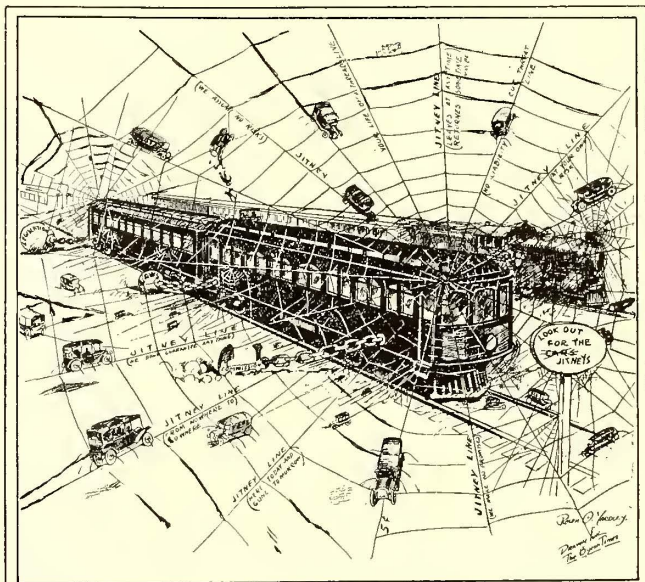
Comment was made upon the use of flexible gears as applied to the locomotives for the Chicago, Milwaukee & St. Paul Railway, these being said to produce an exceedingly quiet-running machine, although speeds as high as 60 m.p.h. were attained. Descriptions were given of the side-rod type of locomotive used on the Pennsylvania Railroad, and on the combined side-rod and jack-shaft design for the Norfolk & Western Railway. The quill type of drive used on the New Haven locomotives was also mentioned briefly.

In conclusion, the report stated that experience with electric locomotives had not been sufficient to warrant a final conclusion as to the merits of the various systems of transmission of power between the motors and the drivers. The fact that scarcely two orders for electric locomotives have been built from the same plans is evidence of this, and in view of the infancy of electric traction as applied to steam railways, it should not be surprising if a variety of designs continue to appear. As yet, however, the Scotch yoke, which has been used rather frequently on foreign locomotives, has not been applied in America.

The report also dealt with the subject of train detention statistics, stating that at the present time there is practically no uniformity in the delay records of railroads. There should, however, be delay statistics that are compiled with special reference toward the needs of the motive-power department as separate from the operating department. These motive department statistics should show miles per detention for the guidance of that department, leaving the basis of miles per minute detention for the sole use of the operating department. The records should classify train detentions under the headings of man failure, mechanical failure and electrical failure. All train detentions of one minute or more should be recorded, but delays to following trains should not be included in the motive power statistics, as such records are only misleading.

Artist's Idea of Jitney Competition

A VERY effective cartoon on the existing transportation systems in California appears in the issue for May 5 of the Byron (Cal.) Times. It is from the pen of Ralph O. Yardley, and the interurban car and the steam locomotive are shown stopped by an anchor and chains labeled "Commission," "Laws" and "Legisla-



Artist Yardley Draws One of the Most Remarkable Pictures of the Year Touching the Jitney Subject. Operators of Railway Lines, Who Have Spent Millions of Dollars, Are Honeycombed by the Irresponsible Jit, Which Networks Their Cars and Tracks, Hampers Transportation and Clammers for Public Support. (Drawn Especially for the "Byron Times" by Ralph O. Yardley.)

CARTOON FROM BYRON (CAL.) "TIMES"

tion," while the jitneys have spun a web about the car and locomotive. The jitney lines are marked "from nowhere to nowhere," "here to-day and gone to-morrow," "we assume no risks," "we don't guarantee anything," "at your own risk," "we make no promises," etc.

A reproduction of this sketch is published herewith.

The committee on electric wiring systems of the electrical industry has appointed a sub-committee to investigate bare grounded return wiring systems. William S. Boyd, Western Association of Electrical Inspectors, 175 West Jackson Boulevard, Chicago, Ill., is secretary of the sub-committee. The sub-committee desires the co-operation of the electrical industry in its studies and requests that information on wiring systems in which bare grounded conductors are used be sent to the secretary.

Storeroom Systems*

A Practical Discussion of the Purchasing and Handling of Supplies and of Stores Accounting with Specific Recommendations as to Procedure

By A. SCHWARZ

Vice-President Toledo & Western Railway

WHERE possible, material stock should be kept close to its point of use. For example, wheels and axles should be stored in a place convenient to the wheel press and lathe; lumber should be stored in a place near the carpenter shop and, in fact, all heavy materials should be stored just as near the point where it will be made ready for application or use as is possible after first unloading, effecting a saving in labor of expensive rehandling.

Material ordered for any specific purpose may be shipped direct to the point at which it is to be used but should be handled through the store accounts. If material is finally charged to operating or construction accounts by other than the stores department, a stock transfer voucher or storehouse invoice crediting stock accounts should be rendered against the department making final accounting for the material.

To care for this material properly the storehouse should be subdivided as follows: lumber, wheels, axles and castings, oils and waste, track material, line materials and miscellaneous materials such as are used in common by all departments of the railway, a material clerk being placed in direct charge of each of these classes of material. This material clerk should be provided with an office as near as possible to the stock over which he has charge so that he will be in position to see what is going on. Of course if the quantity of stock on hand does not justify this plan, one clerk may be able to handle all stock.

Where bins or racks are used to store material, they should have painted or stenciled on them a sufficient description of the material to enable an inexperienced person to fill the order by comparing the material called for on orders with the description on the bin. Lumber should have a sign of some sort showing size, kind, etc., stenciled or nailed on each different pile so that a glance will tell what the material is. Frogs, switches, etc., should have stenciled on them the number and weight. Bolts need nothing more than the size $\frac{1}{2}$ in. x 5 in., car brasses should be marked 5 x 9, 4 x 8 or whatever their size. It is not improbable that two-thirds of the stock can be so marked. In each of the bins should be a card having on it the stock account number and the serial number so that each time a new item is added, simply the next serial number has to be used. That serial number can refer to a book in which is kept whatever description is necessary. On this card should also be shown the stock account number. It is likely that this article may be used for different work and naturally would be classed under one or more accounts. However, it is proper that they should be kept in stock only under one account. The fact that one draws out of stock material that may be charged to various operating accounts has no bearing on the stock room. The only thing to determine is the proper account to which to charge it.

The value of this can be explained by the fact that the general ledgers in the storekeeper's office can be written up by sections according to stock account and serial numbers which may designate the page number

on which the item will be found. We will suppose the storekeeper's office receives an order bearing number 5-20. The clerk handling the stock ledger knows at once that on page 20 of section 5 will be found what he is looking for. The 5 is the stock account number and 20 is the serial number.

On this card should also be kept a record of the quantity in the bin, which is a very easy matter, for the card may be whatever size you choose, preferably 4 in. x 6 in. Each time the storekeeper draws out or adds to any stock he should at once enter on this card a record of this withdrawal or addition so that at all times without counting your stock you have a record at each bin. These records may be checked by inventories taken, say, every three months.

These cards also serve another purpose. In red ink on this card can be placed a figure which has been predetermined shall be the figure representing the minimum amount of this stock to be carried on hand. The storekeeper can then, when he reaches this minimum figure, jot it down in a book so that at the end of the month he may make requisition for this stock. This is a protection for the storekeeper as well as the purchasing agent. This card can also be used to give records of monthly consumption, and in case of rising markets the storekeeper can probably persuade the management to order a six months' supply or a year's supply, which on large roads is very often a considerable item.

Of course, where material cannot be placed in bins it will be necessary to keep these cards in the office of the material clerk in charge.

HANDLING OF REQUISITIONS

On large properties the amount of material purchased each month entails a very great amount of clerical work in the purchasing agent's office, and to distribute this work over a month's time in his office requires that different storehouses forward their requisitions at stated periods. A storekeeper required to forward his requisition on the first of each month will necessarily require his material clerks to furnish him a list not later than the 25th of each month showing what material should be ordered. These lists must show the material number, description of article and quantity on hand as shown by the bin cards. The storekeeper should then have these lists checked against his material ledger. This check will show any discrepancy which might creep in and determine whether the material clerk is properly accounting for stock or any abnormal usages. The clerk making this check will show on the lists the quantity to be ordered according to the record of previous consumption. These lists may then be turned over to a stenographer to be written up.

According to my way of thinking, requisition blanks should be large enough for ordering twenty-five to thirty items on a sheet, preferably 9 in. x 14 in., and should be drawn up as follows: Column for stock account and serial number (as 5-20), description of article, quantity on hand, average monthly consumption, quantity desired and purpose for which material is to be used. These requisitions should be made in triplicate, the original forwarded to the purchasing agent,

*Abstract of a paper presented at the Toledo meeting of the Central Electric Railway Accountants' Association, June 14, 1916.

the duplicate retained by the storekeeper and the triplicate turned over to the material clerk. A separate sheet or sheets should be prepared to cover each individual stock account.

In issuing orders for material on requisitions the purchasing agent should forward to the storekeeper two copies of his order to the supply house. One of these copies should have space provided on the back for reporting the receipt of material to the purchasing department by the storekeeper. The original order forwarded by the purchasing agent to the supply house should bear notation "Show our order and requisition number on all packages." If this is done, the material clerk, on receipt of the material, may check same on his copy of the requisition as being received and make an intelligent report of the receipt to his superior by referring to the order and requisition number. This is a requirement closely watched on steam railroads, for you have no idea what amount of work is entailed on a large system if this plan is not followed.

Another suggestion is that all articles must be shipped to the head of the department who makes the requisition and not shipped in the name of the railroad only, providing they are not handled through the store-room. This plan should be followed also when there is more than one storeroom, such as maintenance of way, shop or car storehouses. These departments often use similar material, and if the name of the head of the department is on the shipment, it often saves a great deal of trouble in determining who shall handle and take care of the material. Whenever shipments are made out on the road to substorekeepers it should be shipped to the name of storekeeper who is to receive it.

INVOICES AND THE RECEIPT OF MATERIAL

On receipt of material, the storekeeper fills out the receipt on the back of the order as mentioned above and forwards it to the purchasing agent who, on receipt of the invoice, attaches this receipt to the invoice, and makes it a part of the permanent record. If only a part of the order is received, another form called "partial received slip" should be forwarded to the purchasing agent.

All invoices should, of course, be sent by the supply house direct to the purchasing agent who transmits them to the storekeeper. On a large system, ability to take advantage of a ten-day discount is very rare, as the red tape necessary on these systems is hard to overcome. On a small system the discounts mean quite a great deal in the course of a year and the material received slips originated by the storekeeper should be quickly transmitted to the purchasing agent so that if it is a discount bill the auditor may take advantage of such discount. The invoice can then be sent to the storekeeper for proper entry as to price and O. K. by himself. However, in a case like this, to be safe in the matter, all invoices if vouchered before passing through the storekeeper should be marked "vouchered" with a large rubber stamp, (preferably in red ink) signifying the auditor has vouchered. We had difficulty at first with our properties in handling discounts but find that we are now able with this method to take advantage of the majority of our discounts.

Purchasing agents and auditors, if co-operating properly with manufacturers, can readily get them to agree that discount for material received during one month will be allowed if paid before the tenth day of the following month after the receipt of material. Under this method, those invoices received after the tenth of the month need not be vouchered until properly O.K.'d by the storekeeper, but when such invoices to be vouchered are received between the first and tenth day of the

month, they should be passed to the auditor by the purchasing agent, as explained, on receipt of the slip from the storekeeper stating that the material had been received.

On large systems where the purchasing agent and perhaps the general storekeeper are not located at the point where the stock is received, the supply house is required to make invoices in triplicate, the original and triplicate being sent to the purchasing agent and the duplicate sent direct to the storekeeper at the point to which the material is consigned. The storekeeper, after receiving the material, can quickly make whatever entries he needs, and on receipt of the original from the purchasing agent who forwards it as soon as his records are taken, may quickly O.K. and return it to the purchasing agent in time to take advantage of any discount which may appear.

The storekeeper should maintain a record of his material received reports to the purchasing agent. This record should show the following information: Date received, purchase order number, date purchase order returned, firm from whom received, description of material, quantity, cost, freight charges, total cost, unit cost, stock and serial number and remarks. Before forwarding these reports to purchasing agent the storekeeper will fill out as much of this record as possible.

In the column headed "remarks," a serial number may be given to each of these received reports returned to the purchasing agent, and this serial number can be placed on the order. When forwarding the invoices to the storekeeper for approval the purchasing agent should attach this receipt to the original invoice, as explained. The storekeeper, on receipt of these invoices, completes his material-received record which is easily done by referring to his receipt number, which he placed on the receipt before forwarding it to the purchasing agent. He turns to this number in his material-received record and fills in columns of date invoice checked, material cost, total cost and unit cost. This, it will be seen, absolutely overcomes a possibility of the storekeeper approving two invoices covering the same material, a number of cases of which I have known to occur.

DISBURSEMENTS

No material should be disbursed by material clerks without an order signed by the foreman in charge of the work on which it is to be used or the head of the department in which it is to be used. When these orders are filled and the material clerks have made the proper entry on their bin cards and have placed on them the stock account and serial number, they should be turned over to the storekeeper. His office will show on the face of the orders, price and extension, stock account to be credited and operating or construction account to be charged. We believe credits to stock accounts and debits to operating and construction accounts should be balanced daily and a recapitulation of each five days' business made. This not only tends to keep the office work up to date but often saves a great deal of checking at the end of the month when the stock report is due in the auditor's office and when time is valuable on account of many other reports being due.

We believe the storekeeper's office should maintain a general ledger compiled so that each stock account will have a separate section, the pages of each section bearing a number and description of material which corresponds with the number and description on the material bin containing that particular item.

The value of this system of material numbers, which is easily established, cannot be overestimated. Those of you who have kept a record of material either by card

or book system, will agree, I am sure, that any sort of an index to such systems is a great consumer of time to the office force, whereas, if the outline I have given is followed, this work will be done by the material clerk, who is not usually an extremely busy person.

This ledger should also show receipts and disbursements, quantity on hand and the average monthly consumption. Under "receipts" should be provided space for date received, from whom received, cost and the page number in the material-received record from which the item is posted, as this information may be desired later on for ordering similar material. If, when receipts are entered in the ledger, it is seen that the cost of material received differs from cost of material previously purchased and a part of that material is still in stock, the value of the material in stock and the value of that last received should be averaged and this price posted in the price column under disbursements.

Under disbursements should be shown date disbursed, quantity, price, balance in stock and value. Disbursements should be posted daily and the ledger balanced monthly. The latter plan is for the purpose of comparing actual stock on hand with that charged against the storehouse by the auditor.

REPORTS OF MATERIAL IN STOCK

We believe the storekeeper should also furnish the various departments with a list of what material he carries in stock. When making requisitions on the storehouse for material, departments should make two sets of requisitions, one to cover material which will have to be purchased and the other to cover that which will be furnished by the storehouse.

I am a firm believer in carrying everything received and disbursed through the stock accounts. We have on our properties a system whereby on any construction work a great many articles are charged directly to the income account on the requisition. I am firmly against such a method, for with a man inclined to be dishonest it is a very easy matter to order more stuff than necessary and not use it but sell it later on, and no one will be any the wiser unless a very strict check is made by the engineering department of such usages, but there are few properties where such a strict check is made.

Some persons will argue that special stuff or special tools should not be carried through stock. Why make fish of one and fowl of another? If you are going to do something, do it right. It might mean a trifle more bookkeeping, but a storekeeper delights in having his accounts checked closely and, I believe, will always agree that this is the safest method for him.

On large steam railroads where a centralized store-room transmits tools to various points along the line for direct use by section men or car repairers, these tools are often charged out directly to the operating account. The foreman after receiving these tools must make a return to his proper officer so that this officer when receiving the invoices from the general stores department does not O.K. unless he has a foreman's receipt which, of course, is all right, although I have known of men ordering more tools than necessary and getting away with them.

A foreman in charge of work will often draw from the stockroom more than is needed for the job and when finished will return what is left. Such credits should be handled in the same manner as if the material was received from a manufacturer, namely debiting the stores account and crediting the operating account to which it had originally been charged. No invoices are necessary, except that on a large system it is wise to have a form on which the foreman records what he returns to the stockroom. This enables him to account for the articles withdrawn.

Some of you, no doubt, are in the same position as ourselves, namely, that we carry stock for freight and passenger cars, rotary stations, line department, track department, new-business department and, in fact, do a general business. One storekeeper should have charge of all these stocks if for no other reason than that of economy, for, by centralizing, the storekeeper is able to reduce the amount of stock necessary, providing each department is required to give him a minimum amount of each stock required. This minimum amount can be further minimized by proper co-operation, which, in the course of a year, amounts to quite a sum of money to a large concern. Any abnormal demands on the storekeeper should be anticipated, giving the storekeeper time enough to obtain such supplies.

Departmental Expense Statements*

The Author Presents a Series of Report Forms and Explains Their Purposes and Application

BY L. T. HIXSON

Auditor Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.

THE classification of operating expenses provided by the Interstate Commerce Commission is not intended to give the detailed information necessary for the various departments of a company but considers the entire company as a unit. Therefore, in order to get data relative to the different sub-divisions comprising this company unit, the operating expenses must be subdivided. The prime factor, then, is the manner of accomplishing this result with the least expense and without interfering with the official classification. This has been accomplished by the Terre Haute, Indianapolis & Eastern Traction Company, as described below.

The operating expenses have for some years been considered separately for seven railway divisions and one lighting division. The operations of the present departmental expense statements, however, are confined to six railway divisions by reason of our accounting conditions requiring separate statements for a combined railway and lighting property. These statements under the present conditions answer for departmental expense accounts. There is no intention of charging to the various departments indirect and overhead expenses. The charges cover only such items as are directly under the control of the department head, and the comparisons each month show very clearly whether the department heads are giving the proper attention to their work.

In addition to the I. C. C. classification charge number being noted on invoices, storeroom requisitions and pay-rolls, the division as well as the department symbol is shown, and, in posting these items to our distribution sheet (Form I), this information is given. The distribution sheet used covers pay-rolls, invoices and vouchers, and stores, the last named appearing on the back of this form. The front of the form (looseleaf, 9 $\frac{3}{8}$ in. x 11 $\frac{7}{8}$ in.) shown herewith, provides space at the top for account title and number. Charges are distributed under the proper subheads, and at the close of each month are posted to the sub-ledger by division totals. This ledger contains looseleaf sheets (11 $\frac{3}{8}$ in. x 14 $\frac{3}{4}$ in.) with the necessary columnar rulings for the seven divisions. For example, the sub-ledger sheet for account 3, "Ties," has a column for each railway division and a grand total column, there being only one entry each month to the various columns, coming directly from Form I, above mentioned. There is also a memorandum ledger sheet (which is the same as the

*Abstract of a paper presented at the Toledo meeting of the Central Electric Railway Accountants' Association, June 13, 1916.

T. H. I. AND E. TRAC. CO.										MONTH OF	ACCOUNT TITLE	ACCT. NO.
DISTRIBUTION OF												
PAY ROLLS, INVOICES, VOUCHERS AND STORES												
PAY ROLL						INVOICES AND VOUCHERS					(SHEET No.)	
SHEET NO.	CHARGE FROM DEPARTMENT	To Div.	To Dept.	AMOUNT	DATE	INV. OR VO. NO.	DESCRIPTION	Div.	Dept.	AMOUNT		

DEPARTMENTAL EXPENSE—FORM I—DISTRIBUTION SHEET FOR PAYROLLS, INVOICES AND VOUCHERS, AND STORES

sub-ledger sheet just described) kept for each account by departments.

After the accounts for the month have been balanced, the charges to the various departments are drawn off from Form I and entered in the proper division column on the page showing the correct account title and department. For convenience, these departments are lettered from A to P, and what is termed department "Z" covers indirect and miscellaneous charges, so that the total of all departments equals the grand operating expense.

After the memorandum department ledger is made up, the expense items by departments are drawn off in pencil on ruled sheets in order that typewritten statements may be made. These statements are in practically the same form as the ordinary monthly expense statement, with the exception that they eliminate all charges for which the department heads are not directly responsible. For example, the statement to the master mechanic at Department A (Lebanon, Moorsville and Crawfordsville shops) covers the following accounts:

<p><i>Way and structures:</i> 24a B., F. & G.—carhouses 24b B., F. & G.—shops Total</p> <p><i>Equipment:</i> 29 Superintendence of equipment 30 Passenger and combination cars 31 Freight, express and mail cars 32 Service equipment 33 Electric equipment of cars 36 Shop equipment 37 Shop expense Total</p>	<p><i>Conducting transportation:</i> 67 Miscellaneous car service expense 70 Carhouse employees 71 Carhouse expense Total</p> <p><i>General and miscellaneous:</i> 94 Stationery and printing 95 Store expense Total Grand total Total—1915</p>
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This statement contains columns for the divisions concerned, with a total column, and it presents the charges for the current month and the accumulated totals for the year to date. The figures for the previous year are not given in detail but only in total. Each

department head receives a copy of the statement applying to his department, while the president and other officials are provided with the complete departmental expense statements, together with a summary of all departments for the current month and period to date in the present and preceding years.

In order that there may be no errors in inter-departmental charges, Form II, which is in reality a bill (9 3/8 in. x 6 in.) is furnished to the head of the department for any charges made to his department from some other department. This bill is approved, and the dis-

TERRE HAUTE, INDIANAPOLIS AND EASTERN TRACTION COMPANY					
INDIANAPOLIS..... 191....					
DEPT.....					
DEAR SIR: THE FOLLOWING TIME OF TRAINMEN IS CHARGEABLE TO YOUR DEPARTMENT					
NAME	OCCUPATION	RATE	TIME ON	TIME OFF	TOTAL TIME
YOURS TRULY,					C T D

DEPARTMENTAL EXPENSE—FORM III—LABOR NOTICE SENT DAILY TO DEPARTMENT HEADS TO GIVE BASIS FOR CHECKING BILLS

tribution is shown on the right. If the bill be incorrect, it is returned with a statement as to the reason for not approving. The charges which are made against the department are shown on the books for the current month as suspended items, subdivided to show the charge to the proper department. When all bills have

TERRE HAUTE, INDIANAPOLIS AND EASTERN TRACTION COMPANY									
INDIANAPOLIS..... 191....									
MR..... DEPT.....									
INTERDEPARTMENTAL CHARGE									
NO.....									
MONTH OF.....									
DEAR SIR: THE FOLLOWING CHARGES HAVE BEEN MADE AGAINST YOUR DEPARTMENT. PLEASE APPROVE THE LEGIT MEMORANDUM. SHOW ACCOUNT CHARGEABLE AND RETURN TO THIS OFFICE PROMPTLY.									
YOURS TRULY, L. T. HIXSON, AUDITOR, PER.....									
CHARGE REFERENCE				DATE	DESCRIPTION	AMOUNT	DISTRIBUTION		
BY DEPT.	SOURCE	REG. PAY ROLL OR INV. NO.	ACCOUNT CHARGEABLE				DIVISION		

DEPARTMENTAL EXPENSE—FORM II—BILL SENT TO DEPARTMENT HEADS TO SHOW INTERDEPARTMENTAL CHARGES

been sent through for the month, this suspense is cleared by journal entry, the items being distributed in the same manner as invoices from various firms would be distributed.

In order that the department head may have the proper information to check these inter-departmental bills, a notice is given to each department head daily covering the charge for labor (Form III). While this form (8¼ in. x 5⅝ in.) was provided for the use of the chief train dispatcher in reporting time of trainmen, it is used with some changes in connection with all other labor. In case material is taken from a storeroom where the storeroom is under the direction of some other department, a duplicate of the storeroom requisition is turned in to the department head by his employee who

receives the material. These forms (storeroom requisition and Form III or labor notice) are retained until the interdepartmental bill is received, so that the department head has at all times the proper information to approve or decline to approve a bill.

While the plant outlined above would appear to be unwieldy and somewhat expensive, it has been found in actual practice that the amount of work and expense was greatly overestimated. It is certainly more satisfactory to be able to provide statements for the different departments showing the exact expense for which the head of each department is directly responsible, than to include in the charge to a department a miscellaneous assortment of indirect and accrued accounts over which he has no control, as is usually the case.

Why Modern Motors Are Economical

A Symposium in Which Is Demonstrated the Ability of Modern Motors to Reduce Energy and Maintenance Costs

AT the meeting of the Illinois Electric Railways Association held in Chicago on June 9, 1916, the presentation of the three papers abstracted below was the occasion of the valuable discussion reported in last week's issue of the ELECTRIC RAILWAY JOURNAL. They summarize the situation with regard to field-control and other modern motors.

Railway Motor Field Control

BY D. C. HERSHBERGER

Electrical Engineer, General Engineering Division, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

The method of controlling the speed of a railway motor by varying the field strength is as old as the art of practical railway motor construction, although the term "field control" was not adopted until about ten years ago. About 1888 to 1890 the Sprague Company was building double-reduction geared motors having three separate field coils per pole. With the three coils in series it was possible, with some of the smaller motors, to eliminate resistors. The coils were arranged in series-parallel groups on the intermediate notches, while on the last notch all coils were connected in parallel. On the large motors it was necessary to employ resistors.

A year or two later there were a few motors which employed the "loop" system, which was similar to the present method of field control. Practically all of the equipments of this period employed rheostatic control without series-parallelism of the motors.

The first Westinghouse series motor, No. 1, designed and tested early in 1890, was essentially a field-control motor. The field was wound with two sets of coils and speed regulation was obtained by the sectional field method, otherwise the control was straight rheostatic. The armatures were connected permanently in parallel and the field windings of the different motors were also in parallel. The No. 2 was also a field-control motor designed for narrow gage.

The field control was abandoned for the time on account of considerations of simplicity, cost, commutation and motor overloading. A period of about fifteen years elapsed before it was applied to locomotives, and twenty years elapsed before it was again applied to car equipments. The introduction of the commutating-pole motor, the general improvement in railway motor design, and a better understanding of motor application led to a revival of field control. The principle of the

modern field control is shown in an accompanying diagram.

The next application of field control was made in 1906 on the a.c.-d.c. passenger locomotives for the New Haven Railroad. These were equipped with four 250-hp. motors of the gearless type. The full field may be used or either of two higher speeds may be obtained by shunting part of the field current through a grid resistor of low ohmic value when operating from the d.c. supply. Forty-one of these locomotives have been in satisfactory operation for ten years.

The giant motors of the Pennsylvania Railroad locomotives stand out as a remarkable application of field control. To date, they are the largest motors in exist-

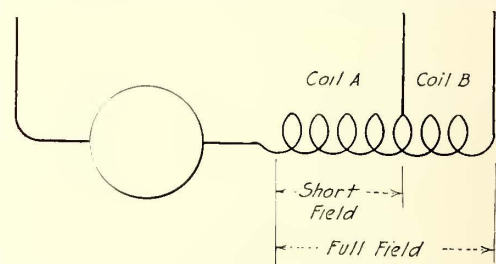
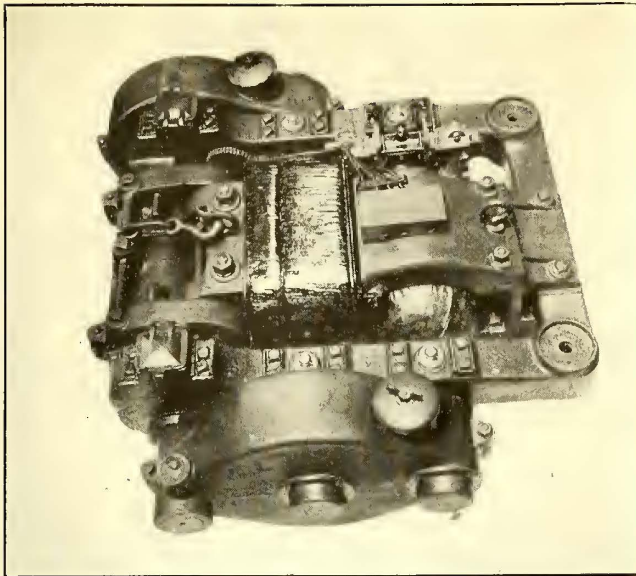


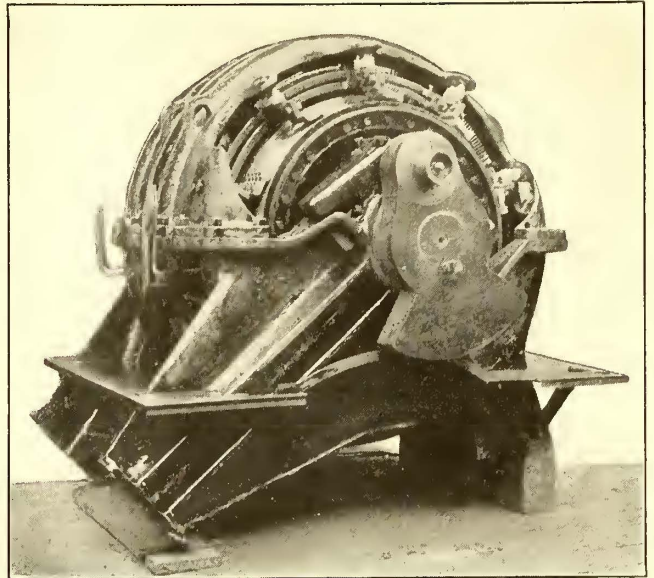
DIAGRAM SHOWING FIELD-CONTROL PRINCIPLE

ence employing this method of control. Each motor weighs approximately 44,000 lb. and is capable of developing 2000 hp. The control used is different from that just described, in that, instead of the field being shunted, half of it is cut out on the final notches in series and in parallel. On notches between full field and short field a part of the field current is shunted through a resistor. Series-parallel control is used, and this, with the field-control feature, provides eight efficient running positions. A tractive effort from 65,000 lb. at 24 m.p.h. to 5300 lb. at 76 m.p.h. is the great range on these locomotives. During acceleration the energy consumption is but 55 per cent of what it would be without field control. At 20,000-lb. tractive effort per locomotive, the change from full field to short field increases the speed 37 per cent. Thirty-three of these locomotives have been in most satisfactory service in the New York Terminal zone since 1910. One of these engines was awarded the Grand Prize at the Panama-Pacific International Exposition.

