Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Now the One-Man Interurban Car

ONE-MAN safety cars for use in city service have become so common that they are accepted as a matter of course. Now, in this issue, an article by C. T. Dehore of Cincinnati, Ohio, relates how one-man, double-truck safety cars have recently been installed on a small interurban road running out of that city with satisfactory operating results and a great improvement in the net earnings. A total saving of $29,905 a year in operating costs, creditable to the new type of cars as compared to the old two-man, heavier cars is expected. On a per car basis this amounts to $5,981 per annum. This total saving represents a return of 79.7 per cent on the net investment made to accomplish the improvements, which was $37,500.

There are many small interurban properties over the country on which the use of such light-weight one-man cars should be satisfactory from the standpoint of service. On some of them it would appear that a step of this kind materially to reduce operating expenses would be very much in order if the property is ever to be expected to produce any return to the shareholders. On fairly short lines, where there is no demand for very high speed, such light-weight cars could be adopted with safety, and the power saving that would result is very material, as brought out in the article mentioned. Of course, one-man cars for interurban service would naturally be equipped with double trucks in order to secure good riding qualities on open-type track, which is rarely as smooth as good city track, as well as to permit a free running speed higher than called for in city service and higher than is safe with a single truck.

As to operation with one man, there should be no particular difficulty inasmuch as the traffic requirements would rarely be of the exacting nature of city service. The number of stops per mile is much smaller and the length of standing time while loading and unloading passengers is of less importance as it forms a much smaller proportion of the total schedule than in city service. Furthermore, any abnormal delay in passenger exchange is more readily made up because of the longer running periods. Hence, in view of these differences—lower density of traffic, fewer stops, higher speed, longer distances—it is logical to assume from present knowledge of the standard one-man safety city car that the similar car for interurban service could be made larger than the city car without overburdening the operator. These thoughts are quite evidently embodied in the design of the car described in Mr. Dehore's article.

While it is highly desirable that those interurban lines which connect important terminals and extend into sizable systems should be developed along the lines of heavy traction, it may well be recognized that those other lines which just run out into the country and stop (most of those radiating from Cincinnati being excellent examples of the type) have no such future and that they can best be developed more along the line of street car practices. The paramount issue with most of them is to get the operating cost down to a basis comparable with their limited earning capacity, so that a surplus will be a possibility. The use of one-man, double-truck safety cars seems to offer an opportunity for more economical operation without introducing any particular hazards, though requiring some changes in operating practices. Hence a widening use of one-man, light-weight, double-truck safety interurban cars in the next few years may not be an unexpected development.

Electric Railway Industry Must Expand with Its Opportunities

THE men who have been brought up in the steam railroad field are apt to look condescendingly in a professional way on their electric railway brethren. They feel that the "trolley" men know light transportation only, while they themselves are engaged in real railroading. This attitude must be changed, and that by demonstration of the fact that there is no sharply defined boundary between heavy and light traction. Electric railways are handling short-haul passengers on a scale unheard of in the steam field, and they are doing a freight business also of no mean proportions. A first-class, high-speed interurban railway or rapid-transit system is giving a service in every way commensurate with corresponding steam transportation. When the steam roads are in a position to finance electrification extensively they will find that many of their problems have already been solved for them by the "trolley" fellows. The multiple-unit cars used in large numbers by the electric railways and to an increasing extent by steam railroads are ideal for intense suburban service. Again, the electric locomotive itself is a product of electric railway development.

The application of the electric motor to transportation has developed in three stages. First the horse, the mule, the cable and the steam "dummy" were supplanted. Then the elevated steam lines were electrified and high-speed interurbans were built. Last, and the greatest development of this still lies largely in the future, the steam locomotive is being displaced by the electric locomotive. This development was traced by Frank J. Sprague in his Franklin Institute address, abstracted this week. In other words, the electric motor is gradually pervading the whole field of rail transportation, which is essentially one field. The engineers and manufacturers who are leading in the campaign for railroad electrification aim simply to convince operators who have been "raised" on the steam engine that a better motive power is now available. The performance of the electric motor elsewhere, and to a limited extent in this field, ought to inspire respect for its power producing characteristics.

The Passing of the Woman Conductor

THREE years ago, or during the labor scarcity caused by the war, many women were employed as conductors on cars both in America and Europe, although the practice was followed to a greater extent abroad than here. Since the armistice the number has decreased for one cause or another. On the New York City properties the direct reason was a law passed by the New York Legislature in May, 1919, forbidding the employment of women on trolley cars before 6 a.m. or after 10 p.m. or for more than nine hours a day. In January of the same year the engagement of any more women as conductors in Detroit was forbidden by the National War Labor Board after the dismissal of those employed by the company had been demanded by the union. A few women conductors or guards are still employed on the Hudson & Manhattan Railroad and on some other lines, but in general throughout the country they have disappeared from service as members of train crews.

The subject may almost be said to have been forgotten by railway men, but has been brought up through a report recently issued by the Women's Bureau of the United States Department of Labor and reviewed in these columns. The conclusions of this report are generally favorable to the service as suitable to women and less onerous and more highly paid than many other lines in which women are employed. Before the subject is passed entirely, it might be worth while to put on record some of the conclusions reached from the railway standpoint during a somewhat limited trial in this country of women conductors.

In the first place there is some additional expense involved to a company employing both women and men in the transportation service over that required when only men are employed, owing to the necessity of providing separate quarters at the carhouses and elsewhere. This means that even if everything else was equal, to make the engagement of women no more expensive to the company the women would have to receive a lower wage than the men. Just how much this differential would be it is hard to say, but it is obvious there would have to be some differential.

In the second place, the tendency toward the use of one-man cars, in the opinion of most operators, still further cuts down the opportunity for women as part of the transportation force. It is probable also that their less physical strength handicaps women for the position of conductor on some lines. Again, new legislation limiting the conditions under which work may be done or the hours in which it may be performed is apt to be more stringent in the case of women employees than with men employees, and any material difference in the conditions or hours permitted for the two classes would require a division into a favored and a less favored class, and this would interfere with seniority rules.

Finally, there is now no difficulty and there probably will not be for a considerable time, at any rate, in securing a sufficient number of men for platform service, so that there does not seem to be the same reason for the engagement of women as during the war.

Abroad, both in England and on the Continent, women have been employed as substitutes for motormen as well as conductors. Testimony as to their fitness for this work varies, but on some roads they are considered superior to men, or certainly to the men who could be hired at the same wages. The way in which this superiority is shown is in the exercise of greater care and the acceptance of greater responsibility in their work. As the use of women as substitutes for motormen has been very limited in this country, American evidence on this point is not of much value.

The modern car has so many labor-saving appliances that much manual power is not required by either a conductor or motorman. Hence the tendency will be more to judge applicants on the basis of intelligence, faithfulness and similar qualities rather than on strength. Nevertheless, the greatest use for women, for some time to come, at any rate, in electric railway transportation service will probably be in the stations and offices and not on the cars.

Has Connecticut Shown the Way in Valuation Procedure?

THE recent valuation of the property of the Connecticut Company, made, as it was, by the Public Utilities Commission of the State, is of more than usual interest. It is what the commission calls a business-like valuation and marks a departure from the usual method of obtaining the fundamental information upon which a commission bases its final action. In this issue Mr. Knowlton finishes his analysis, started last week, of this valuation, and outlines the method by which it was possible to save so much time and money in obtaining the necessary data. A critical examination of this is recommended to all who are interested in valuation procedure. It should be kept in mind, however, that the purpose of this two-part article is to outline and analyze a method. Complete figures naturally cannot be given for application elsewhere and details of the method itself would probably have to be modified in case of its application to other properties.

Progress in valuation practice has, of course, been evident in recent years. This, however, has been chiefly in that the engineers of the various contending groups have agreed upon an appraisal figure for the physical property and thus avoided endless litigation. Instances are the Pittsburgh, Scranton and Nashville valuations. Another step was taken in New Jersey, where the engineers were asked to take the place of the commission, so to speak, and, considering all factors, to name the total valuation figure. But each of these has been accompanied by a long and expensive inventory, which is most undesirable both from the standpoint of expense and also delay and suspense. In these statements regarding the recent New Jersey valuation the inventories made during the previous valuations and used by the last engineers are considered a part of the total appraisal work.

The question is how to get away from this and Connecticut seems to have given one answer. Here more than $50,000,000 worth of property (on a 1910-1915 price basis) was appraised in less than six months and historical value was also determined at a total cost to the commission of less than $10,000. Several factors made this possible: the work was done largely by salaried engineers and accountants of the commission, who already had an intimate knowledge of the property; the commission specified that it wanted a "business-like" valuation; the records of the company were unusually specific and detailed as to the various facts needed. But these factors do not weaken the method, rather do they strengthen it. The method of appraisal itself is logical—the use of measuring sticks for outside

plant and the application of usual business judgment all through. It is of interest to note the relation of the total thus found to the historical cost, and that the appraised value of the physical property differed not more than 2 per cent from the book value of the company.

Most important, the commission accepts and uses this value in its report to the Legislature; the Legislature, in turn, bases its present program of railway legislation upon this report, thus tacitly accepting it as valid. The commission and legislative sanction of this method of appraisal is significant. More than ordinary weight may be given to the attitude of the Legislature in view of the fact that the chairman of the committee considering the report is himself an engineer of note in the State.

Objection to the method itself may be urged in that, by the adoption of unit yardsticks, instances of abnormal construction, of special installations, etc., may be neglected or minimized. But the inspection of the entire system and the method of obtaining a typical unit are both checks against this. And then, actually, way down in his heart, what valuation engineer is there who doesn't use the mile of track, the 1,000 ft. of overhead, the kilowatt of power station and substation as the real check or measure of the reasonableness and accuracy of his valuation, made by however detailed a method? There seems much to support the direct use of such figures if they can be determined with sufficient accuracy to carry weight in the individual case, and this is what Mr. Knowlton tries to show has been done in Connecticut. There are so many other factors than mere physical appraisal which really affect the final rate that it is a serious question whether the expenditure of so much time and money in determining this figure is really justified.

To be sure—to answer a self-evident question—no rates have yet been determined upon this as a base. But Mr. Knowlton shows within what wide limits an appraisal may vary without any effect upon a rate, and as a matter of fact, in how many cases has the valuation had an appreciable—still less a controlling—effect upon rates, anyway?

A valuation figure adopted means business life or death, economic success or failure, more often than anything else. It is fundamentally a business question rather than a rate question and is so recognized by the Connecticut Commmission.

But what will valuation engineers do? Frankly, they may lose one source of lucrative practice. But they ought to be more anxious and willing than any one to adopt a business-like basis of appraisal and to save the time and drudgery of detailed inventory. Valuation is not constructive, though it may be necessary. Engineering is fundamentally constructive and engineers should welcome anything which will relieve them of non-constructive work so that their energies may be directed toward constructive lines.

A big question is the court attitude. Legal rules of evidence have been largely responsible for present appraisal procedure. But there is encouragement in court attitude today. Note the "reasonableness" introduced by the Supreme Court, for example. And courts are more and more inclined to be business-like themselves and to allow commissions to establish their own procedure. In this case, the sanction of both commission and Legislature should have much weight in determining the attitude of the court and therefore the result af any possible court action should a case based on this valuation come up for review.

Viewed broadly, valuation procedure is tending in the right direction. The American Electric Railway Association valuation committee is studying the problem of how to reduce the time and expense of appraisals. It seems logical to approach a business question from a business angle. Connecticut has made a worth-while contribution in this connection to valuation procedure.

Tax Exemption Extended in Massachusetts

IT IS APPARENT that the members of the Massachusetts Legislature are satisfied that their street railways are not yet out of the financial difficulties which began before the war, but were brought to a head by the extreme conditions which that conflict caused. As reported elsewhere in this issue, the Governor's signature has recently made a law of the bill to exempt the companies for the next two years from the operation of the excise tax, imposed in commutation of the cost of repairing and maintaining highways and bridges.

The reputation of the old Bay State as a leader in wise and conservative legislation and regulation concerning her street railways is too well known to require further extensive comment at this time. Having from the beginning restricted the capitalization of the companies to actual cash investment and having prohibited the issue of stock at anything less than par, this State now shows a disposition to make reasonable provisions looking toward the protection of such investments. It is true that a number of companies in that state have been through a receivership, and many miles of track have been abandoned. Perhaps not in all, but at least in a goodly proportion, such cases have been where over-optimistic promoters have built in sparsely settled territories, or where lack of foresight on the part of the managements has resulted in financial embarrassment. No Legislature can be expected to go out of its way to offer protection in such cases. But the recognition by the Massachusetts Legislature of the general financial hardships which the industry as a whole is suffering through no fault of its own is an encouraging sign.

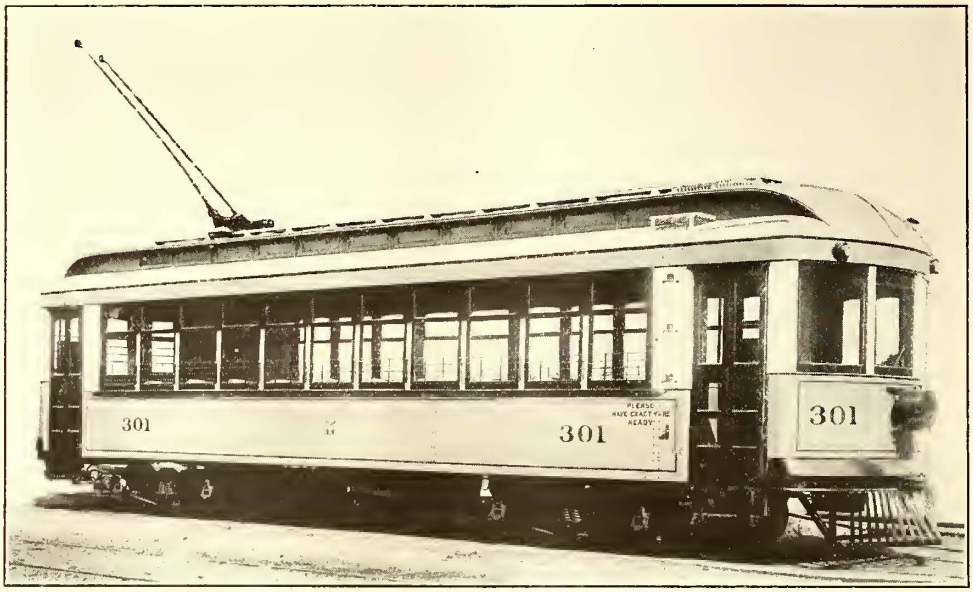
The action of the Speaker of the House of Representatives of Massachusetts in standing up for and securing a reconsideration of the exemption bill, after the original motion was defeated, was an exceptionally courageous proceeding, in view of the apathy if not direct antagonism of the general public toward the financial prosperity of utilities.

Quotation from the Federal Electric Railways Commission Report

No. 22

THE electric railways should adopt the policy of setting aside a depreciation fund with which to take care of replacements and thus preserve the integrity of their investment. It would have a very wholesome effect upon credit. Such has not been the practice in the past. Deferred maintenance has accumulated to an alarming extent during the war period.

Generally speaking, regulating commissions have the power to prescribe methods of accounting and to establish the amount of the depreciation fund. This practice should be observed, and its adoption will improve the situation of the industry and be greatly in the interest of the public welfare.



SINGLE-END, DOUBLE-TRUCK, ONE-MAN SAFETY CAR FOR INTERURBAN SERVICE

One-Man Cars for Interurban Service

How the Cincinnati, Milford & Blanchester Traction Company Met a Difficult Financial Situation by Installing New Equipment and Making Such Changes as Would Greatly Reduce Operating Costs

BY C. T. DEHORE
Cincinnati, Ohio

FACED with an inevitable receivership unless operating costs or earnings could be radically changed, the Cincinnati, Milford & Blanchester Traction Company, Cincinnati, Ohio, under the direction of J. P. Perrung, president and general manager, decided in January, 1920, to take immediate and drastic action to stem the tide of rising costs. The criticalness of the situation can be readily understood from the few words explaining that during one month in the fall of 1920 the cost of power alone was 60 per cent of the total receipts. It is said that had the changes which were effected been delayed three months longer the railroad probably could not have held out. As a result of the changes made, however, it will be possible to continue operation on the line, and in fact indications are that the financial crisis has been passed and that the company should now be able to wipe out its debts and become a paying property.

The changes which were decided upon and which were put into effect as quickly as the new equipment could be secured were these: The old 30-ton, forty-four-passenger, two-man cars were replaced with 15-ton, forty-seven passenger, one-man, double-truck cars. A 1,000-kw., 25-cycle generating station was shut down and arrangements were made for purchasing power from the Union Gas & Electric Company of Cincinnati at 13,200 volts 60-cycle frequency. For the 1,100-kw. capacity of 25-cycle substation equipment 400-kw. capacity of 60-cycle equipment was substituted. The fourth major change made was in connection with the light and power business handled by the company, wherein a 100-kw. frequency changer was displaced with 250-kw. capacity in lighting transformers, which enabled the company to take on 250 new commercial customers.

The C., M. & B. T. line is 28.8 miles long and connects Cincinnati (Madisonville) with Blanchester, Ohio. In addition to handling passengers, freight, milk and express, the company does a general lighting and power business in towns along the line. Travel on the Blanchester end of the road is very light, while fairly good traffic is obtained on the Madisonville end, particularly in the warmer months, when summer homes and camps along the Miami River are open. The equipment formerly in use and the operating conditions generally were similar to those found on a great many other small interurban lines, namely, heavy, obsolete rolling stock with power supplied from a small-capacity and inefficient generating plant.

The old rolling stock consisted of eight passenger cars, three freight cars and two work cars. The passenger cars were in need of paint and repairs and had practically outlived their usefulness. They weighed about 30 tons each, were geared for high speed and were equipped with two different types of old-style motors. These cars were replaced, under the rehabilitation plan, with five 15-ton, forty-seven-passenger, single-end cars equipped with standard safety devices for one-man operation, probably the first cars of this type for interurban operation. They were built by the Cincinnati Car Company. They have a standard monitor deck roof, are 40 ft. long and 8 ft. 6 in. wide and have steel underframes and side-girder plates, wood posts and letterboards and composite superstructure.

There are eleven windows on each side, and notwithstanding the inclusion of a stove and toilet, seats for forty-seven passengers are secured by using the rear "platform" as a smoking compartment. This popular compartment will seat five passengers and it is separated from the main passenger section by a partition and a swinging door. The seats are the Hale & Kilburn 38-in. stationary type with rattan-covered spring cushions and backs. The heater is of the Jewel hot-air type with motor-driven blower. Lighting is obtained from ten 56-watt lamps arranged in a straight line through the center of the ceiling and used in combination with G.E. shade holders and receptacles fitted with holophane shades.

The trucks are of the arch-bar type with a combination semi-elliptical and spiral spring design and a wheelbase of 5 ft. 8 in., manufactured by the Cincinnati Car Company. The electrical equipment consists of four G.E. 264-A, 25-hp. sleeve-bearing motors, and one K-35 controller. A G.E. J-37 type headlight with the new design of "GECO" resistor is used. The air-brake equipment includes the type CP-27 compressor and type ML Form A governor. The cars are geared for a free running speed of about 32 m.p.h. and make a schedule speed of 20 m.p.h. Hourly service is given during the winter months and half hourly service during the summer.

Heretofore, power was manufactured in a steam plant located at Milford, 8.5 miles from the Madisonville end of the line. The equipment there consisted of four 200-hp. Stirling boilers and two engine-driven 500-kw., 370-volt, 25-cycle generators. The engines needed overhauling; the boilers were in only fair shape and an addition to the smokestack was necessary to replace a section blown down in a windstorm. The immediate repairs needed called for an expenditure of about $3,500. The energy used for light and power customers was secured from a 100-kw. frequency changer located in the power house and consisting of a 370-volt, 25-cycle motor and a 2,300-volt, 60-cycle generator. This unit was badly overloaded and there was no reserve capacity available. In fact, the company had reached the point where it was forced to turn away new business.

To alleviate this situation and place the power cost on an economical basis a contract was negotiated with the Union Gas & Electric Company of Cincinnati whereby this company built a 13,200-volt, 60-cycle transmission line to the railway company's substation at Indian Hill, where power is delivered and metered to the latter. The power contract is based on a fixed maximum demand charge with a sliding scale rate for actual energy consumed, so that the railway company has a chance to lower its rate by leveling off its load factor. As an instance of how this may be done, the railway company found that by changing its freight-car schedule slightly it was able to reduce the maximum demand charge about $100 per month. An effort is now being made to secure some pumping load to be handled at night, which will further reduce the cost per kilowatt-hour.

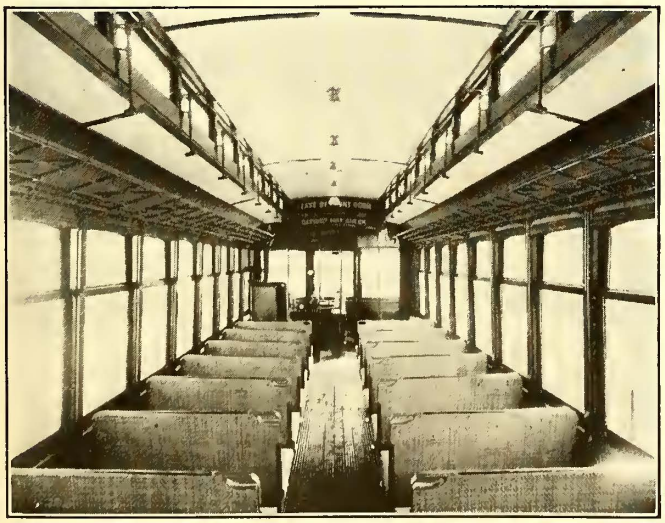
As the power company has a 120,000-kw. turbine generating station of modern design and is in a position to furnish unlimited power, the railway company has laid out its distribution system so that it can be quickly and economically extended to serve new customers. An increase in the gross receipts from the light and power department of from $2,000 to $3,500 per month has been secured as the result of new customers connected.

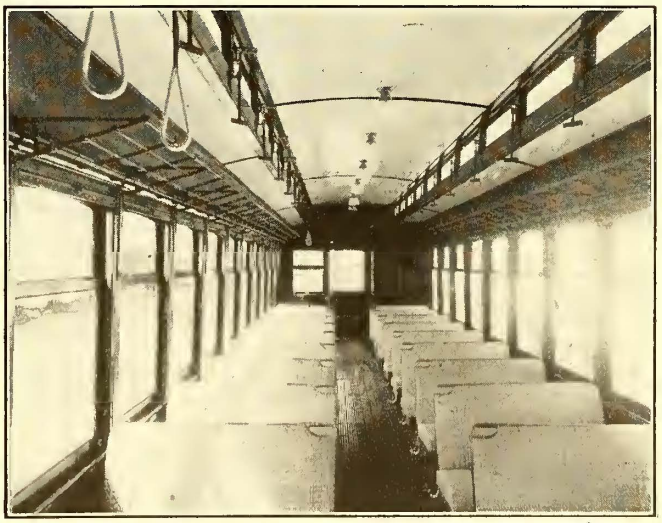
Under the old system of operation the company had a 300-kw. substation at Indian Hill, 5 miles from Madisonville; a 400-kw. substation in the power house at Milford, 3.5 miles farther, and a 400-kw. substation at Newtonville, 9 miles from Blanchester. The total substation capacity was then 1,100 kw. Under the new plan only two substations are used, one at Indian Hill and the other at Newtonville. Each is equipped with one 200-kw., 600-volt, six-phase, 60-cycle G.E. commutating pole rotary converter. The total substation capacity on the system is thus seen to be 400-kw., sufficient for handling the new light-weight cars.

To make the changes necessary, as described briefly above, the company required an initial investment of $63,000, against which there is a credit for salvage of about $25,500, leaving a net capital investment of $37,500 as outlined below:

INVESTMENT COSTS

Five new cars complete at $9,000		$45,000
Two 200-kw. substations at $6,500		13,000
Three lighting transformer stations		5,000
Total cost		$63,000
Less salvage:		
Six 4-motor cars	$6,000	
One 1,000-kw. power station	15,000	
Three rotary converters, etc.	4,500	25,500
Net investment		$37,500





TWO INTERIOR VIEWS, ONE SHOWING FARE BOX, AT THE FRONT END AND THE OTHER THE SMOKING COMPARTMENT AT THE REAR END

COMPARISON OF OPERATING COSTS

	Old System	New System	Saving
Platform wages (passenger), actual	$14,325	$8,290	$6,035
Power (1919 costs)	42,500	21,120	20,620
Maintenance of cars (estimated)	8,500	6,300	2,200
Tie renewals (estimated)	8,750	7,700	1,050
	$74,075	$43,410	$29,905
Increase in lighting business per year (actual)			18,000
Increase in net earnings			$47,905

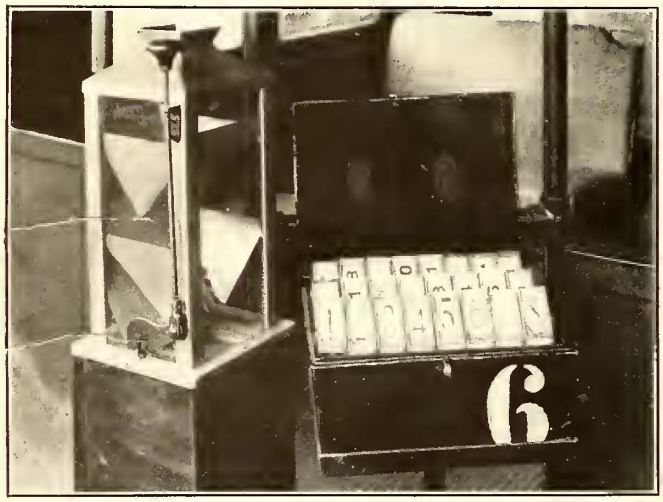
STATISTICS

	Old System	New System
Passenger car-miles	280,000	280,000
Freight car-miles	20,000	20,000
Total kilowatt-hours	2,131,000 kw.-hr.	1,408,000 kw.-hr.
For passenger cars	1,680,000 kw.-hr.	700,000 kw.-hr.
For freight cars	108,000 kw.-hr.	108,000 kw.-hr.
For light and power	343,000 kw.-hr.	600,000 kw.-hr.
Kw.-hr. per car-mile (passenger)	6.0	2.5
Kw.-hr. per car-mile (freight)	5.4	5.4
Maintenance per car-mile	2.83 cents	2.1 cents
Track and roadway maintenance per car-mile	5.3 cents	4.95 cents
Tie spacing	2 ft., 0 in.	3 ft., 0 in.
Platform wages per hour, per man	50 cents	58 cents

As a result of this expenditure the company has increased the net return about $47,905 per year, and this figure does not make allowances for 1920 coal prices. (It actually cost the company $66,000 in 1920 to produce power.) The figure for power in the column "Old System" in the table above is based on 1919 costs.

The saving in platform wages given above is the actual saving obtained after allowing the operators of the safety cars an increase of 8 cents per hour. The saving in power is the actual difference between what it cost in 1919 to produce power in the company's old plant and the cost to purchase their requirements in 1921.

The saving in maintenance is estimated on the basis of a somewhat higher figure than is actually being obtained for similar cars on the Cincinnati, Lawrenceburg & Aurora Traction Company after three years of operation, the actual cost on that railway being 1.45 cents as compared with the above estimate of 2.1 cents.



CLOSE UP OF FARE BOX AND ZONE TICKET BOX

The saving in tie renewals is based on only 12 per cent of the actual cost of 7,000 ties per year at $1.25 each. With the light-weight car, however, the traction company is now spacing ties at 3-ft. centers, as compared to 2-ft. formerly. This means that eventually the tie renewals will actually be reduced about 40 per cent, although this latter figure will not be reached for some three or four years to come. This saving is not theoretical. It has actually been determined from results obtained by the Union Traction Company, Nashville, Tenn., which has operated similar weight cars for about fifteen months, and the Cincinnati, Lawrenceburg & Aurora Traction Company, Cincinnati, which has operated them for three years.

Fare Collection Method

The collection of fares at first seemed rather complicated, but has really worked out very satisfactorily. There are twenty-two zones, some of which overlap, and it seemed quite a task to work out a plan where one man could handle the situation promptly and efficiently. The system adopted is as follows:

ARCH-BAR TRUCKS USED ON LIGHT-WEIGHT, ONE-MAN INTERURBAN CARS

A standard Cleveland fare box is used and all fares are collected pay-as-you-enter. The passenger deposits his fare, either cash, regular ticket or commutation ticket, in the fare box and is presented with an identification ticket (hat check), bearing the number of the zone to which he is entitled to ride. Upon reaching his destination he deposits this identification ticket in the box. Should the zone in which the passenger is alighting not correspond with the number on the ticket the operator calls his attention to this and requests any additional fare that may be due.

The zones are numbered from 1 to 22 from the Madisonville end toward Blanchester, and these numbers are the same, regardless of the direction the car is going.

The identification ticket is 2 in. long x $\frac{3}{4}$ in. wide, with a large zone number printed on both sides so it can easily be read, regardless of how it falls in the fare box. Smaller figures are also printed along the edge of the identification ticket, and, in the case of a cash fare, the number corresponding to the zone in which the passenger boards the car is punched out. These numbers are not punched in case of a ticket fare. For example, a passenger boards a car at Madisonville (Zone 1) and deposits cash fare to ride to Milford (Zone 7). The operator punches out 1 in the small figures of a No. 7 zone ticket. If the passenger deposits a regular or commutation ticket, however, no punch mark is necessary, and he is simply given a Zone 7 ticket unpunched.

It is interesting to note that so far as is known not a single instance of over-riding has been attempted in the four months that the cars have been operated.

When service with the new cars and new fare collection system was started off, two men were used for about forty-five days to allow the operators, as well as the public, to become thoroughly acquainted with the operation. Since that time the cars have been running just as successfully with one man; in fact, most of the operators state that they prefer the one-man operation and responsibility.

Railway Valuation in Connecticut—II*

Development and Application of "Unit-of-Construction" Method of Appraisal in Valuing Large Railway System

BY ARCHER E. KNOWLTON
Instructor in Electrical Engineering, Yale University

IN LAST week's issue Mr. Knowlton presented the arguments which led the Public Utilities Commission of Connecticut, and its engineers, to adopt what they called a "practical, business-like valuation" of the electric railways of the state and also some details of how the "non-outside-plant" accounts were treated.

In this issue, the details of the "unit-of-construction" or "yardstick" method of appraisal are described and the method justified. It was by the use of this method, more than any other one item, that made possible this valuation of more than fifty million dollars' worth of property at a cost of approximately $10,000 to the state and not to exceed that sum to the company. The time consumed in this whole valuation was less than six months and even during this period the engineers had many regular duties to attend to besides the valuation

—EDITORS.

IN THE previous article several arguments were advanced in favor of a quick and inexpensive appraisal of utility property and it was suggested that the greater saving in time and money could probably be effected in dealing with the "outside plant." In both surface construction and overhead electric construction there is presented a peculiar combination of practical uniformity for stretches of more or less length and, at the same time, wide diversity between the characteristics of even consecutive stretches. The engineers (E. I. Rudd, J. P. Wadhams and the writer) who appraised the street railways of Connecticut for the Public Utilities Commission of that state decided to ascertain the value of the extended property as far as possible by setting up an appropriate number of types of construction for track and paving, contact system, feeders, telephones and signals, transmission lines and bonding and then applying these types in "yardstick" fashion to those properties. It was recognized, of course, that occasional irregularities would not conform to these types, but it was not anticipated that the total value of the irregularities would be great enough to invalidate the results obtained by applying the type costs.

