

Electric Railway Journal

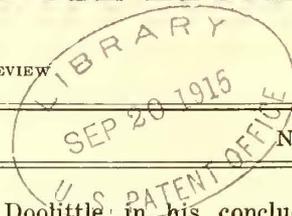
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Consolidation of STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

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SAN FRANCISCO A. I. E. E. MEETING

The American Institute of Electrical Engineers held two conventions this summer, one at Deer Park, Md., in June, which complied with the constitutional requirements that the annual convention be held prior to Aug. 1, and the other in San Francisco this week. At both meetings papers of great value and immediate interest to electric railway men were presented. All of these indicated that the electrical engineering problems of street and interurban railway and steam railroad electrification are not all solved by any means. And the solutions of these problems affect not only the electrical engineers but they reach out into all branches of the transportation business. It is therefore very desirable that the electric railway industry as a whole keep closely in touch with the experiments and achievements of electrical engineers in this field. At San Francisco two papers were presented which are so directly of an electric railway character that we have abstracted them at length elsewhere in this issue. One of these is commented upon below and the other, by E. W. Allen and Edward Taylor on automatic substations, is discussed more at length on page 576.

PREVENTION OF OVERHEAD ELECTROLYSIS

In his A. I. E. E. paper on this subject, S. L. Foster showed that stray currents can cause trouble elsewhere than underground. The operator of an electric railway which is within reach of salt spray must insulate his overhead construction to prevent surface leakage current as well as against disruptive discharge. This is a lesson learned from the experience described by Mr. Foster. The operation of the laws of electrolysis is as sure as fate. Given two metal surfaces connected by an electrolyte and subjected to a difference of potential sufficient to overcome the chemical affinity of the constituents of the electrolyte, and decomposition is bound to follow. Every ampere-hour of electricity will produce a definite effect in accordance with known laws. It is probable that the experience described by Mr. Foster is unusually severe for, to produce the effect described, there must be a more or less continuous supply of moisture. However, if insulators became coated with salt it would be expected that this material would retain moisture and furnish a conducting path. At any rate, Mr. Foster has shown that recognition of electrolytic laws is the first step in preventing the deleterious effects of electrolysis. The paper illustrates the importance of a knowledge of science in solving practical problems.

APPLYING THE TRAFFIC STUDY

Mr. Doolittle in his concluding article on the subject of traffic surveys, published on another page of this issue, discusses in a clearly detailed and illustrated way the methods of constructing schedules. Although traffic studies may serve as bases for rerouting cars, adjusting transfer points and finding the solution of similar problems, the formation of schedules constitutes on the whole the most important and most practical outcome of such work. This fact is now more widely recognized than formerly in the electric railway field, for most present-day managers have come to see the superiority of scientific operating methods over methods devised by the rule-of-thumb. Perhaps the details of Mr. Doolittle's schedule-making will not be used—circumstances alter local cases—but the principles underlying his plan are an absolute necessity in modern operation. It may be well to note, however, that the operating problem does not end with the completion of the schedule chart, for even then the manager is confronted by the daily task of making trainmen observe their time points and maintain the proper headway, without which a technically perfect timetable would be vitiated. This, of course, is not a traffic survey problem; we mention it only to show that traffic studies are not *per se* a panacea for operating ills unless the conclusions derived therefrom are carried out in an exact and sustained regularity of operation.

PUBLIC OPPO- SITION TO THE SKIP STOP

The opinion of C. B. Wells, expressed in last week's issue, to the effect that the skip stop ought to be a prime factor in the solution of the urban transportation problem is very much to the point. It is utterly absurd to call the service that is given in some communities by the name of rapid transit, and where the street cars crawl along at the rate of 7 m.p.h. or even less the public can hardly be blamed for complaining. Of course, it is true that the public is primarily responsible for such conditions because of an almost invariable and utterly reactionary opposition to rerouting and to the elimination of stops—remedies which would cure some 90 per cent of all dragging schedules. But on the other hand the public can hardly be expected to know enough of transportation problems to grasp these facts instinctively, and herein the responsibility is shifted onto the shoulders of the railway officials. It should not be difficult to educate the public in the simple facts that every stop costs about fifteen seconds in lost time and that the elimination of, say, six

stops would save a minute and a half per mile, increasing a 7-mile schedule speed by more than 20 per cent. The man that has been accustomed for years to boarding his car at the nearest corner to his house will naturally complain when he is obliged to walk farther. The only remedy is to explain to him carefully and patiently that to stop at the corner of every short block is nearly as bad as to stop in front of every house when a person wished to board or leave a car, and that the only way to have real rapid transit is to have the stops a reasonable distance apart.