In the latter part of 1910 H. H. Adams of the Metropolitan Street Railway, New York, was investigating



EARLY FIELD-CONTROL MOTOR



2000-HP., FIELD-CONTROL LOCOMOTIVE MOTOR

car designs relative to reducing operating costs by the use of lighter-weight cars and more economical motor equipments. It was decided that field-control motors be tried out, the anticipated energy saving being approximately 10 per cent. Under Mr. Adams' direction a double equipment of No. 307-C3 motors received a thorough test in 1911, this being the first application of modern field control to city service. The results of these tests are shown in Table I on page 1181.

Comparing tests Nos. 1 and 2, it will be observed that an energy saving of 7 per cent was effected. This was due to the use of a lower-speed armature and a greater gear reduction. With 20 per cent more stops in test No. 3 than in No. 1 the saving was 12 per cent. This was due to the use of field control and larger gear reduction.

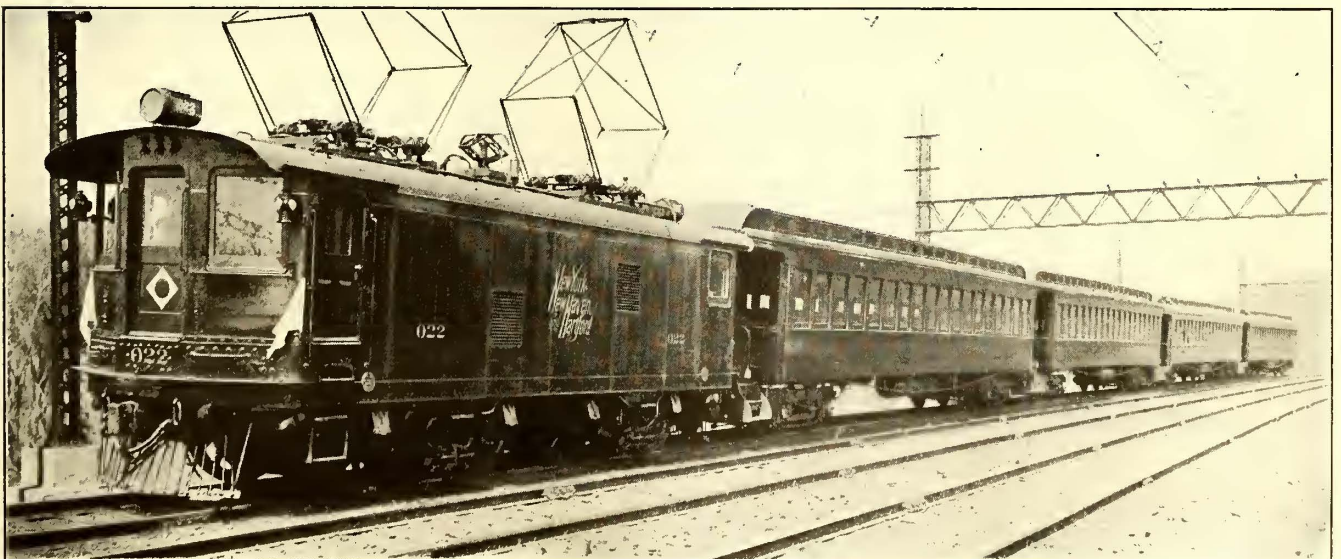
In test No. 3 the equipments were operated in series throughout the congested district and in series-parallel on the remainder of the trip. While there were 23 per cent more stops than in test No. 2, the energy saving was 5.5 per cent, due entirely to field control. In test No. 4 the number of stops and other service conditions were about the same as in tests 1 and 2, but the motors were operated to make full use of field control in both series and parallel over the whole line. This test showed

7 per cent less energy consumption than test No. 3, with its greater number of stops, and 12 per cent less than test No. 2, with practically the same service conditions. The temperature rise on the 60-hp. motors in test No. 1 was approximately 48 deg. C., while on the 40-hp., field-control motors in test No. 4 it was only 58 deg. C., which is a perfectly safe operating temperature.

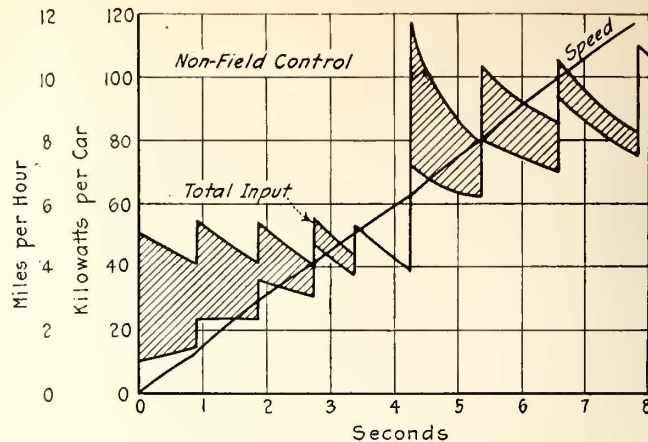
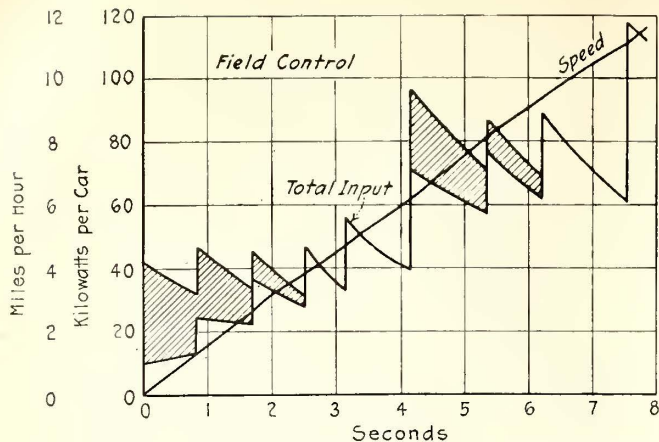
In Chicago modern field-control motors were first put in service in 1913 on both the elevated and surface lines through the efforts of H. H. Adams, superintendent of shops and equipment of the Chicago Surface Lines, and H. A. Johnson, master mechanic Chicago Elevated Railroads.

OPERATING PRINCIPLES OF FIELD-CONTROL MOTORS

The principles of this type of motor are best illustrated by referring to a field-control motor characteristic as illustrated herewith. The two sets of speed-tractive effort curves shown in the figure can be taken to represent respectively the characteristics of two non-field-control motors of different speeds but the same horsepower rating. The slow-speed, high tractive effort motor is the most economical in accelerating, while the higher-speed motor permits maintaining a higher sched-



NEW HAVEN LOCOMOTIVE WITH FIELD-CONTROL MOTOR



NOTCHING DIAGRAMS, FIELD-CONTROL AND NON-FIELD-CONTROL MOTORS

ule speed. Thus the two good features of both non-field-control motors are embodied in one with field control.

In the old motors without commutating poles it was necessary to employ a larger number of field turns in order to secure a strong field to get satisfactory commutation. With commutating poles and present-day motor design, it is possible to employ a much weaker field and still obtain satisfactory commutation and freedom from flashing. With the modern non-field-control motor the field strength, which controls the speed and the tractive effort, is a compromise between those of full field and short field of the field-control motor, using the same frame.

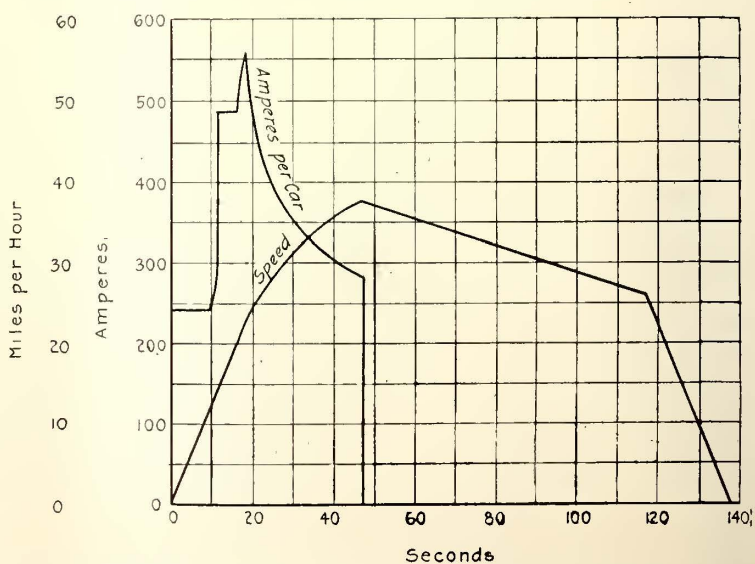
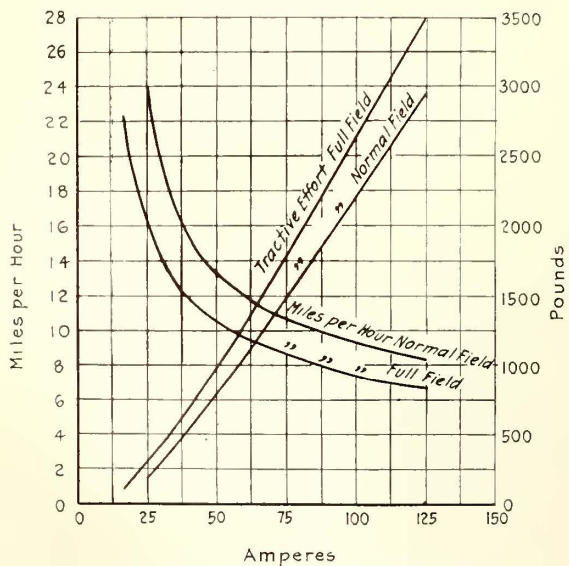
On city surface lines the number of stops per mile approaches the maximum, while the schedule speed and the balancing, or free-running speed are a minimum for railway work. In this type of service a motor with a low armature speed is most economical. The rheostatic loss, other things being equal, varies as the square of the speed at which the resistors are all out of the circuit. It follows, then, that the shape of the motor characteristic and the accelerating rate have a large influence on rheostatic loss. An unsaturated motor having a steep speed curve will, for a given accelerating rate, have all grids out of the circuit at a lower speed than a saturated motor with its flat speed curve, both motors geared for the same balancing speed. This applies to both field and non-field-control motors.

The accompanying notching diagrams have been calculated for a 50-hp. non-field-control motor and a 50-hp.

field-control motor. Both motors are geared to give the same balancing speed and maintain the same schedule with a car with average load weighing 20 tons. An average accelerating rate of 1.5 m.p.h.p.s. was used. The non-field-control motor is geared 16:68 with 33-in. wheels, while the field-control motor has a ratio of 15:69 and 33-in. wheels. The average trolley voltage is 500. In each case a controller with five series points and four parallel points is employed. The diagrams show speed and total energy input per car, while the shaded portion shows the rheostatic losses.

On the basis of eight stops per mile, the total rheostatic loss for the non-field-control equipment is 0.3 kw.-hr. per car-mile, while for the field-control equipment it is 0.16 kw.-hr., a difference of 53 per cent. The total input when accelerating to 11.75 m.p.h. is 0.13 kw.-hr. for the field-control motor and 0.15 kw.-hr. for the non-field-control motor. The former is 86 per cent of the latter, a saving of 13.5 per cent in energy consumption. The speed at which all grids are out of the circuit with the non-field-control equipment is 11.75 m.p.h., while for the field-control equipment it is 9.3 m.p.h., or 79 per cent of the former.

The most prominent factor which determines motor size for a given service and car weight is that of continuous current capacity. With a low-speed, field-control motor, the heating current for average city service is approximately 10 per cent less than that for a low-speed non-field-control motor. It is usually the case that for a service where a non-field-control motor has



FIELD-CONTROL MOTOR CHARACTERISTICS; SPEED-TIME CURVE FOR INTERURBAN CAR WITH FIELD-CONTROL MOTORS

TABLE I—RESULTS OF METROPOLITAN STREET RAILWAY TESTS OF FIELD-CONTROL MOTORS

Test Number	Weight of Loaded Car, Tons	Motor	R.p.m. at 40-hp	Gear Ratio	Stops per Mile	Slow downs per Mile	Average Duration of Stop, Seconds	Schedule Speed, M.p.h.	Average Voltage	Watt-hours per Ton-Mile
1	20.2	Standard 60-hp.	560	4 6	6.97	2.86	8.503	7.126	557	152.26
2	19.7	Standard 40-hp.	550	5.12	6.78	3.08	7.765	7.261	556	141.63
3	20.2	Field-control, 40-hp.	445	5 12	8.33	3.11	7.240	7.142	551	133.85
4	19.7	Field-control, 40-hp.	445	5 12	6.88	3.56	7.335	7.409	555	124.41

*Normal on field-control motor.
 †In congested district ran in series only.

just enough capacity for a given service a field-control motor one size smaller will do the work satisfactorily.

FIELD CONTROL IN INTERURBAN SERVICE

Interurban service presents various conditions which must be met with the same motor equipment. Practically all interurban railways enter one or more large towns or cities, requiring low-speed running and a relatively large number of stops. This part of the service is most economically maintained with low-speed equipment. Many railways give both local and limited service, in which it is desirable to use the same motor and gear ratio for both classes of service. Field control permits economical running over the low-speed city sections, with a gear ratio economical for local service. With the same gearing it gives a higher limited speed than could be obtained with the same size non-field-control motor correctly geared for the local schedule.

For high-speed service it is advantageous to use a motor having a high rotational speed. This is determined largely by the balancing speed required to maintain the schedule. A relatively light motor will perform the high-speed schedule, because increasing the armature speed increases the horsepower rating of the motor. A limiting factor to high-speed armatures is that of mechanical strength with high peripheral speed.

A 75-hp. field-control motor geared for local service, as heretofore described, and operating as shown in another diagram, will maintain a limited schedule speed of 38.4 m.p.h., which is the same as that possible with the next larger size of non-field-control motor. At the same time the 75-hp. field-control equipment, as compared to a 90-hp. equipment, consumes 15.9 per cent less energy in local service and 11.7 per cent in limited service. The energy consumption in limited service is somewhat more than with the ordinary 75-hp. motors on account of the higher schedule speed maintained with the field-control motor. The comparative results are shown in Table II.

TABLE II—INTERURBAN SERVICE DATA

Motor Type	Stand-ard	Field-Control	Stand-ard	Stand-ard	Field-Control	Stand-ard
Length of run, miles.....	1	1	1	6	6	6
Duration of run, seconds.....	150	150	150	611.8	563	563
Duration of stop, seconds.....	12.5	12.5	12.5	60	60	60
Schedule speed, m.p.h.....	24	24	24	35.3	38.4	38.4
Accelerating rate, m.p.h.p.s.....	1.25	1.25	1.25	1.25	1.25	1.25
Braking rate, m.p.h.p.s.....	1.25	1.25	1.25	1.25	1.25	1.25
Motor equipment.....	4-75 hp.	4-75 hp.	4-90 hp.	4-75 hp.	4-75 hp.	4-90 hp.
Amperes at full load of motor.....	130	130	156	130	130	156
Weight of car equipped and load- ed, tons.....	38	38	39.5	38	38	39.5
Accelerating current, amperes per motor.....	127	122	177.5	127	122	177.5
Speed at which rheostats are all out, m.p.h.....	21.3	20.3	28.2	21.3	20.3	28.2
Coasting time, seconds.....	60	70	77.5	67.8	86.2	86.7
Speed at which brakes are applied, m.p.h.....	27.1	26	25.7	30	30	30
Kilowatt-hours per car-mile.....	2.4	2.27	2.70	2.025	2.11	2.39
Watt-hours per ton-mile.....	63.2	59.7	68.4	53.4	55.5	60.5
Temp. rise in service from air 25 deg. C.....	58	60	70	50	58	60

The substation capacities for interurban systems are usually determined by the maximum loads imposed upon them and by the apparatus commercially available. With single-track lines, the peaks usually occur at passing points, where two cars or trains are starting. With the field-control equipments these peaks are reduced from 10 per cent to 20 per cent throughout the greater part of the acceleration. Reference to the speed-time curve shown herewith indicates that for short periods at the end of the acceleration a relatively high peak is attained. This peak can be reduced by having the motor-man halt on the full field notch for a slightly longer time than on the other notches before going over to short field. It seems to be a habit of the motorman to halt on the notch next to the last on full parallel for a somewhat longer time than on the other notches, especially in city service. These peaks are, therefore, frequently reduced as a consequence.

On many interurban roads there are severe grades. With a field-control equipment these grades can be taken at reduced current either in series or parallel. In some cases it may be advisable to use the full-field notch in parallel, even though the current is somewhat more than with non-field-control equipments operating in series. The former would save time and reduce motor heating.

CONCLUSIONS

The prime object of field control is to permit more efficient operation.

Although a field-control equipment is somewhat more expensive in first cost than one without field control, it may be a "penny wise, pound foolish" policy to purchase the non-field-control equipment. It has been found in many cases that field-control equipments pay for the additional first cost in from two to three years. After this period the saving is so much "velvet."

Field control has in recent years been applied to all classes of railway service, and the indications are that it will be applied to far greater extent in the future.

To date the application of field-control motors in this country amounts to approximately 840,000 hp., distributed among some fifty operating companies.

It is difficult to determine the total annual saving effected by the use of the field-control motor. It is, however, estimated at approximately one-third of a million dollars per year.

Comparative Economies of Old and New Motors

BY W. A. CLOUGH

General Electric Company, Chicago, Ill.

Since the early days of large organized industry, economy of operation has been recognized as the keynote of success. From the time when the large steel corporations proved that it was good business to scrap inefficient equipment long before it was worn out, the subject of replacing obsolete equipment has received a great deal of studious attention. Electric railways, however, have in years gone by been very slow to appreciate that this same procedure should properly be applied to their equipment. But conditions have very materially changed. At the same time that the new equipments were being developed, the old ones were receiving from master mechanics a great deal of attention with the view of cutting down the maintenance costs, and in the last few years wonders have been performed in this field. But even when the old equipments have been brought to their very lowest possible maintenance cost, it is essential now as never before to introduce

TABLE I—MAINTENANCE DATA ON OLD-TYPE MOTORS

Type of motor...	WP-	GE-	GE-	W-	GE-	GE-	GE-
Number in service	30	800	1,000	12A	52, 54	67	80
Miles per motor per year.....	2,151	485	1,350	108	330	2,738	1,656
Cost per 1000 miles, dollars:							
Inspection	0.38	0.19	0.18	0.20	0.40	0.11	0.14
Repairs	5.42	2.46	1.71	1.64	2.40	1.14	.88
Total	5.80	2.65	1.89	1.84	2.80	1.25	1.02
Annual cost per motor 40,000-mile basis, dollars	232.00	106.00	75.60	73.60	112.00	114.80	40.80
Saving per motor per year if replaced with modern motors, dollars	224.00	98.00	67.60	65.60	104.00	42.00	32.80

TABLE III—ECONOMIES DUE TO MOTOR WEIGHT REDUCTION

Type of motor.....	WP-30	GE-1000	W-12A	GE-67	GE-80
Saving per motor per year due to weight if replaced by modern motor, dollars.....	30.00	12.50	15.00	25.00	45.00

The tables show that the savings on inspection, including the labor of lubricating, is cut by the use of modern motors in about the same ratio as the cost of repairs. That is, the modern motor may be run a great many more miles between inspections.

SAVINGS DUE TO WEIGHT REDUCTION

During the last few years the weight per horsepower of modern motors of capacity below 100 hp. has been reduced approximately 30 per cent. In addition there has also resulted, through ventilation and the application of greater skill in design, a greatly increased continuous capacity. Taking the conservative figure of 5 cents saving per pound per year, Table III has been prepared to illustrate the economies afforded by a modern motor in this respect. These economies are the combined result of power saving and reduction in wear and tear of track, special work and trucks.

Since Table III was made up there has come to my attention a case where \$75 per year per motor was saved in power alone by replacing Westinghouse 101-B motors by modern motors.

If the attempt is made to calculate the power savings alone there are factors other than weight which enter into consideration. If the power consumption per car-mile is calculated at the car, any reduction in weight will result in a saving of losses between the power house and the car. Ordinarily this would be from 20 per cent to 25 per cent of the power saving at the car.

THE SERVICE FACTOR

Another factor, none the less real but much more difficult to reduce to dollars and cents, is what may be termed the "service factor." It is made up of the following items:

Savings of car-service expense due to reduced number of pull-ins.

Increased public support due to better, less interrupted service.

Greater annual car-mileage per car due to reduction in time required for inspection and repairs at the shop.

The first two items need no comment. A concrete example will serve to illustrate the last factor clearly. Suppose that ten cars which make an annual mileage of approximately 26,000 each can be equipped with motors which, by reason of fewer failures, enable it to remain in service continually so as to make 39,000 miles

still further economies if profits are to be made by the average road.

It will, of course, be understood that the only valid reason for replacement is economy of operation, and it is essential that each case be studied individually, before any definite recommendations can be made. But often the majority if not all of the following arguments can fairly be applied.

MAINTENANCE

Recently a man who has had wide experience with railway motors stated that he had ceased to put much credence in maintenance figures as ordinarily secured from operating companies, because different companies include different items in their maintenance costs. My own experience leads me to the same conclusion, and it seems to me that the subject of motor maintenance is of sufficient importance to warrant this association in making definite recommendations as to maintenance accounting. It seems fair that maintenance should contain two main divisions, the actual repair of the motor and the inspection of the motor, and in the data given herewith these two main divisions of maintenance are kept separate.

There are many factors which influence the cost of maintenance, such as the age of the motor, the service to which it is subjected, and the care that is given it. The largest influencing factor is the last named.

The influence of the motor age on the cost of motor maintenance is illustrated in Table I, which contains data for several motors now considered as obsolete, the data being average values for several roads. It should be noted in the table that the costs for the different roads varied approximately from 50 per cent to 200 per cent of the average.

For comparison of the average costs of modern motors Table II is given. This table includes average data for the following types of motors: GE-212, W-312, GE-213, GE-216, GE-227, GE-200, GE-203, W-307, W-306, GE-201. These motors have been in service from two to six years, and their average age is approximately four years. The data for the several motors on different roads vary by approximately the same percentages as the obsolete motors, but they furnish undeniable proof that a modern motor will cost on the average of from 75 to 80 per cent less to maintain.

Lubrication is not ordinarily included under maintenance cost, yet this very surely is a minor item that should receive consideration. In one instance the saving in lubricating materials was cut 50 per cent by the adoption of modern motors.

TABLE II—MAINTENANCE DATA ON MODERN MOTORS

Total number of motors.....	6,140
Average miles per year per motor.....	39,000
Average inspection cost per 1000 motor-miles, dollars....	0.035
Average repair cost per 1000 motor-miles, dollars.....	0.18
Average total cost per 1000 motor-miles, dollars.....	0.215
Average cost per motor annually, dollars.....	8.60

TABLE IV—MAINTENANCE DATA FROM A TYPICAL RAILWAY

Type of motor.....	GE-1000	GE-800*	GE-67	GE-90
Number in service.....	34	12	88	12
Motor miles run.....	1,060,022	38,958	3,083,384	663,932
Miles per motor per year...	12,630	3,240	35,000	55,330
Number of armatures re-wound	36	9	34	7
Number of armatures repaired	113	14	105	34
Total of armatures changed.	149	23	139	41
Miles per armature defect...	7,110	1,475	22,150	16,150
Actual cost of all repairs, materials only, dollars....	2,045.80	....	5,026.92	305.44
Estimated cost of inspection and repairs, labor only, dollars	2,216.20	....	3,792.08	212.56
Total cost per year, dollars..	4,262.00	....	8,819.00	518.00
Cost per thousand motor-miles, dollars.....	4.00	....	2.87	0.78
Fair cost for modern motors per thousand motor-miles, dollars	0.25	....	0.25	0.25
Annual saving per motor possible with new motors, dollars	131.25	....	91.70	29.15

*Data not available on maintenance costs.

annually. This is equivalent to adding five cars to the service.

Briefly, then, the modern motor is making possible marked economies due to a reduction in repair cost of from 75 to 80 per cent, and in inspection cost of from 50 to 75 per cent, and a power of a percentage which is roughly, although less usually, equal to, or slightly less than, the percentage of reduction in weight. At the same time there is a possibility of giving from 5 to 25 per cent more service with the same rolling stock. If the distinct economies can be shown to amount to at least 15 per cent of the necessary investment it would be economical to replace obsolete motors with modern ones.

To illustrate what may be accomplished along the lines suggested above, the following report is given. A certain road operates 196 motors of following types—GE-1000, GE-800, GE-67 and GE-90. The maintenance costs of all motors are high as compared with many other roads, largely due to the use of high-speed gearing, excessive grades, the use of trailers, etc., with resulting overloading, high temperatures and frequent burnouts. Table IV shows the results obtained.

The data given in Table IV are from actual records, with the exception of the labor costs on which no figures were available as the time of motor inspectors and repairmen is not divided among the different classes of motors handled. The labor costs are, therefore, an estimate, but are proportioned to the material charges on a basis obtained from other roads where accurate records have been kept of both material and labor charges on the same types of motors as are considered here.

Among other things these data bring out the small annual mileage made by the GE-1000 and GE-800 motors as compared with the GE-67 and GE-90 motors. In the case of the GE-800 motors this is, perhaps, due to their use on service cars which are only operated at rare intervals. The GE-1000 motors, however, are for the most part on cars very similar to those equipped with the GE-67 motors, which make three times as much mileage annually. The excessive trouble given by the former type naturally causes the cars to be held from service except when no others are available, and they are frequently tied up in the shop for repairs when actually needed on the road.

The low mileage per armature failure indicates the cause. While no exact figures for field failure could be obtained, there were 104 of these on all motors for the year, the majority of which were of the GE-1000 type.

It seems reasonable to assume that if these motors were replaced with modern ones the cars on which they are mounted could and would be used to the extent as the other single-truck equipments, and would make an annual mileage of 35,000 in place of the present 12,000.

The magnitude of the savings on maintenance costs could be secured by more efficient motors is indicated by the difference in cost per 1000 motor-miles between the GE-1000 and the GE-90 motors. The latter, which are themselves of obsolescent design, cost less than 20 per cent of what the former do for maintenance, and a really efficient motor of recent design should cost not more than a third as much. Assuming, therefore, that with modern motors 35,000 miles annually could be made per car, the motor maintenance per car would not be above \$17.50 per year. The present equipments cost for the same car-mileage \$280. When the other and corresponding savings already referred to are taken into account, a fair and reasonable estimate of the total savings would be at least \$300 per car per year. The cost of making the exchange would be not over \$900 per car. The investment would, therefore, return between 33 1/3 per cent and 40 per cent annually.

Tests of Field-Control Motors

BY H. A. JOHNSON

Master Mechanic Chicago Elevated Railroads

An analysis of the electrical energy consumed in average electric car operation shows that only about 60 per cent is usefully utilized, the remaining 40 per cent being dissipated in rheostatic losses, internal motor losses, friction and windage. Of this waste about 40 per cent disappears as heat in the resistance grids and it is primarily in reducing this loss that the field-control motor is finding extensive application. This type of motor is arranged with a tap on the field coils so that the last resistance step in parallel, or in both series and parallel if desired, can be dispensed with and a fraction of the field turns cut out instead, to weaken the field and produce the additional speed. The reduction in heat loss in the resistance is accomplished at the expense of an additional unit control switch or controller finger with very little complication in the motors themselves.

In 1913 the Chicago Elevated Railroads purchased twenty-one 2-motor field-control equipments and have since put in service 184 additional 2-motor G.E. and Westinghouse equipments. Tests have just been completed to determine how much economy was being obtained by the use of the newer equipment.

For the purposes of the tests it was necessary to use two different motor cars, one equipped with two 165-hp. standard four-pole motors and one equipped with two

TABLE I—ECONOMY OF FIELD CONTROL MOTORS

	Non-Field- Control Motor	Field- Control Motor	Saving, Per Cent
Total weight of motor car and trailer, tons	61.76	62.44	..
Setting of current-limit switch, amp.	238	205	14
Average acceleration to 20 m.p.h., m.p.h.p.s.	1.26	1.26	..
Free running speed at 570 volts, m.p.h.	28.5	30.3	..
Average voltage at car	574	570	..
Average kilowatt-hours per run of 20.08 miles	131.0	122.4	..
Average watt-hours per ton-mile	106	97	8.5

160-hp. field-control interpole motors. The two cars were of approximately the same weight and their bearings were all well worn in. They were operated with the same trail car in each test, so that the comparison of energy consumption on a ton-mile basis cannot be much in error. Both of the motor cars were equipped with Westinghouse unit-switch, automatic control, which was set at a smooth and uniform acceleration of 1.26 m.p.h.p.s. on resistance steps. A calibrated Sangamo watt-hour meter was used, with automatic, calibrated time recorders to obtain a complete time record.

The observations were taken in local service with 2.93 stops per mile and at a schedule speed of 14.6 m.p.h. Typical results are given in Table I.

The field-control motors show a saving at the car of 8.5 per cent, or, assuming 8 per cent line loss in this case, a total saving of 9.2 per cent at the substation bus. The necessary accelerating current of the field-control motors is 14 per cent less than that of the non-field-control motors, principally because a relatively much stronger field is available to produce the necessary starting torque. It has been the writer's experience that any substantial reduction in the maximum current handled by the control results in an appreciable economy in renewals and repairs of the control equipment, and to a lesser degree in the maintenance and failures of the motors.

To date the 205 double-motor equipments of field-control motors which have been in service on the Chicago Elevated Railroads from six months to three years have operated with entire satisfaction.

Economics of the Jitney

L. R. Nash Gives New Figures Showing That Operation of Jitneys Under Ordinary Conditions Is Not Financially Encouraging

IN a lecture to students in the graduate school of business administration, Harvard University, which is published in the May issue of *Stone & Webster Journal*, L. R. Nash recently reviewed the development of the 5-cent jitney movement and brought out some important points in regard to the economics of jitney operation. According to Mr. Nash, the earnings per jitney-mile lie ordinarily between 4 and 6 cents. One of the large distributors of Ford cars has estimated that the operating expenses and upkeep of its touring cars in jitney service should be 3.4 cents per car-mile excluding interest, taxes, insurance, housing and drivers' wages. Other conservative estimates of total cost of service, however, including the items omitted in the above estimate, lie between 5 and 7 cents per car-mile for Fords, between 10 and 15 cents for heavier cars and about 25 cents for large buses.