LOW-VOLTAGE DISTRIBUTION SYSTEM

In investigating the possibility of applying the unit-of-construction method of appraisal to the contact-system, it was quickly ascertained that the character of the highway or community, the type of service provided, and the presence of other utilities' wire circuits were the ruling factors in determining the type of contact construction employed by the street railway company. With the exception of the third item, these factors are usually found to continue constant for sufficient distance to result in practical uniformity of the railway construction for distances of several hundred feet. It was estimated that an observer on an inspection car could probably note the character of construction and status of pole ownership in the various sections and, in addition, identify the points of change in about one-sixth of the time required for two or three men to walk the same section and tally in detail every item of physical property. This estimate was not irreconcilable with the actual experience; the 480 miles of route were covered in about sixteen days and the speed of travel gave ample time to note all necessary features of feeder system, telephones and signals as well as of the contact system. It will be noticed that no reference is made to measurements of lengths in the field. Three principal office sources for such information were available and practically no field measurements were necessary. The company's mileage maps gave, to the nearest thousandth of a mile, the distances from the traffic center to switching points of turnouts, special trackwork and sidings, to town lines, railroad crossings and the line termini. Track and paving sheets prepared and maintained by the company's engineer of maintenance of way gave much detail on rail, paving and ballast and often the points of transition coincided with those for the overhead construction for which no lists were available. Finally highway maps of the state were of aid in other instances.

Before proceeding to establishment of the fundamental types of contact construction, it is necessary to touch upon the extensive practice of wire companies in Connecticut as to joint use and joint ownership of wood poles. One of the joint occupants is agreed upon as the builder and custodian of the line; it shall keep an accurate record of the cost of the construction and subsequently bill the other joint owners for their proper share of that cost, which includes field labor, materials, vehicles and a percentage increment for engineering and supervision. Analysis of the costs of representative sections of line jointly occupied by the street railway, in some cases built by the railway forces but more often by those of other utilities, led to the adoption of the following ratios in value to the railway company between solely owned and occupied wood poles and those jointly owned and occupied:

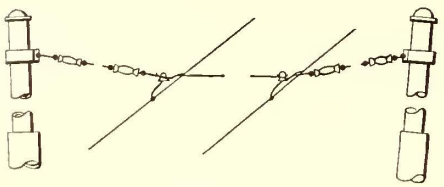
	Per Cent
Solely owned pole	100
One-half interest in two-party pole	62½
One-third interest in three-party pole	50
One-fourth interest in four-party pole	33⅓

The existing cases of permit and rental attachments were treated as joint ownership cases on the assumption that they would practically balance by reciprocity.

As for the size of trolley wire to use in setting up the types, examination of one representative division showing the usual proportions of business district, residential, suburban and rural mileage resulted in an average size of 0.453 lb. per foot. This figure was used even though it is not a commercial size, and the costs of wire, ears, etc., were obtained by interpolation.

*In two parts. Many data and supporting figures for the electrical part of the appraisal treated in this installment are given in greater detail than possible here in a thesis Mr. Knowlton has just presented to the faculty of the Graduate School, Yale University. Complete data are of course on file at the office of the commission in Hartford.

FIG. 1—COST OF SPAN CONSTRUCTION, IRON POLES, DOUBLE TRACK



Type	Cost of SSID Poles	Plus Per Cent of SSID Poles	Plus Part Cost of SSID Poles	Cost 1,000 Ft. SSID Less Poles	Cost of Joint Construction	
					Per 1,000 Ft.	Per Mile
SSID	$685.00	100.0	$685.00	$257.32	$942.32	$4,975.54
SJ_2ID	.....	62.5	428.13	.....	685.45	3,619.17
SJ_3ID	.....	50.0	342.50	.....	599.82	3,167.05
SJ_4ID	.....	33.33	228.33	.....	485.65	2,564.23
SSJ_2ID	.....	81.25	556.56	.....	813.88	4,297.29
SSJ_3ID	.....	75.0	513.75	.....	771.07	4,071.25
SSJ_4ID	.....	66.67	456.67	.....	713.99	3,769.87

Per Span						Item	Per 1,000 Ft. Section					
No.	Each	All	F.C.W.*	A.I.†	Total		Size	Quan.	F.O.B.	F.C.W.	A.I.	Total
2	$24.10	$48.20	$3.10	$17.20	$68.50	Iron poles (caps, gds, conc., S-W.) 934 lb.	No. 3-30 ft.	20	$482.00	$31.00	$172.00	$685.00
2	19	38	.....	.....	.....	Pole bands	5 in.	20	3.80	.....	.....	.....
50 ft.	009	45	.....	.....	.....	Span wire	$\frac{5}{16}$ in.	500 ft.	4.50	.....	.....	.....
4	.16	.64	.....	.....	.....	Wood strain insulators (no clevis)	9 in. E	40	6.40	.....	.....	.....
2	.368	.74	.....	.....	.....	Straight line hangers	.....	20	7.40	.....	.....	.....
.....	.....	2.21	.11	1.00	3.32	Span assembled and installed	.....	.....	22.10	1.10	10.00	33.20
.....	.39	.....	.....	.....	.....	Strain plate	.....	2	.78	.....	.....	.....
.....	.21	.....	.....	.....	.....	Wood strain insulators (with clevis)	.....	16	3.36	.....	.....	.....
.....	.009	.....	.....	.....	.....	Anchor wire	.....	600 ft.	5.40	.....	.....	.....
.....	.....	.....	.....	.....	.....	Strain complete	.....	.....	9.54	.48	2.25	12.27
.....	.....	.....	.....	.....	.....	Trolley wire	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	Ears	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	Suspended trolley wire	.....	2,000 ft.	.....	.....	.....	175.85
.....	.....	.....	.....	.....	.....	Truck or line car, 4 days on poles 0.8 days on wire	.....	4.8	.....	.....	7.50	36.00
.....	.....	.....	.....	.....	.....	Finished construction	.....	1,000 ft.	.....	.....	.....	$942.32

In adopting the types and the associated symbolic notation, the four aspects of contact construction which determine its character and cost are, with the codes for use in the field inspection:

A. **Suspension** {Bracket = B; Span = S}

B. **Ownership of Poles** {Sole = S; Joint = J}

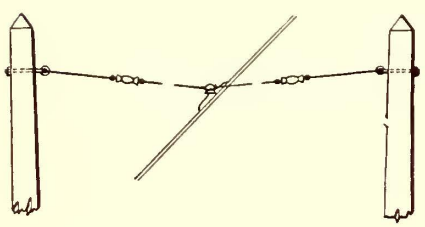
C. **Pole Material** {Wood = W; Iron = I; Concrete = C}

D. **Number of Tracks** {Single = S; Double = D}

The fundamental combinations of these elements were taken to be the following:

1. Bracket construction, Sole ownership, Wood poles, Single track = BSWS
2. Bracket construction, Sole ownership, Wood poles, Double track = BSWD
3. Bracket construction, Sole ownership, Iron poles, Single track = BSIS
4. Bracket construction, Sole ownership, Center Iron poles, Double track = BSID

FIG. 2—COST OF SPAN CONSTRUCTION, WOOD POLES, SINGLE TRACK

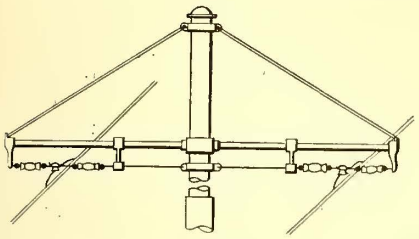


Type	Cost of SSWS Poles	Plus Per Cent of SSWS Poles	Plus Part Cost of SSWS Poles	Cost of 1,000 ft. SSWS Less Poles	Cost of Joint Construction	
					Per 1000 Ft.	Per Mile
SSWS	$158.80	100.00	$158.80	$156.51	$315.31	$1,664.84
SJ_2WS		62.50	99.25		255.76	1,350.41
SJ_3WS		50.00	79.40		235.91	1,245.60
SJ_4WS		33.33	52.93		209.44	1,105.84
SSJ_2WS		81.25	129.03		285.54	1,507.65
SSJ_3WS		75.00	119.10		275.61	1,455.22
SSJ_4WS		66.67	105.87		262.38	1,385.37
SJ_2J_3WS		56.25	89.33		245.84	
SJ_2J_4WS		47.90	76.07		232.58	
SJ_3J_4WS		41.66	66.06		222.57	

Per Span						Item	Per 1,000 ft. Section					
No.	Each	F. O. B.	F.C.W.	A.I.			Size	Quan.	F. O. B.	F. C. W.	A.I.	Total
2	$3.25	$6.50	$2.68	$6.70	$15.88	Chest. poles, shaved, treated, set	.. 30 ft.	20	$65.00	$26.80	$67.00	$158.80
2	.095	.19	.02	.40	.....	Eyebolts, nuts, washers	$\frac{3}{4}$ in. x 16	20	1.90	.24	4.00	.....
50 ft.	.009	.45	.....	.....	.....	Span wire	$\frac{5}{16}$ in.	500 ft.	4.50	.....	.....	.....
2	.16	.32	.05	.60	.....	Wood strain insulators (no clevis)	9 in. E	20	3.20	.50	6.00	.....
1	.368	.368	.....	.....	.....	Straight line hangers	.....	10	3.68	.....	.....	.....
.....	.....	1.328	.07	1.00	2.402	Span assembled and installed	.....	.....	13.28	.74	10.00	24.02
.....	.39	.39	.02	.....	.....	Strain plate	.....	1	.39	.....	.....	.....
.....	.21	.....	.....	.....	.....	Wood strain insulators (with clevis)	9 in.	16	3.36	.....	.....	.....
.....	.009	.....	.....	.....	.....	Anchor wire	$\frac{5}{16}$ in.	600 ft.	5.40	.....	.....	.....
.....	.....	.....	.....	.....	.....	Strain complete	.....	.....	9.15	.45	2.00	11.60
lb.	.162	.....	.01	.....	.172	Trolley wire 1,000 ft.	.453 lb./ft.	453 lb.	73.39	4.53	.....	.....
1	.26	.....	.01	.....	.27	Ears	.....	11	2.86	.11	.....	.....
ft.	.....	.....	.....	.007	.....	Suspended trolley wire	.....	1,000 ft.	76.25	4.64	7.00	87.89
.....	.....	.....	.....	.....	.....	Truck or line car, 4 days on poles 0.4 days on wire	.....	.....	.....	.....	7.50	33.00
.....	.....	.....	.....	.....	.....	Finished construction	.....	1,000 ft.	.....	.....	.....	$315.31

*F.C.W. indicates Freight, Cartage and Warehousing. †Indicates Assembly and Installation.

FIG. 3—COST OF BRACKET CONSTRUCTION, CENTER IRON POLES, DOUBLE TRACK



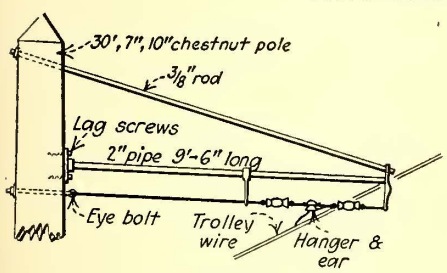
Type	Cost of BSID Poles	Plus per Cent. of BSID Poles	Plus Part Cost of BSID Poles	Cost of 1000 ft. BSID Less Poles	Cost of Joint Construction	
					Per 1000 ft.	Per mile
BSID	$342.50	$100.0	$342.50	$295.27	$637.77	$3,367.43
BJ_2ID		62.5				
BJ_3ID		50.0				
BJ_4ID		33.33				

Per Poles						Item	Per 1,000 ft. Section					
No.	Each	F.O.B.	FCW	A. I.	Total		Size	Quan.	F.O.B.	FCW	A. I.	Total
1	$24.10	$24.10	$1.55	$8.60	$34.25	Iron poles (caps, gds., conc. & S. W.)	No. 3-30 ft.	10	$241.00	$15.50	$86.00	$342.50
2	.19	.38				Pole Bands	5 in.	20	3.80			
2	1.26	2.52				Bracket arm, middle and end casting	2 in.x9.5 ft.	20	25.20			
1	.20	.20				Pole casting	5 in.	10	2.00			
2	.35	.70				Over suppt. rod, thrd. nuts, washers	$\frac{3}{4}$ in. x 11 ft.	20	7.00			
4	.16	.64				Wood strain insulators	9 in. E	40	6.40			
30 ft.	.009	.27				Span wire	$\frac{5}{16}$ in.	300 ft.	2.70			
2	.368	.73				Straight line hanger		18	6.57			
		5.44	.27	2.00	7.71	Brackets complete, less two hangers			53.67	2.70	20.00	76.37
						Strain complete		2				15.90
						Suspended trolley wire	2,000 ft.					174.50
						Truck or line car 3 days on poles 0.8 days on wire					7.50	28.50
						Finished construction		1,000 ft.				$637.77

5. Span construction, Sole ownership, Wood poles, Single track = SSWS
6. Span construction, Sole ownership, Wood poles, Double track = SSWD
7. Span construction, Sole ownership, Iron poles, Single track = SSIS
8. Span construction, Sole ownership, Iron poles, Double track = SSID

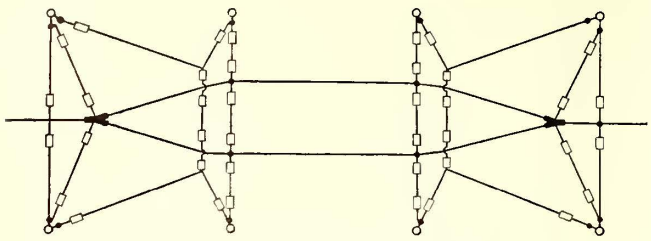
Differences in cost between the rigid and flexible bracket and between double brackets on center poles and long brackets on side-location poles for double track were insignificant and therefore ignored. The cost of a thousand-foot section of each one of these types was then tabulated, the arrangement conforming to the actual subdivision of the work during assembly and construction. Figures 1 to 4 show the tabulated costs for some of the types. The table in the upper right hand

FIG. 4—COST OF BRACKET CONSTRUCTION, WOOD POLES, SINGLE TRACK



Type	Cost of BSWS Poles	Plus Per Cent of BSWS Poles	Plus Per Cent Cost of BSWS Poles	Cost of 1000 ft. BSWS Less Poles	Cost of Joint Construction	
					Per 1000 ft.	Per Mile
BSWS	$79.40	100	$79.40	$151.69	$231.09	$1220.15
BJ_2WS		$62\frac{1}{2}$	49.60		201.29	1062.81
BJ_3WS		50	39.70		191.39	1010.54
BJ_4WS		$33\frac{1}{3}$	26.47		178.16	940.68

Per Bracket						Item	Per 1,000 Ft. Section					
No.	Each	All	F.C.W.	A. I.	Total		Size	Quan.	F.O.B.	F.C.W.	A. I.	Total
1	$3.25	$3.25	$1.34	$3.35	$7.94	Chest. poles (shaved, treated, set)	30 ft.	10	$32.50	$13.40	$33.50	$79.40
1	1.395	1.395				Bracket arms plus castings	2in.x9.5ft.	10	13.95			
1	.089	.089				Eyebolts and washers	$\frac{5}{8}$x12 in.	10	.89			
2	.015	.03				Lag screws	$\frac{1}{2}$x4 in.	20	.30			
2	.16	.32				Wood strain insulators (no clevis)	9 in. E	18	2.88			
15	.009	.135				Span wire	$\frac{5}{16}$	150 ft.	1.35			
1	.368	.368				Straight line hanger		9	3.31			
1	.35	.35				Over suppt. rod (thrd. nuts, washers)	$\frac{3}{4}$x11 ft.	10	3.50			
		2.687	.13	1.10	2.917	Brackets complete (less one hanger)		10	26.18	1.31	11.00	38.49
	.39					Strain plates	15 in.	1	.39			
	.21					Wood strain insulators (with clevis)	9 in. E	8	1.68			
	.009					Anchor wire	$\frac{5}{16}$	400 ft.	3.60			
						Strain complete (one in 1,000 ft.)			5.67	.28	2.00	7.95
	.162		.01		.172	Trolley wire, 1,000 ft		453lb.	73.39	4.53		
	.26					Ears		9	2.34	.09		
				.007		Suspended trolley wire			75.63	4.62	7.00	87.25
						Truck or line car, 2 days on poles, 0.4 days on wire		2.4			7.50	18.00
						Finished construction		1,000 ft				$231.09



Item	Size	Quantity	Each, F.O.B.	Total, F.O.B.	F.C.W.	A. I.	Total
Chestnut poles	30′	8	3.25	26.00	10.73	26.80	$63.52
Eyebolts, nuts, washers	⅝x12″	12	0.089	1.07	0.05	.....	.....
Backbone, 7 strand	½″	480′	0.006	2.70	.90	.....	.....
Pull-off, 7 strand	5/16″	450′	0.0072	3.24	1.71	.....	.....
3-bolt clamps	.....	.....	.....	.....	.....	.....	.....
Wood-strain insulators		40	.16	6.40			
Straight line hangers	9″ E	6	.368	2.21	.76	.....	.....
Double-curve pull-overs	.....	4	.444	1.77			
V-frogs	.....	2	2.50	5.00			
Turnout (less trolley and ears)	.....	.....	.....	22.39	3.42	22.70	48.51
Trolley wire, 700 ft	.....	317 lb.	.....	51.35	3.17	.....	.....
Ears	.....	10	.26	2.60	.10	.....	.....
Suspended trolley wire	.....	.....	.....	53.95	3.27	6.30	63.25
Truck or line car, 1 day	.....	.....	.....	.....	.....	.....	7.50
Finished turnout	.....	.....	.....	.....	.....	.....	$183.50

Detail of labor on spans, 102 splices at $0.15 = $15.30
2 frogs at 1.50 = 3.00
10 spans at .20 = 1.60
12 eyebolts at .20 = 2.40
$22.70

FIG. 5—DIAMOND TYPE TURNOUT—SPAN CONSTRUCTION

corner shows the values allowed for joint pole use, incorporating the ratios previously referred to. Of course where poles are jointly used on one side and solely owned and occupied on the other in the case of span construction, the average for the corresponding pole values applies. A similar average is taken where the poles may be iron on one side and wood on the other. Where double trolley wire was in use over single track, the extra cost (1910-1915 prices were employed throughout the entire valuation) were practically $100 per thousand feet. Proper adjustments were also made for cases where span wires were attached to buildings or bridge structures.

Having established these types, a trial of reliability was made by applying the proper types to a 2-mile rural line which the company had inventoried in great detail. The company on its own pricing claimed a value of $2,643.19 and the result of applying the types was $2,629.50. Some will be inclined to claim that the agreement is too good to be convincing.

The actual length of turnouts shorter than 400 feet was ignored, the value assigned being that for the average 300-ft. turnout; there is also little difference in cost between diamond and jacknife turnouts of that length as will be seen by reference to Figs. 5 and 6. Longer turnouts were treated as double track with turnout ends.

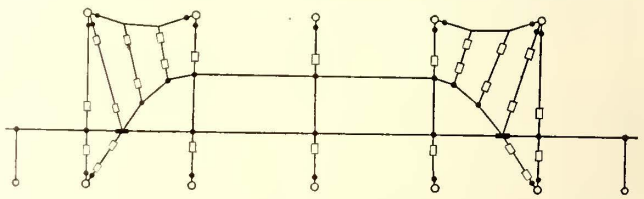
In dealing with the overhead special work, it was recognized that there would be appreciable deviation from right angles at intersections, varying length of approach and curve, unsymmetrical pole locations, etc., but the errors in averaging these factors and even in ignoring joint use of poles in connection with the special work could not accumulate to a significant total. In the case of some kinds of special work the main line mileage for the adjacent tangent construction was taken through the special work, the value of which is then the excess over tangent construction. In other cases the mileage of tangent construction was taken to and from the special work because the special work involved considerable complexity and extra poles for its support.

With the types and symbols thus adopted for the contact system (and also signals, telephones and feeders) the next move was the field inspection for the purpose of listing the construction. An inspection car with an observation end was used, so routed as to keep that end forward as much as possible, and so scheduled as to permit stops for special inspections when deemed necessary. All sorts of identifying notations were made for recording the points where the construction changed in some respect — street intersections, pole numbers, bridges, and even a letter on an enlarged state topographical map when other means failed. The following few lines will show the general nature of the simple field notes necessary to list by symbols and identify the locations of the various kinds of overhead construction:

Fairfield Avenue Line	Distribution	Feeders
(Two blocks HTS; 1 to T.O. then 1 to end of line; both on 2-pin arms)		
End of line to White St. T.O. (T.O. = 275 ft.)	$SSIJ_3WS$	0
White St. T.O. to C (Map 21)	$SSIJ_3WS$	0
C to Fairfield Ave., double track	$SSIJ_3WS$	1
On double track to New Britain Ave. Jnc.	$SSIJ_3WD$	1

The point C was noted as the end of the feeder. The parenthesis refers to a hand-thrown signal and circuit. The poles were solely owned iron ones on one side and three-party joint wood poles on the other side.

The form used for listing and totaling the contact system, feeders, special work and bonding is shown in Figure 7. It is felt that this form will give ample evidence of the possibility of ascertaining with little effort



Item	Size	Quantity	Each, F.O.B.	Total, F.O.B.	F.C.W.	A. I.	Total
Chestnut poles	30′	10	3.25	32.50	13.40	33.50	$79.40
Eyebolts, nuts, washers	⅝x12″	14	0.089	1.25	0.06	.....	.....
Backbone, 7 strand	½″	120′	0.006	0.72	0.24	.....	.....
Pulloff, 7 strand	5/16″	650′	0.0072	4.68	2.47	.....	.....
3-bolt clamps	.....	8	0.20	1.60	.....	.....	.....
Wood strain inculators	9″E	26	0.16	4.16	.....	.....	.....
Straight line hangers	.....	8	0.368	2.94	.....	.....	.....
Single-curve pullover	.....	4	0.41	1.64	0.72	.....	.....
Right-hand frog	.....	1	2.00	2.00	.....	.....	.....
Left-hand frog	.....	1	2.00	2.00	.....	.....	.....
Turnout (less trolley and ears)	.....	...	.....	20.99	3.49	19.85	44.33
Trolley wire, 650 ft	.....	294 lb.	0.162	47.63	2.94	.....	.....
Ears	.....	12	0.26	3.12	3.12	.....	.....
Suspended trolley wire	.....	...	.....	50.75	3.06	4.55	58.36
Truck or line car, 1 day	.....	...	.....	.....	.....	.....	7.50
Finished turnout	.....	...	.....	.....	.....	.....	$189.50

Detail of labor on spans, 83 splices at $0.15 = $12.45
2 frogs at 1.50 = 3.00
8 spans at .20 = 1.60
14 eyebolts at .20 = 2.80
$19.85

FIG. 6—JACK-KNIFE TYPE TURNOUT—SPAN CONSTRUCTION

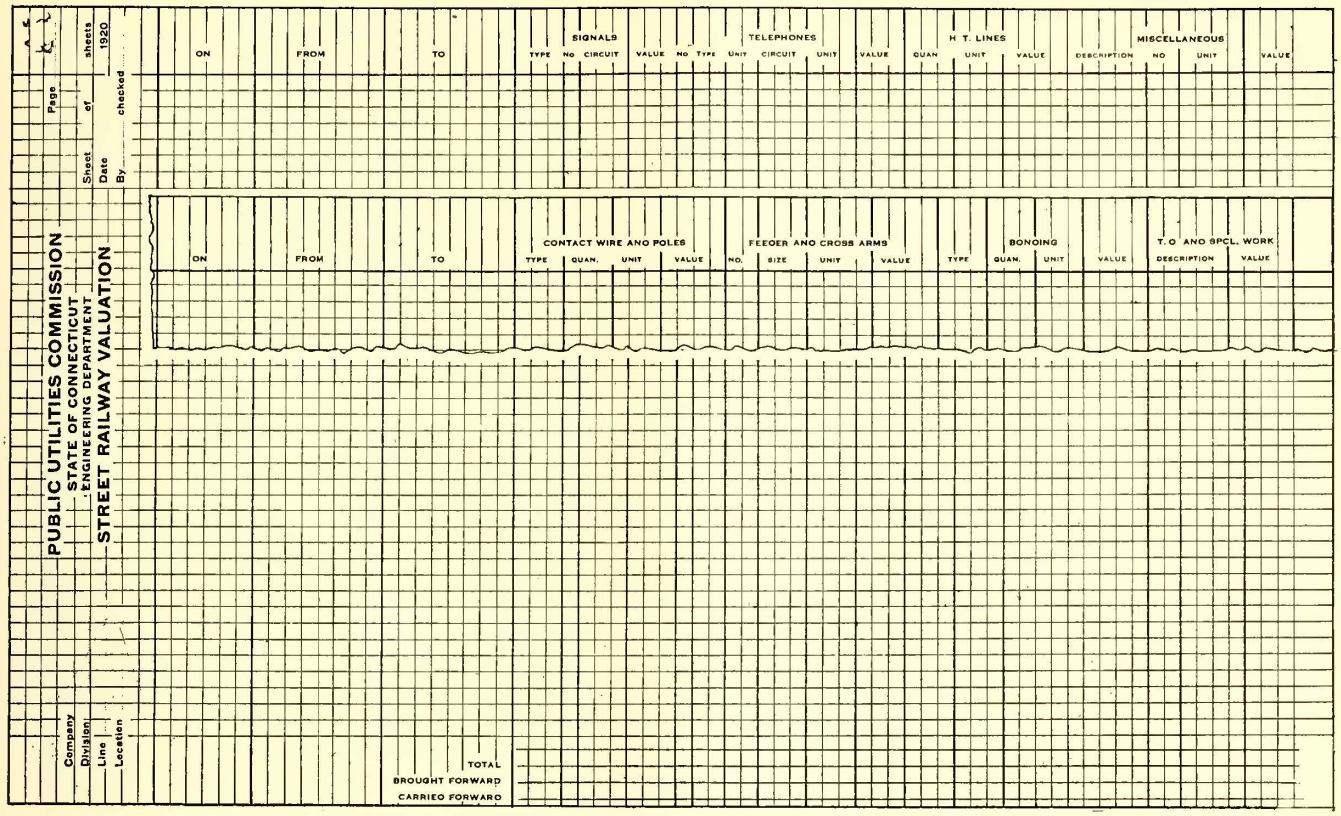


FIG. 7—THE TWO FORMS USED FOR LISTING AND TOTALING ELECTRICAL PLANT OUTSIDE

the capital investment in the electrical construction for any portion of a given street-car line, of differentiating between distinctly city and rural lines, of obtaining totals for portions of the entire system not necessarily coterminous with the company's divisions as established for operating purposes, and finally of identifying at any time the location of each bit of outside plant construction and the value assigned to it. Granting also the propriety of separating the feeder and cross arms from the contact wire and poles as will be described, the method of listing also keeps distinct from the actual distribution (of localized value) the feeder system which functions primarily to supply not so much the section valued but rather the more remote sections.

Feeder System

The Interstate Commerce Commission classification has "Poles and Fixtures" in one account and "Distribution System" in another, but this separation interferes with an estimate of reproduction cost on a unit-of-construction basis. "Fixtures" include the cross-arms and braces and these are associated with the feeders or signal circuits and not with the contact system. "Poles," on the other hand, are necessary for the contact system even when feeders are absent. Except where the feeders follow an independent route, poles have already been included with the contact system. Cross-arms will thus appear in conjunction with the feeders, enough extra pins being allowed in excess of the feeder requirements to provide space for such signal circuits as appear. Of course feeders may be of aluminum as well as copper, underground or submarine as well as aërial, negative feeders may be used in electrolysis mitigation, many combinations of cross-arm sizes and feeder sizes are to be found, and there are always such accessories as feed taps, circuit breakers, knife switches and section insulators, lightning arresters, meters, etc., but no difficulty was found in dealing with these variations. The company had a complete set of feeder maps which were accurate or could readily be made so and these maps indicated the number and sizes of all feeders, the location of changes in number and sizes, the approximate location of feed taps and the accessories. In a few instances the actual measured length of a feeder was recorded, but in general the lengths were obtained from the mileage maps and the track and paving sheets already mentioned.

The following will indicate the allowances for cross-arm sizes with given numbers of feeders, the spare pins leaving adequate provision for the few signal and telephone circuits:

One to four feeders	One four-pin arm
Five and six feeders	One six-pin arm
Seven to twelve feeders	Two six-pin arms
Twelve to eighteen feeders, etc.	Three six-pin arms, etc.

Allowing for double-arming at corners and dead-ends the cost of four-pin arms per 1,000 ft. of feeder circuit was $14 and for six-pin arms $17. Insulators cost about $2 per 1,000 ft., as an average for all sizes of feeders.

No further progress toward reduction to types could be made than thus to standardize on cross-arm sizes for certain numbers of grouped feeders, the large number of possible combinations pointing rather toward a tabulation of individual feeder costs which could flexibly be applied to any selection likely to be encountered. Table I shows these costs per thousand feet. Two illustrations are offered as showing how this table was used for combinations not directly tabulated.

1. Seven 4/0 plus two 750,000 c.m. feeders.
2. Eight 600,000 c.m., twelve 500,000 c.m., five 4/0.

The combination (1) is treated as two groups (of three 4/0 and one 750,000) each at $960 with an extra 4/0; but two six-pin arms would be used, therefore it is necessary to increase the allowance by $6, the difference

TABLE I—COSTS PER 1,000 FT., INSTALLED, OF FEEDER COMBINATIONS

	+ 0	+ 1 2/0	+ 1 4/0	+ 1 250M	+ 1 300M	+ 1 500M	+ 2 500M	+ 3 500M	+ 1 600M	+ 1 750M	+ 1 1000M
1-4/0	160	257		345	379	508	857	1206	571	667	822
2-	307	404		492	526	656	1005	1357	718	814	969
3-	453	550	599	638	672	802	1154	1503	864	960	1115
1-250 M	199	296	395		418	547	896	1245	610	706	861
2-	384	481	530		603	733	1082	1434	795	891	1046
3-	570	666	716	755	789	919	1271	1620	981	1077	1232
1-300 M	233	330	379	418		581	930	1279	644	740	895
2-	451	548	597	636		800	1149	1501	862	958	1113
3-	670	767	816	855	889	1090	1371	1720	1081	1177	1337
1-500 M	362	459	508	547	581				774	870	1025
2-	711	808	857	896	930				1123	1318	1373
3-	1059	1156	1206	1245	1279				1471	1566	1721
4-	1408	1508	1557	1596	1630				1822	1918	2073
5-	1760	1860	1909	1948	1982				2174	2270	2425
6-	2108	2225	2274	2313	2347	2474	2823	3171	2539	2635	2790
1-600 M	425	522	571	610	644	774	1123	1471		932	1087
2-	836	933	982	1021	1055	1185	1534	1886		1343	1498
3-	1247	1344	1393	1432	1466	1596	1948	2297		1764	1909
4-	1658	1758	1807	1846	1880	2010	2362	2725		2168	2322
5-	2072	2169	2218	2267	2291	2421	2787	3136	2483	2579	2734
1-750 M	521	618	667	706	740	870	1219	1568	932		1183
2-	1028	1125	1174	1213	1247	1377	1726	2078	1439		1690
3-	1535	1632	1681	1720	1764	1884	2236	2585	1946		2197
4-	2549	2649	2698	2737	2771	2901	3250	3616	2963		3214
5-	3062	3159	3208	3247	3281	3411	3777	4126	3473	3569	3724
1-1000 M	676	773	822	861	895	1025	1374	1723	1087	1183	
2-	1338	1435	1484	1523	1567	1687	2036	2388	1749	1845	
3-	2000	2097	2146	2185	2219	2349	2701	3050	2411	2507	
4-	2662	2762	2811	2850	2884	3014	3363	3729	3076	3172	
5-	3327	3424	3473	3512	3546	3676	4042	4391	3778	3834	3989
No cross-arm;with Insulator		97	146	185	219	349	698	1047	411	507	662
No cross-arm or Ins.		95	144	183	217	347	694	1041	409	505	660

	1/0	3/0	350M	400M	700M	1 "Al.	1.21 "Al.	1.24 "Al.
No cross arm; with insulator	79	121	252	284	475	292	493	416
No cross arm or insulator	77	119	250	282	473	290	401	414

between the cost installed of six-pin arms and four-pin arms in the thousand feet. Further the odd 4/0 feeder value is taken as $146, tabulated under "no cross-arm; with insulators," because this feeder will appear on one of the unoccupied pins of the six-pin arms. The total per thousand feet of this combination is $2,072. Group (2) is handled as:

Four 600,000 + one 4/0	$1,807
Four 600,000 + one 4/0	1,807
Nine 500,000	3,171
Three 4/0 + three 500,000	1,503
All on five six-pin arms (per 1,000 ft.)	$8,288

Above the broken line in each block of the table the total number of feeders for each combination calls for a four-pin cross-arm; between the broken and dot-and-dash line a six-pin arm; below the dot-and-dash line two six-pin arms. It should be noted that the portions of the above totals which represent the assumed cross-arms amount to percentages ranging from 1.2 per cent to 1.7 per cent and that any error in the above assumption as to number and size of cross-arms would therefore be well within 1 per cent of the over-all value.