Mr. Nash states that he has been able to secure some previously unpublished data in regard to the actual cost of operating a Ford touring car in jitney service for nearly one year under particularly favorable circumstances. The owner, who also drove the car, was a good mechanic, doing practically all his repair work, and through unusual skill in driving and good business judgment in selecting his field he obtained much better results than could be expected from the average unskilled and careless operator. Some of the results of operation of this particular machine, carried out for the full calendar year 1915, are as follows:

Days operated	347
Hours operated per day	15.3
Miles operated per day	245
Schedule speed, miles per hour	16.0
Length of one-way trip (miles)	4.0
Car-miles per gallon of gasoline	20.5
Car-miles per gallon of oil	128
Average cost of gasoline per gallon (cents)	13.2
Tire-miles, per tire	12,000
Total annual mileage, approximately	\$5,000

Mr. Nash notes that the foregoing figures are more favorable than those usually reported, those for daily mileage and tire life being particularly so. The length of trip is not so favorable, being rather long for jitney service, but it was presumably selected because of its steady patronage and good pavement.

The operating figures of this car on a mileage basis are as follows:

Expenses per mile (cents):	
Gasoline	0.65
Oil	0.11
Tires	0.50
Repair bill and material	0.56
Owners' repair time at garage rates	0.73
Total repairs and renewals	1.29
Operating labor, estimated at 25 cents per hour	1.56
Total expense	4.11
Licenses, bond, taxes at interest	0.35
Total expenses and charges	4.46
Total gross earnings per mile (cents)	4.06
Deficit	0.40

The gross earnings per day of this car averaged slightly less than \$10, and a total cost of service, assuming wages at 25 cents an hour, was nearly \$11. It is estimated that to wipe out the deficit the range of operation should be reduced from 4 miles to about 3.6 miles, assuming a constant expense per mile and the uniform 5-cent fare. Mr. Nash notes that no accident cost was reported for the entire period, which situation would not continue indefinitely with the best of opera-

tors. A further study of the operation of the machine, which involved the assistance of a helper at 20 cents per hour, shows that with this payment the owner actually made only 17.4 cents per hour for his own operating time, which averaged 8.9 hours per day. He therefore earned from operation \$44.50 per month or about \$1.50 per day. Including his time spent on repairs at garage rates, his total earnings were \$96 per month. As a driver the owner did a full average day's work at common laborer's pay, and he worked extra hours at his trade as mechanic on the repair work and made a good living, but less than he could have made in good times at his regular work at \$4 per day in regular hours only. If he had not been a good mechanic he could have done only a part of his repair work, and his earnings would have been reduced to that extent.

The Ford car used in this case had been driven 38,000 miles before it started in the jitney service. Before the end of its jitney year all important parts had been renewed, so that the owner estimated an indefinite life under repair expenditures at the rate actually made. Hence, it is said, no depreciation allowance is required and the figures given above contain none. Other makes of cars could not be renewed as readily and the cost would be much greater.

In view of the favorable conditions under which this Ford operated, Mr. Nash concludes that the showing for the financial success of the jitney under ordinary conditions is not encouraging. In general it has been estimated that electric railway service costs about 0.7 cent per seat-mile and that jitney service costs about two and a half times as much. If the jitney as an investment is to be at least equally attractive with the electric railway, which is not considered particularly profitable, it must in some way offset this difference of 250 per cent in cost of service. If it can travel twice as fast as the street car its earnings per seat-mile, other things being equal, will be double, leaving the margin of difference between the street car and the jitney only 25 per cent. If everything else remains equal except the haul, this must for equal profit be less to the extent of this 25 per cent for the jitney than for the street car. Actual experience seems to indicate that there is at least this difference under average conditions. According to Mr. Nash, it should be clear from the figures given that light cars of the Ford type are more successful than any others, and in fact are probably the only ones which have paid their way under normal conditions. The operating expenses and maintenance of the heavy cars and large buses are too great for successful competition with electric railways. He sums up the financial situation by saying that 3 miles or less is the usual limit for profitable operation of jitneys of the most economical type, and under good pavement and traffic conditions.

In discussing the future field of activity for jitney operation, Mr. Nash states that communities must make up their mind that they cannot have a short-haul jitney and a long-haul street car both at a 5-cent fare. If the short-haul riders demand jitney service and the demand is granted, the long-haul riders must pay increased street-railway fare, possibly double. Moreover, many questions arise as to how the operation of jitneys could be controlled even in the short-haul field. In Mr. Nash's opinion, the only logical solution would be to issue a blanket license to a responsible concern to furnish all the jitneys in the city, or a particular section of it, presumably with transfer privileges. This plan would provide definite responsibility, a means of enforcing regularity of service and sufficient assets to cover accident liability. Company operation of jitneys, however, has been tried on a rather small scale and it failed, and the universal experience thus far has been that administra-

tion and higher wages ate up all the profits which individual owners might possibly have made.

In general, therefore, Mr. Nash believes that under strict, adequate regulation and protection to patrons, the jitney as an individual venture will have great difficulty in surviving in good times. As an organized independent business, it has no economic excuse for existence. In either case, it is a cause of traffic congestion and an added danger to necessary users of the streets, and should be eliminated or restricted to a field which cannot yet be definitely foreseen. As to possible future useful and profitable fields, the suggestion is offered that jitneys might be employed by electric railways in comparatively undeveloped sections as feeders to street car lines. Their relatively small cost and low operating expense per car-mile might adapt them for pioneer temporary use, until sufficient traffic developed to justify track extensions. Moreover, instead of using the usual small gasoline car for this purpose, an electric jitney might be developed along the lines of the so-called "trackless trolley" which has been operated to a limited extent abroad. This would involve a comparatively small investment per passenger, with the high power efficiency of the central station instead of the relatively low efficiency of a small gasoline engine. In some such service as this, the jitney in a modified form might find a permanent usefulness.

Prospects Poor for Seattle Municipal Lines

Report of Superintendent to Council Shows that Division "A" Is Facing Twenty Years or More of Losses

IN response to a recent resolution by Council, A. L. Valentine, superintendent of public utilities, has submitted a report to the general effect that Division "A" of the Seattle (Wash.) Municipal Street Railway must be operated for twenty-three years before it will become a paying utility, even though an extension is made into Ballard. This estimate is made with the assumption that there will be no radical changes in methods of urban transportation to reduce the normal patronage. Mr. Valentine states, however, that owing to the probability of a radical modification of the state of the art before the expiration of the twenty-third period, he does not believe that any special value would attach to an estimate of the number of years required to overcome the total loss during this period. The following gives in abstract form the main parts of Mr. Valentine's report.

The total length of Division "A" of the municipal lines is 4.214 miles, this being equivalent to 7.803 single-track miles. The number of persons naturally tributary to the division is computed to be 4120. This figure is reached on the assumption that the line would go through the business district and enjoy transfer privileges to other lines in the city. As a matter of fact, Mr. Valentine says, the figure is subject to a large deduction because of the inability of the city to issue transfers. In 1915, he states, the Puget Sound Traction, Light & Power Company collected 21,368,463 transfers from among the 61,060,906 fare passengers, the transfers thus representing 35 per cent of the total fare passengers. Deducting 35 per cent from the 4120 passengers naturally tributary to Division "A" leaves 2678 persons as tributary to the line if it were to go through the main business district without transfers.

INVESTMENT AND EARNINGS FIGURES

The total fixed investment in the division up to April 1, 1916, was as follows: Way and structures, \$262,579;

equipment, \$87,241; power (substations and equipment, including site), \$49,844; total plant and equipment, \$399,664; general (including interest during construction), \$13,500; grand total, \$413,164.

The gross earnings and cost of operation and maintenance of Division "A" for seven months in 1914, the calendar year 1915 and the first three months of 1916 were as follows:

	1914, 7 Months	1915, 12 Months	1916, 3 Months
Passenger revenue.....	\$9,864	\$15,370	\$3,720
Station and car privileges.....	122	200	50
Rent of equipment to Division "C".....	1,607	2,432	455
Miscellaneous		432	35
Total earnings	\$11,593	\$18,002	\$4,260
Maintenance of way and structures..	\$539	\$4,346	\$1,496
Maintenance of equipment.....	910	5,880	1,390
Power purchased	6,311	5,943	1,385
Conducting transportation	10,457	14,242	3,496
General	152	434	17
Total expenses	\$18,369	\$30,845	\$7,784
Operating ratio, per cent.....	158.46	171.35	182.70

The 1915 maintenance cost per car-mile on Division "A," exclusive of interest, was \$0.026856 for way and structures and \$0.036336 for equipment. The total operating cost per car-mile on the same division amounted to \$0.1906.

DEPRECIATION

Sums were indicated for depreciation for 1915 on Division "A" by the State Bureau of Accountancy as follows, according to Mr. Valentine's report:

	Value	Rate, Per Cent	Amount of Depreci- ation	Less Mainte- ance	Net Depreci- ation
Way and structures:					
Poles and fix- tures	\$11,656	10	\$1,165	\$605	\$560
Distribution sys- tem	27,959	10	2,795	76	2,719
Shops and car- houses	19,233	2	384	....	384
Total					\$3,655
Equipment:					
Cars	\$51,383	5	\$2,569	\$710	\$1,859
Fare boxes	1,323	8½	112	....	112
Fenders	1,200	8½	102	....	102
Freight cars.....	7,678	8½	652	....	652
Service equipment	1,422	8½	120	....	120
Electric equipment of cars	21,044	8½	1,788	227	1,561
Shop equipment...	2,774	5	138	....	138
Furniture	413	5	20	....	20
Total					\$4,568
Grand total					\$8,233

No provision for a renewal reserve was made, however, as the operating revenues were less than the operating expenses. The deterioration in way and structures and equipment was handled by deducting the depreciation from the investment in calculating the taxable value. No obsolete property was placed in suspense account.

TAXES AND INTEREST

In the matter of the amount of taxes and interest Mr. Valentine advises that municipal street railway bonds bearing 4½ per cent interest have been issued to the extent of \$425,000. Interest thereon is \$19,125 per year. There has been invested in plant account and equipment in Division "A" sums aggregating \$399,664, from which depreciation for 1915 to the amount of \$8,233 was deducted, leaving a net taxable value of \$391,430.

As the Puget Sound Traction, Light & Power Company on an appraisal value of its street railway plant of \$19,737,122 estimates its proportion of taxes for the railway at \$264,424, according to Mr. Valentine, it is paying taxes at the rate of 1.3398 per cent on its railway property. On the basis of this percentage, a proper comparative tax charge for Division "A" would be

\$5,244. The total yearly amount for taxes and interest would be \$24,369, not now covered by the operating report.

EXTENDING THE LINE TO BALLARD

Extensions into Ballard could be made on different routes, but in Mr. Valentine's opinion Route No. 3, serving a territory the north end of which does not have street railway facilities equal to those in other parts of Ballard, would be the preferable one for an extension. The length of this route from Thirteenth Avenue West on Nickerson Street to West Eighty-fifth Street on Thirty-second Street Northwest, would be 3.42 miles, and the estimated cost of the extension, not including the track work the city is to place on the Fifteenth Avenue Northwest bridge and approaches, would be \$96,213. Of this \$7,990, representing the cost of construction on Division "A," would be taken from the balance in the municipal street railway bond fund. This remainder of the estimate (\$88,223) would represent new cost of construction in Ballard.

Division "A" as extended to Ballard, Mr. Valentine estimates, would have annual revenues of approximately \$27,000 with annual operating expense, exclusive of interest and taxes, of \$61,955. Interest would aggregate \$23,095 and taxes \$6,534. The revenues would undoubtedly increase as the result of the increase in the tributary population, and the increase in the riding habit, but in Mr. Valentine's judgment the annual increase in the population tributary to Division "A" as extended would not, even with the extra transportation facilities afforded, exceed 5.5 per cent. This percentage increase applied to the whole population would mean that Seattle would gain 18,000 each year. From 1900 to 1910 the increase in population was from 80,671 to 237,194, while according to the United States census figures the earnings per capita of the Puget Sound Traction, Light & Power Company increased from \$8.56 in 1900 to \$14.66 in 1910. From these figures Mr. Valentine concludes that the increase in the riding habit in Seattle would, under normal conditions, approximately double with the trebling of the population. Therefore, there would be a 0.6 per cent increase in the riding habit for each 1 per cent increase in the population.

THE POOR OUTLOOK

"Assuming that there will be no radical changes in methods of urban transportation, and considering the elements of increase of population, increase in riding habit, increase in operating expense and also in plant investment due to equipment, paving, etc.," Mr. Valentine estimates that "it will take at least twenty-three years for Division 'A' as extended to Ballard to become a paying proposition. This line would start the first year with a loss of \$34,995 on operation plus \$23,095 for interest, and the total loss in the twenty-third year would be in excess of \$668,000." Owing, however, to the probability that prior to the expiration of this period the state of the art of urban transportation may be radically modified, Mr. Valentine does not believe that "any special value or utility would attach to an estimate of the number of years required to overcome the loss noted."

CONNECTING THE TWO DIVISIONS

If an extension to Division "A" as at present operated were made to Riverside to a connection with the Lake Burien line, or Division "C," Mr. Valentine feels that the total revenue of Division "A" for the first year would be not to exceed \$38,500. This would be exclusive of any revenue which might be derived from a transfer arrangement with the present patronage of the Lake Burien line. With operating expenses estimated

at \$53,400 and interest amounting to \$22,226, the loss the first year would be \$37,126. The loss during the fifth year would be \$26,500 and the loss during the tenth year \$12,900.

INCREASING THE REVENUES

The city department has had under consideration the matter of attempting to develop a package or carload freight business along Division "A," but it is said that in view of the fact that the formerly extensive package freight business of the Puget Sound Traction, Light & Power Company has practically vanished within the last few years, it has been deemed inadvisable to experiment along this line. If it were merely a matter of securing additional revenue this could be done by increasing the service, but to do so would be simply to add to an already heavy operating deficit. It is quite plain, Mr. Valentine admits, that relief is not to be sought in this direction.

The lines have been operated for such a limited period, it is averred, that no accurate data as to the probable rate of increase of earnings and expenses can be secured therefrom. Division "A" as at present operated would not, however, in Mr. Valentine's judgment, even with the possibility of industrial development in the territory contiguous to the north end, earn an amount equal to the operating expenses and interest prior to 1936. Division "C" as at present operated would not, even with freight-hauling possibilities, earn an amount equal to the operating expenses prior to 1926.

Moreover, Mr. Valentine confesses, the service rendered by the present line of Division "A" or any of its proposed extensions would not under present conditions be such as to warrant any increase in fare. The line with proposed extensions would come into direct competition with routes of the Puget Sound Traction, Light & Power Company which, having been long established, have a fixed patronage, give generally equal fares, cover more advantageous routes, which afford a more frequent headway, and possess the privilege of transfer interchange. In case, however, Division "C" should be extended into the business district, it is believed that those living outside the city who now pay to the municipally and privately-owned lines a minimum total fare of 10¼ cents would be willing to pay the city line a fare in excess of the 6¼ cents they are now paying.

GENERAL CONDITION

In general, Mr. Valentine says, the rapid changes in the art of urban transportation which recent years have brought about render the entire status of the street railway business uncertain and unsatisfactory from the standpoint of the operator. The tendency of all costs has been steadily upward, while the fare has remained the same, and more recently the competition of gasoline motor vehicles, both public and private, has made heavy inroads into the revenues. Even the tentative plan of the street railway companies, involving the operation of one-man cars on more frequent headways to increase their revenues will, in Mr. Valentine's opinion, have but little merit in rendering the status of the street railway business more satisfactory to the operator.

At a recent meeting of the San Francisco Labor Council, Coroner Leland gave the following statistics regarding fatalities due to street traffic in San Francisco. For the twelve months ending May 1, 1916, jitneys killed seventeen, the United Railroads twenty-two, privately-owned automobiles forty-six, and the Municipal Railway nine. Of this total the accidents on Market Street were six killed by jitneys, two by the United Railroads and one by the Municipal Railway.

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

ASSOCIATION NEWS

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

Important Convention Committee Meetings Were Held in Atlantic City This Week—The Human Element Discussed by Manila Section—Association Committees Are Rounding Up the Year's Work

Activities of the Company Sections

PORTLAND (ME.) SECTION ENDS SEASON

The fourth meeting of Section No. 9 was held in Portland, Me., on June 13. This was ladies' night and the attendance was about 100 members together with a large number of ladies. Supper was served and this was followed by dancing and cards.

At a meeting of the executive board announcement was made that a representative of the Westinghouse Electric & Manufacturing Company would give a talk on air-brake equipment at the October meeting. A committee was also appointed to consider the advisability of organizing a minstrel show and to select a manager for the purpose if the show appears feasible.

MANILA SECTION

Meetings of joint company section No. 5 were held on March 7 and May 2 in Manila, P. I. On the earlier date the principal speaker was R. E. Brooks, assistant superintendent of shops and carhouses, who discussed "Derailments, Their Cause and Prevention." At the later meeting, E. I. Jeffrey, assistant chief engineer of power plants, read a paper on "The Power Plant Employee and His Qualifications."

After pointing out how troublesome derailments are to railway operation, Mr. Brooks analyzed the causes of this trouble, which he attributed largely to the motormen. He pointed out that motormen are not as careful as they might be, partly owing to the fact that they are expected to run according to schedule and hence must sometimes risk derailment to keep their cars on time. Mr. Brooks' idea of derailment prevention was that, while all derailments cannot be prevented, many can be by the exercise of proper discipline. Whether the man at fault be a machinist, a blacksmith, a carhouse man, a trackman or a motorman, he should be held strictly accountable for the results of his work.

In the discussion the impression seems to be general that the speaker had been too easy on the shops, and

that no one department is responsible for derailments. Co-operation is necessary in preventing them.

The ideal power plant employee, as pictured by Mr. Jeffery, is one with a suitable technical education, practical experience and personality. He pointed out the results of accurate observation in power plant operation and prompt attention to defects. Intelligence and resourcefulness in emergency are very important in this work. One of the most forceful parts of Mr. Jeffery's paper was that in which he emphasized the necessity for effort on the part of power-plant men to keep out of ruts. For this purpose it is necessary to read systematically, to associate with other men in the same business, and to take an active part in associations in this field. The text and advertising pages of technical journals are of great value. He called attention of the willingness of the local company to pay one-half of the tuition fees of employees enrolled in the correspondence courses of the American Electric Railway Association, and ended with this epitome of the subject: "It is up to every man to be as good as he says he is and better than his superiors think he is."

In the discussion the subject was extended to include other employees, and the difficulties of the local situation in handling native help were pointed out. Two of the predominant characteristics of Filipinos are that they are sensitive and sympathetic, and these qualities must be considered in handling them. In one department by encouraging the Filipino employees to read the value of the service of some had been doubled. C. N. Duffy, vice-president, in closing the discussion, explained the company's attitude toward educational efforts, and pointed out how necessary it is for employees to utilize these if they expect to be considered for higher duties and responsibilities. He said that while he did not desire to reflect on the capabilities of the academic, theoretical or purely scientific "experts," after all the real expert is the practical man who can do things and who has done them.

General Association Activity

EXECUTIVE COMMITTEE MANUFACTURERS' ASSOCIATION

A meeting of the executive committee of the American Electric Railway Manufacturers' Association, to discuss the future plans of the association, was held at the Marlborough-Blenheim, Atlantic City, N. J., on June 20. L. E. Gould, vice-president in charge of finances, presided. Others in attendance were: E. F. Wickwire, Charles R. Ellicott, M. B. Lambert, F. A. Elmquist, Bertram Berry and B. A. Hegeman, Jr., representing George Stanton of Cleveland.

WAY COMMITTEE HOLDS FINAL MEETING

The final meeting of the way committee of the American Electric Railway Engineering Association was held in the office of Chairman C. H. Clark, engineer maintenance of way of the Cleveland Railway Company,

Cleveland, Ohio. On June 8 representatives of the manufacturers of electric railway special work met with R. C. Cram of Brooklyn and Mr. Clark to revise the specifications for built-up special work which were prepared by the 1915 way committee, but not submitted to the convention for approval. These specifications were further revised by the way committee, and will be submitted as a recommended standard. At the first meeting of the way committee held on June 15, the following members were present: H. M. Steward of Boston, A. E. Harvey of Kansas City, W. F. Graves of Montreal, R. C. Cram of Brooklyn, E. M. Haas, Chicago, C. H. Clark of Cleveland, and E. M. T. Ryder of New York.

This meeting of the committee held over for three day and two night sessions, and owing to the large amount of work necessary on some of the subjects, the committee decided to continue those relating to the revision of the design of 7-in. and 9-in. joint plates with

special reference to the sizes of bolt holes and fits; the recommended designs for layouts for switches, mates and frogs; the use of rolled manganese and other alloy steel rails; the investigation of high elastic-steel machine bolts for use with mechanical joints; the preparation of specifications with definitions for sundry track materials, and the report upon the most efficient types of hand track tools. The way committee has submitted the recommended symbols for recording surveys which were reported by the 1915 committee to other committees interested for their revision and approval. The report on ballast for suburban and interurban lines, which was prepared by L. A. Mitchell, Anderson, Ind., will be submitted to the association as information. Specifications for pavements for use with grooved-girder and plain-girder rails were prepared by Mr. Harvey, and those for wood block, granite block and brick will be submitted to the association as recommended standards. A report on specifications for preservatives and the treatment of wood for inclusion in the Engineering Manual was prepared by Mr. Haas, and the committee decided to submit it to the association as recommended practice.

JOINT COMMITTEE ON BLOCK SIGNALS.

The joint engineering and transportation and traffic associations committee on block signals met in Buffalo on June 15 with the following members in attendance: J. W. Brown, Public Service Railway, vice-chairman;

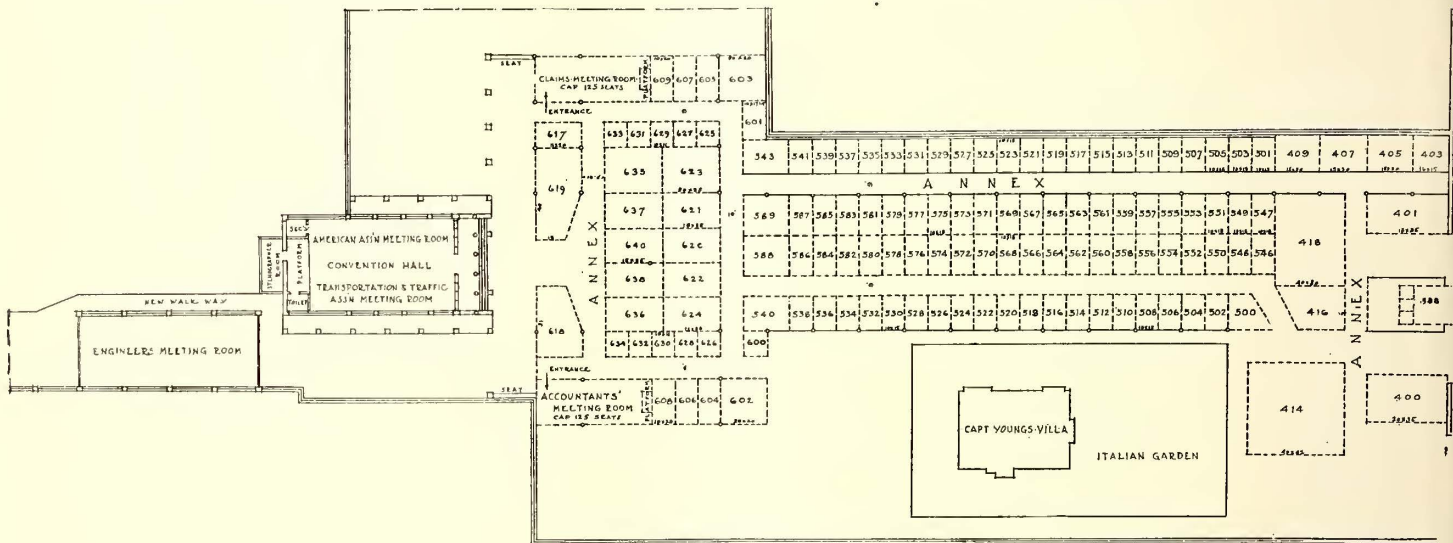
a note appended providing an increase in the distance between the center line of the track and the base of the signal where the signal is placed on the inside of the curve, the amount of this increase to depend upon the degree of curvature and the amount of super-elevation of the outer rail.

It was reported that progress had been made toward getting the American Railway Association and the American Electric Railway Association together to consider jointly the block signal rules. A tentative meeting between representatives of the two associations had been arranged for the latter part of June. A full report on tests for contactor signals was received and with minor changes accepted. Proposed instructions covering methods for using standard aspects for trolley contact signals were also considered.

Progress reports on other assignments were received, and it was decided to refer to next year's committee the development of a form of contract for signal installations and a study of operation without dispatchers.

FALL CONVENTION ACTIVITY

Earnest activity marked the convention committees' work at Atlantic City this week. Plans and budgets were approved and details were settled so that work is now in full swing and the committees are proceeding with the activities so necessary to assure a highly successful fall convention. The committees which met at Atlantic City on June 20 at President Henry's call were



YOUNG'S MILLION-DOLLAR PIER AT ATLANTIC CITY WITH

G. N. Brown, New York State Railways, Syracuse-Utica Lines, and G. K. Jeffries, Terre Haute, Indianapolis & Eastern Traction Company. There were also present by invitation, R. V. Collins, United States Electric Signal Company; F. M. Day, General Railway Signal Company, and H. W. Griffin, Union Switch & Signal Company.

A drawing of a signal number plate prepared by a sub-committee was exhibited and discussed. It was decided to recommend block figures as nearly as possible of the dimensions shown in the drawing, the method of attachment of the plate to the signal being subject to the approval of the customer. It was reported that clearance diagrams had been approved by the power distribution and heavy electric traction committees. The joint committee approved the suggestion of the latter committee that on the drawing showing the clearance, where men are not allowed to climb up the side or ride on the top of the car, there should be

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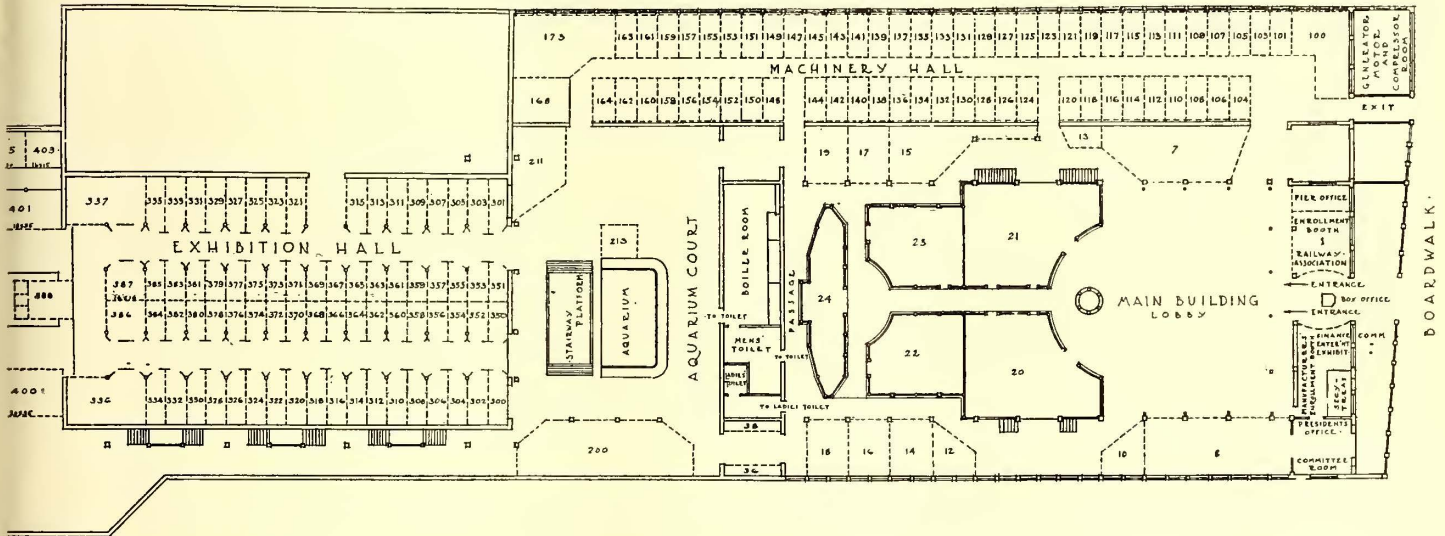
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LAYOUT OF CONVENTION EXHIBIT AND OFFICE SPACE

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special reference to the sizes of bolt holes and fits; the recommended designs for layouts for switches, mates and frogs; the use of rolled manganese and other alloy steel rails; the investigation of high elastic-steel machine bolts for use with mechanical joints; the preparation of specifications with definitions for sundry track materials, and the report upon the most efficient types of hand track tools. The way committee has submitted the recommended symbols for recording surveys which were reported by the 1915 committee to other committees interested for their revision and approval. The report on ballast for suburban and interurban lines, which was prepared by L. A. Mitchell, Anderson, Ind., will be submitted to the association as information. Specifications for pavements for use with grooved-girder and plain-girder rails were prepared by Mr. Harvey, and those for wood block, granite block and brick will be submitted to the association as recommended standards. A report on specifications for preservatives and the treatment of wood for inclusion in the Engineering Manual was prepared by Mr. Haas, and the committee decided to submit it to the association as recommended practice.

JOINT COMMITTEE ON BLOCK SIGNALS.

The joint engineering and transportation and traffic associations committee on block signals met in Buffalo on June 15 with the following members in attendance: J. W. Brown, Public Service Railway, vice-chairman;

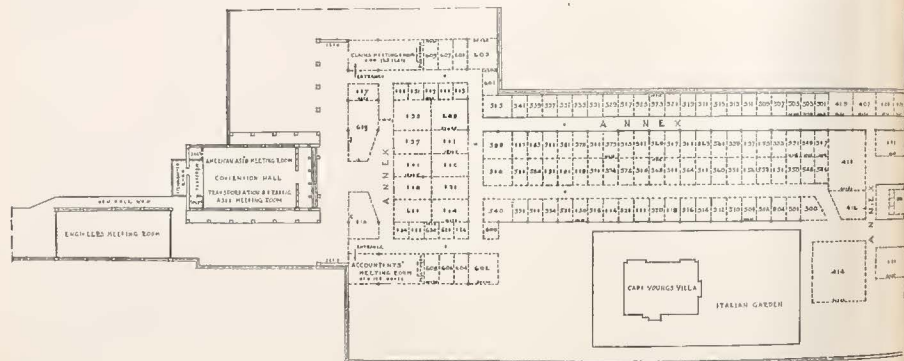
a note appended providing an increase in the distance between the center line of the track and the base of the signal where the signal is placed on the inside of the curve, the amount of this increase to depend upon the degree of curvature and the amount of super-elevation of the outer rail.

It was reported that progress had been made toward getting the American Railway Association and the American Electric Railway Association together to consider jointly the block signal rules. A tentative meeting between representatives of the two associations had been arranged for the latter part of June. A full report on tests for contactor signals was received and with minor changes accepted. Proposed instructions covering methods for using standard aspects for trolley contact signals were also considered.

Progress reports on other assignments were received, and it was decided to refer to next year's committee the development of a form of contract for signal installations and a study of operation without dispatchers.

FALL CONVENTION ACTIVITY

Earnest activity marked the convention committees' work at Atlantic City this week. Plans and budgets were approved and details were settled so that work is now in full swing and the committees are proceeding with the activities so necessary to assure a highly successful fall convention. The committees which met at Atlantic City on June 20 at President Henry's call were



"MILLION-DOLLAR PIER AT ATLANTIC CITY WITH

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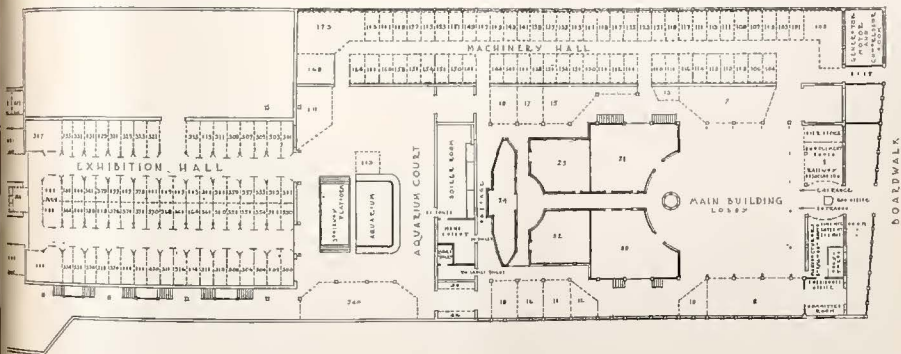
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COMMUNICATIONS

Paving Track Allowances

BROOKLYN RAPID TRANSIT COMPANY
BROOKLYN, N. Y., June 12, 1916.

To the Editors:

I am glad to note that the ELECTRIC RAILWAY JOURNAL has taken up editorially the important question of track pavements, because I believe there is no question of greater importance to the street railway companies, particularly in view of the costly pavements now required as against the comparatively cheap pavements which were installed in tracks in the early construction days when franchises were accepted with the stipulation that the railroad company should maintain the track pavements.

I do not believe that many railway companies to-day know exactly how much the pavement in track is costing for maintenance. Information along this line should be covered by the American Electric Railway Engineering Association, with a view to furnishing data upon which to base arguments in favor of legislative changes looking toward relief in some manner from this incubus. It certainly seems absurd that the railroad companies should continue to install and maintain costly pavements upon which the companies impose no wear and from which there is no income. Neither is the pavement maintenance looked upon as a tax, but in effect, I believe, it is one of the largest single items of taxation to which any street railway company located in a large city may be subject.

R. C. CRAM,

Assistant Engineer Way and Structure Department.

Features of Freight Operation on the L., A. & W. St. Ry.

CUMBERLAND COUNTY POWER & LIGHT COMPANY
PORTLAND, ME., June 5, 1916.

To the Editors:

In response to certain questions which have been asked regarding details of the freight service performed by the Lewiston, Augusta & Waterville Street Railway, as outlined in my article published in the issue of the ELECTRIC RAILWAY JOURNAL for March 11, I take pleasure in giving the following additional information:

First, regarding the form used in collecting data in our farm survey, the accompanying illustration shows the card which we have found very useful by the railway company in securing general information with a view to increasing the productiveness of farms, in connection with which we are providing storage for farm products until the market requires them. The cards, which are filed in an index, show the location of each farm, the name of the owner, his acreage, crops and stock, the length of his hauls to the electric road and to the steam railroad, and his attitude toward the electric road. They also contain his suggestions or criticisms regarding the plans outlined by the agent.

Another point is in connection with the preparation of freight department statistics. In order that the management may be reasonably sure as to whether the freight department is a source of clear revenue to the company or is being operated without advantage, the auditor compiles a monthly statement, showing thereon the sources and amount of revenue, with comparisons of the corresponding month in the previous year. Against the revenue are charged the following items:

A maintenance-of-way charge (based on car-miles operated) for track, roadway and overhead repairs.

A maintenance-of-equipment charge for repairs of cars and electrical equipment, a proportion of shop superintendence and depreciation of equipment.

Traffic charges for all freight department superintendence, solicitation and advertising.

Transportation charges, including a proportion of the superintendence of transportation, wages of freight conductors and motormen, miscellaneous car service expenses, wages of station employees and station expenses, drayage, per diem charges for cars, losses and damages, cost of lubricants, and miscellaneous expense.

Power is charged for on a car-mile basis for each mile operated.

The general expense account, which includes the proportion of the general officers' salaries and expenses, clerks' salaries, law expenses, injuries and damages,

Map No.	House No.	Date
Name		Address
Family		Acres
Crops		Amount
Orchard	Crop	
Lumber	Cut	Standing
Stock		Equipment
Dist. to L. A. & W.		to Railroad
Haul to L. A. & W.		to Railroad

FILING CARD FOR DATA ON FARM PRODUCTIVENESS

stationery and supplies, insurance, rent of track and facilities and miscellaneous general expenses.

After all operating expense has been charged, a deduction is made for taxes, interest on investment, and rental of land. The remaining figure shows surplus or deficit.

Among other sources of profitable freight business on the lines of this company is that of hauling materials for road construction. During the summer of 1915 the Maine Highway Commission placed a contract for the construction of 8 miles of concrete road between Portland and Biddeford, Me., this road being the main artery of travel from New York and Boston into the State. The problem of distribution of materials confronted the contractor, and this problem was solved by securing from the railway company a guarantee to transport gravel, rock, filling and cement, distributing them as desired from dump cars, the tracks being parallel to and located on the road to be built. The sand, gravel and filling were hauled in 15-ton loads by motor cars with two dump cars, of 7½ tons capacity each, attached. These cars were loaded under spouts in the gravel pits from storage bins.

By working two trains 18 hours per day, from 300 to 350 net tons of material were hauled per day. Similar loads of cement were hauled from the company's steam railroad siding, transfer being made from the steam equipment at that point by the shipper. The total gravel, sand and filling furnished amounted to 21,609 tons for the 8 miles of State road, the cement used being 2715 tons. At numerous points along the line, the company handled similar work in smaller amounts, in each case effecting a saving in the construction cost and securing a neat return for the freight department.

F. E. WOOD, General Freight Agent.

The Public Works Direction, Madrid, Spain, is receiving tenders for the construction and operation of an electric tramway at Melilla, Spanish North Africa. The minimum rolling stock required on the line is sixteen closed cars.

EQUIPMENT AND ITS MAINTENANCE

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

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

Successful Under-Water Coal Storage

BY J. D. WARDLE

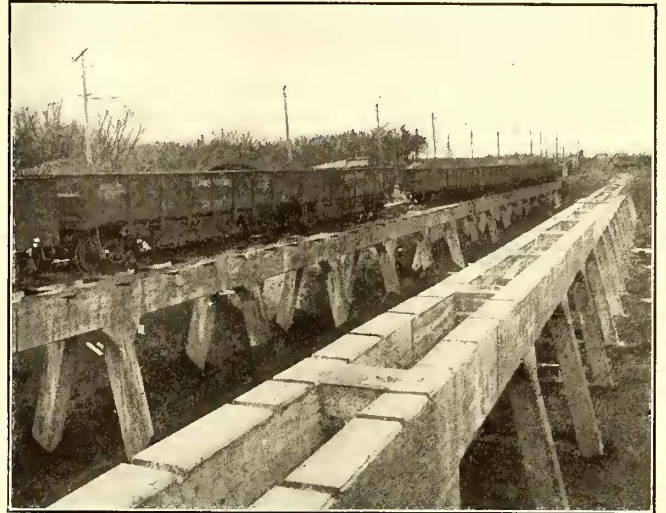
Chief Engineer Iowa Railway & Light Company, Cedar Rapids, Iowa

The Iowa Railway & Light Company, which operates about 50 miles of interurban line and has more than 350 miles of high-tension transmission distribution serving lighting and power customers in central Iowa, has recently put into service a large under-water coal storage. This plant is located on the Cedar Rapids-Iowa City interurban division about 3 miles distant from the generating station in Cedar Rapids. Iowa coal is purchased and is delivered to the company at its southern terminus, Iowa City. It is then brought over the interurban line for a distance of 25 miles to the storage plant.

An accompanying illustration shows the general design of the reinforced concrete trestles which extend the long dimension of the pit, 420 ft. The width of the pit is 135 ft., and the height from the floor to the top of the rails is 22 ft. The west wall of the pit is a fill of the interurban line, the other three sides are made up of banks with a slope of 1 to 1. The two concrete trestles are each surmounted by a single track laid on I-beam cross-ties extending a sufficient distance outside of the rails to carry a walkway so that the hopper bottom cars can be tripped.

Iowa coal when piled ignites itself readily, and therefore it is necessary to keep the pit flooded. The water supply is provided by two Gould centrifugal pumps driven by 10-hp. motors which are fed from the trolley. A comparatively small amount of water is needed after the pit has once been flooded. Coal is reclaimed from the pit with a 15-ton American Hoist & Derrick Company's electrically operated locomotive type crane. This crane has 8000-lb. lifting capacity at 50-ft. radius and a 20-ft. boom with a 60,000-lb. capacity on a 12-ft. radius. The crane has a total weight of 67 tons and is used for general road service as well as for loading coal out of the storage pit into the cars.

The consumption of coal is about 250 tons a day, and it formerly was necessary to carry 5000 or 6000 tons in reserve in cars at a per diem charge for the cars of 45 cents. Now with the new under-water coal storage plant in operation, the reserve in cars has safely been reduced to ten cars on the track, and therefore the per



DESIGN OF REINFORCED CONCRETE TRESTLES FOR UNDER-WATER STORAGE

diem charge proportionately reduced from \$45 to \$4.50 a day. In times of threatened shortage, the new storage plant will afford a reserve capacity of 22,000 tons. This pit has been a successful investment, first because it provides safe, long-time storage of a reserve supply of coal, and second, because it has brought about a reduction in the per diem charges on coal cars of approximately \$40 a day.

Devices for Protecting Armatures

BY R. H. PARSONS
Electrical Foreman

Repairs to armatures are expensive, often ranging from \$20 to \$60, the sum varying with the type, size and condition. A repaired armature, although electrically and mechanically perfect, is easily damaged. As a pin renders an automobile tire temporarily useless, so a tiny piece of steel cut into the coils or between the commutator bars will as quickly disable the most carefully completed armature. The winder may turn out an armature in first-class condition, but improper handling en route to the motor might damage the coils so



STORAGE PIT OF THE IOWA RAILWAY & LIGHT COMPANY, SHOWING 15-TON CRANE USED FOR RECLAIMING COAL FROM PIT

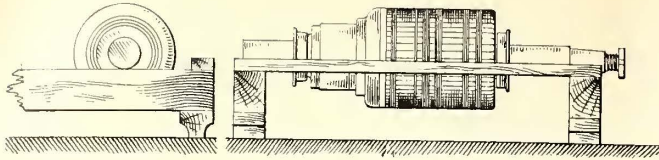


FIG. 1—SKIDS FOR STORING MOTOR ARMATURES

that it would have to be returned to the workman, reflecting unjustly on his workmanship.

Rolling an armature on the floor is the worst practice possible. It should not touch the floor from the time it is taken from the winder's horse until it is placed in the motor. This would be an ideal condition, but as armatures cannot be stored in the air or left on horses, other means should be provided for their protection. Armatures brought into the shop for repairs

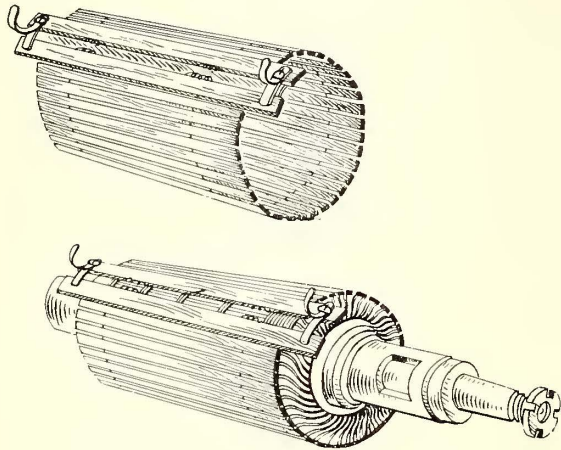


FIG. 2—JACKET FOR PROTECTING ARMATURES IN TRANSIT

should be stored on skids, as illustrated in Fig. 1. These are made of two 3½-in. x 7-in. planks set upon 4-in. blocks, and placed parallel on the floor, properly spaced for the armatures on hand. In the interval between winding and banding, the armature can be left on these skids, but as soon as it is banded and ready to be sent to another part of the shop for commutator turning or bearing fitting, it should be covered with a jacket similar to that shown in Fig. 2.

This jacket consists of a number of hardwood pieces,

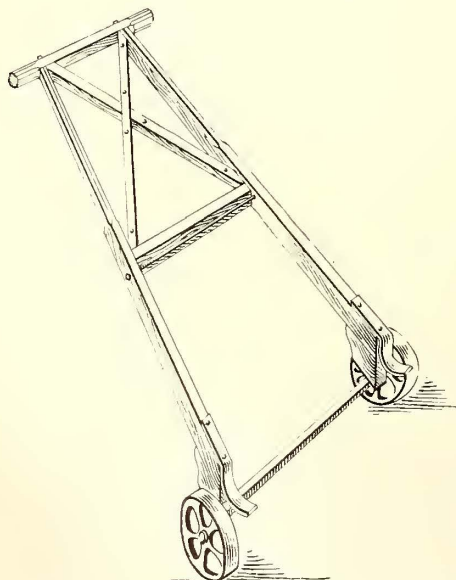


FIG. 3—ARMATURE CARRIAGE FOR USE OVER SHORT DISTANCES

finished smooth and held together by strong ropes run through holes in the ends of each piece. The two end pieces, which are longer than the others, hold the jacket together by means of straps. These jackets serve as a suit of armor, and can be easily placed on the armature. They cause no inconvenience in handling and are invaluable in protecting the armature. The jacket should remain on the armature from the time it is banded until it is placed in the motor. Then the removed armature should be placed in the jacket and returned to the armature room. Armatures incased in these jackets may be placed on rough, wet, or dirty floors or upon sharp lathe chips or tacks without injury, it being

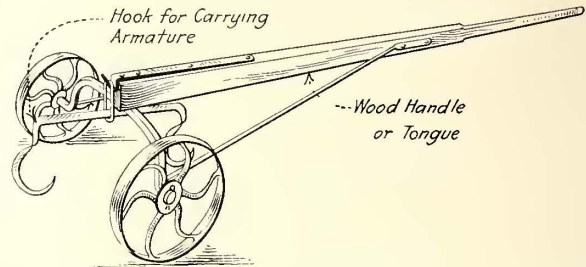


FIG. 4—ARMATURE CARRIAGE FOR USE OVER LONG DISTANCES

assumed that they are subjected only occasionally to these abuses.

It is often necessary to transport an armature on wheels on account of not being able to reach all the machines in the shop with the jib cranes. Two armature carriages are shown in Figs. 3 and 4. The one shown in Fig. 3 can be used between machines in the armature room, while that in Fig. 4 is too large for such purposes. It can be used, however, for conveying the armature to different parts of the building, across streets, or anywhere within reasonable distance. Each carriage performs two functions, lifting and carrying. A long handle which acts as a means of moving the truck, also acts as a lever to raise the armature from the floor. If the handle of either is raised high in the air, the hooks for handling the armature are lowered until they are in a position to pick up the armature shaft.

Granite Paving Blocks Recut and Relaid for \$1.59½ per Yard

BY E. R. DIKE

Engineer Maintenance of Way Chattanooga Railway & Light Company, Chattanooga, Tenn.

Previous to reconstruction and repaving on Market Street from Ninth Street to Main Street the entire street, including the railway tracks, was paved with old-style granite blocks. These blocks were 4 in. or 5 in. wide, 5 in. or 6 in. deep, and 10 in. or 12 in. long. When repaved the street was relaid with creosoted wood block except about the railway tracks. The Chattanooga Railway & Light Company decided to use the same granite block after recutting and dressing them. The total length involved was 3600 ft., mostly double track, there being approximately 6000 sq. yd. in all to relay.

The blocks were recut and laid under the following specifications:

The old granite blocks shall be recut to a substantially rectangular shape so as to present fair and true surfaces on the top, bottom and ends. The blocks when recut shall be not less than 5 in. nor more than 10 in. in length, not less than 3 in. nor more than 4½ in. in width, and not less than 4 in. nor more than 4½ in. in depth, although if the depth of the old blocks before recutting is such as to permit it the recut blocks may have a depth of not less than

4 3/4 in., nor more than 5 1/4 in. The blocks shall be recut so that they may be laid with close end joints, and with side joints not exceeding 1/2 in. in width. A new top face shall be provided for each block, which face shall be so cut as to show no greater depression than 1/4 in. below a straight edge laid in any direction across the face and held parallel to the general surface of the block. Each course of blocks shall be of uniform width and the blocks so laid that all longitudinal or end joints shall be broken by a lap of at least 2 1/2 in.

All blocks used shall be free from seams, scales or discolorations showing signs of disintegration, and all blocks which in quality and dimensions do not conform to these specifications will be rejected.

The blocks shall be laid in courses at right angles to the rails, excepting stretcher courses next to rail, which shall be laid as directed by the engineer.

Nelsonville filler block or its equivalent shall be used under the heads of the rails on the inside of the track. This block shall be of such shape and dimensions as to conform to the channel of the rail and shall be similar in quality to a standard vitrified paving block.

All block shall be well settled in place by means of a tamping block and tamper of approved size and weight. All blocks found to be too high or too low shall be relaid so as to conform to the required grade or surface. Any defective blocks shall be removed and good blocks substituted therefor.

On the outside of the rails the channel of the rail shall be completely filled with a Portland cement mortar mixed in the proportion of one part of cement and three parts of clean sand, said mortar to be put in place previous to laying the blocks along the outside of the rails, and to be flush with the head of the rail.

For filler a one-to-one cement grout was used, applied in several successive coats to insure a complete filling of the joints.

The contract for this work was let to a local contractor who recut the blocks and relaid them on a foundation of limestone screenings for the sum of \$1.59 1/2 per square yard. This price included the cost of the screenings and the cement filler, but of course did not include any concrete foundation, as the blocks were relaid on the existing concrete and wherever it was necessary to remove any concrete it was replaced by the railway company. The contractor furnished the filler block and also filled the head of the rail as described above.

This work was completed several months ago and at present gives every indication of being a durable and satisfactory paving.

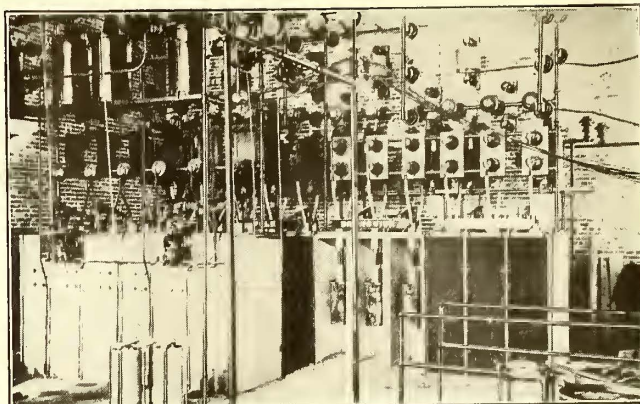
New Transformer House of the C., S. & C. Railway at Elyria, Ohio

BY A. P. LEWIS
Superintendent of Power and Shops

The Cleveland, Southwestern & Columbus Railway has just completed a transformer house in connection with its generating station located at Elyria, Ohio. The 22,000-volt main transformers, which are all oil type, were originally located in the basement of the engine room, jeopardizing the station apparatus through the possibility of fire in a transformer, due to short-circuits or grounds. Serious consideration was also given to the danger of water getting into the basement and flooding the transformers during high-water times.

Accordingly a brick and steel transformer house with a slate roof was built about 50 ft. from the engine room and connected with it by a large concrete tunnel shown in an accompanying illustration. All of the low-tension cables and control wires are carried in the tunnel which also provides free passage from the engine room to the transformer house. The two can be isolated from each other by steel fire doors in case of emergency.

The installation was made as simple and as safe as possible by using only standard material such as 33,000-volt line insulators for supporting bus wires, which are

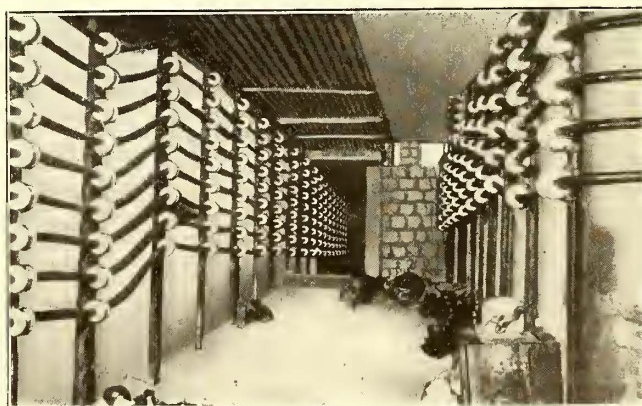


TYPICAL BUS STRUCTURE IN TRANSFORMER HOUSE, C., S. & C. RAILWAY

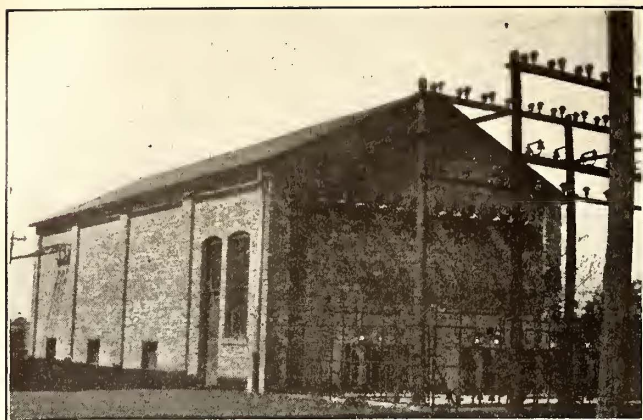
No. 00 copper trolley wire, and 1 1/4-in. pipe and fittings for racks and framework. To avoid possibility of inductance in pipe-work, brass fittings were used freely wherever necessary. All of the lighting and control wires are carried in conduit and the high-tension oil switches are installed in concrete cells. The outgoing three-phase, high-tension lines, four in number, are carried through the building wall through 14-in. tiles fitted with glass through the center of which a hole is drilled for the passage of the wire. Lightning arresters are of the electrolytic type and are located outside the transformer house on a concrete floor directly under the outgoing lines. They are surrounded by a high wire fence. Disconnecting switches are provided for cutting out all switches, lines and transformer banks. Of the last-named there are four, of three transformers each, totaling 10,000 kw.

Each bank of transformers is surrounded by a concrete curbing 6 in. high so that in the event of oil overflowing from the transformers it will not spread over the building. From the base of each transformer a pipe is carried outside the building to a sewer. In the line of this pipe is a quick-opening valve, located outside the building wall and inclosed in a glass box. In case of fire in a transformer the glass is broken, the valve is opened and the oil from the affected transformer is quickly drained out into the sewer which runs directly into the river.

The standard practice of drying out oil and transformers used by this company may be of interest in this connection. The oil is pumped into barrels and the transformers are cleaned of all sediment. From the barrels the oil is filtered into a large metal vat, in which several car-type electric heaters are located. By adjusting the flow of current in the heater, the oil is



TUNNEL CONNECTING ENGINE ROOM WITH TRANSFORMER HOUSE, C., S. & C. RAILWAY



TRANSFORMER HOUSE RECENTLY INSTALLED BY C., S. & C. RAILWAY

brought to exactly the right temperature and held there for from twenty-four to forty-eight hours.

For drying out the transformers the following method is used. They are first raised about 14 in. from the floor and several electric heaters are placed under them. They are next inclosed in a canvas tent which contains a hole in the top. Then by regulating the current in the heaters and the opening in the top of the tent, the case, coils and core are brought to the right temperature and held there for from twenty-four to forty-eight hours. We have dried out dozens of transformers in this manner and have yet to lose a transformer on our system.

Maintenance of Motor Leads

BY E. D. RANSOM, B.E.

It was found some time ago on a large city railway system that sending wire to the maintenance shops and allowing it to be cut to necessary lengths for use as motor leads gave the following troubles: In the first place more wire than was necessary was used, as care was not taken to determine the proper lengths, and to provide a margin of safety the leads were always cut too long, resulting in considerable waste of wire. Again, there was often a tendency to use an improper size of wire if the correct size was not obtainable at the shop in question. In many cases, when the wire was inserted

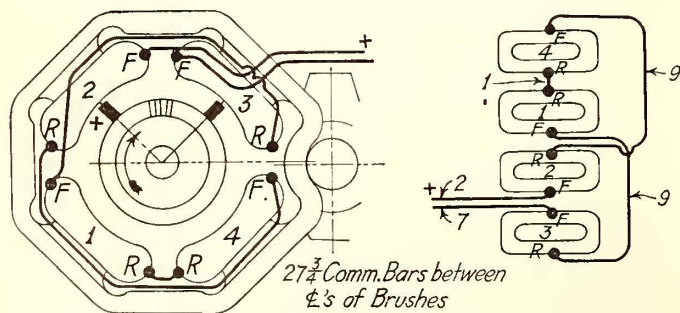


FIG. 1—TYPICAL DIAGRAM FOR IDENTIFYING MOTOR LEADS

in the brush-holder or the field terminal, care was not taken to see that all of the strands were in the terminal holes. This resulted in a poor connection, which caused the leads to burn off at the terminals. In addition to the above troubles, due directly to this careless manner of using stranded wire, trouble was also experienced with terminal screws cutting into strands, which resulted in burned connections. This was taken care of at the same time that leads were made standard by the use of a copper sleeve inclosing the strands.

TABLE I—FIELD LEADS FOR SEVERAL MOTORS

Lead No.	Type of Motor	Length of Lead	Size of Wire
1	WH-101 GE-80	0 ft. 11 in.	B. & S. gage, No. 5, flexible
2	WH-68	1 ft. 6 in.	B. & S. gage, No. 5, flexible
3	WH-68	1 ft. 10 in.	B. & S. gage, No. 5, flexible
4	GE-80	3 ft. 0 in.	B. & S. gage, No. 5, flexible
5	GE-80	3 ft. 10 in.	B. & S. gage, No. 5, flexible
6	WH-68	4 ft. 10 in.	B. & S. gage, No. 5, flexible
7	WH-101	5 ft. 5 in.	B. & S. gage, No. 5, flexible
8	WH-68	5 ft. 10 in.	B. & S. gage, No. 5, flexible
9	WH-101	6 ft. 9 in.	B. & S. gage, No. 5, flexible
10	WH-81 GE-57	1 ft. 6 in.	B. & S. gage, No. 3, flexible
11	WH-81 WH-93	1 ft. 8 in.	B. & S. gage, No. 3, flexible
12	WH-81 GE-57	2 ft. 2 in.	B. & S. gage, No. 3, flexible
13	WH-93	3 ft. 8 in.	B. & S. gage, No. 3, flexible
14	WH-93	4 ft. 2 in.	B. & S. gage, No. 3, flexible
15	WH-81 GE-57	5 ft. 10 in.	B. & S. gage, No. 3, flexible
16	WH-81 WH-93	7 ft. 2 in.	B. & S. gage, No. 3, flexible
17	GE-64	1 ft. 6 in.	B. & S. gage, No. 1, flexible
18	GE-64	3 ft. 3 in.	B. & S. gage, No. 1, flexible
19	GE-64	4 ft. 7 in.	B. & S. gage, No. 1, flexible

To reduce the frequency of motor-lead failures, all leads were made of the proper length and size of wire for each type of motor, and were equipped with terminal sleeves. To make this possible it was first necessary to standardize the internal wiring of the various types of motors as follows: The lengths of leads for the best wiring conditions were determined, each lead being given an individual number. Fig. 1 shows a diagram for a WH-101 motor, which is representative of the type of diagram used for each type of motor. Table I

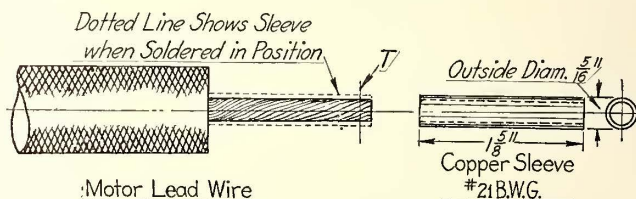


FIG. 2—COPPER SLEEVE FOR REINFORCING MOTOR LEAD TERMINALS

shows the lengths of leads, the sizes of wire and the types of motor for the several leads.

The maintenance shop employees can now pick out the lead wire required from the proper motor diagram and, by referring to Table I can place an order with the department of electrical repairs for the lead numbers required. These leads are furnished all ready to be placed in the motor shell and inserted in the terminals. The table gives lengths for field leads only.

In addition to Table I, Table II was prepared showing the proper lengths of motor leads outside the motor shell. The lengths shown in Table I are the total lengths of leads. The proportion of lead inside and outside the shell is arranged so that the lengths outside have the values given in Table II. To prevent trouble caused by different length leads in the same cleat which resulted in chafing and grounding on motor shell, calculations were made from which this table was developed. All lengths of lead were arranged in such a way that they would not cause binding on curves nor be in danger of chafing or catching on the motor shell.