The feeder maps were spot checked as to feeder sizes and the location, number and types of such accessories as circuit breakers, section insulators, knife switches, feed taps, etc. Bracket and span feed taps were priced separately, that one being assigned which corresponded to the contact construction in the section where it appeared. A single average length of feed wire was used with all circuit breakers and knife switches to allow for the vertical runs.

The 147 miles of circuit are shown schematically in Fig. 8. Although all this mileage is operated at 11,000 volts, three-phase, 25 cycles, some lines are insulated for 22,000 and 33,000 working volts. The fifteen different types of pole tops found are shown in Fig. 9. The conductors are of either copper (No. 4, No. 2, or 2/0) or aluminum (1/0, 2/0 or 4/0). Each of the lines, ranging from 8 to 30 miles in length, was found to be of a high degree of uniformity of type either throughout the entire length or for at least a quarter of the distance. This meant that this portion of the street railway property lent itself very advantageously to the unit-of-construction method of estimation first developed for the distribution system.

The lines were built entirely on wooden poles and these poles would at any point be the same whatever the character of pole-top construction or the character of insulators or conductors.

On the other hand, the pole-top construction would be practically independent of poles and conductors. The insulators seem to be more intimately related to the conductors than to the cross-arms. In view of these considerations the analysis was aimed toward a study independently of poles, pole tops and circuits. With the poles in place any one of the established set of types of pole tops would then be erected on these poles to support any type of circuit existing on the system.

The company had on file route maps of the lines and these were found to be accurate as to lengths of lines and numbers of poles, location of special crossings, etc., but did not give the type of pole top nor the height of the individual pole. It was therefore decided to make a quick field inspection to determine the number of poles

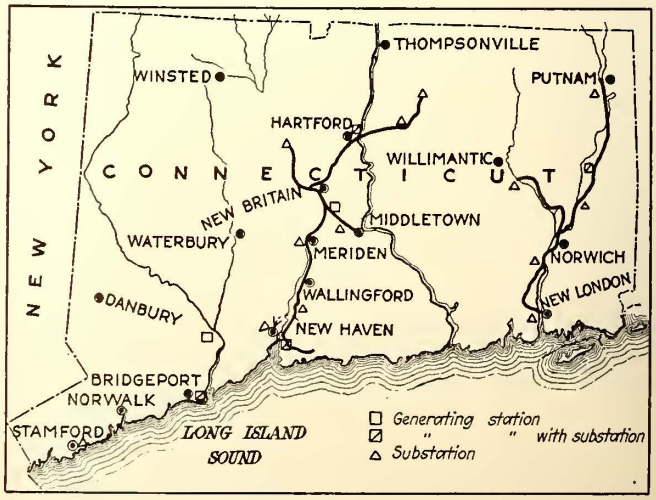


FIG. 8—TRANSMISSION SYSTEM, POWER PLANTS AND SUBSTATIONS

of each size, the number of double cross-arms (at angles, etc.), the number of special crossings (over railroads, other wire lines, etc.), the number of H-frames (at dead-ends and angles), of anchor guys, braces, head guys, and stubs. At the same time the points of transition from one type of pole top or circuit to another could be noted as well as the few irregularities not covered by type treatment.

It was found that the number of poles per thousand feet averaged 9.57, giving an average span length of 104.51 feet, and that the poles were distributed as to size as follows, 10 per cent being set in rock, the remainder in medium earth:

Pole Height, Feet	Poles per 1,000 ft.	Per Cent
35	2.04	21.27
40	5.37	56.17
45	1.36	14.25
50	.48	5.02
55	.18	1.83
60	.09	.94
65	.04	.42
70	.01	.10
	9.57	100.00

The inspection of from 325,000 to 647,080 ft. of line disclosed the frequency of incidental construction to be as follows:

Item	Total	Per 1,000 Ft.
Double cross-arms	906	1.40
Special crossings	301	.49
H-frames	18	.26
Anchor guys	663	2.03
Braces	161	.49

TABLE II—QUANTITIES OF EXCAVATION AND BALLAST FOR VARIOUS KINDS OF TRACK

Track Excavation — Cubic Yards per 100 Lineal Feet

Wood Ties	Single Track							Double Track						
Class Track / Rail Height	9″	8″	7″	6″	5″	4½″	4″	9″	8″	7″	6″	5″	4½″	4″
A	77							150						
B	72	69			61	60		149	143			126	123	
C G J	50	47	44	42	39	37	36	106	100	94	88	82	79	76
D F N	58	56	53	50	47	46	44	123	117	111	106	100	97	94
K M					64	62						135	132	
Side Loc. C G J				25	25	25	25				53	53	53	53
" " D F N				33	33	33	33				70	70	70	70

Paving Excavation

Class Paving / Thick	P X1 / P3 P4 / 9″	P1 X / X3 / 2½″	K / 12″	R1 T3 / R2 T4 / 5″	S W / S1 W1 / 6″	X2 / 8″	T Y1 / 11″	W2 / 4″	P2 / 7″	T2 / 10″	Pockets Under Rail X1 W2	V Z
Single Track	25	7	33	14	17	22	31	11	19	28	1.3	0
Double Track	53	15	70	29	35	47	65	23	41	58	2.7	0

Ballast

	A	A2	A3 A5 A6	B	C G J	D F N	K M	Side Location	R.R. Section
Single Track				22.8	0	28.4	45.1	28.4	34
Double Track	46.6	44.2	48.2	48.6	0	60.5	95.7	60.5	66

Ballast Variation – Paving not same thickness as Rail height

	Decrease – Paving Thicker						Increase – Paving Thinner						Pockets under Rail Deduct.
	1″	2″	3″	4″	5″	6″	1″	2″	3″	4″	5″	6″	
Single Track	1.95	3.9	5.9	7.8	9.8	11.7	2.8	5.6	8.4	11.1	13.9	16.7	1.3
Double Track	4.2	8.4	12.7	16.9	21.1	25.3	5.85	11.7	17.6	23.4	29.3	35.1	2.7

Assembly of the various items in these proportions gave the costs per thousand feet of poles and of each of the types of pole tops. The poles and reinforcement amounted to $211.61 per thousand feet. A thousand feet of "A" pole tops cost $32.70; of "H," $75.58, etc. A similar set-up was made for conductors and insulators.

The ten lines having a total circuit mileage of 147 (with overlap of about 6 miles) were valued at $281,463.61. After adjusting for the overlap, for joint use of poles with trolley contact circuits, and for short sections of cable, the value per mile of single circuit line averages to practically $1,900.

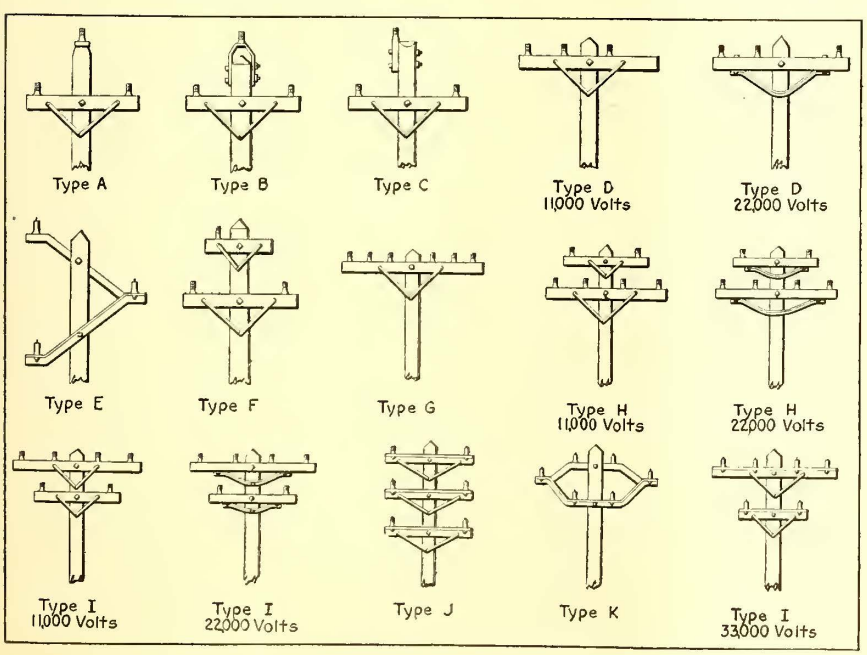


FIG. 9—TYPES OF POLE TOPS USED BY THE CONNECTICUT COMPANY

Signals, telephones and rail-bonding proved susceptible to the same general reduction to type. Signal and telephone circuits were priced on a thousand-foot basis, no allowance being made for cross-arms since spare pins for these circuits were contemplated in pricing the feeders. Four distinct types of signal devices and four telephone station types were found and the costs of these determined separately from the circuits. Similarly the cost per hundred feet of bonding each length of rail, single or double track with each type of bond, from the short U-type to the long 48 in., was tabulated and applied to each section according to the recorded bonding. It is shown that the bonding of special trackwork required special treatment.

Track and Roadway

In attacking the problem of the track and paving costs it was found that the company's engineer of maintenance of way had records which gave in great detail the character of track construction from point to point on the system. It was based on a classification which employed a letter to indicate the nature of sub-foundation and ballast and a numeral to indicate the weight and length of rail, kind of ties and kind of joint. The listing sheets were segregated by divisions, routes and towns and gave to the nearest foot the length of each uniform combination of sub-foundation, ballast, track and paving. The points of change were identified by various methods—names of cross-streets, the approximate distance from

the last named cross-street, special trackwork, railroad crossing, town line, etc. These same sheets have already been mentioned as of considerable value in determining lengths of overhead electrical construction. It has also already been stated that special trackwork was recorded by serial number on individual detailed maps giving all dimensions and such other information as was necessary for pricing purposes. No difficulty was experienced in co-ordinating the special trackwork information with that for tangent track appearing on the track and paving sheets in such a manner as to differentiate wholly between the two as to distances and values.

These records simplified the field work with reference to track to a greater extent, in proportion, than was the case with the electrical outside plant.

To reduce the tangent track construction to a type basis for the purpose of applying the "unit of construction" method of valuation, the classification established by the company was somewhat enlarged to symbolize all

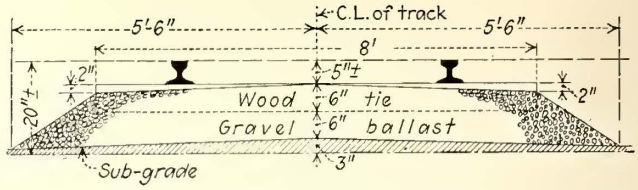
TABLE III—ESTIMATED COST OF 100 LINEAL FEET IN VARIOUS PAVEMENTS
(1910-1915 prices)

Classification	Paving	Cost	
		Single Track	Double Track
A-1	P	541.77	1,046.82
B-2	S	368.07	723.59
C-3	V	209.53	423.17
C-3	X	238.86	485.17
D-4	R	344.92	702.00
F-4	T	295.24	601.79
H-1	P	.....	1,196.46
J-15	R_1	166.80	337.71
K-2	—	254.58	522.37
M-1	Z	232.77	475.04

the elements involved. The letters adopted and their significances as to foundation and ballast are as follows:

A	Concrete mat sub-foundation
B	Telford sub-foundation
C, G, J	On native material suitable for ballast
E	On bridge
D, F, N	On sub-foundation of native soil not suitable for ballast, requiring the placing of either gravel or stone ballast. The ballast differentiates between the three letters.
K, M	Special types, one a sub-foundation of stone, the other of cinders

An excavation and ballast table (Table II) was first prepared to show the cubic yards of track excavation per hundred lineal feet of track for each combination of sub-foundation, rail height and paving. The costs of excavating for the full depth of track construction and for pavement differ and for that reason the quantities involved are shown separately in the two upper tables of the figure. The same table shows in the third subdivision the varying quantities of ballast involved with the different conditions of sub-foundations and ties. The fourth subdivision (at the bottom of the table) shows corrections to be applied to ballast quantities when the paving and its foundation are not of the same total thickness as the height of the rail. Applying the proper unit prices to the quantities for each kind of track as



ESTIMATED COST OF 100 LINEAL FEET OF SINGLE TRACK

Item	Unit	Rate	Quantity	Amount
Rail—T 5 in., 80 lb., 33 ft.	Tons	$35.00	2.381	$83.34
Splices—Angle 30 in., 6 bolt	Complete	1.17	6.6	7.72
Spikes	Pounds	.02	120	2.40
Ties—native wood	Each	.65	50	32.50
Track labor	Lineal feet	.35	1.00	35.00
Ballast—gravel	Cubic yard	.60	32	19.20
				$180.16
Contractor's profit				8.75
Total				$188.91

FIG. 10—TRACK TABLE FOR TYPE J22

determined by reference to this table and tabulating, the results were then in convenient form for use in assigning costs of excavation and ballast for any combination of track and paving.

Unfortunately the numerals adopted by the company to signify the particular combination of rail section, tie and joints were not uniform for the various letter groups representing the character of sub-foundation and ballast. Thus A-1 means a 9-in., 125-lb., 60-ft. rail on wood ties and a 6-in. concrete mat foundation, the whole ballasted with stone; while C-1 means a 9-in.,

TABLE V—PAVEMENT CLASSIFICATION

Class	Thickness	Foundation	Surface
P	9 in.	6 in. concrete	2½-3 in. asphalt
R	12 in.	6 in. concrete	Granolithic Block
R_2	5 in.	Earth	Granolithic Block
S	6 in.	Macadam	Macadam
T	11 in.	6 in. concrete	Brick
V		Earth	Earth
W	6 in.	6 in. concrete	6 in. concrete
W_3	6 in.	6 in. hassam	6 in. hassam
X	2½ in.	Stone	Amiesite
Z		Cinders	Cinders
		No paving (open track)	

84-lb., 50-ft. rail on wood ties on native soil with native soil ballast. But for the engineers of the commission to have attempted reclassification with a view to numeral standardization would have resulted in complication and delay. This accounts for the apparent inconsistency of the classification.

The last letters of the alphabet were used to indicate the character of paving surface, with supplementary numerals for subscripts to designate variations under the principal group:

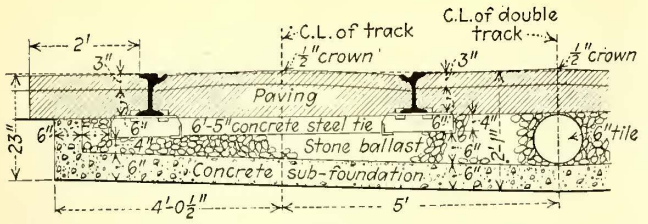
P = asphalt	V = native soil	Y = wood
R = granite	W = concrete	Z = cinders
S = macadam	X = amiesite	— = no paving.

Some 160 different combinations of foundation, ballast and track were recognized and some 30 of paving. Actually over 400 different combinations of track and paving were found, but from the standpoint of cost to reproduce, so many of these were practically identical

TABLE IV—TRACK CLASSIFICATION

Class	Sub-Foundation	Ballast	Ties	Weight	Rail Section	Length	Joint
A-1	6 in. Concrete	Stone	Wood	9 in., 125 lb.	P. S. 273	60	C 12 bolt
B-2	Telford	Stone	Wood	9 in., 84 lb.	L. S. 229	60	C 8 bolt
C-3	Earth	Earth	Wood	5 in., 80 lb.	P. S. 251	60	L 6 bolt
D-4	Sand and Gravel	Stone	Steel Conc.	6 in., 100 lb.	P. S. 163	60	Continuous 6 bolt
F-4	Earth	Stone	Wood	7 in., 70 lb.	P. S. 206	30	C 8 bolt
H-1	Concrete Beam	None	Wood	9 in., 104 lb.	P. S. 260	30	Lorain Weld
J-15	Gravel	Gravel	Wood	4¼ in., 56 lb.	P. S. 51	30	L 4 bolt
K-2	Stone	Stone	Wood	4½ in., 70 lb.	Beth. 37	30	L 6 bolt
M-1	Cinders	Cinders	Wood	4½ in., 70 lb.	P. S. 237	30	L 4 bolt

In the "joint" column, a channeled joint bar is indicated by "C," an angle bar by "L"; the number of bolts employed also appears in this column.



ESTIMATED COST OF 100 LINEAL FEET OF DOUBLE TRACK

Item	Unit	Rate	Quantity	Amount
Rail—G.G. 9 in., 125 lb., 50 ft., 60 ft	Tons	$40 00	7.440	$297.60
Splices—Channel, 32 in., 12 bolt	Complete	2.75	8	22.00
Tie rods—7. ft. centers	In place	0.43	27.2	11.70
Ties—steel concrete, 6 ft	Each	5.00	32 6	163.00
Track labor	Lineal feet	.55	200	110.00
Concrete sub-foundation	Cubic yard	5.00	36 0	180.00
Excavation—paving	Cubic yard	1.75	53	92.75
other	Cubic yard	.80	81	64.80
Drainage—6 in. V.T. pipe	Lineal feet	.20	100	20.00
—catch basins	Complete	30.00	0.17	5.10
Ballast stone	Cubic yards	1.20	44.2	53.04
				$1,019.99
Contractor's profit				71.49
Total				$1,091.48
Paving—Asphalt on concrete	Square yards	2.14	211	451.54

FIG. 11—TRACK TABLE FOR TYPE A2-P

that it was found easily possible to reduce the necessary number of standard types to 50. To indicate the nature of a few of these combinations and the corresponding costs per hundred lineal feet of either single or double track, Table III is given.

In addition, Table IV exhibits the separate details of excavation, ballast and track, and Table V shows the details of paving.

As an indication of the manner in which the over-all cost of the fundamental combinations of track and roadway were assembled there are given two examples out of the 50 standard types. One (Fig. 10) is an inexpensive rural track and the other (Fig. 11) an expensive city track and pavement.

It is naturally not possible in an article of this length to give the costs and quantity data in any greater detail, but it is believed that enough has been set forth to indicate that the value of the track and roadway investment can by this method be estimated with a minimum of approximation. In addition it is possible to list the property with its assigned value in such a way as to permit absolute identification of each stretch of track in the pricing sheets, as sample shown in Fig. 12. This is similar to the electrical overhead listing sheets, Fig 7.

Conclusion

Some of the aspects of the ordinary physical valuation questioned in the former article were the cost, the length of time taken, the uncertainty as to labor costs in connection with the multiplicity of small items, and the inflexibility of the summary as to rational apportionment of the total value among subsequent subdivisions of the property. Superior in the mind of the writer to these objections to an expensive detailed appraisal is the insignificance of appreciable variations in the physical totals when it comes to the actual determination of the reasonable rate. It is felt that the method outlined in this and the previous articles avoids most of these objections and has in addition the advantage, at least in connection with the outside plant, of identifying the location of each piece of valued property and thereby assuring that the errors of omission are at a minimum. Even though the cost of making this appraisal was no more than 10 or 12 per cent of what a detailed-count appraisal would have cost, those who ordered the work as well as those who performed it felt confident that the totals arrived at are just as reliable as if the larger amount had been spent.

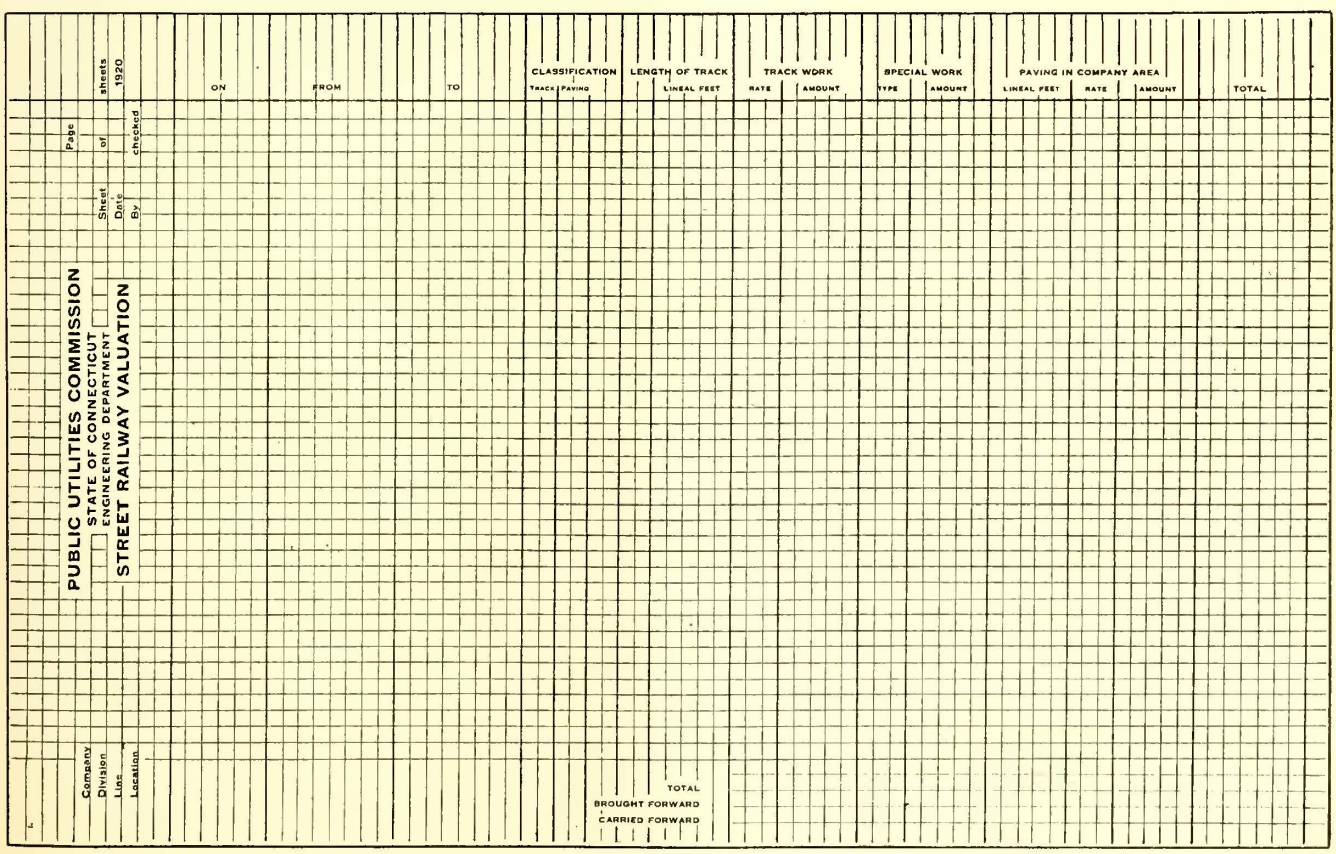


FIG. 12—FORM USED FOR LISTING AND TOTALING TRACK AND PAVEMENT

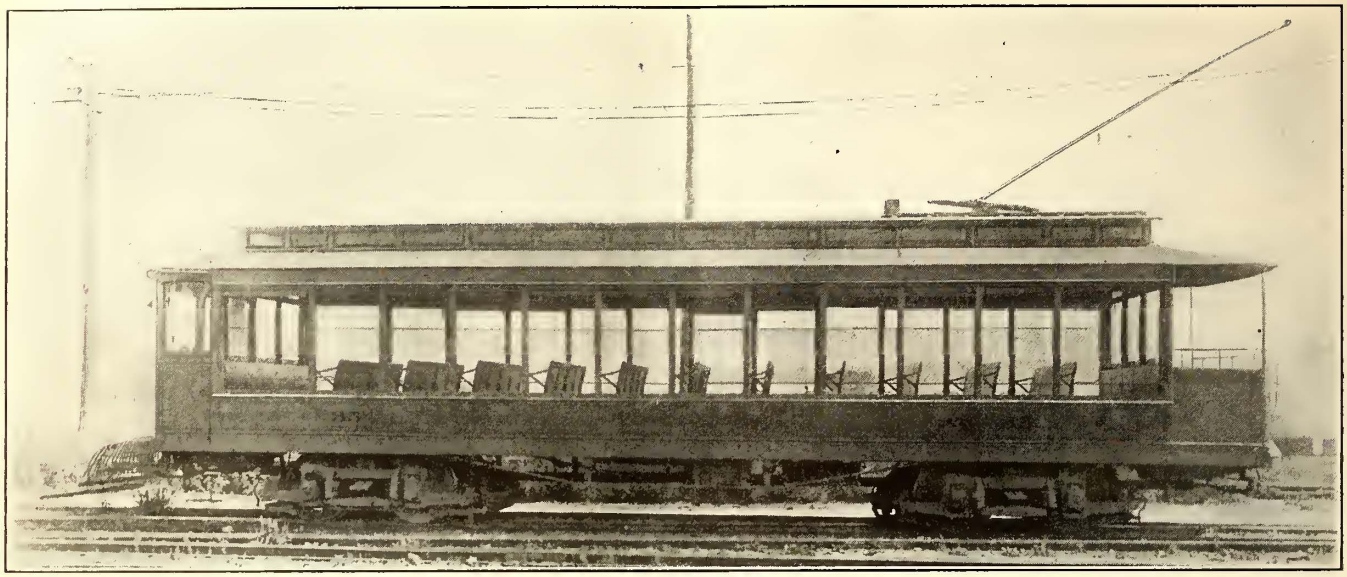


FIG. 1—NINE TRAILER CARS OF THIS TYPE WERE REMODELED BY THE NEW YORK STATE RAILWAYS INTO FRONT-ENTRANCE, CENTER-EXIT CARS

Adapting Cars to Transportation Requirements

New York State Railways Is Gradually Changing Over Rolling Stock to Provide for More Efficient Passenger Interchange and Fare Collection—Latest Examples are Cited

DURING more than four years just past the mechanical department of the New York State Railways has been carrying out a consistent program of remodeling the rolling stock used on the Rochester, Syracuse, Utica and Oneida lines. War and post-war conditions interfered with the continuity of the process, but remarkable results have been accomplished under the direction of J. F. Uffert, superintendent of equipment, and the local master mechanics.

The earliest and largest job was that inaugurated in Rochester in April, 1917, covered in an article in this paper in the issue for April 20, 1918, page 773. The most interesting recent two jobs are the making over of some open-bench cars into those of the front-entrance, center-exit type and the remodeling of a batch of motor cars into trailers. "Before and after" pictures of the first of these jobs are reproduced in Figs. 1 and 2, and interiors are shown in Figs. 3 and 4. As the New York State Railways operates a number of cars of the Peter

FIG. 3—INTERIOR OF THE FIRST CAR REMODELED FROM TRAILER TO FRONT-ENTRANCE, CENTER-EXIT TYPE

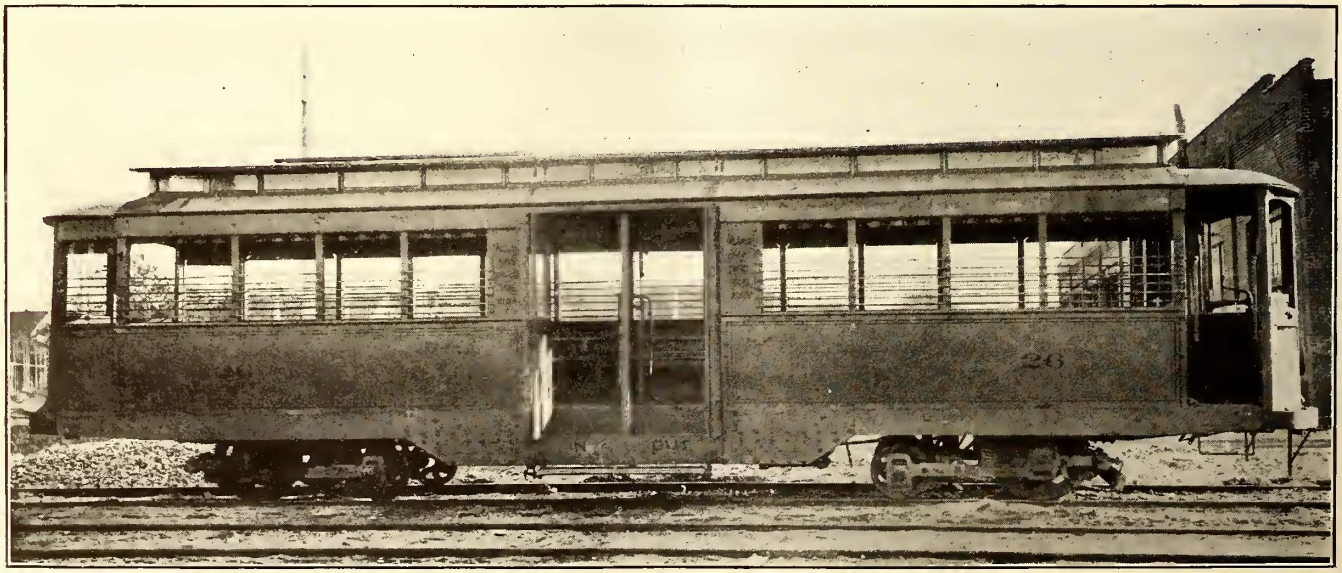


FIG. 5—ONE OF FIFTEEN CENTER-ENTRANCE MOTOR CARS MADE OVER INTO CENTER-ENTRANCE TRAILERS

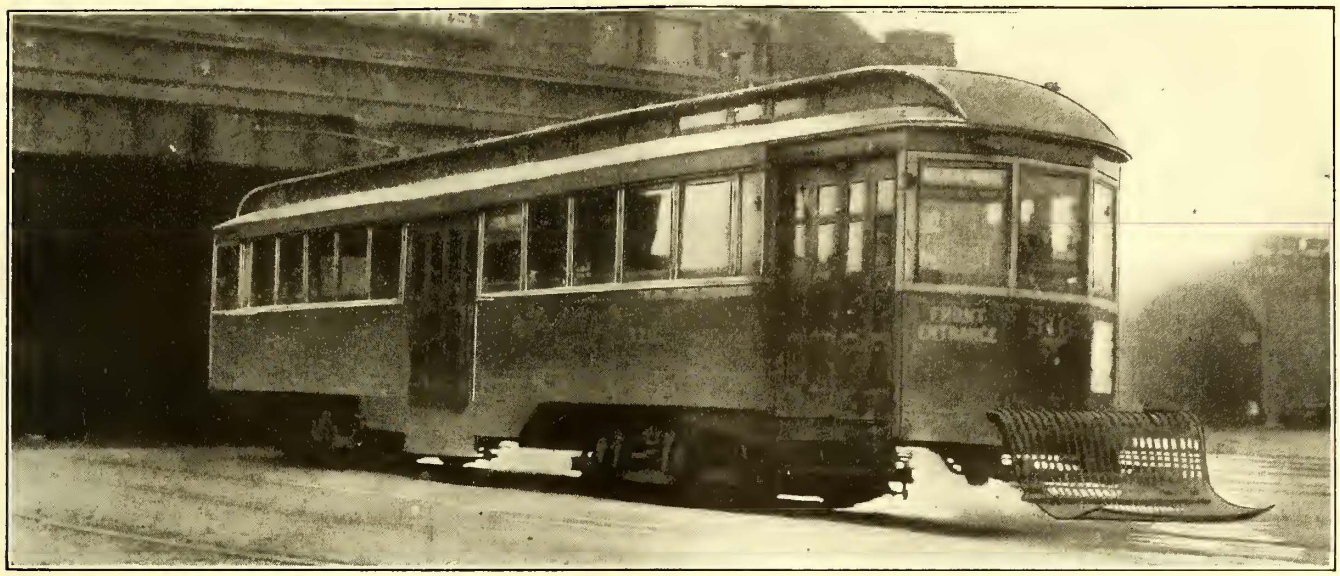


FIG. 2—THIS IS THE FRONT-ENTRANCE, CENTER-EXIT CAR MADE OVER FROM THE OPEN TRAILER ILLUSTRATED IN FIG. 1

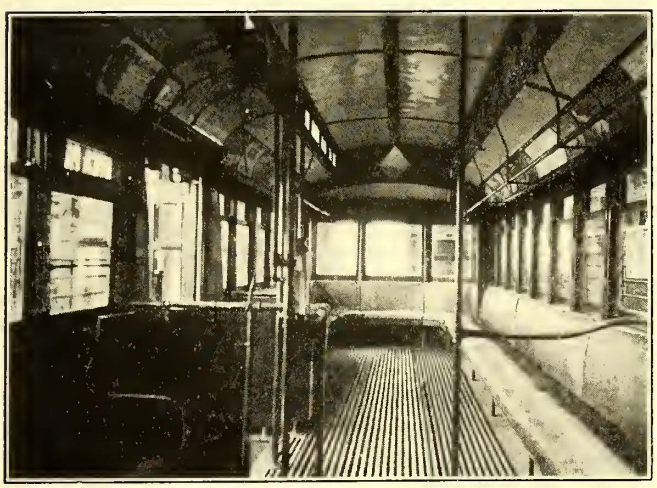


FIG. 4—INTERIOR OF REMODELED CAR EMBODYING IMPROVEMENTS OVER THE SAMPLE CAR

Witt type (see issue of this paper for Jan. 19, 1918, page 120), the experience with which has been highly satisfactory, the present remodeling is a logical development. Advantage has been taken of several years of operating experience with these cars on the property to incorporate into the present cars the latest ideas in regard to details.

The old open cars were of very light construction, in fact the underframing was so light that sagging had occurred at both ends. It was necessary to reinforce the underframe, which was done by transferring the original $\frac{5}{8}$-in. x 8-in. steel plates from the entrance side to the devil-strip side, thus nearly doubling the strength of the sill there, and putting in a $\frac{1}{2}$-in. x 12-in. plate to reinforce the sill on the entrance side. The interior arrangement was made similar to that on the company's other front-entrance, center-exit cars.

Figs. 3 and 4 show some differences in regard to windows, hand rail and floor. The interior shown in Fig. 3 is that of the first of the nine cars remodeled. This has stationary window sash and the floor is slatted crosswise. In Fig. 4 the features of difference are the movable sash equipped with fittings, the handrail offset over the seats and the longitudinally slatted floor.

The cost of this job was about $1,650 per car.

The second job is also illustrated in "before and after" fashion in Figs. 5 and 6. This involved the making over

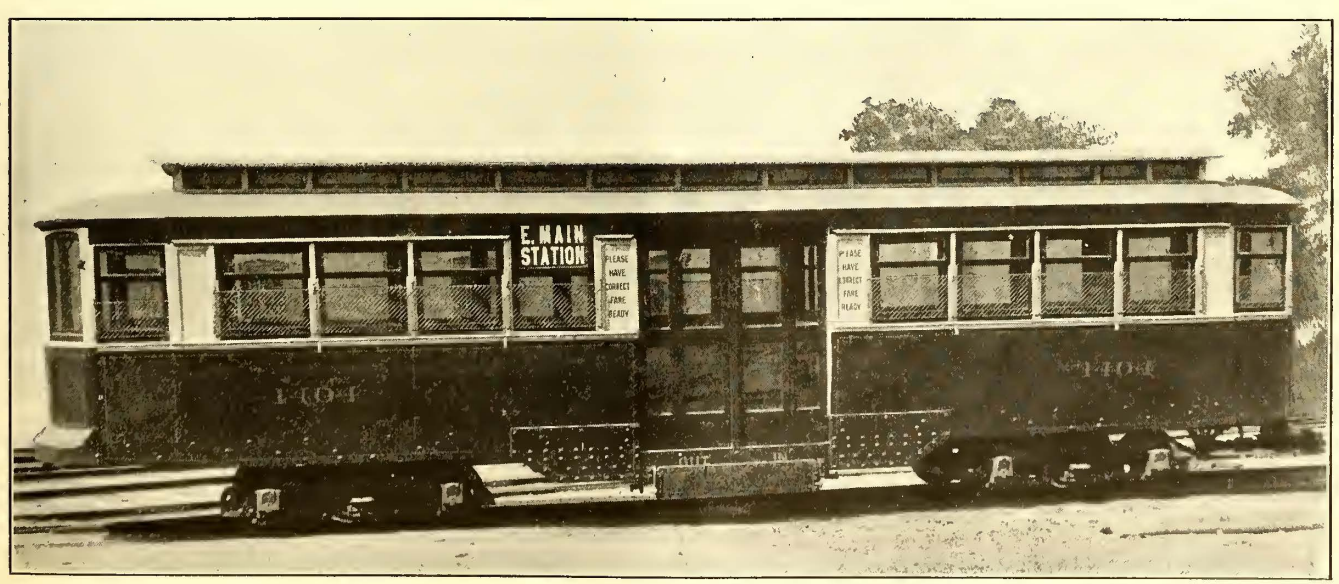


FIG. 6—THE FINISHED CENTER-ENTRANCE TRAILER MADE FROM A CENTER-ENTRANCE MOTOR CAR

of fifteen of the center-entrance motor cars of the type shown in Fig. 5, into center-entrance trailers. These cars were originally open cars but they had been transformed into motor cars for supplementary service. (See article by G. M. Cameron in the issue of this paper for Aug. 1, 1914, page 216.) Present operating conditions made their use as trailers preferable to use as motor cars. The remodeling comprised principally the refitting of the interior to utilize the full seating capacity (now fifty-three); to provide stanchions for convenience of passengers in boarding and alighting, and to standardize the window sash and fittings. In addition Peter Smith hot-air heaters were installed; the hand-brake and air-brake equipment was revised, the space under the seats being utilized for all possible elements of the braking system; couplers were added; the cars were completely repainted, and last, but not least, Taylor trucks with 26-in. wheels were installed. The Taylor trucks are designed to accommodate motors to provide for possible changes in service requirements making this necessary.

The changes mentioned reduced the car weight from 27,000 to 22,000 lb. They cost about $2,200 per car, the subdivision of items being approximately thus: Shop-work, $800; air-brake equipment, $400; trucks, $1,000.

Accomplishments of a Safety Bureau

Accidents Involving Responsibility of Trainmen Materially Reduced—The Same Is True of Damages to Other Cars and Automobiles

BY J. G. JEFFERY
Director of Public Relations Los Angeles Railway

AN EXTENSIVE safety campaign embracing close co-operation between trainmen, the riding public and traction officials has resulted in a marked reduction of all classes of accidents on the Los Angeles (Cal.) Railway. Particularly gratifying results have been obtained in lowering the number of accidents in which the company could be held liable. This safety work has been under the direction of a Safety Bureau created Oct. 1, 1920.

The bureau staff consists of a supervisor of safety, who closely analyzes all accident reports to determine the particular classes of accidents that need special attention, and a traveling supervisor of safety, who spends the greater part of his time on the cars observing operation and instructing trainmen. Two clerks handle the records and correspondence of the bureau.

The safety bureau is notified by the instruction department when a new man is accepted for car service. If such man becomes involved in an accident within three months' time the safety bureau notifies the instruction department when investigation shows the trainman at fault in any degree. A man is then detailed by the instruction department to ride with the new trainman to check up his abilities for safe operation.

When accident reports indicate continued carelessness or inefficiency on the part of a man in service more than three months he is either called to the office and the matter discussed with him or the traveling supervisor of safety rides with him on the car. The latter method has proved highly beneficial. It gives the trainman a chance to show actual difficulties as they occur and the safety expert an opportunity to show correct methods of operation under the actual traffic conditions.

Trainmen's safety committees were organized in each division when the bureau was established and regular meetings were conducted at the carhouses. These meetings for a time brought forth good suggestions, but were later abandoned as they were inclined to develop more controversy than actual beneficial suggestions. However, those that were interested in safety were invited to visit the headquarters of the bureau and discuss features of accident prevention. One of the features of the company's weekly publication are articles by the traveling supervisor of safety prepared in interesting style and in trainmen's language.

Under the company's merit system, upon which the Christmas bonus is based, credits are given for good safety suggestions and for reports of dangerous conditions. This helps particularly in keeping rolling stock in proper mechanical repair. There is also a special award of ten credits for a month's clear safety record.

A gratifying degree of co-operation from auto drivers has resulted from carrying large signs on the dashers of all cars reading, "Autos turn out; we can't." At the same time pointed safety reminders were printed on small cards and hung in the cars. The safety bureau has also been successful through the Los Angeles chapter of the National Safety Council in enlisting the co-operation of the local civic bodies. As an indication of the improvement in safety conditions the safety bureau has compiled the following figures:

The daily average number of accidents in 1920 was forty-eight. In the first half of April, 1921, the daily average was thirty-seven. In March, 1920, there were 1,400 accidents, but in March, 1921, there were only 1,250. This reduction was made with more than 100 cars added in the year. By way of comparison the records of the Automobile Club of Southern California show 1,108 auto accidents in March, 1920, and 1,925 in March, 1921.

The monthly accident records from Dec. 1, 1920, to April 1, 1921, are as follows: December, 1,648; January, 1,480; February, 1,150; March, 1,250. The gain of March over February is partly due to the difference in number of days and also to a general choice of runs by trainmen that month.

Particular interest is taken by the claim department in the reduction of the percentage of accidents for which crews were entirely or partly responsible. On March 20, 1920, trainmen were responsible for thirteen out of the day's fifty-one accidents, as compared with no responsibility for the forty-seven accidents on March 21, 1921.

The cash value of safety is clearly indicated by the fact that damage to cars in collision with other cars and autos was $3,712 less in February, 1921, than in February, 1920.

The trainmen indicate that they have the spirit of safety first to a greater degree than ever before, all of which is shown in the inter-division safety contests which are held to determine the right to display the "Premier Safety Division" flag from their flagpole. The trainmen are now engaged in a ten weeks' safety contest. A "Safety" pennant is to be awarded for permanent possession to the winner of each contest. The scores are compiled like baseball percentages and are based on past records of the risk of the various routes.

An exhaustive investigation carried on by the Society for Electrical Development to ascertain the facts concerning fires which occurred in the year 1919 in communities supplied with electric service showed that out of a total of 138,553 fires in 345 cities, 3,568 were apparently of electrical origin. These figures establish a percentage for electrical fires of only 2.57.

Retrospect and Prospect*

Railway Pioneer, After Recounting in His Franklin Institute Address the Steps Already Taken in Applying Electric Power to Railways, Expresses the Conviction that There Are Large Opportunities Ahead for Further Developments in This Field

BY FRANK T. SPRAGUE
New York City

A RECENT announcement states that in the United States alone electric railways cover a trackage of 44,000 miles and represent a capital investment of approximately $5,000,000,000, while 300,000 men are employed and over 14,000,000,000 passengers are carried annually, ten times as many as are carried by the steam railroads of the country. In addition there is the like class of roads in foreign countries and thousands of miles of trunk lines here and abroad which are electrically operated or for which electrical equipment is planned.

This is a brief epitome of one of the most astonishing of industrial growths, the product of but a third of the century near the beginning of which Faraday, "late bookkeeper's apprentice, now turned philosopher," revealed his discovery that it was possible to produce mechanical motion through magnetic action, an announcement which was followed ten years later by Henry's announcement of his invention of a crude motor.

But Henry knew that as long as the source of energy was a zinc-burning battery, coal could not be replaced. It fell to Thomas Davenport, a blacksmith of Brandon, Vt., to throw himself heart and soul into the attempt to create an industrial revolution, efforts necessarily failing if for no other reason than lack of a suitable source of power. But to him, in all justice, must be given the credit of first proposing, in a small model, the idea of an electric railway and of being granted the first broad patent as early as 1837.

Two years later there appeared in an Edinburgh publication on "Railways" the confident prophecy: "We have no hesitation in saying that electromagnetism will at no distant date compete with steam as a motive power, and successfully."

But it was eight years later before that splendid old scientist Prof. Moses G. Farmer operated at Dover, N. H., a small car carrying two passengers, to be followed four years later by Professor Page's trip with primary batteries on a road near Washington.

All the experiments of this period were, of course, doomed to commercial failure, not alone because of the crudity of the motors but because the source of power was a primary battery. They were, however, indicative of what would come later when the evolution of the modern dynamo had taken place.

Another ten years passed, when Pacinotti's invention of the continuous-current dynamo marked the birth of the modern electric machine, followed, in 1866-67, by the almost simultaneous announcement from English, German and American sources of the remarkable property of self-excitation by energy built up from the latent magnetism in the iron of the field magnets.

At the end of the decade, in 1870, the Frenchman Gramme brought out his improvement on the Italian's valuable invention and produced the first commercial machine for continuous-current operation, this machine being later superseded by the Hefner-Alteneck drum or surface-wound armature, invented also by Rowland.

Then came a discovery declared by Maxwell to be the most important of modern times, the reversibility of function, that which made it possible for the same machine to be used either as a dynamo for converting mechanical energy into electricity or as a motor to convert electricity into power, with the necessary corollary, the electric transmission of energy by coupling two such machines together in the same circuit.

It is said that Pacinotti discovered this also, but this is not an established fact, while it is certain that Gramme demonstrated it at the Vienna Exhibition in 1872 after its possibility was disclosed by a workman's mistake in coupling up a machine to the circuit. Here were at hand all the essentials of a successful beginning of electric railway experiments, but years went by until a quarter of a century had elapsed since Farmer's and Page's experiments.

Then came the crude suggestions of Greene, a poor mechanic of Michigan, who was afterward allowed a very broad patent, and the early plans of Field, who conceived in San Francisco the idea of replacing the cable by electric power. At the Berlin Exhibition in 1879 Siemens made the first public demonstration of a motor pulling a passenger car and operated with a third-rail supply and track return from a continuous-current dynamo-electric generator. This was followed by other exhibitions and then by the equipment of a one-car line at Lichterfelde, opened for traffic in May, 1881. This was the first line put into service.

In 1880, and again in 1882, Mr. Edison experimented with short electric railway lines at his laboratory in Menlo Park, later joining hands with Field in a company which never got beyond the experimental stage and did no commercial work whatever. A patent interference between Siemens, Field and Edison resulted in Siemens being ruled out because his foreign work was not admissible, and a patent was granted to Field, but in terms which proved unsupportable.

SPRAGUE LEAVES THE NAVY TO ENTER ELECTRICAL WORK

In this latter year the writer, then a naval officer on duty in London as a member of a jury at the Crystal Palace Exhibition, proposed a complete system for the Underground Railways, this being followed by a plan for operation with an under-contact overhead trolley following the lines of all tracks and switches, and with rail return. But after resigning from the naval service he devoted himself at first to problems in electric lighting as Mr. Edison's assistant and then to the development of industrial motors through his own company

*Abstract of address at meeting of Franklin Institute, Philadelphia, Pa., on occasion of award of Franklin medal to Mr. Sprague.

until 1885, when he announced plans for equipping and operating the New York Elevated.

During this period there was a renaissance of activity in electric railway development, Van Depoele, Daft and others installing a number of small installations. That by Daft on the Hampton branch of the Baltimore Union Passenger Railway in 1885 was the first railroad regularly operated by electricity in this country. Daft's other most ambitious work consisted of experiments carried on on the Ninth Avenue Elevated Railroad in New York in 1885 and 1888 with two electric locomotives named the "Ben Franklin."

In 1885 the writer, before the Society of Arts in Boston, outlined for the Elevated a new project, to comprise motors carried on the trucks, geared directly to the axles, and with provision for regenerative action and electric braking, following this announcement with important experiments for several months at the Durant Sugar Refinery and on the Thirty-fourth Street Branch of the Elevated, in 1886, where he demonstrated his wheelbarrow method of motor suspension, dual control, regenerative braking and the interpole winding on two motors carried on a truck underneath the car body.

These tests were followed by several with storage-battery cars in various cities, but this method of operation, while promising, has never been able generally to compete with the system of direct supply.

At the beginning of 1887 there were in the entire world nineteen installations, nearly equally divided between Europe and the United States. These aggregated about 60 miles of track and less than a hundred motors and motor cars, and they exhibited the widest variations in equipment and operating characteristics, none of them serving as an acceptable type for adoption. In short, the art was in a chaotic state, and something was necessary to demonstrate that the infant had a manhood ahead of it.

Richmond Road Nearly Doubled World's Electric Rolling Stock

Fortunately that opportunity came to me, and the modern trolley with its sequence, electric traction in general, may be fairly said to date from the installation of the Richmond road, the contract for which was taken in May, 1887. We had little to show save a blueprint and a few crude machines, but faith was strong and the contract was taken under terms, price and guarantees easily placing it in the "knave or fool class," the designation applied by a scientist to Daft's project two years before in Baltimore.

The contract called for the completion in ninety days of the equipment of a road having about 12 miles of track, at that time unlaid and with the route only provisionally determined; the construction of a complete steam and electric control-station plant of 375-hp. capacity, and the furnishing of forty cars with eighty motors and all the appurtenances necessary for their operation. This was nearly as many motors as were in use on all cars throughout the rest of the world. Thirty cars were to be operated at one time, and grades as steep as 8 per cent were to be mounted. Finally, the payment was to be $110,000 "if satisfactory."

Fortunately for the future of electric railways the difficulties ahead could not be foreseen, otherwise the contract might never have been closed. But disheartening as these were, great as was the expense incurred and grave as were the risks encountered, they were justified by the results, for the Richmond road, by common consent, stands as the prototype in almost every essential detail of the modern electric trolley system, and its installation marked the real beginning of the great industry of electric traction.

The history of the Richmond road has been too often written to make it necessary now to dwell upon it at any length. Suffice it to say that after experimental runs in the latter part of 1887 it was put into commercial operation in the beginning of February, 1888, and for a year there followed an experimental period of development which taxed the resources of the company to the limit.

Pope, in a historical sketch read before the Electric Club in 1891, was appreciative enough to say: "Laboring under enormous difficulties and drawbacks, Sprague succeeded by the completion and operation of this (Richmond) plant in establishing beyond peradventure the future supremacy of the electric street railway, and many of the characteristic features at that time designed and introduced by him have practically become standards in the modern system and are found in nearly every one of the thousands of cars now in service."

Among the characteristics were the main and working conductors and feeders, the bonded rails and earth return, the universal-movement reversible trolley in the center of a car, double-end control, axle-suspended motor, series-parallel grouping, variation of field resistance, fixed end-contact brushes and lightning arresters.

The road soon commanded the attention of Henry Whitney of Boston, who soon afterward abandoned his cable projects and adopted electricity.

Richmond's early troubles were buried under a loss of $75,000, fully compensated in the subsequent growth of a great industry.

The use of the tracks by the trolley system accentuated the already serious trouble of the telephone companies, who were also using grounded circuits, and then followed a country-wide legal fight as to earth rights claimed by the telephone companies. The result was a foregone conclusion and eventually they adopted metallic circuits, for which compulsion they can thank the trolley.

Horse Railway Electrification Enters Acceleration Period

The ensuing two years was a period of extraordinary activities, the Sprague company and the Thomson-Houston company, which had succeeded the Van Depoele company and which followed generally the Sprague practice, contracting for over two hundred roads. In Italy, at Florence, and in Germany, at Halle, the first modern roads also were installed on the Sprague system.

As typical of municipal efforts the slogan of a mass meeting called in New Orleans is illustrative. It was: Lincoln Set the Negroes Free! Sprague Has Set the Mules Free! The Long-Eared Mule No More Shall Adorn Our Streets.

Then came the consolidation of the Sprague with the Edison General Electric Company, and a gradual improvement in, and increase in size of apparatus. Form-wound armatures, proposed by Eickemeyer, replaced irregular windings and metallic brushes gave way to carbon, this single change, initiated by Van Depoele in 1888 and 1889, going a long way toward making the art a success. Cast and wrought iron yielded to steel, two-pole motors to four, double-reduction gears to single, and open motors to closed ones protected only by their

own castings. In 1892 the combined series-parallel and resistance control was adopted, when the Thomson magnetic blowout was successfully applied to controllers by Mr. Potter and proved a most effective agent in reducing the troubles of operations.

Limited for a time in extent of operation by the standard of voltage adopted, the invention of polyphase alternating-current transmission, the transformer and the rotary by Ferraris, Tesla, Stanley, Bradley and others, widened out the field by making possible the economies of high-tension transmission, with the advantages of direct-current distribution and motors.

Meanwhile, a few locomotives were built, but to follow steam precedents seemed a pitiful falling short of the possibilities of electric equipment and operation and having developed a system of electric elevators with secondary switch control it suddenly flashed upon me that I could apply a like principle to railway operation; that is, make up trains at any length by the combination of car units, wholly or partly equipped with motors and with train lines, without regard to number, end relation or sequence, and to control such trains from either end of any car by a master switch connected to the common train line.

This idea, sketched quite fully on a scrap of paper, marked the complete birth of this new method, then named and now everywhere known as the "multiple-unit system." Its great possibilities instantly absorbed my interest, for I saw the opening of a new epoch in electric railway operation. Here was a way to give a train of any length all the characteristics of a single car, with every facility of operation demanded by the most exacting conditions of service and capacity, and with like control of any number of locomotives.

Epoch-Making Multiple-Unit Installation on Chicago Elevated

After two years' abortive attempts to get the privilege to demonstrate at my own expense the advantages of the system in New York, the opportunity suddenly arose in Chicago, where I was called in consultation on the South Side Elevated Railroad. Here, just ten years after the contract for the Richmond road, I took one for operating an extensive elevated equipment under conditions even more onerous and with, perhaps, less to show in a tangible way.

As I was called to London in connection with an extensive elevator contract for the new Underground Railroad then under construction, plans for operative tests were restricted in time and development, but on July 16, 1897, after but a few weeks' preparation, two cars were put into operation on the tracks of the General Electric Company, at Schenectady, and on the 26th, the half century anniversary of Professor Farmer's test of a model electric railway at Dover, my ten-year-old son operated a six-car train in the presence of the officers and engineers of the road.

There were, of course, troubles a-plenty, but by the following spring the entire equipment of 120 cars was in regular operation and every steam locomotive was out of service.

The multiple-unit system is now, the world over, an essential fundamental for all electric train operation where two or more equipped cars or locomotives are controlled from a common source, and its value in dense rapid-transit service like that in the subways in New York is indicated by the enormous increase of capacity compared with any other method of operation, a practical result which could not be equaled in any other way on the New York subways alone for less than $100,000,000 increased capital cost of construction.

Heavy Electric Traction Next in Order

Following a serious accident in the yard tunnel of the New York Central Railroad, the first step in America in main line electrification was taken when electricity was adopted for operation at, and for some distance from, the city terminal. And here again there was a radical departure in engineering practice, proposed by Mr. Batchelder.

Up to that time all motors used for railway purposes maintained a fixed relation between the armature and the field, but the locomotives adopted here were bipolar, the fields being supported by the locomotive frames, while the armatures were on the axles and free to move vertically with reference to the flattened field poles. Brackets and gears were thus dispensed with and the machine reduced to the simplest elements.

The assumed limitations of direct-current motors, with which I was in entire disagreement, and the development in alternating-current apparatus, led many engineers to predict the complete supremacy of the latter, in accordance with which belief single and polyphase and combined-phase roads were installed in America and Europe, the most notable here being the Great Northern polyphase and the New Haven single-phase, and in Europe certain Swiss and Italian roads. The controversies which arose were unduly bitter and were based very largely on the assumption that all the apparent merits claimed for single-phase operation should be accepted, even without trial, as a basis, while the possible advances in the rival direct-current system were ridiculed.

The coming of the interpole motor, a modification of the old Sprague Elevated Railway experimental type, put a new aspect on the controversy. Direct-current potentials were promptly increased, first to 1,200 volts, then to 2,400 volts and higher. The largest trunk-line installation thus far undertaken, that of the Chicago, Milwaukee & St. Paul Railroad over the Great Divide and the Cascade Mountains, is operated at 3,000 volts, while experimental operation has reached 5,000 volts.

In England the direct current has been officially adopted for future railway equipment, on the report of a special commission, and a like influential French commission has indorsed the same system after an extended investigation of the work done in the United States.

Despite the enormous advances made and the results accomplished in electric railway development, it would be folly for the electrical engineer or the railroad man to assume that the limit of invention or improvements has been reached. The urban and interurban fields, with the constant linking up of smaller into larger systems, go on expanding, but the trunk lines are still largely steam operated, although there are many thousand of miles here and abroad, on great systems, for which electric operation has been decided in the future. There is still a wide difference of opinion among engineers as to whether a single system will be dominant, and if so, which one, or whether the varying conditions and operating demands will be best met by specific solutions.

The financial question involved in the large cost of equipment cannot but remain a factor which will often prove controlling, for electrical operation will generally be adopted only where there is a commensurate gain

of some kind. Where coal at low unit cost is available the gain in economy alone will not warrant the adoption of electricity on independently operated roads, but where the coal is high in price, or may be unavailable, while water power can be had at a reasonable cost, there is a valid reason for change.

Excluding special cases, what will ultimately be constructively influential is the need of increase in existing or available track capacity, which is undoubtedly possible to a system which permits of individual and simultaneous control of a concentrated or distributed power plant greater than can be got by any other means and can eliminate from its tracks the transportation of its fuel. It seems certain, however, that there must be co-operation in the important matter of power supply, and the whole trunk-line problem will appear less formidable with the elimination of the requirements of installations of individual power houses, with their necessary reserves, and the use of current from great industrial power houses properly linked together, which, in addition to their reliability, can make full use of the diversity factor in a multitude of demands.

Chicago's Transportation Problems

Aspects of Steam Railroads and Rapid Transit Service Considered by Various Speakers at the Spring Meeting of the American Society of Mechanical Engineers Held at Chicago

SIX papers on this topic were presented at the spring meeting in Chicago of the American Society of Mechanical Engineers, May 23 to 26. In the first paper J. R. Bibbins, Chicago, gave reasons for the growth of the freight traffic in Chicago. These are that the city is the principal east-west divisional transfer point between east and west railroads; it is the northern railhead of the Mississippi Valley roads and is the water gate for the interior via the Great Lakes route. The individual railroads have chosen individual terminal development to a large extent, but all the principal local freight terminals are within the one-mile zone downtown.

In a second paper E. J. Noonan discussed the possibility of a more intensive use of railway property through the development of air rights and suggested among other things two-level type freight stations with double-deck streets.

A third paper by Hugh E. Young spoke highly of the container system and declared that the motor truck can never take the place of the rail carrier for long hauls and cannot handle carload freight business in an efficient manner.

A fourth paper by Messrs. Bibbins and Noonan gave particulars of the existing Chicago electric freight tunnel, which is at present handling approximately 1,800 tons of l.c.l. freight, although its capacity is possibly five times that amount. The tunnel now has about 65 miles of line and $15,000,000 investment. A study of the reasons for this comparatively small use shows that some of the reasons are avoidable and some not. A study of the existing union tunnel freight stations shows the following results on design:

1. Platform stations required 25 sq.ft. per ton per ten-hour day.
2. Service track required one standing car per 10 tons handled per day.
3. Average load per car 1.4 tons general merchandise.
4. Team platform length 0.42 lin.ft. per ton per day.
5. Elevator capacity thirty round trips per hour now, thirty-six maximum when speeded up.
6. One thousand-ton station requires 25,000 sq.ft. of floor space, 420 lin.ft. of platform frontage, 1,260 ft. of standing track, two elevators, ninety merchandise cars.

The conclusion of this paper is that from the standpoint of the city of Chicago no transportation agency could be more effective in solving the problem of existing track capacity, and no effort should be spared to make this institution one of permanent success.

The fifth paper, by Mr. Bibbins, describes the points to be considered in a terminal survey. The sixth and last paper is by Bion J. Arnold and it is entitled "The Relation of Steam Roads to Rapid Transit Development." An abstract follows:

The Relation of Steam Roads to Rapid-Transit Development

BY BION J. ARNOLD
Chicago, Ill.

THE time has come for steam railroads entering large cities, especially those who are fortunate enough to own entrance rights-of-way strategically situated for long-haul suburban traffic, to enter the rapid-transit field and enter it properly.

The case of Chicago may be analyzed briefly for illustrative purposes. While Chicago is territorially a big city, 200 square miles in area, with commuter suburbs extending 15 to 20 miles in all directions, its business center is highly concentrated within a so-called "loop" (eight times ten blocks), wherein is conducted the major portion of the wholesale, department store, high-class shopping, theater, restaurant, club, business and centralized social activities of the city. Twenty-six railroad carriers enter this central district over twelve major trunk lines with a traffic of 1,340 trains and 195.-000 passengers per day. All this business is concentrated in five passenger stations, which are clustered around the boundaries of the Loop and as close in as the price and competitive condition of property permitted at the time when the stations were originally located.

None of these, with the exception of the Illinois Central development, is especially adapted for the economical and quick handling of commuter or rapid-transit business. On the other hand, they are distinctly ill adapted for handling the large growth in future traffic which will undoubtedly come. There is no intercommunication between them and consequently they must necessarily remain as traffic "dumps," rather than as traffic distributers.

The Illinois Central lake-front system alone approaches the ideal of a rapid-transit distributing system, with stations distributed along the boundaries of the business district instead of concentrated at one point.

The statement is frequently made by railroad executives, and without refutation, that the commuter rapid-transit business does not pay or is carried at a large loss which must be made up by the long-distance overland passenger and freight business. If this is true, the railroad managements of the country, which are confronted with the problem of adequate revenue, stand in the inconsistent position of harboring a passenger-terminal system and conducting a public service at the expense of the stockholders or the other patrons of the system. Either aspect, if true, represents an unstable economic condition which cannot last. And if the commuter traffic is not in fact supporting the full cost

of producing this service, there is no better time than the present for the railroads to establish the facts in the case and endeavor to have this traffic handled in a more practicable manner.

TRUNK LINES SHOULD CO-OPERATE IN TRANSIT PLANS

However, there are some who believe that railroad accounting has not yet been sufficiently perfected to reveal fully the equitable allotment of terminal and service charges as between long-distance and local rapid-transit service on the steam railroads. Those who defend the use of the monumental terminals claim that they would be required in any event for cross-country travel and that the rapid-transit service can therefore be accommodated at very little cost off hours, as a by-product. But this is hardly the case in a large community such as Chicago, for the rapid-transit peak practically coincides with the main-line peak, especially in the morning when overnight travel reaches the city. Still it is claimed that this commuter travel should not bear the same operating costs and fixed terminal charges per passenger as the overland traffic because the suburbanites use relatively few of the main-station facilities. Whether this is true or not, it is believed by many engineers in railroad service and in civil life that some careful and thorough research into the economics of railroad suburban-passenger business should be instituted at once, with the specific object of finding out whether the railroads could better handle it or should turn it over to some other agency better organized for the purpose.