After the above tables had been satisfactorily ar-

TABLE II—LENGTHS OF FIELD LEADS OUTSIDE THE MOTOR SHELLS

Types of Car and Motors	Length of Lead of Outside of Shell
Single-truck, open and closed cars, with WH-68 motors	25 in.
Double-truck, open and closed cars, with WH-49 motors	30 in.
Double-truck, open and closed cars, with WH-81 motors,	30 in. (except axle jumper, which is 45 in.)
Double-truck, closed, open and convertible cars, with WH-101 or WH-68 motors	30 in.
Double-truck, convertible cars with GE-80 motors,	30 in. (except axle jumper, which is 45 in.)
Double-truck, semi-convertible cars, with GE-90 motors	46 in.
Double-truck, semi-convertible cars, with WH-81 or WH-93 motors	30 in.

ranged, all motor lead wire was concentrated at the department of electrical repairs. It was received in 500-ft. coils and cut to proper lengths, after which the sleeve mentioned previously, and shown in Fig. 2, was put on. This sleeve consists of a piece of copper tubing of dimensions as shown, and is placed over the strands and firmly soldered in place. The chief advantage of this sleeve is that all strands are firmly held in place, making the result as good as a solid wire of equal size. The use of this sleeve eliminated many cases where the ter-

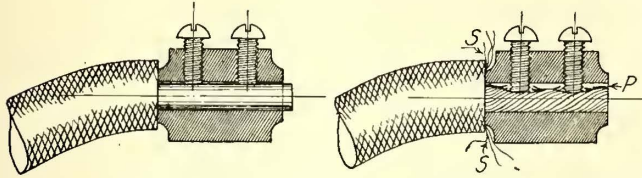


FIG. 3—MOTOR LEAD TERMINALS WITH AND WITHOUT REINFORCING SLEEVE

minal screw was set in so tight that it cut or spread the strands, causing the lead to burn open-circuited.

Fig. 3 shows a motor lead fastened in a field terminal both with and without terminal sleeve applied. The letter *P* indicates the sinking of the screw into the strands. In many cases it was found that nearly three-fourths of the diameter of the wire was cut through and the lead had burned off at this point due to poor contact and insufficient carrying capacity. The letter *S* shows the outside strands which had unravelled and did not get in the terminal at all. Such cases gave rise to burning at the terminals and a possibility of grounding through these strands to the motor shell. The sketch at the left in Fig. 3 shows the wire held as firmly as if it were a solid wire, the terminal screws being pressed against the sleeve which protects the strands. It must be understood that before this step of standardizing motor leads was accomplished, the old-style fields having permanent leads were replaced with fields equipped with terminals, and it was at this time that these troubles were experienced.

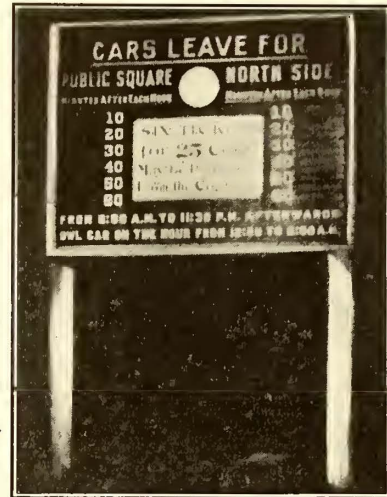
The concentration of the supply of motor leads and end connections at the department of electrical repairs insured the proper length leads of the correct sized wire. In addition the ends were carefully prepared for insertion in terminals, making motor lead maintenance as nearly foolproof as possible. Since the above methods have been in use cases of motor lead trouble due to the lead connection to the field are practically unknown. The length of lead outside the shell has been so changed from time to time that the present length, as shown in Table II, is such that motor lead replacement depends only on the life of the wire used.

An Unprepared Test of the Small Fire Extinguisher

The ready advantages of the type of small fire extinguisher containing volatile liquid of low conductivity to electricity were well demonstrated in an accidental manner on June 5, when a fire broke out in the motor windings of an Omaha street car, just as the car was passing the office of the Johns-Manville Company. According to the Omaha *World-Herald*, an employee of that company, who happened to be looking at the passing car, rushed out with a fire extinguisher and extinguished the blaze with practically no damage, and the car was able to proceed. This prompt action would doubtless have been impossible by using water which, furthermore, would have been dangerous on account of its property as a conductor of electricity.

Flood-Light to Illuminate Time Board

The time board of the Springfield (Mo.) Traction Company, shown in the accompanying illustration, is illuminated by the use of a small General Electric flood-light. This time board, which is located near the

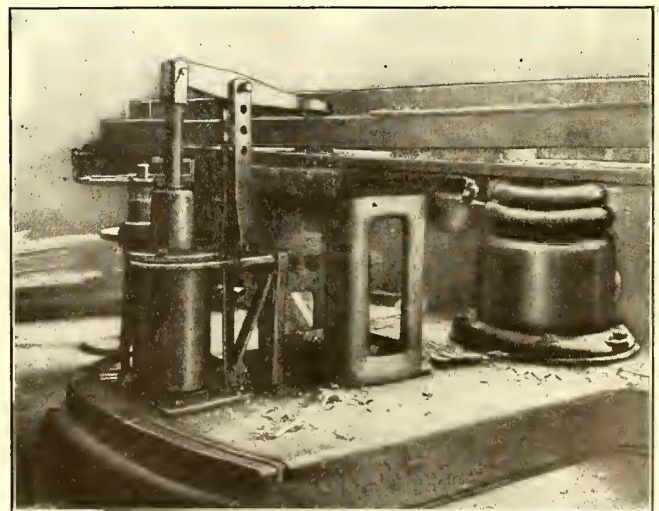


TIME BOARD OF SPRINGFIELD TRACTION COMPANY ILLUMINATED BY FLOOD-LIGHT

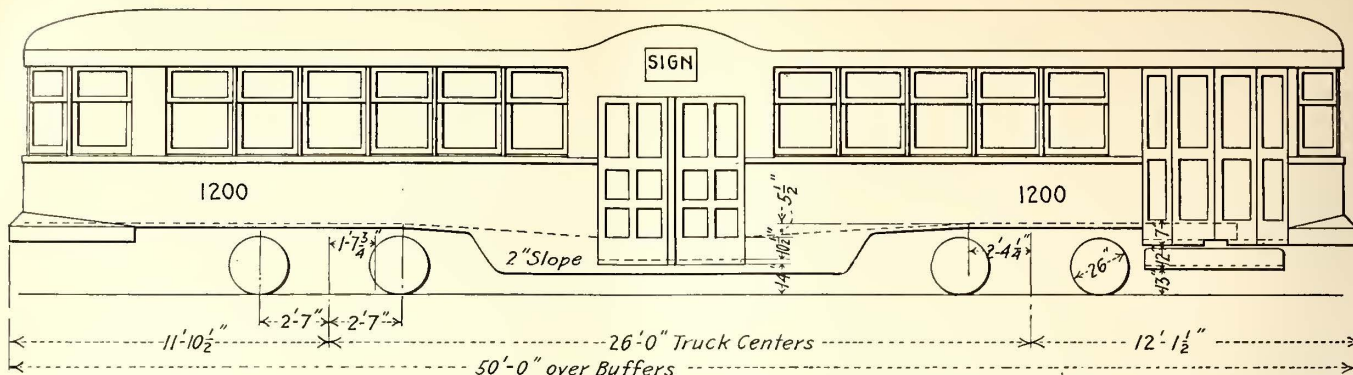
“Frisco” depot, is of great convenience to the traveling public, and will be of still greater convenience as soon as a Western Union clock is installed in the space left for it in the center of the board.

Air Clamp Facilitates Drill Operations

Bolting the work in position on the radial drill in the shops of the Omaha & Council Bluffs Street Railway, Omaha, Neb., has been obviated by the substitution of an air clamp. It has also had the effect of greatly simplifying and hastening all drilling operations. This attachment in the clamped position is shown in the accompanying illustration. It consists of a 7-in. x 12-in. standard air-brake cylinder and an engineer's valve mounted on the radial drill bedplate. Several lengths of clamping arms are provided for different drilling operations and the pivoted point of the clamping arm is adjustable vertically. Air for this clamp is obtained from a shop compressed air line, where a pressure from 80 to 100 lb. per square inch is available. The pressure at



AIR CLAMP WHICH SIMPLIFIES DRILL OPERATIONS



ELEVATION OF NEW PAY-AS-YOU-PASS CAR FOR ROCHESTER, N. Y.

the end of the clamping lever, however, is multiplied at the brake cylinder and by the lever arm, and a force of approximately 1900 lb. is obtainable at the end of the clamping lever.

Fifty Pay-as-You-Pass Cars for Rochester

The New York State Railways-Rochester Lines have just ordered from the Cincinnati Car Company fifty front-entrance, center-exit cars of Peter Witt's post-payment design. As shown in the accompanying elevation and plan, the cars will be 50 ft. long over the buffers and 26 ft. between truck centers. The height from the pavement to the exit level at the center will be 14 in., and the height from this level or well to the main floor, 10 $\frac{1}{4}$ in. At the front entrance, the height from the pavement to the tread of the folding step will be 13 in., the height of the riser 12 in. The doorway to the front well will have an over-all width of 5 ft. 4 $\frac{3}{4}$ in., and will be furnished with a center railing to encourage two people to enter at one time. This front well will be 7 in. below the main body floor. The riser is to be set radially, one object being to secure extra seating capacity and another to permit the passenger to take one step on the lower level before using the riser.

The bodies will be mounted on Baldwin arch-bar trucks fitted with Hess-Bright ball-bearing journal boxes and National 26-in. diameter cast-iron carwheels. The four motors are to be of the GE-258 type, fitted with ball bearings on the armature ends and rated 25 hp. each at 600 volts. The K-12 single-end control to be used includes magnetic line switches.

As the rides in Rochester are comparatively short and it is desired to handle the traffic most expeditiously, longitudinal seats of Hale & Kilburn manufacture are to be used. They will seat fifty-two people. The Cleveland type fare box is to be placed at the center of the car and on the main floor level.

These cars will be furnished with Hunter signs bearing 6-in. to 7-in. lettering. Signs will be placed over

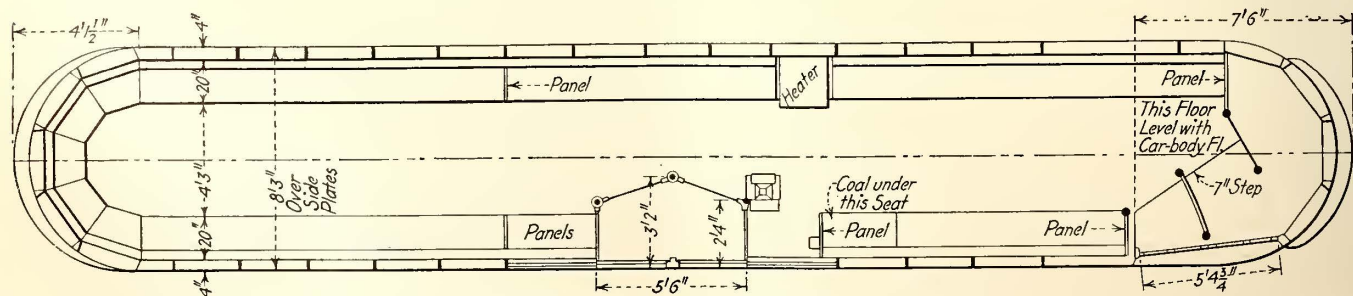
the center exit doors, in the window on the devil strip side opposite these doors, and in the center sash at the front end.

The Consolidated Car Heating Company will furnish the pneumatically-operated door and step mechanisms, the motorman's signal, the passengers' buzzers and the forced-draft heaters. Other equipment on the cars include Q-P trolley catchers and Eclipse fenders.

The Equipment Makes the Wreck Car

Wreck cars for street railway service need not be elaborate, but there are many elements of their equipment which are essential to the quick handling of wrecked cars. There is nothing particularly novel about the construction of the wreck car used by the Public Utilities Company of Evansville, Ind., except that it is a car built especially as a wrecker. This is a double-end car of all wooden construction, fitted with side doors. Westinghouse No. 56 motors and General Electric K-35-G control. The car is 34 ft. long over all, and 8 ft. 6 in. wide. Both ends are fitted with footboards for the convenience of the wrecking crew. The car is equipped with automatic couplers for interurban service and an ordinary link and pin coupler for street railway service.

As a result of experience the equipment of this wreck car, which is used for both city and interurban service, has been added to and improved until the mechanical department believes it is as near perfection for the service it performs as it can be made. Just inside each of the center side doors are pivoted jib cranes with 8-ft. horizontal members fitted with 1-ton chain hoists. The motorman's positions at each end of the car are guarded with substantial wooden frames extending from the roof to the floor of the car. Fastened to these are curtains, which may be pulled down at night so that the light from the interior will not obstruct the motorman's vision. A combination heating and cooking stove, set in a box of sand, occupies a position near one end of the car, and immediately back of it is a combination tool box and bench. This box contains one 1 $\frac{1}{4}$ -in. and one 1 $\frac{1}{2}$ -in. snatch block with 50 ft. of rope; 75 ft. of $\frac{5}{8}$ -in., 50 ft.

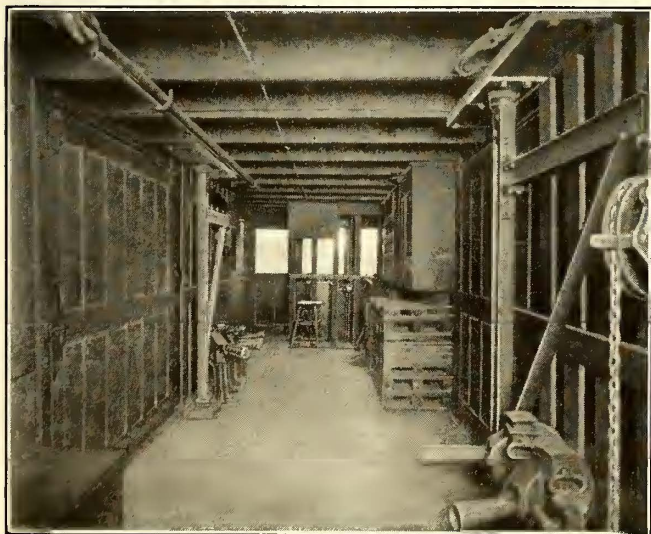


PLAN OF NEW PAY-AS-YOU-PASS CARS FOR ROCHESTER, N. Y.

of 1/2-in., 50 ft. of 7/16-in., 50 ft. of 3/8-in., and 50 ft. of 5/16-in. chain, all fitted with rings and hooks. On the wall of the car above this bench is a folding table, and in a cupboard on the opposite side of the car is a complete cooking outfit and set of dishes. Part of the outfit in the cupboard includes such staple groceries as may be kept there safely in buckets, tins, etc., and, in cases of emergency, arrangements are made completely to supply the larder.

In clearing wrecks jacks play a very important part, and this fact has not been overlooked in equipping the Public Utility Company's wreck car. This equipment includes two 35-ton Simplex ratchet jacks, two 20-ton jacks of the same type, four 15-ton jacks, two 10-ton jacks, one 15-ton slewing jack and two 15-ton journal jacks. A unique feature of the car equipment is the built-up blocking. These blocks range in sizes from 1 in. to 10 in. thick, all being 24 in. long and 10 in. wide. All of this blocking is made of 1-in. oak boards with oak separator blocks of various sizes. The complete selection of blocking includes fifteen 1-in. blocks, twenty 2-in. blocks, and ten each of the other sizes ranging from 3 in. to 10 in. and varying in size in steps of 1 in. Built-up blocking was adopted because it is much lighter than solid blocking, and thus it is more readily handled, and experience has demonstrated that it is just as serviceable.

Two trolley poles fitted with trolley wheels are also carried on brackets suspended from the roof of the car. There are two classification lamps and two marker lamps in a rack at one end, and beside these eight flags of various colors, a set of four railroad lanterns and six large lanterns for night work. In a set of bins mounted on one of the sides of the car is a complete stock of bushings, sleet cutters, fuses, tape, connectors, washers, nails, cotterspines, etc. At convenient points on the car sides and in especially prepared racks are mounted one axe, one hand axe, one cross-cut saw, one hand saw, one set of wrenches, one bolt cutter, one hack saw and a set of track repair tools, including gages, lining bars and spike



INTERIOR VIEW OF ONE END OF EVANSVILLE WRECK CAR

mauls. Four small turtle-back car replacers and a magneto for testing car wiring are also made a part of this wrecking outfit. Various sizes of wire which can be used in making temporary repairs are carried in coils, and as a rule this is supplied in sizes Nos. 2, 4, 6 and 14. Other miscellaneous equipment includes trolley rope, waste, buckets, fire extinguishers, stools, brooms, etc. Many of these tools are shown in the accompanying illustration.

Insurance Increased for K. C., C. C. & St. J. Ry. Employees

The 133 employees of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., who constitute the insurance organization of the company, have increased their life insurance from \$500 to \$1,000, without additional assessments. Group insurance is carried by the Equitable Life Assurance Society, New York. Previous to 1905, the employees paid 10 cents a week, and the company paid \$1 a quarter for each member, into a fund; benefits paid were \$7 a week for disability, and \$100 for death. A year ago the Equitable made a contract to carry the life insurance, each man being protected with a \$500 policy. The organization continued its health and accident feature, the members continuing to pay 10 cents a week, and the company \$1 a quarter for each. The surplus has continued to accumulate, and the doubling of the benefits for death was decided upon. It is likely that the Equitable, which may soon adopt the practice of disability insurance by groups, may take over the entire insurance feature of the organization. The men add money to the insurance fund each year with two or three entertainments. Last year about \$500 was realized from such sources. The surplus now in the treasury would carry both health and life insurance projects for three years, with the 10 cents a week from members. The company and the organization, however, continue to add to such surplus.

Results on Vienna Railways During War

The report of the Municipal Railway at Vienna, Austria, for the fiscal year to June, 1915, is of unusual interest, because it shows the war's effect on a municipal enterprise that employed 12,368 persons at the time of the opening of hostilities. Of these, 5700 men joined the army immediately and 1706 more before the end of the fiscal year, and at that time 10,083 persons were employed, the vacancies having been filled chiefly by women. The service continued uninterrupted and also undertook new work, such as the transportation of wounded by special street trains and the forwarding of freight of all kinds. The official report of the city shows that the total number of paid miles covered by its street cars in 1914-1915 was 55,921,500, or only 11.2 per cent less than in the preceding year of peace, while 327,000,000 passengers were carried, or 1 1/2 per cent less. The total revenue from the electric lines was \$10,764,762; from street traction, \$92,351, and from auto-omnibus service, \$9,875. The last mentioned was just being inaugurated when the war came. Against this was an expenditure of \$6,313,493 for electric, \$155,862 for steam, and \$23,065 for auto service, a total of \$6,492,420 for operation expenses. This, with the usual annual charges for damages, benefits, dividend on invested capital of \$39,077,500, etc., increased by \$710,500 for expenses due to the war, made the total expenditures \$10,021,695. There was a surplus of \$861,676. Of the surplus, part was spent for new equipment, payment of money borrowed, etc.

The *Boston News Bureau* says that the Boston Elevated Railway's snow expense last winter was practically three times as large the year before. Up to April 1 it cost the Boston Elevated Railway \$130,000 to take care of the snow and keep its lines open during the unusually severe weather which featured the winter. This \$130,000 is more than one-half of 1 per cent on the \$23,879,000 of stock.

NEWS OF ELECTRIC RAILWAYS

PORTLAND VALUATION FIGURES ANNOUNCED

Outline of Salient Features of Case—Statement Made by Company in Reply

The Public Service Commission of Oregon has handed down a decision in the matter of the value of the Portland Railway, Light & Power Company properties in western Oregon. The next matter to be taken up will be that of rates, unless the company can secure additional consideration of the valuation question. As stated in the *ELECTRIC RAILWAY JOURNAL* for June 17, page 1151, the commission has decided that the reproduction cost less depreciation amounted to \$40,822,833 on June 30, 1915. This is \$877,940 less than the company claimed the same valuation to be, according to its method of calculation. The commission's valuation of the reproduction cost new is \$45,375,027. It is believed that this estimate will form the basis of the various rate investigations that will be made. The figure does not include any working capital, going value, investments in subsidiaries, construction work in progress or investments in undistributed construction accounts. The commission has made no allowance for going value, but an inspection of the decisions indicates that it is willing to receive additional testimony on this point and will give it attention in the future.

The company's complete claim before the commission was \$61,040,004. The largest eliminations by the commission were \$7,489,446 for "going value" and about \$6,000,000 for property that the commission did not consider useful as public utility property. The commission will allow working capital to the amount of \$1,110,000 instead of \$1,850,000 deemed necessary by the company.

The commission concedes that the company's earnings have been falling off materially, and puts the blame of this on jitney competition and electrical competition in Portland. The commission's remarks on this point are as follows:

"It will be noted that the last few years has shown a marked falling off in earning capacity. This is shown by the record to be due to the following three causes: general and local depressed business conditions; the advent of competition in the electric lighting and power field, which has taken from the respondent a considerable proportion of its most profitable traffic and without correspondingly diminishing fixed and running charges, and the practically uncontrolled destructive competition of jitneys. While revenue has fallen off, it is evident that the effect has been kept to a minimum by rigid economy in other directions. To a very considerable extent the conditions shown for the last three years are abnormal; and the causes for the conditions have apparently reached the climax of their effect."

The commission apparently considers the question of going value to be debatable. Its decision reads in part as follows:

"In this figure the utility included \$7,489,446 as representing the cost of developing its business, commonly known as 'going value' and which is not included in the figure found by the commission as representing the reproduction of physical properties. Whether this claim of going value is reasonable is not determined in the present findings. The theory upon which the going value claim was made is not approved by the commission, and the utility is afforded the opportunity to present further testimony upon the question of going value in order to bring its claim for this element of value, which is well recognized in utility valuations, within the rule of modern decisions.

"The amount claimed by the utility as representing going value is equivalent to 16 per cent of the figure found by the commission as reproduction cost of the physical property of the utility. In the appraisal submitted by the utility a claim was made that the value of its water rights used in both utility and non-utility operations, was \$6,000,-

000. The Supreme Court of the United States has laid down a rule that developed water rights shall be valued in proceedings of this character.

"The commission, by its decision, materially reduced the claim of the utility for water right values, and the principal differences between the appraisals submitted by the utility and the ultimate findings of the commission lie in the elimination, for the present, of the utility's claim for going value, in reduction in the claim for water right and real estate values, in the reduction of percentages for overhead costs added to specific construction, and in a decrease in the amount claimed as working capital."

The commission finds that the company is now paying interest on \$1,057,000 of city bonds for pavements. The company had no share in determining if this money should be spent, though it was one of the heaviest payers. It has already paid off about \$1,000,000 of these bonds. The commission finds that out of every dollar taken in by the company, 20 cents is paid out to city, county and state for taxes, franchises, bridge rentals and other items of a similar nature.

The commission states specifically that the present findings are not to be considered the value of the company as a business entity. The commission found that the aggregate investment of the present holders amounted to \$54,047,042, but this, of course, includes all company property.

Franklin T. Griffith, president of the company, said in part:

"The findings of the Public Service Commission have just been served on us and we have, as yet, had no opportunity to analyze the values found. From such study as we have been able to give the findings, however, it appears that the commission materially reduced our claims as to cost of construction of the physical property and also the values claimed for our rather extensive holdings of real estate used in both utility and non-utility operations. To what extent the commission has been influenced by the abnormally low prices of real estate during the last two years of extreme depression, we are unable to determine.

"One large item of value claimed by the company and not included in the commission's findings is the intangible element of going value which is representative of the cost to the company of developing its business and is not represented by tangible physical property. The claim of the company for this item was approximately \$7,500,000, and this entire amount is excluded in the findings of the commission, although the findings state that going value is recognized in utility valuations as an important element and that the commission is willing to consider the allowance of a going value, provided that upon a further hearing the company is able to comply with certain specific conditions laid down by the commission in its findings as essential to the establishment of such a claim.

"The amount claimed by the utility as representing going value is equivalent to 16 per cent of the figure found by the commission as representing reproduction value of physical property. This percentage is of peculiar interest in view of the fact that this element of value in similar proceedings elsewhere in the United States has been found reasonable by courts and commissions when reaching a figure ranging from 20 to 30 per cent of the reproduction value of physical property.

"The developed water rights owned by the company are used about one-third in non-utility operations and two-thirds in utility operations. Our total claim for water right values is \$6,000,000, and while we cannot, from the findings, determine as yet the theory of value adopted by the commission, it appears that the commission has allowed us practically our appraisal of water powers used in non-utility operations, in which the rate-paying public is not interested, and on some of our developed water powers used in utility operations has allowed us not much more than nominal values."

COURT PROCEEDINGS START IN SAN FRANCISCO
Construction Held Up While Question of the City's Right to
Parallel United Railroads on Market Street Is
Being Determined

In order to determine whether the Municipal Railway, San Francisco, Cal., has the right to construct its tracks parallel to those of the United Railroads on Market Street, the president of the board of works with a construction foreman started work on the Van Ness Avenue crossing on June 13. Attorneys for the United Railroads obtained from the United States District Court a temporary restraining order commanding the city to stop the work and to show cause on June 19 why a preliminary injunction should not be issued pending the settlement of the whole matter in the courts.

Both sides have agreed, it is affirmed, that the case will be carried to the end to determine whether the city has the right to build tracks wherever it pleases regardless of franchises issued to corporations. The United Railroads contends that the provision in its franchise declaring that the city shall not grant a franchise to a competing line for more than five blocks of parallel track binds the city as well as lines operated by private companies. On the other hand, the city cites the Knoxville case, decided a number of years ago by the Supreme Court and since accepted as precedent. In the Knoxville case a franchise was granted to a water company to lay mains and furnish water to the city for a number of years, but before the expiration of the franchise the city decided to build its own water system and furnish a municipal supply. The final decision in the case was that while the city was privileged to grant an exclusive franchise, it could not deprive itself of the right to construct a water system of its own whenever it should so elect.

By bringing up a constitutional question the United Railroads was able to enter the Market Street case in the federal district court. The fight is expected to be carried to the Supreme Court for its final decision. The city desires to complete the laying of double tracks all the way on Market Street from Kearny to the eastern portal of Twin Peaks tunnel and to run a connection on Church Street from Market to the present terminus of the municipal line on Church Street. This would give the municipality double tracks the entire length of Market Street, paralleling the United Railroads, and would connect the Church Street and Van Ness Avenue lines. The injunction not only prevents further construction on the proposed lines affected, but will leave the city's Church Street line isolated and without means of getting cars to it when it is completed in the near future.

CHANGES RECOMMENDED IN QUEENSTON LINE

The Ontario Railway Board made public on May 29 its recommendations to the International Railway, Buffalo, N. Y., based on the study which it made of the property of the company at Queenston following the accident on the grade there last summer. The engineers reported to the board in November. The board orders that the tracks from the upper arch bridge to the Grand Trunk bridge be ballasted with stone and gravel, and that where the board's engineer directs suitable drains or ditches be placed in tracks with cross-drains to carry off the water. This work must be ready for the inspection of the engineer by June 15, 1916. All defective or decayed ties must be removed at once, and low joints be raised or ballasted under the ties; all outer rails which are in a worn condition and are situated on a curve must be replaced; guard rails must be inspected and added to or extended as the engineer of the board requires; the safety switch near Brock's monument must be reconstructed according to a plan approved by the board; all weeds and vegetable growths must be removed from between the rails and for a distance of 18 in. outside the track, as well as from the devil strip, and kept clear; portions of the cliff where the track approaches close to the edge must be inspected and reported upon not later than the first week in May each year.

The company is required, during the current year, to rebuild all its culverts under the tracks, of concrete or cast-

iron pipe, and to reconstruct the railway from Queen Street in the village of Queenston to the river dock with a safety switch, and with altered grades and curves, in accordance with plans approved by the board. Hereafter cars with double motor equipment are to be operated to the Queenston Dock and all brake rods and brake equipment must be strengthened as required; sanders of ample capacity, as approved by the board, are to be fitted to the cars and adjusted to deposit the sand as closely to the wheels as possible. These must be inspected frequently.

The board directs that in operating up or down the Queenston grade an open car must not have a load of more than 30 per cent over the seating capacity, and closed cars not more than 30 per cent over its seating capacity. The board also requires stricter observance of the orders to conductors and motormen dealing with the speed of cars at curves, crossings, etc.

BUFFALO SOUTHERN RAILWAY STRIKE SITUATION
UNCHANGED

All efforts to operate cars over the interurban lines of the Buffalo (N. Y.) Southern Railway, whose platform men have been on strike for seven weeks, have been unsuccessful. E. G. Connette, president of the International Railway, over whose tracks the line operates from the city line to the Main Street terminal, has notified Nathan A. Bundy, receiver for the Buffalo Southern Railway, that owing to an agreement between the International Railway and its employees, cars with non-union crews cannot be operated in the city limits. The sixty employees who went on strike for a wage increase and renewal of their agreement are willing to return to work at the old wage scale, but demand a renewal of their union agreement. Stockholders of the road have notified the Erie County Supervisors' Committee, which has investigated the strike situation, that they have no objections to the renewal of the agreement, but Mr. Bundy is firm in his refusal to recognize the union. He also refuses to arbitrate. P. J. Downey, of the New York State Board of Mediation and Arbitration, has threatened to conduct an investigation in court into the management of the road in an effort to bring about a settlement. Henry Lein, a stockholder, has retained counsel to start a stockholders' action to have Mr. Bundy removed as receiver.

SUBSIDIES SUGGESTED

An interesting program of maintaining the commercial standing of Louisville in spite of prospective prohibition legislation by extension of the electric railways out of the city is suggested in a letter published over the name of Rush C. Watkins, one of the leading business men of that city. Develop the city through interurban service, he suggests, and he proposes that the city shall aid in financing the extensions. His letter follows:

"There is little doubt, I suppose, that the statewide people of Kentucky are going to force a vote on prohibition within a few years, and if this is done Kentucky will likely go prohibition, as there are more voters in the dry than in the wet territory. Louisville will get a severe commercial blow and, in my judgment, one of the ways to offset this damage is by developing the city through interurban service.

"First—Build a line out the Brownsboro road.

"Second—Extend the Bardstown road line to Bardstown.

"Third—Extend the Preston Street line to Shepherdsville, or possibly this line could be run on to Bardstown cheaper.

"Fourth—Extend the Eighteenth Street road line to Mammoth Cave through Elizabethtown and Hodgenville. Push the government ownership of Mammoth Cave.

"Fifth—By all means extend the Shelbyville line to Frankfort, there connecting with the Bluegrass system which gives us traction service all over the Bluegrass country, and I believe we will get our share of that business instead of Cincinnati getting it all. Cincinnati, while a good neighbor, pays no taxes in Kentucky and is not in a position to reciprocate the business Kentucky gives her.