The hopeful plan in mind seems to be that the steam railroads which are so strategically located with respect to long-haul, suburban commuter traffic should undertake an immediate reorganization of this great arm of local transportation and co-ordinate its services with the other surveys of the city in such a way that unified operation of the entire local transportation business may be carried on with the least total expense and maximum usefulness.

The Law of Electrolysis

Analysis of Fifty-three Higher Court Decisions Bearing on the Subject Condensed in a Compact Form Which Will Make It of Interest to Railway Men

IN A RECENTLY published pamphlet Samuel S. Wyer, consulting engineer, Columbus, Ohio, discusses at length some of the legal phases of the electrolysis problem under the title "Analogy of Responsibility for Damages from Leaking or Stray Electric Currents from Electric Railroads to Adjudicated Responsibility for Damages from Leaking Water, Oil or Gas, Noxious Gases or Sparks."

In the introduction the author defines the term "stray current" and explains why stray currents are likely to be destructive agents. He also lists the various classes of underground property most likely to be affected by stray currents. In another part of the report, which is also devoted to the technical side of the question, the more important damages or causes of damage are given as: Fire hazard due to arcing between pipes in a building; gas explosions caused by stray currents igniting gas in basements, manholes, etc.; damage to water pipes, telephone and power cables and metal work in underground structures.

It is assumed in the discussion that the following engineering facts have been established:

1. There will always be some current leakage where a grounded return circuit is used and this leakage can be measured.
2. Stray currents injure underground metallic structures where they leave such structures to go into the soil.
3. Proper mitigating methods will so reduce the leakage as to render it not dangerous.
4. The double-trolley system would eliminate all stray currents and stray current troubles.
5. The cost of elimination or mitigation is not prohibitive considering the hazard which is to be guarded against.

COURT RULINGS ON ELECTROLYSIS

In the discussion of the legal phases it is pointed out that there have been only three important electrolysis court decisions: Manufacturers' Natural Gas Company vs. Indianapolis Street Railway, Dayton vs. City Railway, and Peoria Water Works vs. Peoria Railway. The bulk of the discussion is devoted to an analysis of the pertinent portions of fifty-three important higher court decisions bearing on responsibility for damage from leaking water, gas, oil or noxious gases and sparks. Of these decisions there are one by the United States Supreme Court, one by the British House of Lords, one by the British Privy Council and thirty-one by the supreme courts of various states. The several decisions are arranged chronologically, beginning with a decision of the New York Supreme Court in 1856. In each case the quotation from a decision is followed by what is termed a "stray current analogy"; that is, a statement of what would have been said had the same line of reasoning been applied to stray electric currents. The final conclusion reached is that the old legal maxim "Every man has a right to use his own property as to himself seems proper, but he must be careful so to use it that no injury is done to another" should and can be applied to responsibility for damage from electrolysis or other stray current injury.

The pamphlet is of interest to railway men chiefly because it condenses in a compact form a large number of legal decisions bearing on the stray current problem. It may be pointed out that the same decisions also have some bearing on the legal phases of the inductive interference problem, which of late has been so important in connection with the increasing density of electric power and communication service. The decisions quoted all bear on the fundamental law of the land as it pertains to the rights and duties of the fee simple owners of real property.

There is no analysis of those problems pertaining to the rights of the public in connection with public utility properties nor of those where both parties involved are using public property by virtue of an easement right.

Constantinople Tramways

STREET railway service in Constantinople was stopped in December, 1918, and was gradually resumed beginning March 5, 1919, reaching normal in June. The fares are five times as great as before the war.

Some rolling-stock ordered in Europe has been received and many cars are being rehabilitated. According to the *Revue Générale de l'Electricité*, from which these notes are taken, the exchange rate has been a severe handicap to the railway system.

Trackless Trolleys for New York

Department of Plant and Structures Specifies Details of Trolley Bus to Be Operated on Staten Island in Connection with Municipal Trolley Line

THE city of New York, through its board of purchases, has asked for bids for seven electric motor-driven trackless trolley cars. These are to be put in operation by the department of plant and structures in connection with the municipal trolleys now in operation on Staten Island. The routes for operation will be from Meier's Corner to Linoleumville, and from Manor Road and Schmidt's Lane to Sea View Hospital. The bids were advertised on May 7 and were scheduled to be opened on May 23.

The cars are to be of the semi-open type and equipped for one-man operation. All structural steel shapes, rivet steel, castings, etc., are to be in accordance with the A. S. T. M. specifications. The contractor is required to deposit $1,000 to cover the cost of inspection during construction.

The completed car must be able to travel with a load of 10,000 lb. over New York City thoroughfares without showing evidence of weakness and excessive heating in any part. Tests must also be made by the contractor to conform to all rules and regulations of the New York Public Service Commission and other city and state departments having jurisdiction. Broken parts due to defective design, materials or workmanship are to be replaced without expense to the city for one year.

Some of the requirements of the chassis frame are that it is to be of 6-in. channel section, weighing not less than 13 lb. per foot, properly reinforced with hot-riveted gussets at all corners and intersections of cross members. The front axle is to be of I-beam section, of 3.5 tons capacity, equipped with ball-bearing steering head and roller-bearing spindles. The rear axle is to be of 2.5 tons capacity, fitted with worm drive and full ball bearings, and with internal brakes of 18-in. diameter. Spindles are to be 2.75 in. diameter. The front springs are to be 50 in. long and 3 in. wide with eleven leaves, while the rear springs are to be 56 in. long, 3 in. wide, with fifteen leaves.

A steel body is specified, constructed with steel uprights and rolled steel carlines, all joints to have gussets and to be hot riveted. The body below the window sill is to be paneled with ¼-in. "Steelosote" and so arranged as to be easily replaced in case of damage. The roof covering is to be "Steelosote," in sections shaped to conform to the contour of the roof structure. The floor is to be tongued-and-grooved maple and covered with rubber inlaid tile flooring.

The main entrance and exit door is to be located on the right-hand side, of the two section folding type and operated by a hand lever. An emergency door, fitted with a collapsible folding step, is required at the rear. Plate-glass windows of the best D.T.A. car glass, mounted in brass window sash with detachable rubber weather strips, were specified, as were also Pantasote window shades with rollers and car fixtures.

The carrying capacity of the car is to be thirty seated passengers, with standing room for ten additional. The aisle-way is to be 24 in. Cross seats, 30 in. wide, with steel seat frames fitted with Marshall spring cushions and backs trimmed with No. 1 machine-buffed genuine leather are to be used. In the roof is to be an exhaust ventilating system, and a buzzer signal system is included for convenience of passengers.

Each car is to carry one 25-hp., 600-volt, direct-current motor of the box-frame commutating-pole, self-ventilating, ball-bearing type. The forward end of the armature shaft is to be tapered to fit a standard universal coupling on the drive shaft. The opposite end of the armature shaft is to be equipped with a direct-current generator to charge an 80-amp.-hr. storage battery for marker and emergency lighting.

The type of control specified is of the rheostatic (K) type with five points arranged for foot operation, hand operation being for use only in emergency. The reversing feature is to be the same as in any standard K-type railroad controller. The positive line is to carry a standard railroad-type circuit-breaker while the negative side of the circuit is to be fused.

The drive from the motor to the rear axle is to be through a tubular propeller shaft fitted with universal joints at both ends. The steering gear is of 3.5 tons capacity, compounded at a ratio of 2.5:1 and fitted with a 22-in. handwheel. Or, instead of the axles, drives and motors specified above, truss axles, internal gear drives and multiple motors may be used. The capacity of axles and drives and the aggregate power of the motors, however, shall not be less than already specified. Internal gears shall have not less than two gears bearing on the driving gear.

Details of Equipment

Regular foot and emergency hand brakes, following automobile design, and a 12-in. foot gong are to be furnished.

Front and rear wheels are to be of the American cushion type, with solid rubber tires. They are to be 36 in. in diameter, with a 6-in. tread, and made of second-growth hickory.

The electric heaters specified must provide an even distribution of heat throughout the car with a maximum power consumption of approximately 6 kw. and have an arrangement for three temperature graduations of 2 kw. each. Heater wiring is to be in conduit under the car body and in molding inside.

The main lighting circuit is to carry ten round, 110-volt, 23-watt-type lamps mounted in flush-type receptacles, and the emergency lighting circuit, operated from the storage battery, is to consist of four 6-volt 15-cp. lamps in special dome fixtures. There are to be two 6-volt, 21-cp. headlights and two front and one rear 6-volt, 4-cp. marker lights. All headlights and markers are to operate from the storage battery.

The trolley-pole collector, or pole head, is to be of the sliding type for use with a wire spacing of 14 in. It is the intention that operation shall usually be in but one direction, but provision is made in the design for operation in the reverse direction for short distances at low speed. Another requirement of design is that if the pole head leaves the wire it will not cause a short circuit due to metal parts spanning the two wires. The shoes or contact parts must be renewable, have a liberal contact surface and be fitted with grooves for retaining a lubricant.

Requirements also call for an adapter fastened to the pole head and a trailing rail contact shoe so as to make it possible to operate the car at slow speed on a 600-volt grounded return circuit.

The trolley pole must be sufficiently rigid to force the pole head or contactor against the trolley wires

at a normal working upward pressure of 36 lb. Provision must also be made against short circuit if the pole crosses both trolley wires, and two No. 4 extra flexible insulated cables suitable for carrying 600-volt power are to be used for conductors.

The trolley base is to be of the hand maneuvered type, provided with slip rings so that the pole can be rotated. All bearings are to be of the roller type. The top thrust bearing is to be so constructed that the lubricant cannot leak out on the car roof or down the maneuvering mechanism. Another provision is that the pole head must keep in contact with the trolley wires should the car turn out for another to pass. A buffer spring is required to absorb upward blows in case the pole leaves the wire, with a latch to lock the pole socket in a horizontal position during removing or installation of trolley poles. The maneuvering mechanism is to be of such construction that the operator can rotate, raise or lower the pole without leaving his seat.

Supports are to be provided for a fare box which can be placed at various angles and so held stationary. Finally, the regulations for painting call for the most thorough and careful method known for passenger cars with the special object in view of providing a rust-inhibitive coating. The exterior finish is to be full oil gloss and white enamel for the interior. The paints used must follow New York City specifications.

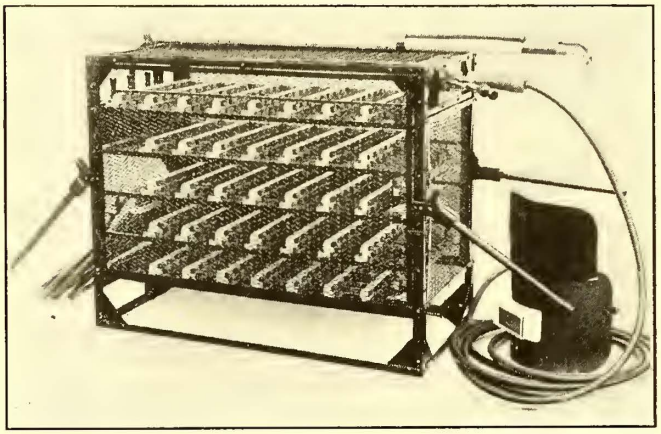
New Resistance-Type Arc Welder

A NEW electric arc welder, called the "Ajax," is being placed on the market by the Railway Track-Work Company, Philadelphia, Pa. It consists of special wire resistance coils supported on insulator bars which are mounted on a frame of steel angles. A switchboard for controlling the current is mounted at one end of the frame.

The type of machine which is recommended for railway work weighs approximately 100 lb., and is 18 in. x 36 in. x 36 in. in size.

The designers of this machine have given special consideration to high current capacity, accessibility of parts, ventilation and portability. The wire used in the resistance coils is a special grade of very high resistivity adopted after several years of tests and experiments.

A control mechanism, consisting of a line switch by means of which current can be cut off from all the coils, is mounted on one end of the framework. At the opposite end the switchboard for regulating the current is mounted. A shunt switching device provides for short-circuiting a portion of the coils where large currents are required. By this arrangement control over several groups of coils is made independently of the other groups. The switchboard provides for thirty-six values of current.



NEW RESISTANCE-TYPE ARC WELDER

Several plugs are provided for attaching the lead wires to the machine. These plugs have wooden handles to protect the operator from shocks and also to prevent short circuits.

Just After Lunch at the Wethersfield Carhouse

This Large Group Indicates the Success of the Joint Meeting of the Two Organizations Which Resulted Largely from the Efforts of I. A. May, Past-President of the New England Street Railway Club. See Last Week's Issue for Details.

Closed Buckets for Track Oilers

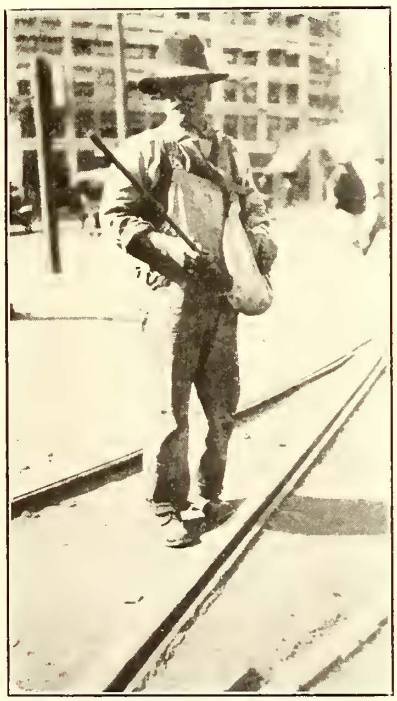
COVERED TRACK-OILING BUCKET

IT USED to be the case on the Pacific Electric Railway that frequent complaints arose about track oilers traveling around on city cars with oil buckets. Oil running down the sides of the buckets offered an opportunity to mar or ruin the clothes of passengers, even though the oilers' instructions required them to seek an isolated section of the car.

To remedy this condition the engineering department devised a closed type, galvanized-iron oil-carrying bucket. It is neat in appearance and when properly handled by the track oiler there is no chance of spilling oil over the side of the bucket. There is an opening in the lid so that it may be closed without removing the brush.

Practical Track Oiling Equipment

ON THE Pacific Coast the sanding of the city tracks is one of the most important units of track maintenance because of frequent heavy fogs and light misty rains. The engineering department of the Pacific Electric Railway has employees who are held responsible for the sanding of the tracks.



SANDING BAG USED ON CITY TRACKS OF PACIFIC ELECTRIC

For efficiently handling this element of maintenance work, particularly when the sanders are given an emergency call during foggy weather, they are equipped with an open-top sanding bag constructed of heavy canvas cloth and provided with straps which go over the shoulders. Attached to the bottom of the bag is a piece of rubber hose 6 in. in length with a ¾-in. opening. An iron tube 3 ft. in length, with a ¾-in. opening, is carried by the sander, who inserts the tube in the rubber hose section when he wishes to begin operation.

When the conveyor tube is not in use, the flow of sand is shut off by merely raising the piece of rubber hose. Likewise, when the sander desires to cease sanding, he merely elevates the iron conveyor tube without detaching it. The benefit of this practical sand bag is its simple arrangement, which makes its operation efficient and economical and which permits work to be handled with dispatch, especially in congested localities.

Association News

Important Meeting of Way Matters Committee

THE committee on way matters held an enthusiastic two-day meeting at association headquarters on May 18 and 19. The meeting indicated that the report of the committee will contain much information on live subjects dealing with track and roadway maintenance.

Among the members present were R. C. Cram, chairman; C. A. Alden, V. Angerer, W. R. Dunham, Jr., E. B. Entwisle, H. H. George and E. M. T. Ryder. Others in attendance on invitation were W. P. Day and F. H. Ogden, International Steel Tie Company, Cleveland, Ohio; H. L. Whittemore, United States Bureau of Standards, Washington, D. C.; G. C. Farkell, National Tube Company, Lorain, Ohio; F. A. Weymouth, Bethlehem (Pa.) Steel Company; W. J. Sheehy, East Rochester, N. Y.; W. W. Wysor, United Railways & Electric Company, Baltimore, Md.; E. F. Hartman, Crotexol Corporation, and S. W. Dannett, Rail Welding and Bonding Company, New York City.

Among the subjects on which definite action was taken for inclusion in the final report were design of curved treads for girder and girder guard rails, method of determining brittleness in rails which entails a change in the specifications for girder rails, a new specification for rail-bound insert special trackwork, and a comprehensive investigation on arc-weld joints, the report on which will contain many data and illustrations.

The Bureau of Standards again expressed a willingness to co-operate in forming a special committee to undertake tests of all forms of welded joints. The way committee recommended that the special committee consist of the following representatives: One each from the Bureau of Standards, the University of Illinois, the manufacturers of welding materials and the American Bureau of Welding and two from the Engineering Association.

In connection with the study of substitute ties the International Steel Tie Company presented a treatise on its form of tie which explained all the details of construction. A model of a pressed steel substitute tie, recently patented, was also shown by the inventor, W. J. Sheehy. A progress report will be made on this subject and reassignment asked for the ensuing committee.

The sub-committee appointed to study curved contour for wheel treads, jointly with the committee on equipment, will submit a progress report. It was the sense of the way committee that the present data are not sufficient to prove or disprove the theory that the curved wheel tread would be worthy of adoption. Continuance is to be asked for the ensuing committee.

A list of approved standards was presented and will be suggested to the committee on standards for submission to the American Engineering Standards Committee.

A progress report, with tables and appropriate information, is to be included in the final report of the committee on clearance curves as a matter of informa-

tion. The sub-committee on standardization of frogs and track centers in special trackwork layouts presented a report on standard turnouts and crossovers which also amends various specifications now in the Engineering Manual as to frog angles, frog-arm lengths and radii of switches and mates.

A report on wood preservatives covering a number of important specifications for creosote oils and other preservatives and methods of preservative treatment of timbers was accepted. It will be published as a separate paper and will cover the joint report of the three principal committees involved. Mention to that effect will be made in the annual report of the way committee.

Chairman Cram is to outline for the benefit of the secretary his views as to research work that can be done by the experiment station of Illinois University on welded joints and curved wheel treads.

Merchandising Transportation Committee Meets

THE T. & T. Association committee on merchandising transportation met at association headquarters on May 20 to discuss the subject in hand preparatory to completion of the report to the coming convention.

Among those present were V. L. Lloyd, Cleveland, representing J. H. Alexander, chairman; W. H. Boyce, Beaver Valley Traction Company; K. A. Simmons, proxy for M. B. Lambert, Westinghouse Electric & Manufacturing Company, and J. W. Welsh, acting secretary. Letters from several other members of the committee reporting on the subject assigned were available for discussion.

In reviewing the subject of courtesy of train crews, it was brought out first that courtesy begins at home and it is necessary to instill this fact first in the minds of the supervisory force. Meetings with this class of employees usually produce the desired result. With the trainmen themselves, however, it takes more than mere meetings at which some official talks to obtain the necessary interest. Letters to the men at their homes have produced better results than notices posted on bulletin boards. These letters, if followed up with individual instructions, soon get the men into such a frame of mind that some good merchandising can be done. Suggestion sheets for improvements in service and equipment should also be mailed to the trainmen, instead of being left where they can be had when wanted. Such a time never seems to come, but if the sheets are sent to the homes they are more likely to be used. If the men's suggestions are used the writer should be so notified.

Other means of enlisting the aid of employees outlined at the meeting were noonday talks, posters at division points and issuance of pamphlets. The spoken word, however, was considered to be by far the best method if the speaker had a message that his audience wanted to hear. An indirect means of accomplishing some good results is the company publication, which can be read at home.

Discussion also brought out that the electric railways should participate in all community activities supported by civic organizations that benefit the territory served. Advertising through the local boards of trade and chambers of commerce where community affairs are largely discussed by all interested are also indirectly of much benefit.

Letter to the Editors

Baltimore Wants Separate Entrances and Exits with One-Man Cars

UNITED RAILWAYS & ELECTRIC COMPANY

BALTIMORE, MD., May 19, 1921.

To the Editors:

While not desiring to enter into a controversy concerning the merits of the present standard Birney safety car, there is one point that seems to me has not been given due emphasis in the discussion that has taken place. This is the fact that because a car will operate in smaller places, such as Terre Haute or some medium sized city in the Southwest, it does not mean that it is the most efficient design for operation in larger cities, under the conditions of heavy traffic which exist there.

The best proof of the need for another design of a one-man car with more adequate passenger interchange facilities is actual operation. Here in Baltimore we equipped one heavy transfer line with one-man safety cars of standard design, and increased the service 50 per cent when the new cars were put on. These cars replaced a single-truck car, seating thirty people, equipped with longitudinal seats and with 5-ft. platforms. Notwithstanding the greatly improved service furnished with the safety cars, we found it necessary to lengthen the running time during the peak hours in order to keep the cars on time.

There has been some complaint on the part of the public, particularly during rush hours, because of the delays due to loading and unloading the cars, to the narrow platforms and to the congestion that inevitably occurs at the front of the car. This latter was intensified because many people were using the car for short transfer rides and would not go to the rear, because they wished to alight a short distance from where they boarded.

We feel that the one thing that made the car at all successful was the large increase in service. This "acid test" proved to our satisfaction that under such conditions of heavy traffic the present design of the one-man car is not adequate. Therefore, when we recently purchased ten additional cars, we specified a wider platform which provided separate exit and entrance passageways in order to prove out our ideas, and if these cars operate as we feel they will, future one-man cars on this property will be provided with the wider platforms.

Thus it will be seen that in order to consider the public and to give it efficient, satisfactory service the present type of standard one-man car was not adequate. Further, we of the industry should be careful not to jeopardize the great advantages of one-man car operation and risk the possibility of losing these advantages through failure to please the public, just because of the arguments being put out at present for holding to a single design, without recognizing the fact that this design is not suitable for all conditions of electric railway traffic.

L. H. PALMER,
Assistant to President.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

Wages Cut in Cincinnati

Eighteen per Cent Reduction Effective July 1 Accepted by Trainmen at Referendum

An agreement was recently entered into between the Cincinnati (Ohio) Traction Company and its union employees, members of the Amalgamated Association, whereby an 18 per cent reduction in wages will go into effect on July 1. Readjustment to the new basis was accepted by the men by a vote of 832 for and 606 against.

The new contract will expire on June 30, 1922. The new and the old rates of pay in cents per hour follow:

	Present	Effective July 1, 1921
Motormen and conductors		
First three months....	54	45
Next nine months.....	57	48
Thereafter	59	50
Curve cleaners	45	32
Car tenders	45	32
Watchmen	45	30
Electric shovel operators	65	52

Barn men, uniform reduction of 20 per cent
Time and one-half for overtime, both periods

There were no important changes in working conditions, except that the men have heretofore been paid at the rate of twelve minutes' time for each accident report made out. Under the new contract they will not receive any additional time for this.

The new arrangement was made following conferences attended by W. Kesley Schoepf, president of the railway; officials of the local union and W. D. Mahon, president of the Amalgamated Association. In connection with the agreement it is significant to note that the contract was entered into voluntarily and without arbitration more than a month before the old contract expired.

Large Saving Made

It is estimated unofficially that the new scale will save the Cincinnati Traction Company a total of between $400,000 and $500,000 in wages in a year. The deficit which has accumulated under the present franchise up to May 1 is $806,427, according to figures of W. Jerome Kuertz, Street Railway Director. Under the terms of the franchise fares cannot be reduced until this deficit is wiped out and a surplus of $650,000 has been built up. The railway has a fund of $400,000 held inviolate which would be applied to accumulation of the $650,000 surplus. Therefore, before fares can be reduced the company must gain $1,056,427, or $250,000 plus the deficit of $806,427.

"It is indeed gratifying to see such a manly expression from the carmen," said W. Kesley Schoepf, president of the traction company, in commenting on the action of the union men.

Street Railway Director Kuertz said that he had been working and will continue to work for a reduction in fares. "I am conducting an investigation and have found that wages are a large factor in the proposition," said Mr. Kuertz. "But there are many other considerations. For instance there was a considerable falling off in the number of car riders in April of this year compared with April of 1920. There also has been a reduction in the cost of material such as coal."

Service-at-Cost Grant Upheld

The validity of the Findlay service-at-cost ordinance has been upheld by Common Pleas Judge William F. Duncan at Findlay. The Toledo, Bowling Green & Southern Traction Company was granted the franchise by the Findlay Council last February.

Attorney George H. Phelps attacked the franchise in the court.

Judge Duncan held that the city had relinquished none of its rights under the new grant.

The City Street Railway Commission also issued a statement to the public informing riders that unless traffic increases in the next month fares would automatically jump from 8 to 9 cents.

The stabilizing fund which was originally set at $20,000 has now a balance of $17,486. The April deficit was $1,654. The ordinance became effective on March 17.

In April, 1921, there were 2,000 riders daily as compared with 2,900 in April last year.

Ten-minute service was put into effect with the new ordinance and it is possible that the commission may cut service to twelve minutes if the traffic slump continues.

City Construction with Private Operation Suggested

John W. Shartell, owner of the railways in Oklahoma City and Tulsa, Okla., told the City Club at Tulsa that the only hope for improvement in service and needed extensions was in municipal ownership, as the company could not hope to build extensions or otherwise improve the service. It will cost $5,000,000, he said, to build the Tulsa street railway up to the needs of the traffic. He advocated an immediate bond issue of $1,000,000 for railway extensions to be built by the city, explaining that the lines so built could be leased to the traction company for operation.

Another Settlement Proposed

Banker Makes Concession Looking Toward Rehabilitation of Company at New Orleans

C. C. Chappele, representative of the junior security holders of New York, interested in the New Orleans Railway & Light Company, has been in New Orleans for several days in conference with Mayor McShane and the City Commissioners trying to work out a plan whereby the traction company may be refinanced and rehabilitated. He is accompanied by W. W. Harris, an expert on public utility matters. Mr. Chappele is for any plan that will stabilize the securities of the company and restore its credit.

Mr. Chappele has sought to stress three points which he regards as essential of achievement if the city's railway troubles are to be settled. The first of these is a fair valuation; the second, a fair return; and the third and last, reorganization on lines that will instill confidence and enlist the aid of capitalists who might be induced to advance the money necessary to rehabilitate the property.

He deprecated any settlement by the courts which might lead to delays even if it placed a higher valuation upon the property than had been fixed by the citizens' committee of forty. The valuation by this body was $44,700,000. Mr. Chappele believed that this valuation did not represent the true value of the property, but said he would be willing to accept that amount and would recommend it to his principals as the minimum.

It was his honest opinion, however, that the property was worth $50,000,000 and he felt confident that, if the matter were left to the courts for adjudication, the valuation would very likely be fixed at $60,000,000. His belief was based upon the decisions of the courts in similar cases in the recent past.

The several conferences held by Mr. Chappele with the Mayor and Commissioners disclosed the fact no proposition would be entertained which did not give promise of lower fares and reduced gas and electric light rates. Mr. Chappele promised to prepare a statement for the Commission Council which would show the effect of the drop in the cost of labor and material upon the operating expenses, since Commissioner of Finance Murphy declared he would not commit himself to the $44,700,000 valuation until shown that the fare and rates for gas and light would be affected by the fall in the price of labor and material.

It has since been disclosed that the

plan submitted to the Commission Council on May 20 by Mr. Chappele contemplates the formation of an entirely new company. The plan adheres to the valuation placed upon the property by the citizens' committee of forty which was acceptable to the Eastern bankers at an 8 per cent return. The bankers had signified their willingness to accept a 7 per cent return, but the Council at that time was unwilling to consent to either that return or the valuation.

Mr. Chappele declared in his statement to the Council that nothing less than an 8 per cent return will be feasible to work out the tangle in which the company now finds itself and is of opinion that the courts, if left to adjudicate the matter, would give a higher rate of interest than was fixed by the committee of forty.

This plan, Mr. Chappele indicated in his report to the Council, would attract the capital desired to rehabilitate the company and would make ultimately for lower fares. The Commission Council decided to postpone consideration of the matter until May 23.

The city of New Orleans has been afforded an opportunity of carrying up its case against Receiver O'Keefe, who enjoined the Commission Council from interfering with the collection of the 8-cent car fare. Judge Clayton, who issued the injunction, has granted the city an appeal from the order. The case will now go to the United States Circuit Court of Appeals.

Injunction Denied to City

Justice McAvoy in the Supreme Court has denied the application of the city of New York for an injunction restraining the new Public Service Commission from taking office. The court's decision upholds the State law under which the Governor appointed the transit board, and permits the new members to take possession of their offices, which had been denied them by the old board.

The injunction, brought by Corporation Counsel John P. O'Brien in behalf of the city, sought to prevent the Governor's appointees, headed by Commissioner George McAneny, from taking charge of public service affairs.

Justice McAvoy, in the course of his decision, said:

> The complaint grounds its demands for the inhibition of the injunctive process upon an allegation that the Transit Commission, these defendants, are about to and will grant under the pretended consents in the form of contracts which they will make for and in the name of the plaintiff with various street railroad companies and said contracts will purport to relieve the companies from the obligation of compliance with the provisions and conditions and obligations theretofore imposed, and that these defendants will modify and alter provisions and conditions of the contract and restore and validate rights of operation which the local authority, for instance now the Board of Estimate and Apportionment, has forfeited, and that such acts will result in irreparable financial injury to the plaintiff, its people and inhabitants unless thwarted by judicial order. . . . The imminence of danger of the execution of contracts that will violate the city's prescribed constitutional rights cannot be before the court for even an examination of the legality thereof until they are proposed to be executed.

Twenty-three Hurt on Washington Interurban

A head-on collision between a passenger train and a work extra on the Washington, Baltimore & Annapolis Electric Railroad at Ferndale, Md., on May 5, resulted in the death of one employee and the injury of ten passengers and thirteen employees. After investigation of this accident, the chief of the Bureau of Safety of the Interstate Commerce Commission reports the following conclusions:

> This accident was caused by work extra No. 7 being operated against train No. 339, an overdue superior train, without proper authority, for which Conductor Johnson and Motorman Dyson are responsible.
>
> The statement of Conductor Johnson indicates that in some manner he and Motorman Dyson reached the conclusion that inasmuch as the train leaving Baltimore at 2:20 p.m. had passed, the next southbound train they would have to meet would be the train leaving Baltimore at 3:20 p.m., both of them overlooking train No. 339, which was scheduled to leave Baltimore at 2:50 p.m. This accident could have been avoided had either of these employees consulted the time table before proceeding northward from Marley, for they would have seen that the train scheduled to leave Baltimore at 2:50 p.m. was operated daily.

At the time of the accident the crew of train No. 339 had been on duty a little more than ten hours, after about 11½ hours off duty. The crew of work extra No. 7 had been on duty about 8½ hours, previous to which the members had been off duty twenty-one hours or more.

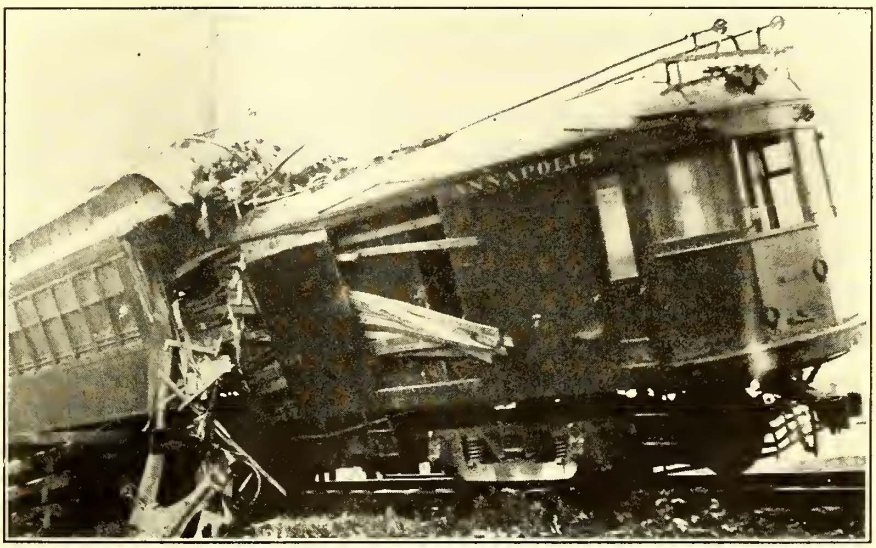
$1,000,000 for Storage Yard at Boston

The Boston (Mass.) Elevated Railway is constructing an elevated train storage yard at Forest Hills, the southern terminus of the main trunk line elevated road. The present stub-end double-track line, which ends about a train length beyond the Forest Hills Terminal Station, is being extended across the junction of Washington and Walk Hill streets, onto private land purchased by the company. Here the structure will branch out into one four track section and one three track section.

Only the three track section will be built at the present time, but the leads are being installed for the four track section. On this latter, it is planned also in the future to construct a 500-ft. house, for an inspection shop and minor emergency repairs.

The immediate work on hand contemplates the completion of three storage tracks with a total capacity of eighty standard elevated cars. The estimated cost is $660,000, for the immediate work, and about $1,100,000 for the entire job, including the house. The latter will be of brick and concrete construction, on a steel framework. The ground floor below the structure will serve as a basement for the storage of supplies, and will be connected with the surface car tracks.

Capital for this improvement is coming from the money made available by the State purchase of the Cambridge subway, and the expenditure has been approved by the Massachusetts Department of Public Utilities.



TWO TRAINS OF THE WASHINGTON, BALTIMORE & ANNAPOLIS LINE COLLIDED AT FERNDALE ON MAY 5

The line on which the accident occurred, at present extending between Short Line Junction and Annapolis, was taken over by the Washington, Baltimore & Annapolis Electric Railroad on March 16, 1921, and a contract was made six days previous thereto for the installation of an automatic block signal system between the two points. The opinion of the commission is that had such a system been in use at the time of the accident, the collision undoubtedly would have been prevented.

Conductor Johnson was employed as a brakeman in 1918, promoted to extra motorman and extra conductor in January, 1919, and to freight conductor in April, 1919. On Sept. 20, 1919, he failed to observe an order and ran by a meeting point. Motorman Dyson was transferred from the shop department to the transportation department in March, 1914, and assigned to service as an extra motorman and inspector. His record is clear.

Employees Approve 15 per Cent Wage Reduction

Employees of the Fonda, Johnstown & Gloversville Railroad, Gloversville, N. Y., at a recent meeting voted on the compromise proposition of a 15 per cent wage reduction offered by the company and the vote was carried by a substantial majority. The men had previously rejected two proposed wage reductions. In accordance with its contract, the company notified the men that on May 1 the agreement was to be opened up. A proposition was then made to reduce the wages of all employees 20 per cent, all rules and working conditions to remain the same.

After the men had flatly rejected this proposition the company made a compromise proposition, offering a wage cut of 15 per cent. This was also rejected. The company then notified its employees that it was willing to put the matter up to arbitration and that the original plan of 20 per cent reduction would go into effect on May 1, subject to award by the arbitration board retroactive to May 1. Soon after this decision the committee representing the men asked for a further conference, stating that they would call a special meeting and ask the employees to reconsider their former action. It was at this special meeting that the proposition of a 15 per cent reduction carried.

Order Attacked Directing Terminal Improvement

The Pacific Electric Railway, Southern Pacific Lines and Los Angeles & Salt Lake Railroad have asked for rehearings with the Railroad Commission on its recent passenger terminal order, declaring that the tendency of the order is confiscatory, that it was apparently prepared in a hasty manner, that it intermingles and confuses their separate interests, and calls upon them to participate in a colossal improvement which, they insist, only Congress can bring about.

In case the application for a rehearing is denied by the commission the railroads state that they are prepared to ask the State Supreme Court for a writ of review. If the State Supreme Court should uphold the order of the commission, the next step will be to ask the United States Supreme Court for a writ of error. It is stated that it is not unlikely that some of the railroads will ask for a Federal injunction against the commission's order.

The Pacific Electric Railway objects to the order, its officials say, because it requires the company to participate in the construction of a union passenger terminal, and it looks with disfavor upon the commission's requirement to the effect that it pay for a separation of grade crossings at the Macey Street and Seventh Street crossings, declaring that it has no property there and that other roads should bear the expense.

The attack of the Southern Pacific upon the commission's order declares such authority lies only with the Interstate Commerce Commission. The Pacific Electric petition is based upon jurisdictional and constitutional grounds, challenging the authority of the Railroad Commission to order payment by the railway for work in which it has no interest and where it will not be required or permitted to use the new facilities.

The order of the commission directing the expenditure of $32,000,000 in terminal improvements at Los Angeles was reviewed in the ELECTRIC RAILWAY JOURNAL for May 7, page 868.

Legislative Inquiry Completed

Massachusetts Railways Absolved — Evidence to Go Before District Attorney

The special committee of both houses of the Massachusetts Legislature which has been investigating alleged irregularities in connection with the passage of street railway relief bills in 1918 and 1919 has filed its report. In all, thirty-eight members of the legislatures of those two years were found to have purchased securities of either the Massachusetts Electric or the Boston Elevated Railway companies at various times during those years. Of these, a number opposed and voted against the bills, but apparently felt sure they were certain to pass.

The two companies were entirely absolved from the insinuations that were made before and during the hearings that they had led the members of the legislature to speculate in the stocks of the companies with a view to influencing their votes, or that the companies or anyone representing them, had used any improper influence to secure favorable action on the bills. Allegations were dismissed that there was a "slush fund" raised and used for purposes of corrupting legislators.

The committee consisted of two senators and three representatives, none of whom was a member of the 1918 Legislature, although one was a member of the following year's body, it being determined to include that year's transactions in the investigation, after the committee had been appointed. Four of the committee were Republicans and one a Democrat. The report was unanimous as far as the main findings were concerned and was signed by all members of the committee, but the Democratic member filed a minority report dissenting from some of the conclusions.

The report recommended that copies of the evidence brought out in the hearings be transmitted to the District Attorney of Suffolk County, for such action on his part as he feels advisable. There was no censure offered for those members who had speculated in the railway stocks, nor was there any recommendation for the expulsion of those still serving in the Legislature, as had been expected. The committee took the ground that being a joint committee it had no right to recommend to either house what action each should take with its own members who were involved. It is expected that each branch of the Legislature will take up this matter on its own account.

Claims were refuted that the bill authorizing the purchase of the Cambridge Subway by the State from the Boston Elevated was a "steal," and that the $7,868,000 paid for it went into the pockets of "State Street financiers." The evidence showed that the money paid by the State is being legitimately devoted to capital improvements by the trustees of the Elevated, under the control of the Public Utilities Board. As the expressed and understood purpose of the purchase was to provide capital for the trustees to use for necessary improvements, no criticism is attached to anyone on this score. It was shown that the rental being paid to the State by the company for the use of the subway, not only pays the interest on the State's investment, but also provides a sinking fund, which will ultimately retire the whole indebtedness, and leave the commonwealth the owner of the subway without cost to itself.

The committee recommended that the Legislature adopt a joint rule which will clearly define the rights and duties and members hereafter, with regard to purchase or ownership of stock in corporations, when legislation affecting them must be voted on.

Ten-Cent Cut in Toledo

Union Insists on Arbitration Although Matter Would Appear to Be Self-Adjusting

After more than a month of parley in which time the employees of the Community Traction Company at Toledo, Ohio, turned down one offer of a wage cut of 2 cents an hour from their maximum of 60 cents, company officials put into effect a reduction of 10 cents making the scales 45, 47 and 50 cents beginning May 23. The union submitted to the cut only on consideration that the disputed wage question shall be arbitrated according to the terms of the Milner service-at-cost ordinance.

Frank R. Coates, president of the railway, declared that he saw no need of arbitration, under the terms of the ordinance, which provides that all salaries and wages shall be based on rates prevailing in other cities. He put the matter before the board of control for final action as to whether or not arbitration should be resorted to.

Edward McMorrow, member of the executive board of the "Amalgamated," who has been spokesman for the union men, said:

> The union will accept as a maximum wage any award of the board of arbitration over the offer of 50 cents an hour.

This proposition is regarded as so ambiguous that it is doubtful if the board of control will go to the mat on such a question. If the board should agree to open up the whole question of wages company officials believe that

they will be able to secure a larger cut than is made in the proposed scale.

The cut in wages is only 18 per cent as compared with cuts of 20 per cent in Cleveland and Detroit, the rates in which cities have always governed Toledo wages on a differential basis.

Many of the working conditions forced into agreements during the war period are also omitted from the proposed agreement at Toledo. Two weeks' vacation with pay is also cancelled and special provisions for overtime rates and runs are also changed.

The board of control and Street Railway Commissioner W. E. Cann have taken no part in wage negotiations up to this time and it is possible that they may decline to step into the controversy unless the interest of the public is at stake.

By dating of the wage contract from May 21 rather than April 1, the Toledo negotiations now follow those of Cleveland and Detroit.

The 1920 wage rate was 54, 56 and 60 cents. The new scale is 45, 47, and 50 cents an hour. Common labor rate in Toledo is now 35 to 45 cents an hour.

Wage Reduction Accepted Gracefully

Foregoing their contract with the company in order to accept a reduction in wages, motormen and conducters of the Pittsburgh, Harmony, Butler & New Castle Railway, Pittsburgh, Pa., have accepted a voluntary reduction in wages of 5 cents an hour, retroactive to May 1. The pay will now be 66 cents an hour. The men's old contract had some time to run.

About a year ago, when the wage was 54 cents an hour, the company set aside its contract with the men in order to increase their wages to 71 cents an hour. The interurban line is headed by David J. McCahill, and the employees said they took the cut in appreciation of the treatment accorded them by the company and its president.

On the men's initiative the reduction was made retroactive to May 1, although President McCahill said he would be satisfied to have it begin May 16. They also offered to take a greater reduction if it should prove necessary. Approximately 450 men are affected.

The employees of this road operate under a plan which provides for their participation in the profits of the company different from most other plans of the kind. This plan was described at length in the ELECTRIC RAILWAY JOURNAL for March 27, 1920, page 664.

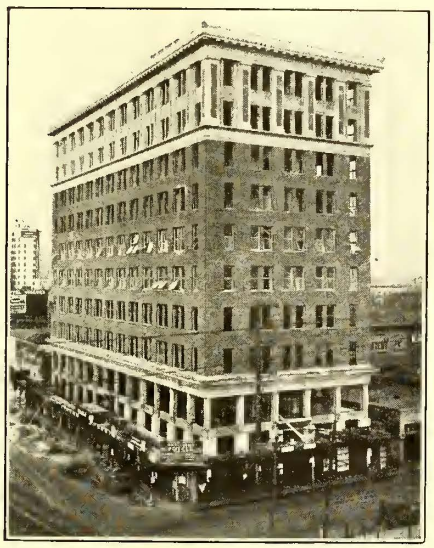
Approves of One-Man Cars.—The Rhode Island Company, Providence, R. I., has received authorization from the Public Utilities Commission to operate one-man cars in Woonsocket and Pawtucket. The petition was made after President Wood, of certain Bay State lines, notified the Rhode Island Company that one-man cars would be run over their lines into the cities of Woonsocket and Pawtucket.

New Home for Railway

Company at Los Angeles Will Soon Occupy Top Five Floors of New Structure

Up-to-date architectural and engineering features are embodied in the new building of the Los Angeles (Cal.) Railway at Eleventh Street and Broadway, into which the company is now moving. The structure is of class "A" reinforced concrete construction.

The building is 176 ft. long and ten stories high. It has the greatest area of frontage on Broadway of any building in the city. It is of "flatiron" type, measuring 65 ft. on the south end, which fronts on Eleventh Street, and 30 ft. on the north end. The center of this north end is on the center line of Broadway extending from the tunnel at Temple Street to Tenth Street and affords an impressive view down the main artery of Los Angeles.



LOS ANGELES RAILWAY'S NEW HOME

A granite base supports the two lower stories of terra cotta and the six-story shaft of brick exterior extending to the ninth floor. The two top stories have a terra cotta finish with colored decorative pilasters and figureheads at the four corners of the building. The main supporting columns of the building are 28 in. and 30 in. square.

The main floor will be devoted to stores. The second to fifth floors will have general offices and the Los Angeles Railway will use the top five floors. Several features particularly adaptable for the railway are included in the architecture.

There will be no assembly room for lectures, with blackboards, maps and other equipment to be used by the instruction department.

The railway's library for employees will be on the sixth floor. The medical department will be equipped for using an X-ray machine and other modern electrical equipment of the profession. A specially constructed sound-proof room will be used by the auditing department for the punching and sorting machines.

Occupancy of the new building will centralize the offices of the railway, as the instruction department is at present located at Sixth Street and Central Avenue. This will leave only the five carhouses, the shops and electrical construction and repair department outside the main offices. Noerenberg & Johnson are the architects.

$200,000 for Improvements

Federal Judge English, sitting in East St. Louis, Ill., has approved an appropriation of $200,000 for the betterment and replacement of property of the Alton, Granite & St. Louis Traction Company, after a personal inspection of the company's property made with W. H. Sawyer, Fred Allen and C. B. Thomas, receivers for the company. Of the appropriation $80,000 will be used for repair work and the purchase of one-man cars for use in the city of Alton. A new bridge, costing $15,000, will be built at Woodriver, Ill. Judge English recently made permanent the temporary receivership under which the company has been operating.

Disorder Rife in Albany

After perhaps the worst outburst of rioting and violence since the beginning of the strike waged by the employees of the United Traction Company, Albany, N. Y., quiet and order again prevailed on May 23 with the state troopers and the city mounted police patrolling the business zones. Both day and night service has been resumed by the railway.

The riots on May 19 and 20 followed a recent campaign to oust the jitneys from the streets. This campaign instituted by police authority proved unpopular and as a result the cars were battered with flying rocks and stones and the non-union crews had to desert their posts for safety. Though police reserves were immediately summoned and troopers from Troy were rushed to the scene, several persons were injured and many cars were wrecked before order was restored.

Frankford Lease Probably Best

Director Twining of the Department of City Transit, Philadelphia, Pa., at a recent hearing submitted to twenty-eight questions put by E. E. Ziegler, president of the North Philadelphia Business Men's Association, on the proposed temporary lease of the Frankford elevated and Bustleton surface lines to the Philadelphia Rapid Transit Company. The director declared that the lease as now drafted would not hold up the operation of the Woodland Avenue line and the Chestnut Street subway. He said further that the lease was in fact only a compromise, but that it was the best that could be arranged. Mr. Twining emphasized the fact that the lease under consideration would be rewritten after the Public Service Commission had determined on the Philadelphhia Rapid Transit valuation.

Additional Transit Acts Approved

Governor Miller of New York on May 6 signed two bills relating to New York City transportation matters. One was the Burling measure, which authorizes the creation by the Westchester County Board of Supervisors of a commission of seven members to arrange for improved transportation service by railroad or electric railways between New York City and points within Westchester County.

The other bill is the Walker measure which amends the rapid transit act with reference to payment for work done. This measure is aimed to meet conditions which may arise as a result of the eventual adoption of the unified system which is to be created by the new transit commission. It provides that where the Rapid Transit Commission shall have failed to certify a voucher for the payment of money a proper or sufficient voucher shall not be a condition precedent to the liability of the city.

$1,643,000 to Be Spent in Portland

The Portland Railway, Light & Power Company, Portland, Ore., announces that reconstruction work, improvement, extension and maintenance either now under way or already authorized and ready to be undertaken in the near future will entail expenditures of between $1,500,000 and $2,000,000. The following projects are included in the exhaustive plan for 1921:

New steam turbine of 12,500 kilowatt rated capacity installed in Station "L," work now under way	$400,000
Replacement of 50,000 ties on lines of the interurban system, now under way	75,000
Bridges and buildings and maintenance work on the interurban system, now under way	150,000
Maintenance of way work on the Portland city car lines, now under way	350,000
Reconstruction and repaving of car tracks on First Street, from Alder to Madison	36,000
Reconstruction and repaving of Third Street from Washington to Glisan, authorized	52,000
Reconstruction and repaving of East Twelfth Street from Hawthorne Avenue to Milwaukee Avenue, contract let	36,000
Reconstruction and repaving of Woodward Avenue from Grand Avenue to East Tenth Street, now under way	20,000
Reconstruction and repaving of Vista Avenue from Spring Street to Patton Road, just completed	14,000
Repaving on Main Street, Oregon City, under way	5,000
Rebuilding trestle on Oregon City line, under way	4,000
Repairing and repainting over 50 stations and waiting-rooms on the various interurban lines, now under way	5,000
Reconstruction and repaving of Killingsworth Avenue from Interstate Avenue to Greeley Street in prospect	57,000
Reconstruction and repaving of Ravensview Drive from Greenway Drive to Elizabeth Street, in prospect	20,000
Reconstruction and repaving of East Lincoln Street from East 54th to East 57th Street, in prospect	16,000
Reconstruction and repaving of Twenty-seventh Street from Thurman to Upshur Street, contract let	3,000
Other work	400,000
Total	$1,643,000

News Notes

Franchise Negotiations Renewal. — The conferences have been renewed looking toward the drafting of a new franchise for the Grand Rapids (Mich.) Railway. At a recent session General Manager De Lamarter is said to have been inclined to the insertion in the franchise of a four-tickets-for-a-quarter proviso with a charge of 10 cents for transients, until the company has made good its accumulated losses from operation.

May Establish Car Service. — The Interstate Electric Corporation, which owns the San Angelo (Tex.) Water, Light & Power Company, plans soon to establish railway service in that city. This report is given credence by the placing of an order by the San Angelo Water, Light & Power Company for a 500-hp. oil-burning engine and electric generator. The new equipment will double the capacity of the San Angelo plant.

Minneapolis Veterans Organize.—The Veterans Club has been organized by old-time employees of the Twin City Rapid Transit Company, Minneapolis, Minn. One hundred and thirty-four men who had been more than twenty-five years in service were present at the first meeting. Nels J. Nelson, claim adjuster, was made chairman and F. A. Anderson, social service director, was temporary secretary. A committee was appointed to draw up the constitution and its members will be directors for the first year.

Investors Will Be Protected. — Each employee of the Beaver Valley Traction Company, New Brighton, Pa., and the Pittsburgh & Beaver Street Railway, Pittsburgh, Pa., recently received a notice from General Manager Boyce reminding the employee of the "Pull Together" motto of the company which makes each employee a booster of his company, fellow workers and management officials. Every man is urged to defend the company in a courteous manner and to secure the names of people who make erroneous statements about the company, and the management will be glad to send a letter or have an interview with such complainants to inform them of the truth. The manager announces that for the first three months of this year the Pittsburgh & Beaver Street Railway and the Beaver Valley Traction Company had a combined loss of $6,845.

Funds Needed for Transit Facilities. —E. W. Edwards, president of the Rapid Transit Commission, Cincinnati, Ohio, at a recent meeting before the business men of the city declared that a bond issue of $3,000,000 in addition to the amount paid by the abutting property owners would probably go before the public at the August primary election for the purpose of boulevarding the canal. He discussed the outlay of funds of the commission and just what accomplishments were expected. He said that the operation of the loop by the Cincinnati Traction Company would mean many years of court action and that the commission had decided to go ahead with the work on the canal and leave the question of operating until such time as the traction company had reduced fares to a lower limit. Speaking on the cost of the rapid transit system, Mr. Edwards said the commission had spent $542,000 for property, and that contracts had been let for the first four sections totaling $2,079,000. Of these contracts, there had been $977,000 worth of work already completed. This had left the commission a balance of approximately $3,500,000 with which to push the completion of the loop.

Programs of Meetings

American Institute of Electrical Engineers

The American Institute of Electrical Engineers will hold the thirty-seventh annual and Pacific coast convention at Salt Lake City, Utah, on June 21-24. A tentative program has been arranged, including an address of welcome by Charles R. Mabey, Governor of Utah, and an address by President Berresford. The entertainment program will consist of sight-seeing trips to Great Salt Lake and Salt Lake Valley, where members can inspect a mining canyon. An opportunity will also be afforded the members to see the largest outdoor substation in the world, the property of the Utah Power & Light Company. Various technical papers will be read on each of the convention days.

New York Electric Railway Association

The thirty-ninth annual meeting of the New York Electric Railway Association will be held at the Fort William Henry Hotel, Lake George, N. Y., on June 11. The meeting will convene on the arrival of the delegates who come by the morning train. Reservations so far received far and away exceed the number enrolled for previous years' meetings of the association so long in advance of the date of the meeting. Various subjects will be discussed, special attention being given to the questions of one-man car operation and taxation in its different phases.

The entertainment features for the men will not be started until the conclusion of the business sessions. The ladies will have bridge parties and will enjoy golfing, boating and other outdoor sports such as the territory around Lake George affords.

Requests for hotel accommodations should be made as early as possible to Charles A. Douglass, manager, Fort William Henry Hotel.

Financial and Corporate

$1,000,000 Lost by Seattle

City Running Steadily Behind in Its Operation of the Seattle Municipal Railway

According to the 1920 annual report of Seattle's superintendent of public utilities, the operating revenue of the Municipal Street Railway showed a gain of 31.4 per cent over the previous year. This increase was due principally to the fact that the 5-cent fare was changed on July 24, 1920, to a 7-cent cash fare with four tickets for a quarter or two cash fares for 15 cents.

Notwithstanding this increase in revenue it was impossible to keep the expenses of operation to less than 102.2 per cent, with the result that the net loss for the year was nearly $1,000,000. If the previous deficit in the profit and loss account is added the total deficit since the city took over the operation amounts to $1,236,284. The accompanying tables speak for themselves and show the detail of operation for the past two years.

In referring to the jitney situation the report recommends that some action be taken whereby the system may be regulated and the operators compelled to live up to such regulation.

WOULD BAR JITNEYS

Jitneys, the report says, should not be allowed to operate on the same street on which car lines are located, as there is a sufficient amount of equipment in the railway department to take care of all travel on any line operated without the assistance of jitneys. There are, however, a few outlying districts which at this time are not served by the Municipal Railway, and in such locations the jitneys could legitimately operate, provided they are compelled to pay a certain percentage of their earnings to the city for the right to operate over the streets, as they are operating simply for the purpose of making money and are not in the same class as a privately owned machine.

Substantial decrease in the number of accidents on the car lines during 1920 as compared with the previous year is shown by the report. The total number of accidents in 1920 was 6,511, as against 7,291 in 1919. The number of collisions with cars, 246; collisions with vehicles, 2,976; collisions with pedestrians, 205; injuries on cars, 317; step accidents, standing cars, 403; derailments, 231, and miscellaneous, 680. There were 106 ejectments of passengers for which damage claims were filed and six fatalities among passengers and trainmen against nine in 1919.

The traffic handled during the year was 122,866,577 passengers as against 133,176 297 the previous year. Revenue passengers decreased 9,114,648, while free passengers increased 363,297 and transfer passengers decreased 1,558,369. To handle this traffic 15,829,054 car-miles in 1,765,635 hours were operated as against 16,162,539 miles in 1,771,138 hours the year before. The average speed of cable cars for the year was 6.47, for electric cars 9.17 and the average for all services 8.97 miles per hour.

INCOME AND PROFIT AND LOSS STATEMENT—SEATTLE MUNICIPAL RAILWAY

	1920	Per Cent of Total Operating Revenue	Per Cent Change Over Previous Year	1919	Per Cent Total Operating Revenue
Operating revenue:					
Passenger	$5,283,658	96.72	31.1	$4,030,602	96.94
Firemen and police	54,000	0.99	42.1	38,000	0.91
Special cars	1,698	0.03	260.0	471	0.01
Mail service—postal employees	9,388	0.17	51.0	6,213	0.15
Express revenue—newspapers, etc	8,770	0.16	122.0	3,948	0 09
Freight	39,977	0.73	24.6	32,112	0 77
Miscellaneous transportation	1,055	0.02	*67.5*	3,264	0 89
Auto bus revenue	12,218	0 22	4349 0	275	0 01
Total from transportation	$5,410,764	99 04	31 5	$4,114,885	98 96
Non-operating revenue:					
Station and car privileges	17,158	0.300	32.6	12,947	0 31
Rent of equipment	105	0.002	*96.9*	3,523	0 09
Rent of track and facilities	24,089	0.400	15.1	20,938	0 50
Rent of real estate	96	0.002	*98.0*	4,638	0 11
Power sold	465	0.008	*19.7*	579	0 01
Miscellaneous revenue	723	0 010	12.5	643	0.02
Lost and found department	1,680	0.030	....	.....	.....
Miscellaneous rent revenue	8,312	0.150	....	.....	.....
Total	$52,628	0.96	2 2	$43,268	1 04
Total operating revenue	$5,463,392	100.00	31.4	$4,158,153	100.00
Operating expenses:					
Way and structures	$457,105	8.18	61.8	$282,993	6.93
Equipment	734,017	13.16	38.9	528,507	13.00
Power	683,934	12.24	22.5	558,528	13 70
Conducting transportation	2,644,291	47 45	35.5	1,950,460	48.00
Traffic	3,273	0.05	47.0	2,228	0 05
General and miscellaneous	362,547	6.49	48.0	245,109	6.01
Auto bus expense	22,956	0.41	2437.0	904	0.07
Depreciation	677,179	12.12	35.7	499,173	12.29
Total	$5,585,302	100.00	3 73	$4,067,903	100.00
Gross income	*121,910*	.....	*235 5*	90,250	.....
Deduction:—					
Interest on general bonds	35,750	.....	53.5	23,281	.....
Interest on revenue bonds	823,000	.....	42.0	579,684	.....
Discount on funded debt	6,908	.....	199.0	2,314	.....
Interest on warrants due	2	.....	*99.9*	2,145	.....
Total	865,660	.....	42.5	$607,424	.....
Net income to P & L	*987,570*	.....	*91.0*	*517,174*	.....

$2,000,000 of Stock to Monongahela Patrons

George M. Alexander, president of the Monongahela Power & Railway Company, Fairmont, W. Va., has announced that $2,000,000 of preferred stock of the company will be offered to patrons for subscription. The company is the successor to the Monongahela Valley Traction Company, the change in name having been made so as to reflect more accurately the operations of the company.

The preferred capital stock of the company has recently been increased from $4,000,000 to $8,000,000. Of the increase approximately $2,000,000 has been made available for purchase by the patrons of the company in the communities served by it.

In announcing the change in plan Mr. Alexander said in part:

> The company in adopting this policy, making it possible for its customers to acquire its stock, feels that the patrons of its railway lines, the users of its power, electric light and gas are entitled to participate in the profits arising from such service for the following reasons:
>
> 1. So that the company and the public it serves shall be partners in fact in order that the service rendered shall respond to the demands of the public.
> 2. So that the actual ownership of the property shall be vested in the people upon whom the company depends for patronage.
> 3. So that the profits (or wages paid for the use of capital) of the company shall be returned to the people who make these profits possible by their patronage.
> 4. So that the company and the public may work in closer co-operation for the benefit of the territory served.
> 5. So that the money obtained from the sale of securities will be used where obtained and will go for purposes that will benefit the entire community.
> 6. So that the people of these communities may have a sound home investment for their capital and savings.

The par value of this stock is $25 per share and the patrons may purchase this stock at $19 per share. The stock pays dividends at the rate of 6 per cent annually on the par value, which makes the return at the above price nearly 8 per cent per annum. The stock may be purchased for cash or on a satisfactory partial payment plan.

Time Extended for Filing Inventory

The Indiana Public Service Commission has extended until June 15 the time in which the Indiana Railways & Light Company must file an inventory with the commission. Last January the commission ordered an inventory filed by March 15, and at the end of that time an extension until April 15 was granted. The company failed to report then and another extension was granted setting the date as May 15. The commission announced recently that it would instruct the engineering department to investigate the company's property and set the final date for filing the inventory as June 15.

Deficit Still in Toledo

Pay-Leave Fare Collection Proposed During Rush Hours—Commissioner Building for Permanency

Operations of the Community Traction Company, Toledo, Ohio, for the month of April showed a deficit of $72,730 after payment of all charges and fund accruals. The total decrease in gross revenue for the month was $14,229.

Earnings from operation for the month totaled 41.17 cents per car mile. Expenses of operation took 39.3 cents. The balance plus miscellaneous income gives 4.08 cents per car mile to meet taxes, reserves and fixed charges. The total passenger riders per car mile amounted to 8.14 exclusive of employees carried.

The operating ratio was reduced to 90.60 in April from 92.21 in February and 93.25 in March. With the elimination of the Huron Street line it is anticipated that this ratio will be less than 90. The maintenance and repair fund allowance is being arbitrarily maintained at 10 cents a car mile for the summer months.

Street Railway Commissioner McCann has outlined some of his plans for increasing economy. He is conducting operations on a strict business basis and is trying to do justice to the property itself rather than attempting to make a showing during the first few months of operation under the new service-at-cost plan.

During rush hours the pay-leave system of fare collection is to be used on the cars to speed up downtown loading. By having the cars pay-enter inbound the collection of fares would be eliminated in the congested district.

Safety rules may also be changed to allow loading of more than one car at a time at some of the downtown corners. A plan of complete downtown rerouting so as to separate railway and vehicular traffic is also being developed.

The new rate of 40 cents a car mile for interurban rental has become effective and the commissioner believes he can persuade the interurban companies to build a stretch of track on Jackson Avenue between Huron and Superior Streets to make a new loop for Detroit-Cleveland cars and several other lines now using a long loop through the congested district. It is estimated that the mileage saved at 40 cents per car mile under the new arrangement would save to the interurbans the cost of the track in less than a year. This plan if carried out would make Toledo's new interurban station approachable from both sides and greatly facilitate the speed of loading and dispatching cars.

Stock Dividend at Detroit

In connection with the stock dividend of 2½ per cent declared on the $15,000,000 of capital stock of the Detroit United (Mich.) Railway, it has been explained that in view of the abnormal business conditions prevailing the board of directors, notwithstanding the existence of a surplus of many million dollars represented in the value of its properties, deemed it prudent to proceed with extreme caution and to conserve the company's resources in every possible way and therefore decided to declare a stock dividend at 2½ per cent payable on June 1, 1921, in lieu of the usual cash dividend payable at that date.

$179,000 Loss in Buffalo

The International Railway, Buffalo, N. Y., shows a deficit for the three months' period ended March 31, 1921, of $179,924 against $77,822 for the corresponding period of 1920. Operation in 1921 so far presents none too bright a situation. For the two months ended Feb. 28 the company failed by $300,000 to earn the amount required and at the end of March, as is noted in the accompanying table, the gross revenues are insufficient by $466,576 to meet operating expenses, taxes, depreciation, etc. Mr. Tulley, president of the railway, in a recent statement announcing a wage cut for unskilled employees effective May 1, spoke of the financial distress of the company. He stressed the industrial depression which had been so acute that a falling off of 17 per cent was noted in the company's gross receipts.

STATEMENT OF EARNINGS OF INTERNATIONAL RAILWAY

Three months ended March 31:	1920	1921	Per Cent Change
Operating revenue	$2,418,022	$2,685,550	10.6
Operation and taxes	2,092,841	2,497,489	19.3
Operating income	$325,181	$188,061	42.4
Non operat ng income	5,092	7,863	54.4
Gross income	$330,273	$195,924	40.7
Income deductions	408,095	375,848	7.9
Deficit	$77,822	$179,924	131.1
The formula for the determination of a fair return upon the value of the property, adopted by the Public Service Commission when granting the 7c. cash fare—4 tickets for 25c., for the City of Buffalo, represents an annual sum of approximately $2,650,000. Proportion for three months	.....	$662,500	....
Gross income for three months ended March 31, 1921	.....	195,924	....
Amount by which gross revenues are insufficient to provide for operating expenses, depreciation and renewals, taxes, and this return upon the value of the property devoted t the public service	.....	$466,576	....