"Sixth—The banks are full of money, and a flotation of bonds to cover these extensions could be easily sold. Louisville and Jefferson county could afford to guarantee these bonds rather than not have these improvements."

ROCHESTER LINES REPLY TO COMMISSION RECOMMENDATION

The reply of the New York State Railways, Rochester Lines, to the recommendations for improvements in service in Rochester made by the Public Service Commission for the Second District of New York in connection with the decision adverse to the jitneys referred to in the *ELECTRIC RAILWAY JOURNAL* of May 20, page 957, was filed with the commission on June 20. The *Rochester Herald* of June 21 said that the reply had not been given out for publication there. In the absence of Horace E. Andrews, president of the company, from New York access to the copy of the reply at the office of the company in New York was made contingent upon securing the necessary permission from Rochester. This could not be done before going to press. From Albany it was reported that the answer of the company was in the nature of simply a formal reply, with the prospect of conferences being held by the company, city and commission representatives before final disposition is made of the case.

INTERURBAN MEN TESTIFY BEFORE TOLEDO COMMITTEE

At a meeting of the subcommittee of the Milroy Street Railway Commission at Toledo, Ohio, on June 16 D. D. Schenk, president of the Toledo & Indiana Railway, and E. A. Burrill, general manager of the Northwestern Ohio Railway & Light Company, estimated from statistics that seven interurban lines entering the city paid the Toledo Railways & Light Company \$83,563 in 1915 for the use of its tracks. Six of these lines carried 2,418,797 passengers, but there were no figures to show what the seventh did. The average amount per car-mile paid to the company was 0.2015 cent. In addition, the roads paid a share of the maintenance of the freight and passenger depots. This information was sought by the committee in its endeavor to learn all the sources of revenue of the city line. Messrs. Schenk and Burrill estimated the cost of building single track at \$60,000 a mile, and of double track at \$110,000 a mile. They said that the interurban companies would prefer an independent track for their entrance to the city, because it would allow them to make better time.

ST. LOUIS MILL TAX JUDGMENTS PAID

The United Railways, St. Louis, Mo., on June 15 notified the City Counselor that it would send a check to the city for \$1,839,205, the full amount of seven judgments in favor of the city to cover the mill tax owed by the company from 1903 to 1910. On the day following, payment was made. Acknowledgments were filed shortly before noon in the divisions of the circuit in which the judgments were obtained. The total amount due for that period is about \$2,300,000, but the excess over what the United Railways has paid is represented by judgments against the St. Louis Transit Company. The United Railways contends that the transit company has no assets. No bond was put up to insure any possible judgment against the transit company. About \$1,000,000 of mill tax has accrued since 1910. This is still in litigation. The money with which to pay the tax is available through a special reserve fund set up to meet a possible decision unfavorable to the company. The Supreme Court early in the previous week decided against the United Railways on its final appeal for a reopening of the case.

SELECTION OF TRENTON ARBITRATOR STILL UNSETTLED

Another conference was held at Trenton, N. J., on June 21 on the arbitration covering the reinstatement of employees of the Trenton & Mercer County Traction Corporation, but no agreement could be reached on the arbitrators and from present indications the arbitration in these cases will be prolonged for some time. C. Howard Severs, arbiter for the union, printed a statement in the newspapers in which he charged the company with delaying the matter. Peter E. Hurley, general manager of the company, has denied this. He said that the company is anxious to have the matter cleared up as soon as possible. According to Mr. Hurley the union objected to Samuel T. Atchley, warden of the New Jersey State Hospital for the Insane; J. M. Berrien, tax

collector of Lawrence township, and William Hutchinson, retired. Mr. Hurley further said that when the third arbitrator was selected he would bring before the arbitrators the men who checked up the conductors and whose evidence was responsible for their dismissal. Representatives of the company and union on June 21 again discussed the proposed new working agreement to become effective on July 1. No conclusions were reached and further conferences will be held.

Progress Made in Massachusetts Arbitration.—It was announced in Springfield on June 18 that an agreement between the Springfield Street Railway and the Worcester Consolidated Street Railway and their employees has been reached so far as the wages of uniformed men were concerned. The next conference was arranged to be held at Worcester on June 22.

Increase in Wages Granted in Saginaw.—The Saginaw-Bay City Railway, Saginaw, Mich., has increased the wages of its motormen and conductors 1 cent an hour. Under the new scale beginners receive 21 cents an hour. The pay of men who have been in the company's employ five years or longer is increased to 25 cents an hour. On the interurban lines the scale is from 24 cents for first-year men to 27 cents for fourth-year men.

Action on Pittsburgh Transit Commissioner Delayed.—The City Council of Pittsburgh, Pa., upon motion of John H. Dailey, has referred back to the finance committee the resolution for the selection of a transit commissioner to consider and report on the rapid transit needs of the city with respect to some of the proposals for traffic betterment already advanced. The measure authorized the Mayor to nominate the commissioner, who is to be confirmed by Council.

Conductor Indicted for Using Spurious Coin.—An indictment has been returned by the United States Grand Jury in Buffalo, N. Y., against a conductor formerly employed by the International Railway charging him with using a coin in imitation of a nickel. The coin, when deposited in the fare box, would register as a penny. The evidence was obtained and presented to the Federal Grand Jury by United States District Attorney Stephen T. Lockwood, who acted in cooperation with local United States secret service operatives. The case will probably go to trial before District Judge Hazel.

Military Precautions Tightened at Niagara.—Owing to stringent military and immigration restrictions along the Canadian-Niagara frontier, conductors on all Gorge Route and International Railway cars operating over the Park and River division and Upper Steel Arch bridge at Niagara Falls, Ont., are instructed to notify the military authorities of all passengers who do not hold round-trip tickets. Tourists of German extraction are practically prohibited from entering Canada except under special permission. Armed uniformed Dominion soldiers ride on every car between Niagara Falls and Queenstown, Ont.

Rights Denied to California Monorail Line.—The Railroad Commission of California has denied, without prejudice, an application of the Clear Lake Suspended Monorail Company, for authority to issue \$50,000 of stock and \$900,000 of bonds, to provide funds to build a monorail line between Hopland, Mendocino County, and Lakeport, Lake County, 24 miles. The commission says that as it is estimated standard type of steam road can be built between these points for \$600,000 and the estimate for the monorail construction is \$1,223,000, the authority should not be granted. This denial does not preclude the applicant from renewing its petition.

Negotiations Still Pending on East Cleveland Franchise.—At a conference last week between officials of East Cleveland and Fielder Sanders, street railway commissioner of Cleveland, Mr. Sanders demanded that the suburb accept a franchise with a 5-cent cash fare and free transfers or six tickets for a quarter, with 1 cent for transfer. J. J. Stanley, president of the Cleveland Railway, agreed to this. Mayor Minshall of East Cleveland made a counter proposition that the company build a crosstown line in East Cleveland, renew its tracks and pave its portion of Euclid Avenue through the town and establish an express service on Superior Avenue for East Cleve-

land patrons. He did not commit himself to the higher fare which Commissioner Sanders proposed.

Kentucky Compensation Law Upheld.—One of the important court rulings of the year in Kentucky is that of the Court of Appeals of the State upholding, as the court of last resort, the constitutionality of the Kentucky workmen's compensation law. This measure will go into effect on Aug. 1 and the commission which will administer it is now listing employers who signify their intention to accept it. The measure is virtually compulsory, affecting businesses with more than five employees, since it deprives those employers, and employees, who do not accept it of the important common law defenses. No State fund is provided for and employers may insure with commercial or mutual companies or, if they are able, may carry their own insurance. All the electric railways in Kentucky will be affected.

Cleveland a Mecca for Pickpockets.—For the last two or three weeks pickpockets have been unusually active on street cars at Cleveland and in the crowds boarding and alighting from cars. It is estimated that \$2,000 was taken in that way within one week. Chief of Detectives Rabshaw suggested to J. J. Stanley, president of the Cleveland Railway, that the motormen and conductors aid the police in apprehending offenders by acquainting themselves with the pictures of pickpockets in the Bertillon bureau and then keeping a close watch. In many cases the courts have suspended sentence and this has discouraged Mr. Stanley. He said that he is willing to co-operate with the police department if the thieves are punished when captured, but that "golden ruling" will do no good in such cases. He will, however, have the men warn passengers when they see suspicious characters enter the cars, and it will be done in such a way as to give all notice.

Agreement Predicted for Operation of New Philadelphia Line by P. R. T.—A meeting of the board of directors of the Philadelphia (Pa.) Rapid Transit Company, including Sheldon Potter and William Hancock, the two new city representatives, was held on June 19. Mayor Smith said that an informal talk with Mr. Stotesbury and Mr. Mitten led him to the conclusion that the transit company was in a "most receptive mood." The Mayor said: "We discussed the prospects for a new agreement between the company and the city covering transit matters, and arranged for a conference between the new city representatives and Mr. Stotesbury, Mr. Mitten and myself for the preliminary discussion. I do not know when this meeting will be held, but I think it will be soon. I have been studying the 1914 agreement in order that it might be used as the basis for the new contract. I feel certain that the company will take over and operate the new lines. It naturally does not want to be placed in the position of competing with other companies."

Comptroller Gives New York Subway Expenditure Figures.—William A. Prendergast, comptroller of the city of New York, on June 4 issued his report on the city's financial transactions for the first quarterly period of the year. Tables in the report show that the commitments for rapid transit construction to March 31 of this year aggregated \$227,272,122, and the expenditures to March 31 were \$164,613,010. In a summary of the report Comptroller Prendergast says: "The outlays by the city on the present subway operated by the Interborough Rapid Transit Company have amounted to \$56,246,458. The commitments under contracts, which cover the additional railroads now in course of construction, to be linked with the present system operated by the Interborough Rapid Transit Company, total \$65,925,888, of which \$42,225,565 has already been expended. Under Contract 4, which comprises the Centre Street loop lines, the Fourth Avenue subway, and the other lines to be operated by the Brooklyn Rapid Transit Company, or the New York Municipal Railway Corporation acting for it, the city's commitments aggregate \$102,211,190, of which \$66,162,986 was expended up to March 31."

Strict Accountability Demanded in Bridge Fare Case.—The Public Service Commission for the First District of New York has ordered the Brooklyn & North River Railroad, which operates over the Manhattan Bridge from Manhattan to Brooklyn, not to engage in undue competition with the Manhattan Bridge Three-Cent Line, which operates over the same bridge. The Brooklyn & North River Railroad is

owned by the Third Avenue Railway, New York Railways and the Brooklyn Heights Railroad. It received a franchise for operation across the bridge in 1913, the year after the Manhattan Bridge Three-Cent Line obtained its bridge rights. The franchise of the Brooklyn & North River Railroad was hedged about with restrictions that were designed to prevent it from competing unfairly with the Manhattan Bridge Three-Cent Line. The complaint that led to the present order was made on Dec. 13, 1915. The Three-Cent Line charged its rival with having started a service from Broadway, Manhattan, across the bridge to Concord Street, Brooklyn, with a rate of fare of 3 cents or two tickets for 5 cents. Commissioner Hayward held that no reasonable effort had been made, according to the evidence, to see that the 3-cent passengers of the Brooklyn & North River Railroad were dropped before being carried a reasonable distance from the Brooklyn terminal of the bridge. He believed that sort of service was indefensible under the franchise and should be discontinued. He added that the practice of turning back cars at Concord Street instead of sending them through to Fulton Street should be discontinued and it was so ordered.

PROGRAMS OF ASSOCIATION MEETINGS

Central Electric Railway Association

All those who decide at the last moment to take the Central Electric Railway Association's cruise on June 27-30 on the Great Lakes may make reservations with John Benham at the Hotel Secor, Toledo, Ohio, on Monday, June 26. A souvenir roster containing the names of all members and their guests, as well as their railway and business affiliations, will be published in connection with this trip. Those who make reservations with Mr. Benham on June 26 will not be included in the alphabetical list of attendants, but will be listed in an addenda which will be bound in the booklet. Up to June 21 more than 275 tickets for the trip had been sold.

Central Electric Railway Association

On June 20 William F. Stanton, secretary-treasurer of the New York Electric Railway Association, mailed to members the program for the thirty-fourth annual meeting of the association to be held on June 27 and 28 at the International Hotel, Niagara Falls, N. Y. The meeting will be opened at 10 a. m. on June 27. After the address of the president has been presented, the executive committee and the secretary-treasurer will report. Reports of committees will then be presented as follows:

Workmen's compensation insurance, by James P. Barnes, chairman; taxation and rates of fare, by E. G. Connette, chairman; safety rules by James P. Barnes, chairman; joint use of poles, by B. Penoyer, chairman; public relations, by C. Loomis Allen, chairman; membership committee, by James F. Hamilton, chairman.

The subjects for discussion at the session are as follows:

"The Use of Electric Railways in the Military Service," introductory paper by Col. J. B. Bellinger, U. S. A.

"The Advantage of Electric Traction in Time of War," introductory paper by James E. Hewes, general manager of the Albany Southern Railway, Rensselaer.

At the session of the association on the forenoon of June 28, the election of officers and other business will be transacted.

The program of entertainment for June 26 provides for tea and dancing at 5 p. m. and a concert and dancing at 9 p. m. On June 27 there will be golf at the Niagara Falls Country Club at 10 a. m., a concert from 11 a. m. to 12 o'clock noon, a luncheon for the ladies at the Buffalo Country Club at 1 p. m., an automobile trip for the ladies at 3 p. m., and tea and dancing at 5 p. m. The banquet will be held at 7 p. m. on June 27 and will be followed by dancing. At 10 a. m. on June 28 there will be a clock golf competition for the ladies; at noon there will be a trip through the power house at Niagara Falls, and at 2 p. m. a trip around the gorge route. The speakers at the banquet will include a number of men prominent in public life.

Financial and Corporate

ANNUAL REPORTS

Underground Electric Railways of London, Ltd.

The reports for the calendar year 1915 of the electric railways controlled by the Underground Electric Railways of London, Ltd., London, England, show that, while revenue has been larger, expenses have also been heavier. The Metropolitan District Railway alone of the group is under government control and has its net receipts guaranteed, but the Central London Railway, the City & South London Railway, and the London Electric Railway remain independent and have to bear unaided the higher cost of wages, fuel and materials. But under the "London electric railway companies' facilities act (1915)" the four railways, together with the London General Omnibus Company, have for the first time placed their net profits in a common fund to be divided in agreed proportions. The aggregate gross receipts of the five companies from all sources for 1915 were £5,481,144, of which £5,029,779 was retained by the several companies for revenue liabilities. The balance of £451,365 was divided in the following proportions: Central London Railway, 20 per cent, or £90,273; City & South London Railway, 2 per cent, or £9,027; London Electric Railway, 26 per cent, or £117,355; Metropolitan District Railway, 12 per cent, or £54,164, and London General Omnibus Company, 40 per cent, or £180,547.

The railways have benefited more from the arrangement so far than the London General Omnibus Company. The following table shows the revenue, expenditures and fixed charges of the railway companies:

	Revenue		Expenditure		Fixed Charges	
	1915	In-crease	1915	In-crease	1915	In-crease
Central London Ry.	£316,527	£39,151	£156,523	£12,184	£38,131	*£2
City & South London Ry.	202,389	56,471	110,609	16,642	30,253	1,932
London Electric Ry.	963,131	181,186	428,307	83,306	270,522	37,286
Metropolitan District Ry.	1,066,247	133,016	511,721	97,751	350,432	6,770

*Decrease.

Each of the railways thus showed substantial improvements in its earnings, and, although the operating costs increased, the margin available for dividends was larger, and each company was consequently able to pay larger dividends than in 1914. The London Electric Railway paid a dividend of 1¼ per cent on its ordinary shares, as compared with five-eighths of 1 per cent in 1914. The Metropolitan District Railway paid a dividend of 3 per cent on its second preference stock, as compared with 2 per cent in 1914. The City & South London Railway paid its full dividends of 5 per cent on all its preference stocks, as compared with 5 per cent on its 1891 and 1896, and only 2½ per cent on the 1901 and 1903 preference stocks. The Central London Railway paid a dividend of 3 per cent on its ordinary stock, as compared with 2½ per cent in 1914. These dividends were paid after making adequate allowance for reserves and without decreasing, and in some cases increasing, the balances carried into next year's accounts. The London General Omnibus Company showed a falling off in revenue and a decrease in working expenses. The amount available for dividend was less than in 1914, and a dividend of 12 per cent, free of income tax, was paid, as compared with 16 per cent for 1914.

The various companies, it is said, were caused by the war to contend with difficulties, problems and requisitions which disturbed their operations. Before the outbreak of war they employed approximately 27,500 men; of these 7700 are enlisted and 6300 attested, representing approximately 50 per cent of the staff. When all these disturbing elements are taken into consideration the results show the strength and vitality of the enterprise. The maintenance of its revenue during war-time is a proof of the strength and

soundness of the position of the Underground Electric Railway system as a great transport enterprise.

The "facilities act" above mentioned, under which an agreement was entered into on Dec. 21, 1915, but taking effect as from Jan. 1, 1915, provides that the five companies are to afford each other all reasonable facilities for through passenger traffic, etc., without apportioning the through fares among the five companies. In other words, each of the companies in the first instance keeps the whole of its takings from every source. Out of these takings it pays all of its revenue liabilities, which include working expenses, interest and dividends on all prior stocks (except the second preference stock of the Metropolitan District Railway Company) and sets aside a sum for reserve. The balance of the takings is credited to a common fund, and this fund is apportioned among the five companies as specified.

Omaha & Council Bluffs Street Railway

The comparative statement of income, profit and loss of the Omaha & Council Bluffs Street Railway, Omaha, Neb., for the calendar years 1914 and 1915, follows:

	1915		1914	
	Amount	Per Cent	Amount	Per Cent
Revenue from transportation.	\$2,839,180	94.76	\$2,822,953	95.17
Revenue from other operations	156,898	5.24	143,260	4.83
Gross earnings from operation.	\$2,996,079	100.00	\$2,966,213	100.00
Operating expenses	1,656,643	55.29	1,608,231	54.22
Net earnings from operation.	\$1,339,435	44.71	\$1,357,982	45.78
Miscellaneous income	12,919	0.43	7,214	0.24
Gross income.	\$1,352,355	45.14	\$1,365,196	46.02
Deductions from income.	872,010	29.10	856,875	28.89
Net income	\$480,344	16.04	\$508,321	17.13
Dividends	412,500	13.77	450,000	15.17
Surplus for the year.	\$67,844	2.27	\$58,321	1.96

The gross earnings in 1915, as compared with those of the year before showed an increase of \$29,865, or 1 per cent. The operating expenses increased \$48,411, or 3.01 per cent. A large part of this was due to increased service and to increased charges to injuries and damages. The occupation tax paid to the city of Omaha increased \$4,961, largely due to the consolidation with South Omaha and Dundee. The total increase in taxes for the year is \$7,533. The balance shown in the reserve for depreciation as of Jan. 1, 1916, was \$1,254,837. A total of \$83,011.83 was charged to this account during 1915 for rebuilding tracks and other replacements. During the year \$45,127 was expended for betterments, additions and extensions.

During the year the competition of the jitneys was at times very annoying and impaired the earnings to the extent of about \$100,000. This was practically all a loss in net earnings, as the operating expenses were not in any manner reduced by a decrease in service. During all of the first seven months of the year the jitneys were allowed to operate without any regulation whatever. The City Council passed several ordinances regulating them, but the ordinances were suspended by referendum petitions and therefore promptly repealed by the City Council, rather than to wait eighteen months for the next city election. Finally, in August, a very mild ordinance was passed and accepted by the jitney operators.

At times during the period the jitneys were operating without license or regulation, more than 100 jitneys were in operation daily on the streets where the traffic was most congested, and therefore where the street car service was most frequent. After the regulating ordinance went into effect forty-five licenses were issued, and bonds were furnished by the jitney operators in each instance. The most of these bonds were taken out for short periods, and, as they expired, the jitneys gradually retired from the field, until at the beginning of the year there were only fifteen jitneys in operation.

On account of the jitney situation, the dividend on the common stock was reduced to a 4 per cent basis, orders for twenty-five new cars were rescinded, and a conservative policy in general was adopted. It is said, however, that the loss of revenue through the jitneys was not without its compensations, for the company was almost entirely free from attacks by agitators for lower fares or requests for increased service or extensions.

SUPPLEMENTARY ACTION EXPECTED IN SYRACUSE

It is stated in Syracuse that on June 24 or on July 1 Justice W. S. Andrews is expected to hear the application of the Columbia Trust Company, as trustee, under the mortgage of \$2,500,000 of the Syracuse, Lake Shore & Northern Railroad, to make Hendrick S. Holden and C. Loomis Allen, the co-receivers of the Empire United Railways, Inc., parties defendant in the action to foreclose the Syracuse, Lake Shore & Northern Railroad mortgage. At the same time the application is made the Columbia Trust Company is expected to request the appointment of receivers for the Syracuse, Lake Shore & Northern Railroad. The bondholders' protective committee, at whose request the application will be made, will ask that Justice Andrews name C. Loomis Allen and Hendrick S. Holden as co-receivers of the road. This will take the affairs of the Syracuse, Lake Shore & Northern out of the receivership of the Empire United.

MARCH AND JANUARY-MARCH EARNINGS

Net Electric Railway Earnings Show Improvement in Sections Other Than the West

A comparison of electric railway statistics for the quarter January-March, 1916, with figures for the corresponding months of 1915, made by the information bureau of the American Electric Railway Association and shown in the accompanying tables, indicates a considerable improvement in the electric railway business of the United States. Data for the quarter, representing 6,966.38 miles of line of companies scattered throughout the country, indicates an increase in operating revenues of 8.90 per cent, in operating expenses of 6.81 per cent and in net earnings of 12.47 per cent, while data representing 5,508.71 miles of line indicates an increase in taxes of 3.17 per cent, and in operating income of 14.26 per cent.

The number of revenue and transfer passengers carried by companies representing 5,352.41 miles of line increased 6.80 per cent, while the revenue car mileage increased 3.49 per cent. It must be pointed out, however, that the Western district did not share in the improved business conditions.

Of the three sectional groups the Western, represented by 1,886.40 miles of line, indicates an increase in operating revenue of 1.78 per cent, in operating expenses of 2.89 per cent and a decrease in net earnings of 0.42 per cent. Returns for some 96 per cent of this mileage show a decrease in taxes paid of 1.09 per cent and in operating income of 0.12 per cent. The decrease in amount of taxes paid may be explained by the method of taxing gross receipts in vogue in several of the Western cities.

The Southern group, represented by 707.73 miles of line, shows an increase in net earnings of 15 per cent; however, returns for 78 per cent of this mileage indicate an increase in net of but 9 per cent, while taxes increased about 11 per cent and operating income 8.73 per cent.

The Eastern group, represented by 4,372.25 miles of line or about 60 per cent of the total mileage, indicates an increase in operating revenue of 11.92 per cent, in operating expenses of 8.95 per cent, and in net earnings of 16.74 per cent. Returns representing 72 per cent of this mileage show an increase in the amount of taxes paid of 5.04 per cent and in operating income of 21.61 per cent. The large percentage increase in the operating income is not due so much to the improved business conditions of this year as to the poor conditions of the past year and a comparison with figures for 1914, which are not available, would perhaps result in a poorer showing.

As a whole the number of passengers carried has increased as has the number of revenue car-miles run. While the Eastern district shows an increase of 10 per cent in the number of passengers carried and one of 3.5 per cent in the number of car-miles run, the Southern shows an increase of about 22 per cent in the number of passengers and an increase of 7.43 per cent in car-miles.

In the Western district, on the contrary, the number of car-miles run has increased faster than the number of passengers carried, but both increases have been small.

All of the districts, except the Western, show a decrease in the operating ratio, the United States as a whole indicating a decrease from 63.11 in 1915 to 61.90 in 1916. The operating ratio of the Western district increased from 66.48 in 1915 to 67.21 in 1916.

The returns for March shown in Table I indicate an improvement over January and February, though they are not strictly comparable because of the difference in miles of line represented. As a whole, the Western district shows better for March than for the two previous months.

TABLE I—REVENUES AND EXPENSES OF ELECTRIC RAILWAYS NOT REPORTING TAXES, FOR MARCH, 1916, AND FOR THE FIRST QUARTER OF 1916.

Account	March		Jan.-March	
	Amount In 1916	Increase Per Cent Over 1915	Amount In 1916	Increase Per Cent Over 1915
<i>United States*</i>				
Operating revenues....	\$11,181,404	9.63	\$38,681,617	8.90
Operating expenses....	6,919,275	5.62	23,944,169	6.81
Net earnings.....	4,262,129	16.85	14,737,448	12.47
Operating ratio, per cent:				
1915	64.23	...	63.11	...
1916	61.88	...	61.90	...
Miles of line represented	6,670.39	...	6,966.38	...
<i>Eastern District*</i>				
Operating revenues....	7,065,760	12.97	26,887,806	11.92
Operating expenses....	4,263,747	8.20	16,196,261	8.95
Net earnings.....	2,802,013	21.08	10,691,545	16.74
Operating ratio, per cent:				
1915	63.00	...	61.88	...
1916	60.34	...	60.23	...
Miles of line represented	4,076.26	...	4,372.25	...
<i>Southern District*</i>				
Operating revenues....	730,950	5.56	2,127,729	6.49
Operating expenses....	435,985	1.96	1,251,375	1.22
Net operating revenue....	294,965	11.38	876,354	15.05
Operating ratio, per cent:				
1915	61.75	...	61.87	...
1916	59.64	...	58.81	...
Miles of line represented	707.73	...	707.73	...
<i>Western District*</i>				
Operating revenues....	3,384,694	4.09	9,666,082	1.78
Operating expenses....	2,219,543	1.68	6,496,533	2.89
Net earnings.....	1,165,151	9.03	3,169,549	d 0.42
Operating ratio, per cent:				
1915	67.13	...	66.48	...
1916	65.57	...	67.21	...
Miles of line represented	1,886.40	...	1,886.40	...

NOTE.—Letter *d* denotes a decrease.

TABLE II—REVENUES AND EXPENSES OF ELECTRIC RAILWAYS REPORTING TAXES FOR MARCH, 1916, AND FOR THE FIRST QUARTER OF 1916

Account	March		Jan.-March	
	Amount In 1916	Increase Per Cent Over 1915	Amount In 1916	Increase Per Cent Over 1915
<i>United States*</i>				
Operating revenues....	\$8,281,255	9.28	\$30,356,769	8.65
Operating expenses....	5,250,937	5.50	19,147,095	6.75
Net earnings.....	3,030,318	16.51	11,209,674	12.05
Taxes.....	540,850	3.32	2,050,780	3.17
Operating income.....	2,489,468	19.83	9,158,894	14.26
Operating ratio, per cent:				
1915	65.68	...	64.19	...
1916	63.41	...	63.07	...
Miles of line represented	5,210.72	...	5,508.71	...
<i>Eastern District</i>				
Operating revenues....	4,415,074	14.63	19,308,513	12.96
Operating expenses....	2,769,812	9.69	11,903,299	9.72
Net earnings.....	1,645,262	24.04	7,405,214	18.59
Taxes.....	249,916	4.92	1,196,793	5.04
Operating income.....	1,395,346	28.22	6,208,421	21.61
Operating ratio, per cent:				
1915	65.56	...	63.46	...
1916	62.73	...	61.64	...
Miles of line represented	2,831.73	...	3,127.72	...
<i>Southern District</i>				
Operating revenues....	527,190	1.32	1,523,899	2.64
Operating expenses....	298,220	d 1.62	858,078	d 1.91
Net earnings.....	228,970	5.41	665,821	9.17
Taxes.....	45,759	11.04	136,348	10.91
Operating income.....	183,211	4.10	529,473	8.73
Operating ratio, per cent:				
1915	58.25	...	58.92	...
1916	56.56	...	56.30	...
Miles of line represented	551.50	...	551.50	...
<i>Western District</i>				
Operating revenues....	3,338,991	4.15	9,524,357	1.73
Operating expenses....	2,182,905	1.59	6,385,718	2.78
Net earnings.....	1,156,086	9.35	3,138,639	d 0.34
Taxes.....	245,175	0.45	717,639	d 1.09
Operating income.....	910,911	12.02	2,421,000	d 0.12
Operating ratio, per cent:				
1915	67.02	...	66.36	...
1916	65.35	...	67.04	...
Miles of line represented	1,827.49	...	1,827.49	...

NOTE.—Letter *d* denotes a decrease.

TABLE III

Miles of Line Represented	Revenue and Transfer Passengers		Revenue Car Mileage		
	Total	Increase Over 1915	Total	Increase Over 1916	
United States....	5,352.41	498,471,541	6.80	77,688,363	3.49
Eastern District..	3,088.13	242,913,999	10.24	35,674,750	3.51
Southern District	440.03	18,515,398	21.91	5,939,743	7.43
Western District	1,824.25	237,042,202	2.52	36,073,870	2.85

*Groupings are as follows: *Eastern District*—East of the Mississippi River and north of the Ohio River; *Southern District*—South of the Ohio River and east of the Mississippi River; *Western District*—West of the Mississippi River.

\$14,000,000 OF CHICAGO NOTES EXTENDED

The details have been announced of the arrangements made for a three-year extension of \$14,000,000 of Chicago (Ill.) Elevated Railways two-year 5 per cent secured gold notes which mature on July 1 next. As stated in the *ELECTRIC RAILWAY JOURNAL* of June 3, page 1060, it is proposed that the rate of interest on the extended notes be increased to 6 per cent per annum, payable semi-annually. The sum of \$15 in cash will be paid in respect of each \$1,000 face amount of notes extended as an inducement to the present holders to come in under the proposed extension plan. The company has arranged to increase materially the value of the security for all extended notes and has made public the manner in which this will be done. The provisions of the trust indenture of July 1, 1914, will remain in full force and effect. The extension does not involve the payment of commissions. All incidental expenses, however, will be borne by the Chicago Elevated Railways. Holders of the gold notes may become parties to the extension agreement by depositing their notes before July 15 with the National City Bank, New York, or with the Illinois Trust & Savings Bank, Chicago, and the International Banking Corporation, London, sub-depositaries. The two-year 5 per cent secured gold notes of the Chicago Elevated Railways were issued on July 1, 1914, as part of a plan of temporary financing. Since that date the city of Chicago has appointed a commission of eminent engineers to study transportation conditions and to formulate concrete plans for the unification of all the elevated and surface lines in the city. This commission is now actively engaged in its labors. Pending the promulgation of such plan and of appropriate municipal action in the matter, the company believed it neither practical nor desirable to undertake permanent financing and as a result it was decided to extend the present notes to July 1, 1919.