The formula for depreciation and renewal adopted by the Public Service Commission when granting the 7c. cash fare—4 ticket for 25c., for the City of Buffalo, represents an annual charge of $1,016,000, and effective July 1, 1920, the monthly appropriation from earnings has been in accordance therewith.

Comparative charge for depreciation and renewals for the first three months of 1921 and 1920, as included in "Operation and Taxes".	$99,998	$254,000	154.5

Massachusetts Roads Exempted From Excise Tax

An additional exemption of two years, 1922-23, from the assessment of the so-called commutation or excise tax in Massachusetts has been granted the street railway companies of that state by a bill just passed by the Legislature and signed by the Governor. During the severe financial crisis which confronted the companies two years ago they were relieved from the operation of this tax for the years 1920-21 by legislative enactment, and the present bill is in the nature of a further extension.

There was considerable opposition to the passage of the present extension, and the original bill was defeated. The speaker of the lower branch of the Legislature, B. Loring Young, who is exceptionally well acquainted with street railway financial conditions, himself took the floor on a motion for reconsideration, and so impressed the members with the necessity for continued relief from this tax that the measure was reconsidered and passed.

This tax is levied as a percentage of gross receipts, the maximum being 3 per cent, for the use of the various towns in which the street railway tracks are laid, to pay for maintenance of public ways and bridges. The tax is apportioned among the towns in the ratio of the mileage of track in each one.

Brief Filed in Suit for Restoration

Edward C. Turner, former attorney general of Ohio and now counsel for the Columbus Railway, Power & Light Company, Columbus, Ohio, has filed a brief of 128 printed pages in the suit of the company against E. W. Clark & Company, Philadelphia, Pa., former operating managers of the railway, to recover $2,737,621 or $2,655,040 depending upon which of two sets of claims is considered. The brief represents the summation of the controversy that has been in progress almost three years before Common Pleas Judge E. B. Kinkead and Master Commissioner George B. Okey, Columbus.

Mr. Turner charges that the Clarks underwrote and others invested. According to him "Columbus and the surrounding territory are full of suckers." He charges that for a quarter of a century the Clark interests exercised a control at Columbus through the proxy committee—"the very weapon by which they were finally unhorsed." According to Mr. Turner the management of the company was finally taken away from the Clark interests by Charles L. Kurtz, the present president of the Columbus Railway, Power & Light Company, and by D. Meade Massie, Chillicothe, Ohio.

The brief is considered one of the most remarkable documents ever submitted in a suit brought in Franklin County, particularly in a civil suit. It is replete with the reiteration of charges of mismanagement on the part of the former operators. Mr. Turner

says that "throughout a busy career covering the trial of many cases where brains were combined to circumvent justice, I have never encountered an abler witness or one who could play a better game of mental chess on the witness stand than Mr. Clark. But truth is mighty and will prevail."

Counsel for E. W. Clark & Company have not yet filed their brief in reply.

Miami Traction Has Quit for Good

The Miami Traction Company, which ceased operating the electric railway in Miami, Fla., following the fire that destroyed its plant, carhouse and some equipment more than a year ago, will "never operate another car in Miami," S. M. Tatum, treasurer of the company, told the Civic Voters League at a meeting which he was invited to address. Mr. Tatum discussed the traffic situation from the standpoint of the company. He did not touch on the latest development—the suggestion that the Carl G. Fisher interests owning the Miami Beach Electric Company take over the franchise and track of the Miami concern.

Mr. Tatum described how the City Council had failed again and again to provide protection for the company from the inroads into the transportation business made by the jitneys, and how at last the Council had refused to call an election on the question of buying the car line although petitioned to do so by the Chamber of Commerce, the Rotary Club, the Real Estate Board and several hundred citizens. It even refused to accept the report favorable to municipal ownership brought in by a committee of citizens appointed under the Council's own direction to investigate the traction situation and make recommendations for a resolution.

The speaker ventured the opinion that no company could be induced to come in and take over the railway franchise unless the jitneys were legislated off the streets. The franchise, he said, is very severe, anyway, and had been looked upon unfavorably by railway operators to whom it had been shown.

The last direct offer made by the company to the city was to sell the tracks to the city for $75,000, and the cancellation of debts owned by the company to the city. These debts total about $14,000.

Abandonment Ahead

The critical situation regarding the railway at Lafayette, Ind., took a new turn recently when it was announced that the Northern Indiana Gas & Electric Company has bought the railway's power plant at the foot of South Street and had taken an option on the car lines, effective until June 10.

Clarence H. Geist, president of the Northern Indiana Company, has conferred with George R. Durgan, Mayor, and the members of the Board of Public Works and told them that his company had persuaded the Terre Haute, Indianapolis & Eastern Traction Company to take over the railway lines and operate them as lessee providing the city will guarantee the company protection from the competition of jitney buses.

The alternative to the offer made the city by the Northern Indiana Gas & Electric Company and the Terre Haute, Indianapolis & Eastern Traction Company is complete abandonment of the railway. The Northern Indiana Company plans to dismantle the power plant and take over its business at the newly enlarged power station of the Northern Indiana Company. The plan is to have the railway buy power from the Northern Indiana Company.

Financial News Notes

Short Abandonment Approved.—The Board of Public Utility Commissioners of New Jersey has granted permission to the Millville Traction Company to abandon 0.8 of a mile of track and relinquish the franchise on South Second Street, Millville, at the end of the line.

Cannot Abandon Service.—The State Public Utility Commission recently refused permission to the Bridgeton & Millville Traction Company, Bridgeton, N. J., to cease operation on its line between Newport and Bivalve. Vigorous opposition was voiced to this abandonment by residents along the route.

Westford to Contribute to Railway.—The town of Westford, Mass., has secured authority from the Massachusetts Department of Public Utilities to contribute the sum of $1,829.23 toward the cost of operation and the fixed charges of the line of the Lowell & Fitchburg Street Railway within the limits of that township.

Successor Company Chartered.—The Abilene (Tex.) Traction Company has been chartered with a capital stock of $100,000 to take over the property of the old traction company which failed and which has not been operated for two years or more. The incorporators of the new company are J. N. Burjac, Price Campbell and G. W. Fay.

Sale Under Foreclosure Restrained.—The sale of the property of the Standard Traction Company, Dallas, Tex., under foreclosure proceedings to satisfy a judgment for $5,000 obtained by C. F. Farmer and wife in the District Court of Dallas County, has been stopped by the granting of a receivership for the property. This action was taken by Judge W. F. Whitehurst upon application of the Power Investment Company, holder of a first lien for $10,000 upon the property. George P. Dunlap has been appointed receiver for the company.

$5,000,000 Milwaukee Bonds Offered.—A syndicate of bankers, including Dillon, Read & Company, Harris, Forbes & Company, Inc., and Spencer Trask & Company, New York, N. Y., offered for subscription on May 12 $5,000,000 of twenty-year 7½ per cent refunding and first mortgage gold bonds, series A, of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., dated June 1, 1921, and due June 1, 1941. The offering price was 95 and interest yielding more than 8 per cent. A semi-annual sinking fund will retire 2 per cent per annum of the bonds until June 1, 1926, and 1½ per cent per annum thereafter if obtainable at or under par and accrued interest. The trustee of the issue is Central Union Trust Company, New York. The bonds become a first lien on the company's entire property by Dec. 1, 1931.

$4,500,000 of Portland Bonds Offered.—The National City Company, New York, N. Y., is offering for subscription at 96 and accrued interest, yielding more than 7.85 per cent, $4,500,000 of first lien and refunding mortgage gold bonds of the Portland Railway, Light & Power Company, Portland, Ore. The bonds are dated May 1, 1921, and are due May 1, 1946. Interest is payable May 1 and Nov. 1 at the office of the National City Bank, New York. The bonds are known as series A and bear interest at the rate of 7½ per cent. The net earnings of the company are said to be more than twice the annual mortgage bonds interest charges. Associated with the National City Company in offering the bonds was Halsey, Stuart & Company, Inc., New York. The bonds were advertised for public subscription in the newspapers of May 13. In the advertisements it was explained that the Portland City Railway system is showing a substantial earning power and that the Public Service Commission of Oregon had valued the properties of the company at a figure which was more than 150 per cent of the outstanding mortgage debt including the present issue.

Southern Indiana Bonds Offered.—The National City Company, New York, N. Y., is offering for subscription $1,000,000 of first lien and refunding mortgage gold bonds of the Southern Indiana Gas & Electric Company, Evansville, Ind., the successor to the Public Utilities Company. The subscription price is 94 and accrued interest, yielding more than 8.10 per cent. The bonds are dated April 1, 1921, and are due April 1, 1941. The company owns and operates without competition the electric light, power, gas, street railway and steam heating properties in Evansville. It also does electric light and power business in nearby communities and operates an electric interurban railway. The bankers say that on the basis of appraisals by independent engineers the replacement value of the property is substantially in excess of the present mortgage debt of $5,630,000. The equity is represented by $335,000 of 6 per cent debenture bonds, $2,527,300 of outstanding preferred stock, and $3,000,000 of common stock.

Traffic and Transportation

Jitney Regulation Attacked

Operators Appeal to State Supreme Court in Effort to Nullify City's Ruling

The Supreme Court of the State of Washington set May 19 as the date for hearing the appeal of the Seattle jitney drivers from the verdict of the King County Superior Court subjecting them to regulation by the City Council. A decision is not expected, however, for sixty days, the time usually elapsing between hearing and ruling. The city was represented by George A. Meagher, city attorney in the litigation that developed last summer, when the city attempted to enforce an ordinance submitting the jitneys to drastic regulation. He argued the case before the higher court. As the case involves the city's rights to exercise police powers municipal officials are confident they will win.

Under an ordinance passed a year ago the city forbade operation of jitneys except under licenses, subject to conditions which the jitneurs alleged virtually made it impossible for them to continue running. The jitney operators sued for an injunction in the Superior Court to restrain the city from enforcing the ordinance, but the injunction was denied. An appeal was taken, and operation of the ordinance has been suspended pending the appeal, the jitney buses running without municipal supervision.

Under the ordinance requiring permits a majority of the members of the City Council last summer showed a disposition to keep all the jitneys off the streets, refusing licenses except to a few drivers, and curtailing their runs to routes that would serve as "feeders" to the municipal railway.

Ten-Cent Plea May Be Renewed

Upon motion of Judge C. P. McIntyre, special counsel for the city of Montgomery, the Public Service Commission of Alabama recently granted a rehearing of the original petition of the Montgomery Light & Traction Company for authority to advance fares to 10 cents and institute a service-at-cost plan.

May 17 was set as the date for the rehearing for the traction company and the city of Montgomery to submit further evidence in connection with the petition of the company, but this date was later changed. The petition of the company has been so amended that should the public service body finally decide it has no jurisdiction in the matter of granting a rate that will create a reserve fund for the company application will be made for a straight fare of 10 cents, or such a fare as the commission may decide is a fair and just return on the company's investment.

Ray Rushton, receiver of the railway, addressing the commission in behalf of the company, stated he was surprised that the commission had "thrown the original petition out of court" on what he termed a "technicality." A. G. Patterson, president of the commission, replying to Mr. Rushton, reiterated the commission's position that it had no jurisdiction in the establishment of the proposed service-at-cost plan. Mr. Rushton then stated that if the commission felt it was not authorized to pass upon the service-at-cost plan then he, as receiver for the company, would ask the commission to authorize a fare of 10 cents or whatever amount the commission may decide is a fair return on the investment of the company. He added, however, that he hoped the service-at-cost plan would receive the commission's endorsement, and referring to the 10-cent fare stated it is now in operation in 120 cities in the United States.

Three Cents a Mile Fare Granted for Fast Line

The Public Service Railroad, Newark, N. J., operating the so-called fast line, was allowed a three-cents-a-mile fare on May 20 by the Public Utilities Commission. The present minimum fare of 10 cents was continued.

The board held that inasmuch as the valuation made of the railroad property showed that the increase of 0.4 cents a mile was warranted and that there was no opposition it saw no reason to withhold the extra fare. Hearings will be continued, however, to fix definitely a just and reasonable fare.

In this proceeding the decision is based upon the value of the physical property of the company, which the board found to be $2,524,755. Against this are outstanding securities amounting to $2,296,650. The decision states that the value of the physical property without any allowance for intangibles of any kind is in excess of the total amount of the securities issued.

For the year 1920 the company showed a loss, after payment of operating expenses and income deductions, amounting to $66,395 and for the year 1919 the net loss was $85,313. With the increased fare proposed it is estimated that there will be a net loss of more than $9,000. The board holds, said Secretary Barber, in a synopsis, that the proposed rates are not unjust or unreasonable and will not produce an excessive return on the physical value of the property. The schedule of rates filed is allowed to become effective on June 1.

More Bus Feeders

Self-Preservation Measure Taken by Pacific Electric Railway—Six-Cent Fare with Transfers to Railway

Additional bus line feeder service has been commenced, experimentally and on a small scale, by the Pacific Electric Railway, Los Angeles, Cal., in connection with its rail lines, and in competition with motor lines, as a matter of self-protection. The present plan has in view immediate relief for the Hollywood district of the city of Los Angeles, which is at present without electric railway service.

Local Body Urged Service

The appeal of the company to establish the service was made to the Los Angeles Board of Public Utilities on May 10 in the form of a request for motor bus line reaching from Sunset Boulevard and Western Avenue to the Los Felix boulevard at Griffith Park, the largest park in the city established in the outlying section, attracting a large volume of travel, but reached only by automobiles at present.

In the company's application, which is formally made by the Pacific Electric Land Company, it is stated that this motor bus service is to be operated in conjunction with the electric railway now serving the Hollywood district. Approximately 2 miles will be covered by the motor bus line. At least two motor buses will be placed on this new route when it is established. The buses will operate every twenty minutes, and during the two rush hours in the morning and evening the buses will have a headway of fifteen minutes, it is declared. During the weekdays the bus line will operate between the hours of 6.30 a.m. and 11:30 p.m.; on Sundays the hours of operation will be between 7 a.m. and 11.30 p.m. It is anticipated that a fare of 6 cents will be charged on these buses, and it is declared by the company in its application that transfers will be given on its electric car line, good for transportation on the motor buses and vice versa. The buses, it is stated, will be the latest model, with pneumatic tires and a passenger capacity ranging from nineteen to twenty-three persons. If the bus line application is granted this will make the second feeder line of the kind operated by the company as it is now operating autos between San Bernardino and Highland, some 9 miles.

Through Fares Now in Effect

In this connection the company has just announced that it has published and put into effect its through fares and joint ticketing arrangements for the making of connections with the auto stages of the San Bernardino Mountain Stage Line, which operates stages from San Bernardino to a large number of mountain resorts in the San Bernardino Mountains; also, similar arrangements for the company's trains to be met by the auto stages of the Cregar Auto Stage Lines at Riverside, operating auto stage lines between Riverhead and the mountain resorts in the

San Jacinto Mountains. By this arrangement the running time is reduced 45 minutes as compared with the trip entirely by auto stage.

In discussing this question it is of interest to note that the bill to tax motor freight and passenger lines 2 per cent of their gross receipts, less local taxes, is now before the Governor for his signature. The motor transit companies claim this proposed 2 per cent tax on motor carriers would be "confiscation of property without due process of law."

New Five-Cent Lines Started by Boston "L"

A 5-cent fare for local riders will be instituted on the Medford and Somerville lines running to Sullivan Square Terminal of the Boston (Mass.) Elevated Railway on Saturday, May 28. Plans of the trustees to extend this experimental low-fare service to this district were announced in these columns several weeks ago. Six main lines, and several rush-hour tripper routes will be affected.

It is known that the trustees have under consideration plans for starting this 5-cent fare service in other districts, from time to time, unless the present experiments should prove unsuccessful. It should be understood that the regular fare for a through ride from any district to Boston, as well as regular fares on city lines, is still 10 cents. It was recently stated by General Manager Edward Dana that less than 3 per cent of the total passengers were riding for 5 cents. This change in Medford and Somerville, however, will undoubtedly increase the percentage.

In a statement issued to the public advising of the new system in Medford and Somerville, Mr. Dana said:

> This experimental method offers a means of separating through traffic from local traffic and thereby permits a different rate of fare. Its success will depend entirely upon the amount of local revenue produced.
>
> Modifications will undoubtedly be necessary as the results of the experiment are known.
>
> Sufficient new business must be secured so that the new rates of fare will not be a burden upon the present 10-cent car riders of the system.
>
> The success of the plan rests entirely with the car riders of the district, and in view of the fact that the experiment is one along broad lines of a progressive nature, if sufficient new traffic is not received it will be conclusive proof and offset previous theories.

"Ain't It Discouraging"

In a recent issue of *Trolleygrams*, a leaflet issued by the Dallas (Tex.) Railway, has this to say about presenting the exact fare as a means of speeding up traffic:

> When the car stops and there are eight or ten people waiting to get on—and you have your 6 cents in your hand—and several of your friends have their exact fare all ready—and it looks like "easy sailing"—and then a feller in front of you pulls a five-spot on the conductor and wants change—and you have your foot on the step—and the rest of the crowd is waiting in the street—Gee! Don't you wish that everybody could remember to have the exact fare ready?

Emergency Plea Disallowed

Ten-Cent Fare Refused to Public Service Railway by New Jersey Board

The application of the Public Service Railway, Newark, N. J., for permission to charge a 10-cent fare on its lines in New Jersey was denied by the Board of Public Utility Commissioners on May 20. At the present time the fare of the company is 7 cents, and it asked permission to increase this to 10 cents.

It is held by the board that no such critical condition exists in the company's affairs as would require the application of the 10-cent rate, or any other emergency rate at this particular time.

There were two proceedings pending before the board, in which the company's rates were involved. One was the application disposed of on May 20, which was predicated upon the existence of an emergency. The other is the action instituted by the board, in which it proposes to fix just and reasonable rates for the company, and in which the valuation of the line must necessarily be one of the bases to be considered.

The board in its decision stated that there have been so many variations in the rates charged by the company within the last few years that it becomes pertinent to inquire whether or not such an emergency exists as to necessitate immediate disposition. Reference is made to the fact that emergency rates were allowed the company at a time when the country was at war and a crisis was imminent.

At that time it was held that additional revenue was necessary, and the boards holds that it now must be satisfied that a similar emergency exists if any new rate is to be approved. In the pending proceeding involving valuation, a finding will result upon the full consideration of all factors, and this proceeding must be terminated not later than July 14.

In its finding the board said:

> The board is unwilling to extend the emergency doctrine made necessary, as it was, by the government increasing wages as a war measure, at least until it is shown that an increase in rates is imperatively needed to render safe and adequate service to tide the utility over until a just and reasonable rate can be fixed after all the elements involved in the making of such a rate have been considered.
>
> The board does not consider an allowance for many of these items appropriate in an application of this kind. They do not constitute elements of emergencies and more appropriately deserve consideration in the fixation of just and reasonable rates rather than "emergency" rates. The board, therefore does not approve of the schedule of rates filed by the company.
>
> Nor is there, in the opinion of the board, such an emergency present as would require it to fix any other rate in excess of the existing rate without consideration of all of the elements recognized as being entitled to consideration in a proceeding to fix a just and reasonable rate. The rate proceeding which was begun by the board and is now pending has consumed more than two years. Supplementing the vast amount of testimony as to value which has been taken in this proceeding, there has been filed with the board the valuation fixed by the engineers engaged pursuant to the legislative enactment of 1920.
>
> This proceeding must be terminated by the board not later than July 14. The case will necessarily have to be proceeded with as rapidly as possible and under all conditions a result based upon the investigation with a full consideration of the various factors necessarily requiring consideration for the fixation of a just and reasonable rate would be more just to both the public and the company than one based upon the few factors presented in and necessarily the only ones considered in emergency cases.

A writ of certiorari to review the action of the commission in refusing a 10-cent fare was granted on May 21 by Supreme Court Justice F. J. Swayze in Jersey City. Application for the writ was made by Frank Bergen, general counsel for the Public Service Corporation, of which the railway company is a subsidiary.

Edward Herman, who is the counsel for the commission, opposed the granting of the writ. He said that the investigation made by the commission showed that the company could maintain adequate service at the present rate of fare. The writ is returnable on May 28.

Thomas N. McCarter, president of the company, issued a statement to the public in which he said in part:

> A property that has been starved under forms of legal procedure for three years past can, perhaps, continue to subsist on limited rations for seven weeks more, but to the extent that the premises of the board and the legal principles adopted by the board are in conflict with the law, they should be corrected by the proper tribunal to the end that justice may be done.
>
> In substance, the board holds that, by estimating a gross increase in the company's business for the current year far in excess of that justified by the portion of the year which has expired, or by any facts indicating any such increase, and by a further paring down of the estimated operating expenses to the very bone, which, of course, must reflect itself in less efficient service, the company will have enough revenue to pay its operating expenses.
>
> And in addition to its operating expenses, the board holds that it will have enough for its fixed charges, and $510,000 for replacement and renewals. Not a cent is provided for return upon the stockholders' investment of $50,000,000.
>
> Under these conditions, the company is without credit and unable to obtain capital. If the basis on which this report is made can be sustained, and is to be a criterion of operations directed by the board, there is no hope for the Public Service Railway, and, in my opinion, none for the public regulation of utilities.

Toledo Bus Men Attempt to Trick City

Bus owners of Toledo, Ohio, have failed in their attempt to bring to a referendum vote the regulatory measure passed recently by Council at the solicitation of Street Railway Commissioner W. E. Cann. They will have until June 1 to secure their licenses and indemnity bonds. This was determined at a conference of city officials Saturday.

The bus men had organized and submitted a petition to the electorate, but when the 17,498 names were checked over by City Clerk Albert Payne it was found that not more than 4,575 were bona fide signatures. This lacked 2,084 of the legal number to bring a vote on the ordinance.

The ordinance is to be defied by the bus drivers, according to one of their attorneys. However, the city police department is ready to enforce the ordinance and the buses will be fined $100 to $500 for operating after June 1 without a license.

Jitney Fight in Birmingham

The fight over jitney regulation in Birmingham, Ala., will probably begin when H. P. Burruss introduces an ordinance drawn by the city attorney providing for a liability insurance amounting to $5,000. J. Weatherly, representing the jitney operators, will defend the present system.

The matter recently came to a head after an inspection of all the public utilities in Birmingham by the State Public Service Commission. The commission found that unrestricted jitney operation was taking too much revenue from the Birmingham Railway, Light & Power Company, the local company in Birmingham, and that another increase in fares was imminent unless something was done to relieve the financial distress of the company.

Associate Cooper's report follows in part.

> Relief from the disturbing conditions in the company's finances must come through readjustments which will give the company reasonable revenue without decreasing the service. It seems to me the solution of the problem must be in the regulation of those agencies in Birmingham which are now taking the short hauls from the company, the operators of automobiles for hire or the so-called jitneys. The commission found that operators of jitneys were obtaining the cream of the business on the short hauls, leaving the long hauls to the street railway. For instance, not many months ago the paving of Tuscaloosa Avenue in West End was completed. Since that time the revenue from the West End line of the street railway has shown a decrease of about 30 per cent. This decrease has resulted from the operation of jitneys on Tuscaloosa Avenue to the end of the pavement.

Dallas Denied Seven-Cent Fare

One of the last acts of the retiring city administration in Dallas, Tex., was to refuse to grant the application of the Dallas Railway for authority to increase its fares from 6 cents to 7 cents. The application had been pending for several months during which time the City Commission had conducted exhaustive investigation into the financial status of the traction company.

The commitments and promises made by the Strickland-Hobson interests in securing the present franchise in 1917 were also investigated and the traction company was shown to have failed to carry out all these promises. Lack of funds was pleaded as an excuse and this in turn was used to show the pressing need for additional revenue. The traction company has filed with the new city administration a motion for rehearing.

The action for a rehearing is taken under a provision of the recently enacted charter amendment which provides that any public utility must file motion for rehearing with the city commission before it is permitted to take an appeal to the Federal court. This action is believed to be preliminary to an appeal to the Federal court on the plea that the present fares in Dallas are confiscatory in that they do not permit an adequate return on invested capital. Traction company officials some time ago intimated that if the city refused to grant the increased fare the case would be taken directly to the Federal court in an effort to get needed relief.

The board of city comissioners in refusing the application for a 7-cent fare for the railway went on record as recommending to the new board of city commissioners that if it is shown that the traction company needs more revenue after the permission for the 6-cent fare expires on June 25 an extension of twelve months be made on the 6-cent fare agreement. When the railway company was given permission to inaugurate a 6-cent fare such permission was limited to one year, but the company was given authority to ask an extension of twelve months after the expiration of the year.

Jitneys a Menace in Indianapolis

H. O. Garman, chief engineer of the Public Service Commission of Indiana, in an address on May 20 declared that the jitneys are taking away from the Indianapolis Street Railway between $600 and $700 every day. He firmly believes that the jitney buses caused the decline in the revenue of the railway which necessitated an increase in fare. Mr. Garman brought out in his address the result of a recent informal conference between members of the commission and officials of the railway.

Evidence was submitted indicating that present rates are inadequate and that the company will face a deficit at the end of the year under present operating conditions.

Mr. Garman said it is his belief that the jitney should be eliminated. Perhaps the city officials who are opposing additional fare increases could refuse to permit the jitneys to operate over the streets.

Dr. Henry Jameson, chairman of the board of directors of the railway, when informed of Mr. Garman's statement, said:

> If the city is going to continue to have street car service it's got to do something on this jitney proposition, and do it pretty quick. I would not go so far as to say a return to 5-cent fares would follow immediately an order prohibiting operation of jitney buses. I do, however, believe such a decrease would result eventually. The company has been coming out on the red side of the ledger for the greater part of the last six months. We never have been able to show a satisfactory balance. Until we can show a surplus of between $200,000 and 300,000 we will be unable to obtain the extended credit necessary to provide improvements.

The present fare of 6 cents, with a 1-cent transfer charge and provision for the sale of twenty tickets for $1, has been continued by the commission until June 1.

Third Arbitrator Still Unselected

Charles Currie and Judge S. W. Crawford, representatives of the Northern Ohio Traction & Light Company, Akron, Ohio, and the unions respectively, have been unable to agree upon the selection of a third arbiter to settle the wage dispute now pending. It is likely that the third arbiter will have to be appointed.

Commission Bill Being Jammed Through

The bill before the Illinois Legislature which would abolish the present utilities commission and create the Illinois Commerce Commission with greatly reduced authority was passed by the house on May 25 by a vote of 100 to 23. It was jammed through as an administration measure, having been heralded as carrying out Governor Small's pre-election pledge. The bill will come before the senate during the week commencing May 30.

Transportation News Notes

Seven Cents Asked in Duluth.—The Duluth (Minn.) Street Railway has filed a request for an emergency fare of 7 cents or four rides for 25 cents with the State Railroad & Warehouse Commission. The request was filed in informal form only. Later papers setting forth in detail the financial needs of the company will be filed with the commission.

Railway Reduces Rate.—L. E. Myers, president of the Ironwood & Bessemer Railway & Light Company, Ironwood, Mich., announced that the fare would be reduced to 6 cents in Ironwood, effective May 9. The fare between Ironwood and Bessemer has been reduced 1 cent for each zone, making the new rate 18 cents instead of 21 cents. The reduction was made voluntarily by the company.

Asks to Run Bus Line.—The Springfield (Mo.) City Council has been petitioned by the Springfield Traction Company for permission to discontinue service on Center Street and to substitute bus service. The company states that modern auto buses would be procured and that a 5-cent fare would be charged with an additional 2 cents for a transfer to any other company line. The line is known as one of the short lines of the railway, and has been operated at a loss for some time. No action has been taken by the City Council.

Jitney Hearing Continued.—A hearing before the Board of Public Utility Commissioners of New Jersey took place on May 9 at Camden relative to licenses issued to jitney operators after March 15, which was the limit placed by the law when buses would be allowed to run on streets where there were trolley tracks, without the permission of the commission. The hearing will be continued, but tentative rulings were made relating to the operation of the Swedesboro and Blackwood buses. It is understood these buses will be allowed to operate provided they do not pick up and discharge passengers for rides wholly within the city limits.

Safety Islands for Columbus.—The Columbus Railway, Power & Light Company, Columbus, Ohio, may have "safety islands" for the benefit of pedestrians and car riders at High Street stops. The Columbus Automobile Club has asked Council for permission to construct the "islands." It is planned, if Council agrees, to construct "islands" at the two stops at Broad and High Streets, in the city's center, to test them out.

First Safety Contest Successful.—The first safety contest on the lines of the Southern Public Utilities Company in Charlotte, Winston-Salem and Greenville ended on Feb. 28 with the city of Charlotte making the best showing. A summary of the accidents shows that during the four months of the contest there were 97 accidents at Charlotte, 125 at Winston-Salem and 184 at Greenville. In all $1,635 prize money was awarded. The contest was so successful that the president of the company authorized the expenditure of $1,500 in a second contest which was scheduled to start April 1.

Needs Increased Rates.—The Ontario Government, owner of the Nipissing Central Railway, North Cobalt, Ont., recently applied to the Dominion Board of Railway Commissioners for an order authorizing a 25 per cent increase in passenger rates on this line. In the application it was stated that last year the net deficit on passenger traffic alone came to $21,024, while for the five months ended March 31 last the deficit reached $18,000. Several towns on the route opposed the increase. Assistant Chief Commissioner McLean suggested that the question of reducing service should precede the raising of fares.

Eight-Cent Fare Extended. — The Missouri Public Service Commission recently authorized the extension of the 8-cent fare in Kansas City for six months from April 8. In extending the present Kansas City carfare for another six months, the State Public Service Commission has issued a statement that the last four months indicate the company now has an annual net income slightly less than $1,000,000, while the company's indebtedness carries an interest charge of about $2,000,000, now in default.

Seeks Ten-Cent Rate.—The Southwest Missouri Railroad, operating in Jasper County, Missouri, and into the mining districts of Kansas and Oklahoma, has filed a petition with the Missouri Public Service Commission asking for an increase in passenger rates between Carthage and Joplin to 10 cents. The fare has hitherto been 1⅔ cents a mile. Much of the prosperity of the mining regions has departed, the petition recites, as the sharp drop in the price of lead has practically depopulated many of the towns. The company lost $8,212 in March, 1921, as the result of its operations between Carthage and Joplin.

Fare Raised to Seven Cents.—The State Public Utilities Commission has authorized the Nashville Railway & Light Company, Nashville, Tenn., to charge a straight 7-cent fare at Nashville in lieu of the four tickets for a quarter heretofore in vogue. Tickets will be issued five for 35 cents. The new rate was ordered for May 8. The utilities commission will retain jurisdiction of the case for such other and further orders as the conditions may warrant from time to time. Rates stand to be adjusted so as to give a return of not less than 6 per cent nor more than 7½ per cent on valuation as made several months ago.

Fare Increase Protested. — Through the instigation of a number of patrons of the Valley Railways, serving the Cumberland Valley in Pennsylvania from Harrisburg, an appeal will be made on the recent decision of the Public Service Commission allowing the railway to increase its fare from 7 to 8 cents. In all probability the Superior Court of the State will be asked to overrule the Public Service Commission on the ground that the increase is unjustified on account of decreasing cost of materials. This is the same ground cited by the commission in refusing the increase appeal of the Pennsylvania-Ohio Electric Company, operating in the city of New Castle, Pa.

Eight Cents in Helena.—The Montana Railroad & Public Service Commission has given permission to the Helena Light & Railway Company, Helena, Mont., to charge an 8-cent fare on its city lines. The East Helena fare will be 15 cents. The higher rate in the city will have a sixty-day trial beginning May 20. Provision has also been made for commutation tickets—forty for $2, to be used within 15 days. These will be issued in place of the present tickets, which are forty for $2.50, or 6¼ cents each. The company recently petitioned for a 10-cent fare, claiming that the award of the commission last July granting a 7-cent fare with a 6¼-cent ticket rate did not net a reasonable return.

Wants Increased Rates.—The Lynchburg Traction & Light Company, Lynchburg, Va., recently petitioned the State Corporation Commission for an increase in railway rates from 5 cents to 6 cents on both city and suburban lines. The company had asked for a 6-cent fare over all its lines and according to the franchise between the city and the traction company, the Council has permission to increase the rates. However, the City Council declined to grant the increase and accordingly the company petitioned for an 8-cent fare outside the city limits of Lynchburg. At a recent hearing before the commissioners former Senator Aubrey E. Strode appeared for the County of Campbell protesting against the proposed increase. The commission adjourned the case until June 1, when further opposition will be heard. A digest of the valuation figures of the Lynchburg property was published in the ELECTRIC RAILWAY JOURNAL for May 14.

Petitions Council for Increased Rates.—The Buffalo & Lackawanna Traction Company, Buffalo, N. Y., has petitioned the City Council of Buffalo for a 10-cent fare and abandonment of the transfer exchange with the International Railway. The company leases to the Buffalo & Lake Erie Traction Company the right-of-way along the Hamburg turnpike to the city line at Lackawanna. Under the franchise provision was made for a 5-cent fare only with an interchange of transfers between Buffalo & Lake Erie and the International Railway. There has been no local service for more than a year, which fact will be used by the city as an argument against the traction company. Under a decision of the Court of Appeals the old commission lacked authority to raise the fares. The new commission can suspend franchise obligations. An appropriation of $5,000 was authorized to oppose the petition for increased rates.

New Publications

Maintenance of Way Cyclopedia

Compiled and edited by E. T. Howson, editor *Railway Maintenance Engineer;* E. R. Lewis, formerly chief engineer Duluth, South Shore & Atlantic Railroad, and K. E. Kellenberger, editor *Railway Signal Engineer,* assisted by Homer Hughes, formerly assistant field engineer Interstate Commerce Commission, in co-operation with a committee of the American Railway Engineering Association. Published by Simmons-Boardman Publishing Company, New York, N. Y.

As stated on its title page, this is a reference book covering definitions, descriptions, illustrations and methods of use of the materials, equipment and devices employed in the maintenance of the tracks, bridges, buildings, water stations, signals and other fixed properties of railways. The volume is composed of two general divisions, the illustrated text and the catalog section. More than 2,500 illustrations are employed, and the illustrated text is separated into sections corresponding to the several subdivisions of maintenance-of-way work, including tracks, bridges, buildings, water service, signals and wood preservation. There is also a general section including the devices commonly used in railway work. A directory is appended giving names of manufacturers of the products included in the cyclopedia. While the articles in the several sections are arranged alphabetically by titles, there is also a complete general subject index which will facilitate the use of the volume. In the space available here it is impracticable to review the contents of this valuable compilation, which will be useful in supplying definitions and reference information to electric railway engineers who are responsible for tracks, buildings, signals, etc.

Personal Mention

Mr. Sprague Honored Again

"Father of Electric Traction" Awarded Franklin Medal in Recognition of His Scientific Attainments

Frank Julian Sprague, who was awarded the Franklin Medal, with unanimous election to honorary membership, by the Franklin Institute on May 19, in addition to his pioneer work with the electric motor has had a hand in a large part of the electric railway development which has occurred in this country. A summary of his connection with several significant enterprises in this field, which has earned him the sobriquet of the "father of electric traction," was included in the address delivered on the occasion of the presentation of the medal and abstracted elsewhere in this issue.

FRANK J. SPRAGUE

Mr. Sprague was graduated from the United States Naval Academy in 1878, at the age of twenty-one. He was appointed to the Academy from Massachusetts, to which state he had moved in early youth. Five years after graduation he resigned from the Navy to join the technical staff of Thomas A. Edison, with whom his duties related principally to lighting matters, to which he made essential contributions. His main interest was even at this early date in the application of electricity to power purposes, both industrial and for traction, and within a year he had organized a company to carry on this work. His indomitable energy, as potent today as it was thirty-seven years ago, enabled him to overcome heart-breaking obstacles. His work developed logically along the lines, first of the application of new types of the electric motor to general industry, and then successively to the trolley, rapid transit and steam railway electrification. Meanwhile he developed an electrical system of elevator drive and control, the problems of which were analogous to those of traction. At present he is concentrating attention upon a system of speed control and automatic brake application on steam trains, to which he has given the past eight years.

During his vigorous career Mr. Sprague has been honored in many fields. He was awarded a gold medal at the Paris Exposition in 1889 and the grand prize of the Louisiana Purchase Exposition in 1904; and also in 1910, from the American Institute of Electrical Engineers, of which he is a past-president; the Edison medal "for meritorious achievement in electrical science, engineering and art, as exemplified in his contribution thereto." He is also past president of the American Institute of Consulting Engineers, the N. Y. Electrical Society and the Inventors' Guild, was a member of the Naval Consulting Board during the war and has acted as consultant on some of the most important electrification projects.

The Franklin medal, which is one of the highest world awards, is the second medal awarded to Mr. Sprague by the Franklin Institute, the former being the Elliott Cresson medal, which he received in 1904 for his development of the multiple-unit system of railway control. The Cresson medal recognizes "some discovery in the arts and sciences, or the invention or improvement of some useful machine, or some new process or combination of materials in manufactures, or ingenuity, skill or perfection in workmanship."

The Franklin Medal is awarded annually from a fund founded by Samuel Insull "to those workers in physical science or technology, without regard to country, whose efforts . . . have done most to advance a knowledge of physical science or its applications," and was given to Mr. Sprague "in recognition of his many and fundamentally important inventions and achievements in the field of electrical engineering, notably his contributions to the development of the electric motor and its application to industrial purposes, and in the art of electric traction, signally important in forming the basis of world-wide industries and promoting human welfare."

The meeting of the Institute on May 19 was a notable affair, attended by General John J. Pershing, who was made an honorary member of the organization; Ambassador Jules Jusserand of France, who accepted the same honor and the Franklin Medal on behalf of the distinguished French physicist, Professor Charles Fabry of the University of Paris, and many other celebrities. A paper by Professor Fabry was read by Professor J. S. Ames of Johns Hopkins University and Mr. Sprague gave an abstract of an extended paper on the history and prospects of electric traction.

Opens Consulting Office

S. H. Grauten, Who Redesigned Kansas City Railways Distribution Systems, Has Resigned

S. H. Grauten, electrical engineer and head of the research and consulting department of the Kansas City (Mo.) Railway, left the service of that company on April 15. Mr. Grauten has opened a consulting electrical engineering office in Kansas City. He has signed contracts to act as electrical engineer for the Kansas City Western, the Kansas City-Kaw Valley & Western, and the Pittsburg and Joplin Railways, and also for several other roads.

While with the Kansas City Railways Mr. Grauten had charge of the redesigning and construction of the entire distribution system, which included the rearrangement of substations and the installation of new ones. Some of these were automatics and were among the first to be installed in the United States. His duties included preparing the estimates, specifications, plans and contracts, and supervising the construction. In 1918 he was also responsible for the operation of the distribution system, involving power dispatching, substations and the transmission system. At the same time he was also engaged in an electrolysis investigation in connection with engineers of the United Gas Improvement Company and the research committee of the American Committee on Electrolysis.

S. H. GRAUTEN

An article appeared in the JOURNAL of Dec. 11 under Mr. Grauten's name in which he described the most recently completed substation, where there were incorporated several unusual features of building design and equipment.

Since his graduation from the University of Illinois in 1907 Mr. Grauten's experience has been wide. His first year out of school was spent at the Massachusetts Institute of Technology at Boston as an instructor. Following this he entered the electrical department of the New York Central in connection with the electrification of the Grand Central Terminal, where he acted as engineering assistant to the superintendent of power. After four years of this he went to the Panama Canal.

There he had charge of putting into service and making the tests of the entire electrical and mechanical equipment at the Gatun Locks hydro-electric plant and spillway. Mr. Grauten was in charge of the operation of the Gatun Locks from the passage of the first boat on Sept. 18, 1913, until the appointment of an army captain to that position in May, 1914.

MR. GRAUTEN VERY POPULAR

From September, 1914, to May, 1916, Mr. Grauten was with the Public Service Company of Northern Illinois, under J. L. Hecht, assistant to the president. He was employed on appraisal work and later on substation design, being in charge of this work during 1915-16.

Mr. Grauten was very popular with the organization at Kansas City and his leaving is a matter of regret to every one connected with the company. Although a highly technical engineer both by education and training, Mr. Grauten had the happy faculty of combining technical engineering with practical operation in a manner to secure the best results.

H. E. Blain, C. B. E., assistant manager of the London Electric Railway, sailed from England on May 25 for New York on the Olympic. He expects to remain in this country about six weeks, and will study recent developments in American traction systems.

Reinier Beeuwkes, chief electrical engineer of the Chicago, Milwaukee & St. Paul Railroad, who has recently been given a several months leave of absence, sailed from New York City on May 11 for Panama and South American ports.

Walter Jackson, consulting engineer, sailed May 24 for Europe on the *Aquitania* for a tour of the United Kingdom and the principal continental cities to make further first-hand studies of the latest developments in fares, transportation salesmanship, motor buses and trackless trolleys. He does not expect to return to the United States for several months.

Edgar Blessing, Danville, Ind., an attorney, has been appointed by Governor Warren T. McCray to membership on the Indiana Public Service Commission. He succeeds E. I. Lewis, who resigned to become a member of the Interstate Commerce Commission. Mr. Blessing, whose term will expire May 1, 1923, will assume his duties with the commission June 1.

L. H. Appel has been appointed assistant electrical superintendent of the Pacific Electric Railway. Mr. Appel first affiliated himself with the Pacific Electric Railway in June, 1912, under S. H. Anderson, electrical superintendent. He served in the capacity of operator, electrical inspector, estimator and power clerk. In December, 1915, he was advanced to the position of chief clerk to the electrical superintendent, in which capacity he served until April 1, 1921, when he was promoted to his present position.

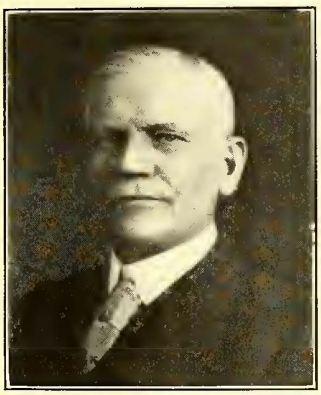
Obituary

Col. J. F. Strickland

All Texas Mourns Death of Eminent Utility Promoter, Financier and Operator

Col. J. F. Strickland, president of the Dallas (Tex.) Railway, the Texas Electric Railway, and several other utility companies, recognized as one of the leading traction men of the entire country, died suddenly at his home in Dallas on May 21. Death was due to an attack of illness affecting the heart.

Colonel Strickland was 60 years old, and at the time of his death could look back from a position of power in the traction world over a path of remarkable successes that come to few men. Born in Alabama, he early in life decided to come to Texas, and borrowed



COL. J. F. STRICKLAND

money to make the trip. His first work was on a farm near Waxahachie, where he saved his money and soon had sufficient capital to enter the cotton ginning business at Avalon, a small village near Waxahachie. Later he engaged in the wholesale grocery business under the firm name of J. F. Strickland & Company. In 1897 Col. Strickland entered the utility field as manager of the Waxahachie Light & Power Company, in which position he continued until 1902 when he became associated with Judge M. B. Templeton, Dallas, now head of the legal department of the Strickland interests, and Ocie Goodwin, also an official of the Strickland companies.

These three men conceived and carried through the idea of a central electric generating plant to supply current for a number of northern Texas cities out of which eventually grew the present great company known as the Texas Power & Light Company.

At this time the territory north of Dallas appealed to the three men as a field of large possibilities for interurban lines, and they began to lay plans for building interurbans which today are consolidated into the Texas Electric Railway, one of the longest interurban lines in the world. In 1904 the Texas Securities Company was organized to own the stocks and to finance the various projects which these men were planning.

In 1906 the preliminary work of constructing the interurban line from Dallas to Denison was begun and the Texas Traction Company was organized with Col. Strickland as president. It is generally conceded that it was due largely to the tenacity of purpose and broad vision of Col. Strickland that the money was procured to complete the line, which was put into operation on July 1, 1908.

The next large venture of Col. Strickland was the organization of the Texas Light & Power Company, under which organization electric current for lighting and power is supplied to more than 100 cities and towns of northern Texas and power for the operation of the interurban lines of the Strickland interests is generated.

Organization of the Southern Traction Company was the next big venture, and in 1912 the interurban lines from Dallas to Waco and Corsicana were completed and put in operation by this company. The Texas Traction Company and the Southern Traction Company were later consolidated into the Texas Electric Railway and the interurban line from Denison to Waco operated as a unit with through service from one of the lines to the other.

In 1916 Col. Strickland, at the request of the city officials of Dallas, undertook the work of developing franchises granted by the city of Dallas to the electric light company of the city. Service had been poor and unsatisfactory and the city officials turned to a man who they believed would be able to bring order out of chaos and give the city adequate service. The Dallas Power & Light Company, one of the most successful lighting and power companies of the entire state, attests the genius and ability of the man the city officials had chosen.

About this time the four street railways operating in Dallas were consolidated under the direction of C. W. Hobson of the General Electric Company. Just before the consolidation was effected Mr. Hobson discovered that he would be unable to take control of the lines as he had planned, and Col. Strickland was persuaded to take over the lines. The Dallas Railway was organized with Col. Strickland as president, under the so-called service-at-cost franchise granted in October, 1917.

Under the commitments made at the time the traction franchise was granted in 1917, Mr. Strickland was compelled to build two interurban lines each at least 30 miles long into the city of Dallas, and he recently organized a company to build an interurban line from Dallas to Terrell. Work on this line is now under way.

At the time of his death Col. Strickland was president of seven utility and allied companies in Dallas.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

Lower Prices No Stimulant to Line Material Demand

Last Decrease of 6 to 9 per Cent the First of This Month Makes Third This Year

Price reductions on overhead copper line material have failed to stimulate buying to any degree as yet. The last reduction was made by producers around the first of this month, the decrease taking effect on April 29 in one instance and on May 5 in a couple of others. This decrease, which is the third since the first of the year, amounted to from 6 to 9 per cent and covered both bronze and malleable iron material. The discount allowed by one producer on a certain item in this field shows the trend of prices very well. The peak appears to have been reached about last July when in this one representative instance the discount went from 20 to 10 per cent. It remained there until January, 1921, when it went to 15 per cent, in February it increased to 20 and with this last price decrease goes to 25 per cent.

Buying continues to be for maintenance only, though a slight improvement recently in that respect is noted in one or two quarters. The general market remains quiet, however, with railways not endeavoring to stock ahead. Some consumers, it is stated, are still looking for lower prices, but on the other hand, a representative producer states that this last price decrease was made more in an attempt to induce buying rather than because of lower costs.

Stocks of standard finished products and semi-finished material in this field are good, with prompt deliveries prevailing. Some manufacturers are continuing production on a basis whereby demand is expected to increase materially later in the year.

Electrolytic copper is stronger again with producers quoting 13.37½ cents to 13.50 cents for spot, May and June delivery.

Lower Prices on Brass

Buying, Although Light, Is Better Than It Was in April

Reductions in brass prices of the order of 1 cent per pound were annouced last week in manufacturing circles. Makers of schedule material expressed to the ELECTRIC RAILWAY JOURNAL their satisfaction in this reduction upon receipt of the new price lists. At present business in the brass field as related to electrical production is much below normal, but a leading producer of socket-shell material said last week that the May business had been considerably better than that of April. The chief demand just now is for copper products. Competition for business is very acute. Reductions in wages and salaries of the order of 10 per cent have lately been made in the brass industries, and some of the mills are running on half to two-thirds time. A 10,000-lb. order looks large today.

There has been no change in the price of copper products since April 18, according to a representative manufacturing establishment. The new base prices for brass in quantity lots as issued by a leading house are as follows: Sheet metal, high brass, 16¼ cents per pound; low brass, 17¾ cents. Wire, high brass, 14¼ cents; low brass, 18¾ cents. Rods, high brass, 14¼ cents; low brass, 18¾ cents. Brazed tubes, brass, 27½ cents. Seamless tubes, high brass, 20 cents; low brass, 21½ cents; copper, 22 cents.

Rail Mill Operation at Higher Capacity Than Other Steel Business

Sizable Orders for Both T and Girder Rails Placed Early This Year Keep Plants Fairly Busy — Present Buying Is Light Though Improvement Is Expected This Fall

Steam railroads have ordered steel rails this spring comparatively better than electric lines, according to reports received from producers. The tendency of electric traction companies has been to hold off buying and though there is undoubtedly a tremendous potential need for girder rails throughout the country, it has not resulted in heavy buying. The same is more or less true in the steam road field, only with this difference—steam railroads have ordered only for maintenance too, but their absolute repair needs have so accumulated that the tonnage placed has been considerable.

The standard T-rail business of mills at the present time is in much better shape than other classes of steel business. Around the first of the year sizable orders were placed, the buying coming early and largely at one time. The same is true of girder rail orders; a fair tonnage was placed early this year, and these orders are now keeping mills fairly busy. Unfortunately, however, at the present time there is hardly a thing in sight in the way of new business and when present orders on the books are filled it looks as if rail departments will be in the same condition as the other classes of the steel business.

Of course production even now is by no means at capacity and it is very possible that operation can be strung out until business improves. In fact, rail producers in several instances are counting upon this fall to develop good buying. By that time the all-important wage decision, which it seems will be in favor of the railroads, will have had time to make itself felt.

Foreign buying is flat for there is considerable competition offered by rail mills abroad whose output is greatly favored by prevailing exchange rates, and customers seem to be waiting for lower prices to develop here. In this connection a South American country has recently placed an order for more than 4,000 tons of steel rails with a German company at a price which American producers could not meet and at the same time the seller extended longer credit terms than Americans are accustomed to do.

The market for open-hearth rails in this country remains unchanged at a price of $47 per ton. Girder rail prices are not uniform at present but on a recent order for 100 tons of a 122-lb. grooved girder rail a price of about $65 per ton was made, while for 200 tons of a 140-lb. guard rail section the price was about $93.25 per ton. Labor costs are now considerably lower in this field, for with the wage cut of 15 per cent inaugurated by the U. S. Steel Corporation, all producers have reduced wages from 15 to 20 per cent and some of the independents have recently announced a second reduction. Shipments at the present time are prompt and in general average from 4 to 6 weeks.

Some Further Data on Raw Material Costs

Increases Over Pre-War Prices Appear to Be Still Above Those of Finished Products

Prices of raw material used by manufacturers in the electric railway field have of course receded within the past few months and discussion is frequently heard as to whether reductions in the cost of materials have not outstripped the decreases that have been passed on in the finished products. In this connection it is interesting to get a line on where material costs stand at the present time compared with prewar prices.

The table which is presented here gives the cost of certain materials purchased as late as May, 1921, compared

with the middle of 1915, which materials go into the makeup of electric railway products.

	Increase, Per Cent
Pig iron	180
Steel plates	101
Copper	12
Steel castings	180
Coke	150
Mica	83
Asbestos insulation materials	395
Other insulation materials	156
Magnetic sheet steel	221

Turning to the status of present prices of several finished products compared with pre-war prices, an increase of 120 per cent is shown on car equipments; electric locomotives, 120 per cent; rotary converters, 117 per cent; switchboards, etc., 120 to 146 per cent, according to the labor content and materials used.

Reduction of prices, according to the same source of information as the above figures, will probably be gradual, depending upon decreases in labor cost throughout the country, declines in raw material cost and increased production. As long as production is low, opportunities for lowering prices, it is stated, are very limited. The problem confronting the average buyer is to determine the value and earning power of new equipment during the next six to ten months and compare this with a possible price reduction of 8 to 10 per cent that might be gained by holding off from buying for that length of time.

Interest Being Displayed in Steel Tower Market

Although Activity Is Not Pronounced, Utilities Are Keeping in Close Touch with Transmission Market

A survey of the foreign and domestic market for steel transmission towers reveals fairly uniform conditions among producers. Present activity at home and abroad is very light, there being little or no demand for this class of material as yet this year. Furthermore, there does not seem to be much prospect of greater buying developing later in the year, for customers are still holding off for lower prices and difficulty in financing new transmission projects continues to retard the market.

In view of the position of this market as a barometer in the electrical industry, however, it is gratifying to note that producers are generally quite optimistic over the future. At the present time several companies report that they are receiving a large number of inquiries both in the United States and from foreign countries. Actual orders, as stated heretofore, are not being placed, but at the same time the pulse of the market is being closely felt and interest on the part of central-station companies and electric railways is considerable. From all accounts it seems that there is a large potential demand being held in abeyance.

The average base price on galvanized material used in fabricating steel towers is now said to be about 7 cents. There does not seem to be much chance of further price decreases being made, it is stated, unless steel declines further. The extent of price reduction made by different producers varies somewhat, but in a representative instance prices have receded approximately 30 per cent from the peak reached about one year ago. This figure is based upon the cost of one particular job which was figured last spring and finally held over until this year.

Deliveries can be made promptly, for though the finished product is not stocked, steel mills are keen for business and fill orders in quick time. Some producers are also carrying good stocks of material ready for fabrication.

Railway Supplies for Ecuador

The National Tramway Company in Quito, Ecuador, is in the market for tramway materials, railway tools and equipment and hydro-electric plant supplies, according to the Guaranty Trust Company, New York.

Electrification of Railways in South Africa

Tenders will be received by the High Commissioner for the Union of South Africa, Trafalgar Square, London, Eng., or at the office of the general manager, Johannesburg, South Africa, until July 5 for equipment, switchgear and accessories, etc., in connection with the electrification of the Cape Town-Simonstown and the Durban-Pietermaritzburg railway lines. Specifications, etc., at the above offices. Further information on application to Merz & McLellan, consulting engineers, 32 Victoria Street, S. W., 1, London, Eng.

Bids for the Electrification of Santiago-Valparaiso Railway

Bids will be taken by Railway Council until June 30, 1921, for the electrification of the first zone of the railway running from Santiago to Valparaiso. The cost, including electric locomotives, is estimated at 40,000,000 pesos.

Rolling Stock

The Tiffin, Fostoria & Eastern Electric Railway Company, Tiffin, Ohio, has just placed an order with the Differential Steel Car Company for one new dump car.

The Southern Pacific Railway, according to J. A. Ormandy, assistant general passenger agent, will put 12 new cars in operation on the Portland (Ore.)-Corvallis line about July 15. The new cars will cost $37,000 each, about double what the ones now in operation cost the Southern Pacific.

Canadian National Railways, Toronto, Canada, is testing an electric storage battery car on its tracks between Trenton and Belleville. The car is operated by Edison batteries which it is said will drive it 140 miles on one charge. Maximum speed on level track is given as 40 m.p.h.

The Municipal Railway System, San Francisco, Cal., mentioned in the May 7 issue as completing arrangements for purchasing about 30 new cars, has issued the following information regarding these:

Number of cars ordered	20-30
Type	Center entrance; center exit
Seating capacity	32
Weight	26,200 lb.
Length over all	29 ft. 10 in.
Truck wheelbase	12 ft. 0 in.
Width over all	8 ft. 8½ in.
Height, rail to trolley base	10 ft. 2 5/8 in.
Body	Semi-steel
Interior trim	Birch
Roof	Arch
Air brakes	Westinghouse
Axles	A. E. R. E. A. Standard E-4
Bumpers	Cast steel
Car signal system	Consolidated
Car trimmings	Bronze
Control	K 36 J R
Curtain fixtures	National Lock Washer Company
Curtain material	2-ply Fabrikoid
Designation signs	Hunter
Fare boxes	Johnson
Fenders or wheelguards	Eclipse
Gears and pinions	Helical
Hand brakes	Peacock Staffless
Headlights	Golden Glow
Journal boxes	Brill
Lightning arresters	None
Motors	2 Westinghouse 532A Inside Hung
Registers	None
Sanders	Air
Seats	Hale and Kilburn
Seating material	Rattan and 3-ply Veneer
Step treads	Mason Safety
Trolley catchers or retrievers	Ohio Brass
Trolley base	Ohio Brass
Trolley wheels	Kalamazoo
Trucks	Brill Radiax E-1
Ventilators	Gartland
Wheels	26 in. Steel

Franchises

Walla Walla Valley Railway, Walla Walla, Wash.—The Walla Walla Valley Railway, through C. S. Walters, general manager, has made formal application for a franchise from the county commissioners for operation of a trolley line on East Alder Street and Pacific Avenue, from the city line to the natatorium. The franchise is sought from the county because the extension is beyond the city limits.

Tacoma Railway & Power Company, Tacoma, Wash. — Arrangements for street railway service into the North Stevens Street, or the College of Puget Sound district, are being completed, and the City Council has notified the state department of public works that the Council will grant the Tacoma Railway & Power Company a franchise to operate a car line on the proposed route of the Sixth Avenue extension, if the department grants the request of the citizens that the company be directed to give them service. The route to be followed has been agreed upon by the various interests involved.

Recent Incorporations

Abilene (Tex.) Traction Company.—The Abilene Traction Company has been chartered with a capital stock of $100,000. It will take over the property of the old traction company which failed and which has not been operated for two years or more. The incorporators are J. N. Burjacs, Price Campbell and G. W. Fry.

Track and Roadway

Miami Beach Electric Company, Miami, Fla.—Permits have been secured from the county commissioners for four turnouts on the Miami-Miami Beach electric line, and J. H. McDuffee, treasurer of the Miami Beach Electric Company, announces rolling stock has been ordered along with material for the sidings, preparatory to making the service between Miami and the beach a ten-minute schedule instead of twenty minutes as at present.

Indianapolis (Ind.) Street Railway.—The placing of new special work in car tracks in Indianapolis at Illinois and Thirty-fourth Street, which will make possible the routing of Mapleton cars over Illinois Street, instead of Central Avenue, and also the operation of a crosstown line in Thirty-fourth Street, will start June 15 and be rushed to completion, officers of the Indianapolis Street Railway Company told the board of public works on May 12. The company reported that considerable progress has been made in the rebuilding of the tracks in West Washington Street, from Belmont to Harris Avenue. As soon as this work is done the company will start the rebuilding of the tracks in Delaware Street from Massachusetts Avenue to Washington Street.

Detroit, Mich.—The Department of Street Railways, City of Detroit, expects to build 82 miles of single track this summer, with International steel twin ties and 93-lb. and 100-lb. T rail with concrete foundation. The overhead will call for tubular steel poles in the central district, cedar poles in the outlying districts, feeder cable, 2/0 trolley wire, hangers, gears, span wire, strain insulators, various pole line hardware, etc.

Detroit (Mich.) United Railway.—The Detroit United Railway has received the approbation of the Flint Common Council in the matter of temporary construction for the line on Bray Avenue from Saginaw Street to Flint Lake Park. Owing to the expense of new material the company will use old rails and other materials on hand. This construction is permitted for a period of five years.

Southern Public Utilities Company, Charlotte, N. C.—Large track building and paving will be started soon by the Southern Public Utilities Company in Winston-Salem. The tracks on Liberty Street will be relaid for a distance of approximately one mile.

Power Houses, Shops and Buildings

Central Maine Power Company, Augusta, Me.—The Central Maine Power Company will build a new substation in Augusta at the corner of Bangor and Lock Streets. The new building will be of tapestry brick with a roof of green tile. The change in location has given the company an opportunity to improve its local service by the addition of modern bus structures, new transformers and new wiring.

Detroit, Mich.—The Department of Street Railways, City of Detroit, has practically completed plans for the construction of a new office building, a carhouse and outside storage for 200 cars, and a shop building capable of handling 500 cars. It is planned to construct these buildings this summer so that they will be ready for use by Sept. 1, at about which time 100 new safety cars are expected to be delivered from the manufacturers.

United Railways, St. Louis, Mo.—Contracts will be let in the next few weeks for a new substation and car house for the United Railways to take the place of an obsolete station on the North Side. The new buildings will cost approximately $250,000. The management is completing the installation of two small automatic substations on St. Louis county lines, one a Westinghouse and the other a General Electric of 300 kw. capacity each. For the conversion of additional power needed on city lines four or five additional automatic stations aggregating 8,000 kw. capacity will be installed the latter part of the year, according to the plans of Col. A. T. Perkins, manager for the receiver. The two small stations, which cost approximately $26,000 each, will be in service in a few weeks.

Professional Note

Ford, Bacon & Davis announce the opening of a Philadelphia office in the Morris Building, 1421 Chestnut Street. H. V. Coes will act as manager.

Trade Notes

Dahlstrom Metallic Door Company, Jamestown, N. J., has moved its New York City office from the Consolidated Gas Building, to suite 832, Cunard Building, 25 Brodway. The company reports business generally good throughout the country, but especially in the New York and Atlantic Coast district.

The Rome Wire Company, Rome, N. Y., has opened district offices at 50 Church Street, New York City, in line with the company's expansion of manufacturing facilities at Rome and at Buffalo, N. Y. The new office will be in charge of R. S. Hammond who has represented the company in the eastern territory during the last twenty years.

Raymond Roth has located at 30 Church Street, New York City, where he has opened a district sales engineering office, covering the central Atlantic district, representing Schweitzer & Conrad on switching and protection equipment, the G. & W. Electric Specialty Company for distribution specialties, the Hopewell Insulation & Manufacturing Company, and the MacGillis & Gibbs Company on cedar posts, poles and ties.

E. Jacobus Orange N. J. announces that after the introduction of the Jacobus vacuum lightning arresters on railroads of the United States it has been decided to prosecute the sale of this apparatus most extensively throughout the United States and Canada. Consequently the entire sale has been placed in the hands of the Multiple Electric Products Company, Inc., 450 Fourth Avenue. New York City, manufacturer of "Atlas" multiple fuses, through the offices and sales organization of which both this country and Canada will be covered.

"Ingeniería Internacional" Issues New Foreign Trade Bulletin.—*Ingeniería Internacional*, published by the McGraw-Hill Company, Inc., at Tenth Avenue and Thirty-sixth Street, New York, has issued Volume 1, Number 1, of "International Engineering," a foreign trade bulletin. Printed in English, its function and purpose are to show how American manufacturers may cement sound economic and commercial relations with the great potential market in the Spanish-reading countries and to explain and interpret the work of *Ingeniería Internacional* in forwarding these purposes.

New Advertising Literature

Electric Hoists. — The Allis-Chalmers Manufacturing Company, Milwaukee, has issued bulletin No. 1819, covering its electric hoists.

Controllers. — General Electric Company, Schenectady, N. Y., has issued bulletin No. 44678-A describing the various kinds of drum-type controllers for railway service.

Switch Box.—The Multiple Electric Products Company, 450 Fourth Avenue, New York City, has developed a switch box for lighting circuits where exposed molding or conduit wiring is employed.

Excavators.—The new P. & H. shovel attachment for use with P. & H. types 205 and 206 excavator cranes is described in Pamphlet SX just published by the Pawling & Harnischfeger Company, Milwaukee.

Oil Circuit Breaker—Type F-10 oil circuit breaker, with an interrupting capacity of 10,000 amp. per phase at 15,000 volts, has been put on the market by the Condit Electrical Manufacturing Company, South Boston 27, Mass.

Power Plant Piping. — The M. W. Kellogg Company, 90 West Street, New York City, has issued a 130-page illustrated catalog on power plant piping, embodying numerous tables.

Oil Circuit Breaker.—The Condit Electrical Manufacturing Company, South Boston 27, Mass., has placed on the market its type D-17 oil circuit breaker with resiliently suspended tanks in single units up to 1,200 amp. at 15,000 volts and up to 800 amp. at 25,000 volts.

Steel Sheet Piling.—Lackawana Steel Company, Buffalo, N. Y., has issued bulletin No. 109, containing 171 pages describing steel sheet piling.