Ardmore (Okla.) Railway.—The Ardmore Electric Railway has been reorganized by the election of Edward Galt as president, Wirt Franklin and Sam Apple, vice-presidents, I. M. Putnam, secretary and manager, and Roy M. Johnson, treasurer. It is planned to resume operation of the system by July 1. The application for a charter for the Ardmore Railway as the successor company was noted in the *ELECTRIC RAILWAY JOURNAL* of May 20.

Bay State Street Railway, Boston, Mass.—Hayden, Stone & Company, Boston, Mass., are offering for subscription at 103 and dividend, yielding 5.82 per cent, \$250,000 of 6 per cent cumulative first preferred stock of the Bay State Street Railway, preferred as to dividends and assets. The stock is redeemable, all or in part, at 120 on any dividend date.

Boston & Worcester Electric Companies, Boston, Mass.—The trustees of the Boston & Worcester Electric Companies have declared a dividend of \$1.50 per share on the preferred stock, payable on July 1, to holders of record of June 23. The trustees say: "The increase in the dividend from the usual \$1 semi-annual declaration is a reflection of the steady growth of the business and development of the territory served by this property."

Elmira Water, Light & Railroad Company, Elmira, N. Y.—The Public Service Commission for the Second District of New York has authorized the absorption of the Elmira Transmission Company and of the Elmira & Seneca Lake Traction Company by the Elmira Water, Light & Railroad Company. All the capital stock of the transmission company is authorized to be bought and it is to be merged with the larger concern, which will purchase all the assets and assume the liabilities of the Elmira & Seneca Lake Traction Company. The Elmira Water, Light & Railroad Company is authorized to issue \$100,000 of its 5 per cent first consolidated mortgage bonds at not less than 92½, \$125,000 of its 7 per cent cumulative preferred and \$200,000 of its 5 per cent second preferred stock both at par, netting in all \$417,500. The proceeds will be used toward paying \$402,114 of bills and accounts payable of Oct. 31, 1915, against the Water, Light & Railroad Company, \$55,000 bills payable of the transmission company, \$16,250 ex-

penses incident to these transactions and \$63,570 for new construction from Oct. 31, 1915. The commission approves the inventory and appraisal of the Elmira Water, Light & Railroad Company's property as of June 30, 1914, as affected by its subsequent operations and provides for the amortization of \$1,500,000 of the company's \$2,500,000 "intangible suspense to be amortized" account at the rate of \$20,000 a year for five years and then at the rate of \$30,000 a year.

Kansas City (Mo.) Railways.—N. W. Halsey & Company, New York, N. Y., are offering \$4,000,000 of Kansas City Railways first mortgage 5 per cent gold bonds. These bonds are dated July 1, 1915, and are due July 1, 1944. They are callable as a whole or in part at 103 and interest on any interest date upon sixty days' notice. The bonds are secured by an absolute first mortgage on the entire property of the company. Under the terms of the mortgage additional first mortgage bonds may be issued on account of new expenditures for new construction, additions, extensions, betterments and improvements, properly chargeable to capital value in the ratio of \$1,000 bonds for \$1,100 of expenditures so made. It is announced that the bonds have all been sold.

Monmouth County Electric Company, Red Bank, N. J.—The property of the Monmouth County Electric Company, which operates an electric railway between Long Branch and Red Bank and to Rumson, has been sold under foreclosure to Charles A. Porter, Jr., Philadelphia, Pa., and Frank C. McDermott and A. A. Eldridge, Jersey City, representing the bondholders. The committee paid \$10,000, subject to a \$500,000 mortgage, interest and taxes. The company operates 26 miles of line. The jitneys are said to have been the largest single contributing factor to the company's recent failure.

Northern Ohio Traction & Light Company, Akron, Ohio.—The statement made in the *Cleveland News* of June 13 to the effect that negotiations had been resumed by eastern bankers for the purchase of the controlling interest in the Northern Ohio Traction & Light Company is authoritatively denied in New York. Application was filed with the Ohio Public Utilities Commission by the company on June 16 for permission to issue \$14,075,000 of first lien and refunding 5 per cent bonds. Of the proceeds approximately \$2,000,000 are to be used in making improvements and the remainder will be used to refund outstanding bonds that mature at an early date. The company recently sold to N. W. Halsey & Company, New York, N. Y., and Hayden, Miller & Company, Cleveland, Ohio, subject to the approval of the commission \$4,000,000 of the bonds.

Public Service Corporation of New Jersey, Newark, N. J.—The Public Service Corporation of New Jersey has declared a quarterly dividend of 2 per cent, an increase of one-fourth of 1 per cent over the last quarterly declaration and placing the stock on an 8 per cent basis. The directors of the company have voted to recommend to the stockholders an increase in the authorized capital stock from \$25,000,000 to \$50,000,000.

DIVIDENDS DECLARED

American Cities Company, New York, N. Y., 1½ per cent, preferred.

Asheville Power & Light Company, Asheville, N. C., quarterly, 1¾ per cent, preferred.

Boston & Worcester Electric Companies, Boston, Mass., \$1.50, preferred.

Carolina Power & Light Company, Raleigh, N. C., quarterly, 1¾ per cent, preferred.

Cleveland (Ohio) Railroad, quarterly, 1¼ per cent.

Columbus (Ga.) Electric Company, 3 per cent, preferred.

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

Commonwealth Power, Railway & Light Company, Grand Rapids, Mich., quarterly, 1½ per cent, preferred; quarterly, 1 per cent, common.

Eastern Texas Electric Company, Dallas, Tex., 3 per cent, preferred; 2 per cent, common.

Traffic and Transportation

Elmira Water, Light & Railroad Company, Elmira, N. Y., quarterly, 1¼ per cent, second preferred; quarterly, 1¼ per cent, first preferred.

Mohawk Valley Company, New York, N. Y., quarterly, 1¼ per cent.

National Properties Company, Philadelphia, Pa., 2 per cent, common.

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

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

Public Service Corporation, Newark, N. J., quarterly, 2 per cent.

Reading (Pa.) Traction Company, \$0.75.

Washington, Baltimore & Annapolis Electric Railroad, Baltimore, Md., quarterly, 1½ per cent, preferred.

Western Ohio Railway, Lima, Ohio, quarterly, 1¼ per cent, first preferred.

HEARING ON ONE-MAN AND OWL CARS

Commission Takes Under Advisement Plea of Spokane Companies to Effect Economies

The hearing by the Public Service Commission of the State of Washington on complaint of the city of Spokane against the Washington Water Power Company and the Spokane & Inland Empire Railroad in regard to owl and one-man car service was held in Spokane on June 9 and 10. D. L. Huntington, president of the Washington Water Power Company, stated that the railway lines were losing money daily and that the company could not count on any large increase of revenue in the future. The only thing the company could do toward self-preservation was to reduce expenses. Both companies contended that they should be allowed to discontinue their owl service and be permitted to continue their system of having new cars of the near-side type operated during the part of the day by one man. Mr. Huntington stated that if the companies were permitted to operate one-man cars, a saving of about \$35,000 a year would result.

Evidence submitted by the Washington Water Power Company showed that the lines of the corporation began to show a deficit in 1913-14, and have not been profitable since. The company hoped that revenues would increase with the increase in the population of the city and with the coming of better business conditions, but this hope had not been justified. Mr. Huntington said that the loss had been a steady one, and that the company did not feel like asking the stockholders to shoulder the deficit indefinitely. He gave the gross receipts of the railway lines of the company for 1910 as \$1,050,000 and as \$660,000 for 1915, and the expenses as \$900,000 in 1910 and \$700,000 in 1915. The record of passengers carried was as follows: 1910, 24,730,000; 1911, 23,691,000; 1912, 20,726,000; 1913, 19,437,000; 1914, 17,840,000; 1915, 15,714,000. These figures show a decrease since 1910 of 36½ per cent. The taxes of the company in 1910 were \$34,000 and in 1915 \$60,000. The record of miles traveled since 1910 was as follows: 1910, 3,621,000; 1911, 3,634,000; 1912, 3,398,000; 1913, 3,344,000; 1914, 3,308,000; 1915, 3,293,000. The operating expenses per car mile since 1910 follow: 1910, \$0.2878; 1911, \$0.2721; 1912, \$0.2571; 1913, \$0.2489; 1914, \$0.2285; 1915, \$0.1998.

J. F. Reardon, inspector of safety appliances for the commission, stated that while he approved of near-side cars, he regarded the one-man car as operated in Spokane as unsafe. Mr. Reardon said:

"The emergency door in the rear of the car is on the wrong side. It should be on the left and not on the right. Where it is, it opens directly on the opposite track. Furthermore it cannot be easily opened. The knob indicated for the release of the door is too high for the average person to reach. Sometimes it cannot be pulled out without great effort. The longitudinal seats in front of the car should have their corners sawed off, as they block the exits and entrances. The motorman is in a position where everyone can talk to him and distract his attention. He should be curtained off from the rest of the car."

Both companies contended that they should be allowed to discontinue the owl service. The Spokane & Inland Empire Railroad, which operates only one one-man car, devoted its statistics to the owl car service, showing how the number of after-midnight passengers had decreased since the closing of saloons the first of the year. On the other hand, Mr. Reardon submitted figures he had collected, showing the number of night workers who find the owl car a necessity. His testimony was corroborated by that of post office employees, newspaper men, telegraph operators, railroad employees, clerks, theater employees, telephone employees, janitors, etc. Suggestions that some night car other than the 12:30 be discontinued were favorably received by the commission and the representatives of the companies. Mr. Reardon suggested that if cars were oper-

ELECTRIC RAILWAY MONTHLY EARNINGS

ATLANTIC SHORE ELECTRIC RAILWAY, SANFORD, ME.

Period	Operating Revenue	Operating Expense	Operating Income	Fixed Charges	Net Income
1m., May, '16	\$26,079	*\$24,520	\$1,559	.....	.....
1 " " '15	27,878	*26,004	1,874	.....	.....

BATON ROUGE (LA.) ELECTRIC COMPANY

1m., April, '16	\$15,746	*\$8,239	\$7,507	\$3,463	\$4,044
1 " " '15	14,517	*8,998	5,519	2,146	3,373
12 " " '16	198,865	*106,176	92,689	32,306	60,383
12 " " '15	181,150	*112,334	68,816	25,071	43,745

COLUMBUS (GA.) ELECTRIC COMPANY

1m., April, '16	\$64,878	*\$27,249	\$37,629	\$28,653	\$8,976
1 " " '15	56,408	*25,431	30,977	28,791	2,186
12 " " '16	760,864	*330,277	430,587	344,103	86,484
12 " " '15	691,947	*309,939	382,008	340,043	41,965

EL PASO (TEX.) ELECTRIC COMPANY

1m., April, '16	\$85,799	*\$43,892	\$41,907	\$4,670	\$37,237
1 " " '15	76,697	*43,293	33,404	4,201	29,203
12 " " '16	1,023,938	*532,301	491,637	52,430	439,207
12 " " '15	1,016,196	*555,052	461,144	50,351	410,793

GALVESTON-HOUSTON ELECTRIC COMPANY, GALVESTON, TEX.

1m., April, '16	\$151,416	*\$102,096	\$49,320	\$36,579	\$12,741
1 " " '15	152,211	*98,240	53,970	36,059	17,911
12 " " '16	1,924,891	*1,224,641	700,250	435,388	264,862
12 " " '15	2,283,456	*1,256,641	1,026,815	434,963	591,852

NORTHERN TEXAS ELECTRIC COMPANY, FT. WORTH, TEX.

1m., April, '16	\$146,494	*\$91,984	\$54,510	\$28,724	\$25,786
1 " " '15	123,464	*79,249	44,215	27,215	17,000
12 " " '16	1,801,013	*1,099,351	701,662	337,140	364,523
12 " " '15	1,910,801	*1,077,722	833,079	321,637	511,442

OHIO RIVER ELECTRIC RAILWAY & POWER COMPANY, POMEROY, OHIO

1m., April, '16	\$6,368	\$3,967	\$2,401	\$1,662	†\$915
1 " " '15	5,561	3,543	2,018	1,604	†834
10 " " '16	70,141	40,700	29,441	16,050	†15,202
10 " " '15	59,695	36,101	23,594	16,526	†11,045

PHILADELPHIA, (PA.) RAPID TRANSIT COMPANY

1m., May, '16	\$2,391,370	\$1,296,001	\$1,095,369	\$815,599	\$279,770
1 " " '15	2,070,160	1,213,940	856,220	817,318	38,902
11 " " '16	23,526,374	13,106,169	10,420,205	8,977,507	1,442,698
11 " " '15	21,846,966	12,700,115	9,146,851	8,918,781	228,070

PUGET SOUND TRACTION LIGHT & POWER COMPANY, SEATTLE, WASH.

1m., April, '16	\$645,088	*\$422,899	\$222,188	\$184,290	\$37,898
1 " " '15	605,180	*394,582	210,598	181,325	28,273
12 " " '16	7,643,873	*4,879,073	2,764,800	2,192,916	571,884
12 " " '15	8,072,022	*4,905,547	3,166,475	2,141,107	1,025,368

REPUBLIC RAILWAY & LIGHT COMPANY, YOUNGSTOWN, OHIO

1m., May, '16	\$326,400	*\$199,694	\$126,706	\$69,132	†\$57,838
1 " " '15	247,644	*149,448	98,195	55,248	†43,011
5 " " '16	1,612,894	*\$954,731	658,162	339,057	†320,533
5 " " '15	1,210,228	*760,355	449,873	276,348	†173,848

SAVANNAH (GA.) ELECTRIC COMPANY

1m., April, '16	\$64,897	*\$43,257	\$21,640	\$23,501	†\$1,861
1 " " '15	65,689	*40,959	24,730	23,226	1,504
12 " " '16	785,244	*523,311	261,933	278,677	†16,744
12 " " '15	829,427	*538,953	290,473	276,816	13,657

WESTCHESTER STREET RAILROAD, WHITE PLAINS, N. Y.

1m., Apr., '16	\$20,072	\$21,152	†\$1,080	\$1,755	†\$2,813
1 " " '15	19,369	21,096	†1,727	1,449	†33,167
10 " " '16	206,432	212,102	†5,670	16,792	†32,179
10 " " '15	213,056	224,792	†11,736	13,168	†24,798

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

ated at twenty-minute intervals between 9 p. m. and 12.30 a. m. instead of fifteen-minute intervals no great inconvenience would be caused, and a late car would be provided for night workers. Tables were presented by the Washington Water Power Company to show the increased losses in the operation of owl cars.

At the conclusion of the hearing Corporation Counsel H. M. Stephens of Spokane urged the abandonment of duplicate car lines of the Washington Water Power Company and the Spokane & Inland Empire Railroad as a means of reducing the expense of operation. F. T. Post, attorney for the Washington Water Power Company, agreed with Mr. Stephens that this suggestion was worthy of consideration. Will G. Graves, attorney for the Spokane & Inland Empire Railway, agreed with Mr. Post that a conference of the two companies on the question of abandoning duplicate lines was desirable.

Commissioner C. M. Fassett of the Spokane City Council made a voluntary statement explaining the condition that confront the companies and expressing fear that if additional burdens were imposed it might mean the curtailment or abandonment of outside lines and the loss of homes by many persons. Mr. Fassett stated that due to real estate speculators Spokane extended over two or three times the area of most cities of corresponding population.

It was stated in the hearing that the companies had made injudicious investments by extending their lines into thinly populated districts. Mr. Huntington replied to this as follows:

"In the more prosperous days of the street railway business we built lines into several districts that could not reasonably be expected to pay in years to come. But we justified this by considering that we were using the large surplus earnings of our downtown lines to develop new territory. That downtown surplus has been taken from us by the jitney buses."

NEW YORK ACCIDENT INVESTIGATION CONCLUDED

The coroner's jury which has been considering the question of responsibility for the accident on the elevated lines of the Interborough Rapid Transit Company, New York, N. Y., referred to at length in the ELECTRIC RAILWAY JOURNAL of June 17, page 1158, has returned its finding. The jury found that Kerrigan, the motorman, met death in an accident. The coroner discharged the towerman who was on duty at the point at which the accident occurred. Travis H. Whitney of the commission commented as follows on the recommendations of the jury:

"So far as specific matters relating to the accident are concerned, the jury makes a recommendation with respect to one signal. As a matter of fact, the commission has devoted a great deal of attention to the matter of proper signals on the elevated railroads.

"The Interborough Rapid Transit Company is now spending more than \$1,500,000 in the installation of trip signals on express tracks throughout and on local tracks at curves and cross-overs. I was most careful to explain to the jury that while the company considered it unnecessary to extend the signals to the straight stretches of the local tracks, due to the closeness of local stations, this was as a matter of fact an open question with the commission, which might consider it necessary to require complete equipment of local tracks with such signals.

"Any system of signals must, because of the great expense involved, combine two elements. They are, first, insurance of safety, and, second, the reduction of train capacity as little as possible. The company contends that the extension of trip signals throughout the local tracks would force a reduction in the number of trains by at least 25 per cent. The commission, however, considers safety of primary importance. The commission is controlled in what it is able to do and in what it is able to compel companies to do by the provisions of the law and not by the findings of a coroner's jury.

"The inquest gave as its chief finding that there should be a Public Service Commissioner from The Bronx. The coroner who presided has annually been a candidate for appointment to the office. From July 1, 1907, to Dec. 30, 1915, there was a commissioner from The Bronx."

CALIFORNIA RAILROADS LOSE MORE THAN \$4,000,000 THROUGH JITNEYS

The California Electric Railway Association has completed a tabulation of the losses suffered by all of the railroads of the State, steam and electric, due to the competition of jitney buses during the year 1915. The figures show the estimated losses in gross receipts in both passenger and freight service where there was competition in both classes. Where no freight traffic losses are mentioned the figures refer to reduction in income on passenger service. The figures in the second column refer to losses attributed directly to the use of privately owned automobiles as reported by companies which in most cases did not report losses by jitneys. The tabulation for the lines affiliated with the association is as follows:

	Jitneys	Private Cars
Bakersfield & Kern Electric Railway.....	\$50,000	.....
Central California Traction Company.....	52,214	.....
Fresno Traction Company.....	.....	\$60,000
Glendale & Montrose Railway.....	6,570	.....
Humboldt Transit Company (includes private cars).....	18,999	.....
Los Angeles Railway Corporation.....	500,000	.....
Northern Electric Railway.....	30,000	.....
Northwestern Pacific Railroad (steam and electric divisions).....	40,000	.....
Oakland, Antioch & Eastern Railway.....	.....	.....
Pacific Coast Railway.....	24,000	.....
Pacific Electric Railway.....	454,360	.....
Pacific Gas & Electric Company (Sacramento Street Railway).....	100,000	.....
Petaluma & Santa Rosa Railway.....	.....	8,000
Peninsular Railway, passenger.....	11,850	.....
Peninsular Railway, freight.....	500	.....
Riverside Rialto & Pacific Railroad.....	.....	.....
San Diego Southeastern Railway.....	150,000	.....
San Diego Electric Railway (includes \$10,000 for Point Loma Railroad).....	210,000	.....
San Francisco, Napa & Calistoga Railway.....	.....	.....
San Francisco-Oakland Terminal Railways.....	400,000	.....
San Jose Railroads.....	4,700	.....
Santa Barbara & Suburban Railway.....	8,000	.....
Southern Pacific Company (electric division).....	.....	.....
Stockton Electric Railroad.....	10,000	.....
Tidewater Southern Railway.....	40,000	.....
Union Traction Company.....	.....	.....
United Railroads of San Francisco.....	1,000,000	.....
Visalia Electric Railway.....	35,000	.....
Total	\$3,146,193	\$68,000

The tabulation for the electric railways and the cable lines that are not affiliated with the association is as follows:

Monterey & Pacific Grove Railway (six months; jitneys discontinued latter part of June, 1915, account ordinance passed in Monterey).....	.....	\$1,640
Modesto & Empire Traction Company.....	.....	.....
Municipal Railway of San Francisco (cannot estimate).....	.....	.....
Nevada County Traction Company (includes private cars).....	.....	1,242
North San Francisco Railroad & Power Company.....	.....	1,800
California Street Cable Railway (no loss account grades).....	.....	.....
Total.....	.....	\$4,682

The tabulation which was made for the steam railroads is as follows:

	Jitneys	Private Cars
Amador Central Railroad.....	\$3,000	.....
A. T. & S. F. Ry., passenger loss only.....	335,000	\$1,200,000
Colusa & Lake Railroad (auto competition for several years was largely responsible for discontinuance of operations).....	.....	.....
Holston Interurban Railway, passenger.....	25,000	.....
Holton Interurban Railway, freight.....	15,000	.....
Lake Tahoe Railway & Transportation Company.....	1,600	.....
Los Angeles & San Diego Beach Railway... ..	7,900	7,800
Mt. Tamalpais & Muir Woods Railway—(no loss account grades).....	.....	.....
Nevada County Railroad (N. G.), passenger.....	350	.....
Nevada County Railroad (N. G.), freight... ..	5,000	.....
Ocean Shore Railroad, passenger (19.26 per cent).....	13,095	.....
Ocean Shore Railroad, freight.....	6,000	.....
Pajaro Valley Consolidated Railroad.....	360	.....
Quincy Western Railway (no competition account friendly attitude of people).....	.....	.....
Sierra Railway of California.....	50,000	.....
Santa Maria Valley Railroad.....	.....	.....
Southern Pacific Company, passenger loss only.....	500,000	.....
Stockton Terminal & Eastern Railroad.....	4,200	.....
Sunset Railway, passenger loss only.....	43,200	.....
S. P., L. A. & S. L. RR., passenger, including private cars.....	75,000	.....
S. P., L. A., & S. L. RR., freight, Los Angeles and San Pedro business.....	7,500	.....
Tonopah & Tidewater Railroad.....	.....	.....
Ventura County Railway.....	1,607	.....
Western Pacific Railway (no records kept).....	.....	.....
Yreka Valley Railroad.....	5,000	.....
Yosemite Valley Railroad.....	40,000	.....
Total	\$1,138,812	\$1,207,800
Grand totals	4,289,687	1,275,800

Safety-First Work Among Winnipeg Scholars.—R. R. Knox, traffic superintendent of the Winnipeg (Man.) Electric Railway and president of the Winnipeg school board; H. Long, electrical engineer of the company, and L. Polk, secretary to Wilford Phillips, manager of the company, have been visiting the schools of Winnipeg armed with safety-first literature, which at their request was distributed among the teachers, who in turn imparted the information to the scholars.

New Jitney Ordinance in Muskogee.—An agreement has been reached between officials of the Muskogee (Okla.) Traction Company on the one side and the city officials of Muskogee on the other, by which the company will improve its service in return for an ordinance designed to prohibit jitneys from operating in the city. The city has enacted an ordinance levying a license fee of \$25 a month on each jitney, and the company has inaugurated ten and fifteen-minute service on all its lines.

Extension of Safety Zones in Kansas City.—Safety zones, heretofore confined to a few corners in the business district of Kansas City, Mo., are to be painted on the pavements at all corners on Grand Avenue south to Thirty-first Street and on Fifteenth Street eastward to Troost Avenue, extending the zone-territory southward twenty blocks and eastward ten blocks. These two streets have the heaviest combined street car and automobile traffic. They are the widest streets in the city and are well paved.

Bus Venture Unprofitable.—About a year and a half ago a number of officers and employees of the Southwest Missouri Railroad, Webb City, Mo., organized and incorporated the Auto Transportation Company with a capital of \$30,000, half of which was paid in. Buses were bought and operated between Jasper and Carthage, Neosho and Joplin, and Baxter Springs, Kan., and Galena. The project did not prove as profitable as desired and the business has been discontinued. Part of the equipment was sold and the balance is for sale.

Dissensions Among Topeka Jitney Men.—The organization of jitney owners and drivers which was to maintain definite schedules and give transfers as a demonstration to secure more favorable license terms from the City Commissioners of Topeka, Kan., has largely disintegrated. Many operators have ceased to accept transfers, and the service has been demoralized through many drivers leaving routes to take special contracts for trips and because of light trade in non-rush hours. Another attempt is being made to guarantee jitney service at rush hours. It seems almost impossible to distribute routes equitably among the drivers.

Safety Talks in St. Louis.—H. L. Brownell, public safety engineer, Chicago, Ill., has recently completed a six weeks' campaign for safety methods in St. Louis. During this period he delivered about 100 lectures. Most of them were at schools and department stores, but they included a "lunch hour" talk to a large audience of business men given in the main dining room of the Masonic Athletic Association. One outcome of the series of talks was the organization of a safety committee by the Business Men's League. The chairman of this committee, Arthur T. Morey, has complimented Mr. Brownell on his work in St. Louis.

Final Hearing on Additional Surface Cars for Brooklyn.—The final hearing before the Public Service Commission for the First District of New York, on additional surface cars for Brooklyn, scheduled for June 2, was postponed until June 9 when William Siebert, superintendent of surface transportation for the Brooklyn Rapid Transit System, continued his testimony regarding the number of surface cars which would be released from certain lines when the rapid transit lines now under construction are opened. J. J. Dempsey, superintendent of elevated transportation, was also questioned regarding the amount of traffic the new rapid transit lines would take away from the surface lines.

St. Louis Files Brief in McKinley Fare Case.—The brief of the city of St. Louis in opposition to the proposed increase in passenger fares from 5 to 10 cents on the Illinois Traction System between St. Louis and Granite City has been filed by the City Counselor. It raises the question of jurisdiction because the company operates in St. Louis as a street railway and not as a common carrier. The rea-

son for the company's poor financial showing is declared to be its failure to develop freight traffic. The brief is also signed by C. E. Smith, consulting engineer of St. Louis. The City Counselor has received from the Interstate Commerce Commission official notification of its decision several days previous, suspending the increased tariff until Dec. 29.

Police Urge San Francisco Jitney Regulation.—Chief of Police White of San Francisco recently addressed the Board of Supervisors on the traffic situation on Market Street, stating that "the point is now reached where it is absolutely necessary that something be done properly to safeguard pedestrians" and also to answer the complaints of property owners and business men along the main thoroughfare. He suggested several possible means of relief, some of which are that the supervisors refuse to grant any more jitney permits; that all jitney buses be diverted off Market Street between Sixth Street and the ferries, or that they be diverted during the hours of 10.30 a. m. to 4 p. m., or that they be allowed to run one way only on Market Street; that the limit be placed at 700 buses; that all drivers must be citizens of the United States and residents of the city for not less than one year, and that fixed points be established for receiving and discharging passengers. In conclusion Chief White recommended that the supervisors take some action to relieve the situation, as he is unable to assign the number of men to the traffic bureau that would be necessary to cope with the present situation.

Roosevelt and Billy Sunday as Traffic Producers.—The campaign of Billy Sunday in Kansas City, Mo., for seven weeks increased the business of the Kansas City Railways about \$700 a day, under a conservative estimate. This is figuring 7000 passengers carried to and from the tabernacle of the average of 30,000 who attended the services every day. Exact figures were difficult to arrive at, because of the large increase of business of the company since March 1. The business shows a gain, starting with the last week or so of February, of 4½ to 5 per cent over corresponding months last year. The jitneys were credited with about \$250,000 last year, but they are absent now, accounting for a gain in 1916 of about \$900 a day. The increase of \$700 a day credited to Billy Sunday leaves a large margin of gain unaccounted for. The day Theodore Roosevelt was in Kansas City the receipts of the company were \$4,200 better than for the corresponding day in 1915. Decoration Day the receipts increased \$4,200 over the corresponding day last year. The increase in receipts for May was in excess of \$60,000. The Kansas City Railways contributed \$1,000 to the \$32,000 fund raised for Mr. Sunday, and the Kansas City Light & Power Company gave \$1,000.

Kates Jitney Law Being Put Into Effect in New Jersey.—Reports from New Jersey indicate the crumbling of the defense of the jitneys before the decision of the local authorities in the municipalities throughout the State to put into effect the Kates law, which became operative on May 16. The principal provisions of the law are that each jitney owner shall file with the city in which he operates a bond showing that he has taken out liability insurance and that he must pay the municipality in which he operates a percentage of his gross receipts. There was at first a measure of unwillingness on the part of the municipalities to take the initiative against the operators of the buses. At the time the law went into effect on May 16 it is estimated that there were approximately 400 jitneys in operation in Newark, many of them running all the time. On June 14 it was estimated that there were not more than 180 still in operation. There were many itinerant operators of touring cars in Newark who confined their activities to Sundays, holidays and days when the weather was extremely propitious. Up to June 14, 172 jitney owners had filed bonds in Newark. To none of the 172 had a permanent consent to operate been given, as the Board of Works decided to wait until the City Counsel had approved the technical points in all the bonds. On June 17 a number of jitneys quit in Paterson. On the same date twelve jitney owners who had failed to pay to the city 5 per cent of their gross receipts for the previous month in accordance with the Kates law received notice to appear before the Board of Public Works on June 20 and show cause why their licenses should not be revoked.

Personal Mention

Mr. Philip J. Kealy, president of Kansas City (Mo.) Railways, has gone to Nevada, Mo., with the third regiment of Missouri, of which he is lieutenant-colonel.

Mr. Harry A. Arthur has resigned as assistant treasurer of the Savannah (Ga.) Electric Company, to become connected with the American International Corporation in New York.

Mr. Lawrence I. Grinnell, news editor of the *ELECTRIC RAILWAY JOURNAL*, has been mustered in at Beekman, N. Y., as a member of Troop D, Squadron A (mounted), for service on the Mexican border.

Mr. T. H. Bowden, formerly freight and passenger solicitor with the Lackawanna & Wyoming Valley Railroad, Scranton, Pa., is now commercial agent with the Scranton & Binghamton Railroad, Scranton.

Mr. C. C. West, of the Galesburg Railway, Lighting & Power Company, Galesburg, Ill., will have charge of the Peoples' Traction Company, succeeding Mr. S. E. Boggess, who has been transferred to Abingdon, Ill.

Mr. L. E. Drew, chief clerk of the Savannah (Ga.) Electric Company, has been appointed assistant treasurer of the company to succeed Mr. Harry A. Arthur, resigned, who has become connected with the American International Corporation.

Mr. S. E. Boggess, superintendent of the Peoples' Traction Company, Galesburg, Ill., has been transferred to Abingdon, Ill., as superintendent of the Abingdon Light & Power Company. Both properties are controlled by the Illinois Traction System.

Mr. Percy Ingalls has been elected secretary of the Public Service Corporation of New Jersey, Newark, N. J., to succeed Col. E. W. Hine, who on account of his military connections has relinquished the position and been made assistant to the president.

Mr. Matt Louy, chief instructor in the traction school of Toledo Railways & Light Company, Toledo, Ohio, operated by Henry L. Doherty & Company, has been visiting the electric railways in Brooklyn, New York, Boston, and Washington to obtain additional ideas for the Toledo school.

Mr. W. F. Turner has been elected vice-president of the Oregon Electric Railway, Portland, Ore., to succeed Mr. C. O. Jenks, who resigned to become general manager of the Great Northern Railway. Mr. Turner has relinquished the position of secretary of the company, but retains the office of comptroller.

Mr. George A. Butman, for twenty-five years identified with street railway interests in Massachusetts, and treasurer of the Boston & Worcester Street Railway, Boston, Mass., since its inception, has resigned, to enter another line of business in New York. Mr. Butman is widely known in electric railway circles in New England.

Mr. Frederick W. Lindars has been appointed chief of accounts of the Public Service Commission for the First District of New York. His principal duty will be to establish an adequate system of accounting under the dual system of rapid transit. Mr. Lindars is a public accountant and was connected formerly with the Bureau of Municipal Research.

Mr. Arthur H. Sooy, who has been connected with the Bridgeton & Millville Traction Company, Bridgeton, N. J., for many years, has been advanced to the position of manager, succeeding Mr. B. Frank Hires, who has been appointed to the International Electric Light, Heat & Power Company. Mr. Sooy started in the company's employ as a conductor.

Mr. Charles E. Cooley, an attorney, has been appointed head of the department of the Kansas City (Mo.) Railways which will give free legal aid to employees. The service will include advice and also practical assistance, at first in legal defense and later through a loan bureau. An office will be opened in an up-town location, separate from the street railway headquarters.

Mr. Charles A. Reynolds, chairman of the Public Service Commission of the State of Washington, recently tendered his resignation to Governor Ernest Lister and it has been accepted to become effective on July 1. Mr. Reynolds gives among his reasons for leaving the commission a desire to re-enter private law practice in Seattle. He was appointed to the commission about two years ago to succeed the late Judge M. M. Godman.

Mr. L. M. Levinson, general manager of the Bryan & College Interurban Railway and the Bryan & Central Texas Interurban Railway, Bryan, Tex., has also been appointed general manager of the Southwestern Traction & Power Company, New Iberia, La. For the present his headquarters after June 30 will be in Bryan, Tex. Mr. Levinson was general manager of the Shreveport (La.) Railways for fourteen years and subsequently was manager of the Mineral Wells (Tex.) Electric System, before taking charge in Bryan, Tex.

Mr. Arthur E. Stone has been elected treasurer of the Boston & Worcester Street Railway, Boston, Mass., succeeding Mr. George A. Butman, who has resigned to take up business in New York. Mr. Stone entered street railway work in 1896, with the Wakefield & Stoneham Street Railway, being connected with that company in various capacities in the operating, accounting and construction departments. He entered the service of the Boston & Worcester Street Railway in 1904 as auditor, and later was appointed purchasing agent. He was elected treasurer of the company on June 16.

Mr. Ferris LeRoy Francisco has been appointed by Mayor Thompson, with the concurrence of the City Council, as Chicago's representative on the Boards of Supervising Engineers, Chicago Traction,

Chicago Traction, to succeed Mr. E. W. Bemis. Mr. Francisco is the senior member of the engineering firm of Francisco & Jacobus, New York. He began his engineering work in connection with power house construction with the Newark Electric & Power Company, Newark, N. J., and for more than twenty years has been actively engaged in similar work embracing the supervision and construction of transmission lines and electric railways. In addition he has personally had charge for the last fourteen years, as electrical



F. L. FRANCISCO

and chief engineer, of all the construction, power houses, lighting and heating systems of the American and Continental tobacco companies, including the Canadian company. Under his personal supervision his firm has also been extensively engaged in building power houses, installing pumping and hoisting equipment, and transmission systems in connection with groups of mines in Mexico. A little more than a year ago, Mr. Francisco was retained by Chicago to make a study of the electrolysis conditions as they affected the city's water mains and its other underground properties. In this work he was the personal representative of Mr. W. R. Moorehouse, Commissioner of Public Works. In the discharge of these duties Mr. Francisco came in close touch with the details of construction of the street railways and thus will assume his duties as the city's representative on the Board of Supervising Engineers possessed of considerable first-hand information. Mr. Francisco was born in Cleveland, Ohio. He is a member of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the Engineers' Club of New York City.

Gen. Edwin W. Hine has resigned as secretary of the Public Service Corporation of New Jersey, Newark, N. J., because of enforced absence in military service in his capacity as brigadier-general of the New Jersey National Guard. He has been elected assistant to the president of the company, thus retaining his official connection with the com-

pany. General Hine became connected with the Public Service Corporation in 1903 at the time of the organization of the company. He had previously been with the Elizabeth, Plainfield & Central Jersey Railway. General Hine was made assistant to the president on becoming connected with the Public Service Corporation, and continued in that capacity until 1907. He was then elected secretary of the company and the position of assistant to the president was abolished.

Mr. R. W. Palmer has resigned as manager of the Cleveland & Erie Railway Girard, Pa., to accept a position with Allen & Peck, Inc., in charge of the Auburn & Syracuse Electric Railroad, Auburn, N. Y. Mr. Palmer has been associated with the electric railway and lighting business since 1889. His first work was with the construction department of the Chicago branch of the Thomson-Houston Electric Company. In the fall of 1889 he accepted a position with the Eckington & Soldiers' Home Railway, Washington, D. C., to overhaul old equipment and look after the installation of new equipment. After the work at the Eckington shops had been completed, Mr. Palmer became associated with Mr.



R. W. PALMER

Malone Wheelless, in the development of an electro-magnetic railway conduit system at Washington, D. C. In June, 1892, he accepted a position with the construction department of the General Electric Company to assist in the installation of electrical equipment on the Rock Creek Railway, then under construction between Washington and Chevy Chase, Md. After this road was placed in operation Mr. Palmer assumed charge of the electrical and mechanical departments and remained with the company until the road was consolidated with the Washington & Georgetown Railway into the Capitol Traction Company. When the Capitol Traction Company decided to change its motive power from cable to underground conduit system, Mr. Palmer was placed in charge of the electrical department, in which capacity he served during the entire reconstruction. On March 14, 1899, he resigned from the Capitol Traction Company to accept a position with Mr. James F. Heyward, street railway expert, New York City, to look after his interests in connection with the reconstruction of the electric railway property at Petersburg, Va., which was later reorganized into the South Side Railway & Development Company. After the work at Petersburg was finished, Mr. Palmer assumed charge of the Roanoke Railway & Electric Company, but resigned from the company when it changed hands in 1902 and entered the testing department of the General Electric Company at Schenectady in order to familiarize himself with modern equipment. He remained at Schenectady until June 3, 1903, when he was transferred to the railway department of the company's Cincinnati office. In 1907 he was transferred to Columbus, Ohio, by the General Electric Company and placed in charge of its office there. On Sept. 30, 1907, he accepted the position of manager of the Conneaut & Erie Traction Company, Girard, Pa., and remained with the company during the reorganization into the Cleveland & Erie Railway and up to the present time. Mr. Palmer has contributed occasionally to the ELECTRIC RAILWAY JOURNAL articles on practical electric railway subjects based on his wide knowledge of the problems met in operation.

OBITUARY

Cyrus B. Winters, author of the first public utilities law in Ohio, died at his home in Castalia, south of Sandusky, on June 9.

Frank E. Seagrave, who was a pioneer in street and electric railway development in Toledo, is dead. He was seventy-one years of age. Mr. Seagrave was for a number of years secretary and manager of the Toledo & Western Railway.

Construction News

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

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

RECENT INCORPORATIONS

*North River Terminal Underground Railroad, New York, N. Y.—Incorporated in New York to operate a railway from Broadway and Battery Place, Manhattan, under Battery Place and the Hudson River to Communipaw. Capital stock, \$100,000. Incorporators: G. Russell, J. M. Fiske, H. I. Swelton; L. C. Ferguson, 41 Park Row, New York, and O. P. Pell, 54 New Street, Brooklyn.

McConnellsburg & Fort Loudon Railway, McConnellsburg, Pa.—A charter has been approved by Governor Martin G. Brumbaugh of Pennsylvania for the operation of this company's proposed line from McConnellsburg to Fort Loudon by steam. The company was originally projected as an electric railway, but the character of the country, it is understood, required a change in the plans. [July 3, '15.]

FRANCHISES

*Camden, Ark.—R. W. Mason and S. Q. Sevier have asked the Council for a franchise to construct a line in Camden.

*Lodi, Cal.—W. T. Owens has received a franchise from the Council to construct a line in Lodi.

Aurora, Ill.—The Aurora, Elgin & Chicago Railroad has asked the Kane County Board of Supervisors for a twenty-year extension of the franchise under which it is operating cars on public highways between Fox River Park, Aurora, and the northern terminal at Carpentersville, including only highways which are outside of the corporate limits of cities and villages. The company petitioned for a franchise which will allow them to build extensions, sidings and double tracks without seeking special permission from the County Board.

Pontiac, Mich.—William H. Osmun has received a franchise from the Council to construct a line in Pontiac. [May 13, '16.]

Reno, Nev.—The Reno Traction Company has received a franchise to construct an extension to the race track.

Seattle, Wash.—Hugh M. Caldwell, Corporation Counsel of Seattle, has advised the City Council to pass an ordinance declaring forfeited the franchise of the proposed Seattle-Tacoma Short Line, granted in 1907 to M. J. Wightman and C. E. Muckler, and that \$14,000 deposited with the city treasurer by the promoters be forfeited to the city. It was proposed to construct a line on Fourth Avenue south to Spokane Street, thence to the city limits of Seattle and on to Tacoma. Little work was done on the road, although the line was to have been completed by July 1, 1909. Several years ago, the franchise for the road was assigned to the Seattle-Tacoma Short Line Company. In September, 1915, the City Council adopted a resolution, declaring its intention to forfeit the franchise, unless work on the line began at once. [Sept. 18, '15.]

Tacoma, Wash.—The Tacoma Railway & Power Company has asked the County Commissioners for a franchise to erect a power line along Lincoln Avenue on the tide flats.

TRACK AND ROADWAY

Municipal Railways of San Francisco, San Francisco, Cal.—Bids will be received until June 28 by the Municipal Railways of San Francisco for furnishing and delivering track special work, contract No. 82. Printed proposal forms may be obtained on application to the City Engineer.

Clear Lake Suspended Monorail Company, Hopland, Cal.—The Railroad Commission of California has denied the application of the Clear Lake Suspended Monorail Company for permission to issue \$50,000 worth of stock and \$900,000 worth of bonds. The company was recently incorporated to construct a suspended monorail system between Hopland and Lakeport, 24 miles. [April 15, '16.]

***Grand Junction, Col.**—The Western Slope Railway Development & Investment Company has been organized to secure finances to build an electric line from Grand Junction to Vernal, Utah, and the Uinta basin. Officers: Alonzo M. Schmidt, president; C. P. McCary, vice-president; W. A. Marsh, treasurer, and J. H. Barclay, secretary.

Georgia Railway & Power Company, Atlanta, Ga.—Plans are being considered by this company for the construction of a double track along the present Lakewood line and the extension of the line in the form of a loop inside the fair grounds to accommodate the crowds expected at the southeastern fair and grand circuit races at Lakewood during October.

Fairburn & Atlanta Railway & Electric Company, Fairburn, Ga.—This company, which operates an 11-mile gaso-line railway from Fairburn to College Park, reports that it will not electrify its line in the near future as rumored.

Chicago & Interurban Traction Company, Chicago, Ill.—Permission has been given by the City Council of Kankakee to the Chicago & Interurban Traction Company to install wyes on Schuyler Avenue near Oak Street running into the proposed new traction station and the Public Service Building.

Peoria (Ill.) Railway.—Plans are being made by this company to improve its Heights line. It is proposed to construct an extension from the present double track on Frye Avenue to Wilcox Avenue on Pacific Street.

Kankakee & Urbana Traction Company, Urbana, Ill.—Rails are being laid by this company into Paxton, Ill., and through service will be opened between Urbana and Paxton on or about July 1. Wesslund Park, owned by a private stock company, will be opened to the public on July 4. This park is located midway between Ludlow and Paxton on the company's new line.

Public Utilities Company, Evansville, Ind.—This company is making extensive repairs to its Washington Avenue line between Linwood and Kentucky Avenues.

The Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan.—This company will have completed its temporary pile bridge across the Kaw River at Lawrence by July 1, and will then enter its station at Sixth and Massachusetts Streets, Lawrence. At present the trains from Kansas City stop on the north side of the river, near the Union Pacific station. The company uses the tracks of the Lawrence Street Railway & Light Company in the city. Practically all the rights-of-way have been secured for the extension of the company's line to Topeka, Kan., but the route has not been selected, three being available. Construction work will not begin until the permanent highway bridge, use of which will be rented by the interurban company, is completed over the Kaw River at Lawrence.

United Railways & Electric Company, Baltimore, Md.—This company reports that it now has under construction 5084 ft. of new tracks through the Guilford section from St. Paul Street and University Parkway to Charles Street.

Cumberland & Westernport Electric Railway, Cumberland, Md.—This company will relocate ½ mile of track at Barton and will erect a new bridge across Georges Creek at Gilmore.

Connecticut Valley Street Railway, Greenfield, Mass.—This company will reconstruct 2000 ft. of 60-lb. track with 90-lb. rail.

Detroit, Pontiac & Owosso Railway, Owosso, Mich.—A contract has been awarded to the Detroit Construction Company for the engineering and construction of this company's proposed line in Pontiac. [May 13, '16.]

Gulfport & Mississippi Coast Traction Company, Gulfport, Miss.—This company will construct an extension to the Hines mill site.

Kansas City (Mo.) Railways.—It is reported that arrangements may be made by the Kansas City Railways for the use of the Inter-City viaduct between Kansas City, Mo., and Kansas City, Kan., pending the rebuilding of the Central Avenue structure and also pending negotiations by the two cities for the purchase of the Inter-City viaduct. The Kansas City Railways had used the viaduct until 1911, paying 1 cent a passenger, which totalled about \$10,000

a year. The recent offer to the company was \$5,000 a month. The company is said to be willing to pay part of the cost of the viaduct if the two cities arrange to purchase it.

United Railways, St. Louis, Mo.—A permit has been granted to the United Railways by the Board of Public Service to remove its loop from the Laclede Pavilion in Forest Park and lay it just south of the West Line Boulevard.

***New York, N. Y.**—The Public Service Commission for the First District of New York has ordered the Secretary to advertise for bids for the construction of a tunnel from Second Avenue under Sixtieth Street and the East River to Blackwell's Island and Queensboro to the Queensboro Bridge Station. The bids will be opened on July 13. Some time ago one of the prominent contracting companies undertook to build this tunnel at a cost not to exceed \$4,500,000, but since that offer has been withdrawn because of the increased price of materials and labor, it is estimated that the construction will cost the city about \$6,000,000.

Interborough Rapid Transit Company, New York, N. Y.—The Public Service Commission for the First District of New York has approved the requisition of the Board of Estimate for \$200,000 to cover the cost of the property required for the Brooklyn approach of the East River tunnel section of the Fourteenth Street subway. The property to be purchased is at the foot of North Seventh Street and is owned by the Brooklyn Cooperage Company. It includes the pier at this point, the land under water, a strip 100 ft. wide from the bulkhead line to the pierhead line, and an easement in a 100-ft. strip under water on either side.

Columbus, Marion & Bucyrus Railway Company, Marion, Ohio.—The Silver Street line of this company will be operated to Lee Street, following the installation of crossings over the railway tracks at a cost of \$10,000, if the present plans of the company are carried out.

Tulsa (Okla.) Interurban Railway.—It is now assured that an interurban line from Tulsa to Wagoner, 37 miles, will be built this summer, according to H. D. Pattee, promoter of the Tulsa Interurban Railway. The line will be built from Tulsa to Broken Arrow, and will extend northeast from that place to Wagoner. Mr. Pattee announces that grading on the roadbed will begin within fifty days. Bonuses amounting to \$250,000 from towns and communities along the route are assured.

***Gananoque & Arnprior Railway, Gananoque, Ont.**—An extension of time has been granted this company by the Ontario Legislature in which to construct its proposed railway from Gananoque, Ont., north to Arnprior, about 80 miles, with extensions from Morton to Lyndhurst and from a point on the proposed line to Ottawa. The company has been given authority to use steam, electricity or other motive power. Chrysler & Higgerty, Ottawa, are interested.

Pittsburgh & Butler Street Railway, Butler, Pa.—It is reported that this company is considering the construction of an extension on Center Street.

Westside Electric Street Railway, Charleroi, Pa.—This company reports that it has purchased a set of Spalding's all-steel apparatus for playgrounds and has placed same in its park.

Lewisburg & Ronceverte Electric Railway, Lewisburg, W. Va.—Plans are being made by this company to rehabilitate its entire system, about 6 miles.

SHOPS AND BUILDINGS

Municipal Railways of San Francisco, San Francisco, Cal.—Plans for the superstructure of Laguna Honda station, which will be the first stop of tunnel trains in the west of Twin Peaks district, have been given out by City Engineer O'Shaughnessy. The floor of the superstructure will be 60 ft. above the promenade of the substructure, which has been built in the main tunnel section. Elevators will be provided to lift passengers from level to level. The substation is 300 ft. long, giving immediate access to five-car trains. The superstructure will be 60 ft. x 100 ft., of reinforced-concrete, the exterior being of classic design. It is expected that the station will be fully completed by Oct. 1. The cost is estimated at \$250,000.

Illinois Traction System, Peoria, Ill.—This company is erecting a station at Muncie, Ill.

Kankakee & Urbana Traction Company, Urbana, Ill.—This company has purchased a site for a new station in Paxton, Ill.

New York Municipal Railway, Brooklyn, N. Y.—The award of the contract for the construction of twelve stations on the Jamaica Avenue extension of the Broadway elevated line in Brooklyn by the New York Municipal Railway Corporation to the P. J. Carlin Construction Company, the lowest bidder, at \$280,700, has been approved by the Public Service Commission for the First District of New York. The stations are located at Cypress Hills, Elderts Lane, Forest Parkway, Woodhaven Avenue, Freedom Avenue, Greenwood Avenue, Spruce Street, Metropolitan Avenue, Queens Boulevard, Sutphin Road, Newark Street and Cliffside Avenue. The six stations from Cypress Hills to Greenwood Avenue must be completed within five months from the date of the contract, and the others within four months from the time the steel structure is turned over to the station contractor.

Hanover & McSherrystown Street Railway, Hanover, Pa.—A new building is being constructed by this company at Eickelberger Park to replace the restaurant recently destroyed by fire.

Scranton (Pa.) Railway.—The Scranton Iron & Steel Company has been awarded a contract by the Scranton Railway covering alterations on the carhouse at Providence Road. The contract covers not only the steel work, but all other work connected with this operation. The work comprises the cutting away of the first section of the carhouse erected in 1892, so that all the tracks inside the carhouse can be connected directly with the siding now in the street. The steel which is being removed will be replaced in the rear of the same building, so as to carry the roof and eliminate the heavy brick partition. The contract calls for this work to be finished by July 15.

POWER HOUSES AND SUBSTATIONS

Madison Light & Railway Company, Madison, Ind.—Among the improvements being made by this company to its power station is the construction of a 46 ft. x 46 ft. brick and steel boiler room and the installation of a 400-hp. Babcock & Wilcox boiler. A 160 ft. x 5 ft. concrete stack is also being built.

Cumberland & Westernport Electric Railway, Cumberland, Md.—This company is installing a 500-kw. turbine in its Clarysville power house and a 400-kw. turbine in its Reynolds power house.

Beaver Valley Electric Railway, Baker, Mont.—This company, which proposes to construct an electric railway from Baker to Ekalaka, contemplates the construction of a power house and two substations.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company is transferring a 750-kw. rotary unit from its central station to its Lake Street substation and is replacing same with a General Electric eight-pole, 2000-kw., 375-r.p.m., 600-volt rotary unit.

Atlantic Coast Electric Railway, Asbury Park, N. J.—This company is installing a 5000-kw. General Electric turbo-generator in its power station.

Public Service Corporation of New Jersey, Newark, N. J.—The Hay Foundry & Iron Werks, Newark, has received a contract from the Public Service Corporation of New Jersey for the erection of new electrical equipment at its substation at Albany and Peace Streets, New Brunswick. The contract price is \$13,000.

Cortland County Traction Company, Cortland, N. Y.—This company is installing a 1500-kw. General Electric turbine in its power plant.

Toledo & Indiana Railroad, Toledo, Ohio.—This company is installing in its power house a 2000-kw. General Electric turbine and 800-hp. Stirling boilers.

Hanover & McSherrystown Street Railway, Hanover, Pa.—This company has recently installed a 400-kw. General Electric 2200-volt generator direct connected with a heavy-duty cross-compound engine.

Manufactures and Supplies

NEW CARHOUSES FOLLOW TENDENCIES OF MODERN BUILDING CONSTRUCTION

A very small amount of work on new carhouses and repair shops is now being carried on. Reference to the Construction News columns of the *ELECTRIC RAILWAY JOURNAL*, which contain an approximately complete record of new electric railway work, shows that from Jan. 1, 1916, to the present date only eighteen different cases were recorded of new carhouses and repair shops or extensions to such buildings being planned, under construction or completed, as compared with twenty-three for the same period in 1915, a period which could hardly be termed fruitful in construction. It is evident, however, from the reports of manufacturers furnishing materials embodied in the construction of carhouses and repair shops that the tendencies applying to industrial plants in general apply even more forcibly to the electric railways in furthering the construction of a better class of buildings of the modern fire-proof type. This movement towards more permanent fire-proof construction has been shown through the steadily growing demand for reinforced concrete. The present condition of the steel market is another important reason for the adoption of concrete construction. The rise in the price of steel has greatly increased the cost of building with structural steel, while in a reinforced concrete structure, such a small amount of steel is used that the increase in the cost of the building is relatively small. Furthermore, the reinforced steel can be secured with practically immediate deliveries, while with the structural steel it is usually a matter of months.

A tendency in the direction of fire-extinguishing apparatus for carhouses and repair shops is shown by the steady increase in the demand for sprinkling devices and small fire extinguishers containing special extinguishing liquid. In spite of the recent rise of prices for the sprinkling outfits, which in one device has been 25 per cent owing to the higher cost of brass and iron materials, a good demand is expected in the future, owing to a general awakening consciousness of the need of safeguarding buildings and also to the fact that insurance is reduced by the installation of such precautionary equipments. One company which markets a small portable type of fire extinguisher apparatus reports an increase of business since Jan. 1 of 100 per cent, a large proportion of this business being for renewals of liquid as well as for complete new apparatus. The tendency toward fire prevention is certainly well warranted by the unusually high proportion of serious fires to carhouses and repair shops which have occurred during the last year.

ROLLING STOCK

Chicago & West Towns Railway, Oak Park, Ill., is in the market for five city cars.

Topeka (Kan.) Railway is building five one-man cars which will soon be placed in service.

Gadsden, Bellevue & Lookout Mountain Railway, Gadsden, Ala., is rebuilding one ten-bench open car.

Columbus Railway, Light & Power Company, Columbus, Miss., is reported to have purchased three double-truck cars.

Beaumont (Tex.) Traction Company is reported to be in the market for seven single-truck cars similar to those purchased in 1915.

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., will build fifty cars in its own shops. Work on them is expected to start at once.

Iquique (Chile) Tramways have purchased one five-bench open storage battery car and an extra set of batteries from the Railway Storage Battery Car Company.

Oakwood Street Railway, Dayton, Ohio, is building in its shops five double-truck, pay-within cars which will have

Westinghouse 323-V. quadruple equipment, H. L. control and GE air brakes.

Steubenville, Wellsburg & Weirton Railway, Wellsburg, W. Va., has ordered from The J. G. Brill Company three double-truck, pay-as-you-enter cars. The company is also rebuilding three of its cars.

Union Street Railway, New Bedford, Mass., noted in the ELECTRIC RAILWAY JOURNAL of June 17 as expecting to purchase twelve closed car bodies has ordered this equipment from the Osgood-Bradley Car Company.

United Railways & Electric Company, Baltimore, Md., has under way the work of lengthening platforms and complete vestibuling of 560 semi-convertible cars. This company is also installing automatic wheel guards on 1250 cars.

Cumberland County Power & Light Company, Portland, Me., noted in the ELECTRIC RAILWAY JOURNAL of June 3 as being in the market for four 36-ft. semi-convertible single-truck pay-as-you-enter passenger cars equipped with Brill Radiax trucks, has ordered this equipment from the Wason Manufacturing Company.

Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan., has recently added a second electric locomotive to its freight equipment. The company has two self-propelling electric freight cars in service, and twelve box cars, the regulation railroad cars, besides its construction and other cars. It will probably have a total of thirty freight cars in service within a few months.

TRADE NOTES

Lord Manufacturing Company, New York, N. Y., has received an order from the Osgood Bradley Car Company for twenty-four Horne double-acting brakes for the twelve cars being built for the Union Street Railway, New Bedford, Mass. This company has also received an order for a screenless air cleaner from the Milford & Uxbridge Street Railway, Milford, Mass.

The White Company, Cleveland, Ohio, announces that during the last six weeks it has received orders for 100 motor truck equipments from thirty-nine companies, including street railway and other public service corporations. The types of gasoline motor truck included in the above consists of construction and delivery, line repair, emergency and cable pulling power winch.

E. P. Seymour Portable Rail Grinder Company, Waltham, Mass., announces that its rail grinder is now being used by the following companies: Public Service Railway, six machines; Connecticut Company, four machines, Rhode Island Company, Middlesex and Boston Street Railway, Union Street Railway of New Bedford, Mass., Manchester (N. H.) Street Railway, and the Concord and Manchester electric branch of the Boston and Maine Railroad.

ADVERTISING LITERATURE

Ohmer Fare Register Company, Dayton, Ohio, has issued a booklet entitled "Your Public—Your Men—Yourself," which deals with the relation of the employees to the company and what the Ohmer system accomplishes in this regard.

Moller & Schumann Company, Brooklyn, N. Y., has issued Bulletin No. 1 on its black enamels and japans, which describes the range of blacks which fit every need, whether wood, steel, cast iron, tin or brass. Each article is described in a manner to indicate the type of article for which it might be used and gives the necessary reduction for applying, as well as the various methods of brushing, spraying, dipping and tumbling.

Ebert, Michaelis & Company, New York, N. Y., have issued a very attractive circular of eighteen pages and cover with two inserts dealing with the United Light & Railways Company organization and its properties. They describe the physical properties of the company and then proceed to the financial structure, giving statements of the capital liabilities of the company. Following this details are presented of the first and refunding 5 per cent bonds, the 6 per cent gold coupon notes and the first preferred 6 per cent stock. There is also a map showing the location and nature of the properties and an insert chart showing the intercor-

porate relations between the company and its subsidiaries as of March 31. There are also maps of the Tri-City Railway & Light System and of the Grand Rapids, Grand Haven & Muskegon Railway, the so-called Lake Line.

Railway Improvement Company, New York, N. Y., has issued a beautifully printed book entitled "Increasing Car-Operation Economies," by C. C. Chappelle, consulting engineer and vice-president. The book contains five chapters on these subjects respectively: The Commercial Application of Fundamental Principles of Car-Operation Efficiency; Relation Between Car Operation and Power Consumption, by J. F. Layng, railway and traction engineering department, General Electric Company; Economies in Railway Operation, by F. E. Wynne, engineer railway section, general engineering division, Westinghouse Electric & Manufacturing Company; and Car-Operation Efficiency, with Special Reference to the Energy-Input Method of Determining Motormen's Efficiency. In a brief preface the contents of the book are analyzed and interpreted. Chapter 1, by Mr. Chappelle, discusses the applications of the Rico coasting recorder and the Rico C & S recorder of the company; Chapter 2 is a reprint from the ELECTRIC RAILWAY JOURNAL of an article by Mr. Chappelle; Chapter 3, by Mr. Layng, is a reprint from the *General Electric Review*; Chapter 4 is a reprint of parts of a paper delivered in 1912 by Mr. Wynne before the Baltimore section of the A. I. E. E., and Chapter 5, by Mr. Chappelle, analyzes the comparative advantages of the coasting recorder and meter for checking motormen's efficiency, and is based largely on communications heretofore appearing in the ELECTRIC RAILWAY JOURNAL.

JITNEY COST FIGURES ANALYZED AT DALLAS

Jitneys operating twelve hours a day on the streets of Dallas, Tex., should make a net profit of \$429.18 a year, according to estimates carefully compiled by the city of Dallas under direction of J. W. Shull, departmental accountant. The figures were prepared at the instance of Mayor Henry D. Lindsley. Investigation disclosed that there are eleven jitney lines in Dallas, averaging 3 miles in length. The longest is 4½ miles and the shortest 2 miles. It is estimated that the average jitney in Dallas runs twelve hours a day, making fourteen round trips and averaging 168 miles a day, or 61,320 miles a year. The average number of passengers per round trip is five. A Ford, the car generally used in jitney service, costing \$474.10 new, was used in making the estimates. Depreciation was estimated at 33 per cent a year. From the report compiled by Mr. Shull, the following is taken:

Cost of operation a year:	
Depreciation	\$158.03
License	75.00
Interest	37.928
Gas, oil, etc.	759.754
Wages operator	1,095.00
Total cost a year	\$2,125.71
Total cost a day:	
Depreciation	\$0.43295
License .....	.20547
Interest .....	.10535
Gas, oil, etc.	2.08152
Wages, operator	3.00
Total cost a day	\$5.82529
Cost of operation a mile:	
Depreciation	\$0.002577
License .....	.001233
Interest .....	.000627
Gas .....	.012390
Wages .....	.017859
Total cost a mile	\$0.034667
Net profit a year:	
Gross receipts for year	\$2,554.89
Less cost of operation	2,125.71
Net profit	\$429.18
Net profit for day:	
Gross receipts for day	\$6.99972
Less cost of operation	5.82529
Net profit a day	\$1.17443
Net profit for mile:	
Gross receipts for mile	\$0.041665
Less cost of operation .....	.034667
Net profit a mile	\$0.006998