AUTOMATIC APPARATUS IN SUBSTATIONS

The A. I. E. E. paper by Messrs. Allen and Taylor describes an interurban railway system in which the substation apparatus is automatically connected to and disconnected from the a.c. and d.c. lines. The directing agency is the variation in the d.c. voltage which, everything else being equal, is an indication of the demand for power. If such a system should become popular it would revolutionize electric railway power distribution practice; hence it is most important that the merits and shortcomings of the plan should be carefully investigated. The present experiment has been made possible through the co-operation of Bion J. Arnold, who has always sympathized with attempts to apply remote and automatic control devices. The Arnold plan of power station layout, providing flexible connection of engines and generators, will be remembered as an example of this in the early days of power-plant history. A later example is seen in the Grand Trunk Railroad power plant at Port Huron, Mich., in which the variation in steam pressure due to the fluctuating demand for electric power was utilized to stimulate or depress the activity of the power plant through changes in the speed of stokers, fans, etc.

Of course, the first objection that will be raised in connection with any scheme of automatic control is its complication. This objection will not hold as it might have done in some instances twenty years ago for the reason that power plants and transmission and distribution systems are already to a large extent dependent for satisfactory and safe operation upon automatic devices. The automatic relay is to-day an almost absolutely reliable device, for it simply had to be made reliable. Nearly twenty years ago the critics predicted failure for Frank J. Sprague's multiple-unit train control system because it was so complicated, but he knew that if the apparatus was well made and the wiring carefully installed it was bound to work, and it did work. In the case under discussion we have no doubt as to the ability of engineers to make the automatic substations operate successfully, particularly in the field of interurban railway service with long headway between cars, where it seems to offer the most advantages. A few practical demonstrations like the one described in the paper will supply much desired data as to the actual savings produced by the automatic substation. The number of substation movements per

failure should be stated, together with the cost of the equipment and the net savings. It is important to note that after a half year of operation with one trial equipment the two remaining substations on the line were made automatic. Undoubtedly the automatic substation has its limitations, for reliable operation must depend ultimately upon the human element. If it is injured the automatic station can only put itself out of commission and wait patiently for repairs, although it can in the meantime call for help.

DEVELOPMENT CHARGES

"The law which governs the value of a railroad, as well as every other undertaking for investment, is that it shall yield a profit equal to a fair interest on the whole amount of its cost."

The sentence just quoted sounds as if it had been taken from the brief of an attorney for a railway company in a valuation case now before the court. But it is not. It is found in a book entitled "Street Railways," published by Alexander Easton of Philadelphia in 1859 at a time when horse railways were just beginning to replace omnibuses in New York, Philadelphia, Boston and other large cities, and was in part the answer to the question propounded by the author at the beginning of his chapter "Does the Stock of Street Railways Afford a Secure and Profitable Investment?"

A perusal of this little book, written nearly sixty years ago, is extremely instructive. A large part of it is devoted to proving the superiority of the street car over the bus, its greater economy of time and space on the street, and its higher degree of safety to passengers and pedestrians, all of which is extremely interesting at this time when there is a movement to return to bus operation. We may have occasion to refer again in these columns to some of these early arguments in favor of the street car but will skip over that part of the book now to touch upon some of the managerial and financial questions which it discusses and which, in a way, help us better to understand the genesis of some of the industry's present-day problems.

In the first place, in reading this little book one is struck by the similarity between many of the questions even in those early days and those at present. Thus we find a strong plea for lighter cars in the following words: "Let the purchaser of equipment be guided by a judicious consideration of the local requirements of the business, instead of blindly following the custom adopted by other companies. In the construction of cars the proportion of the paying weight to the dead weight, although in some instances not excessive, in many other is susceptible of material modifications and economy." There is then a calculation of the cost of hauling for a day the excess weight on a car equal to that of a passenger. "The manager must look after these [transportation] matters himself, take his stand on what he thinks is right and insist upon having it," sententiously remarks the author. "The directors of street railways are usually entirely ignorant of the details of the matters over which they have authority;

and even if it were otherwise they could not personally superintend the work under their charge." Again, he says, in speaking of the importance of the selection of an able manager: "Gratuitous services are but temporary and generally terminate in disappointed expectations. Skill and executive labor must be adequately paid for, if expected to be constantly and usefully exerted, and if so exerted, the price is no consideration when compared with the advantages derived." Another statement which throws light upon the early financial practices of the companies reads as follows: "The practice of misapplying capital for the payment of dividends and the charging of current expenses to the account of capital cannot be too strongly condemned. Cases have occurred where the future profitable working of roads has been endangered for years under this system—which, however, suitable as it may be for the convenience of speculators, is fatal to the interest of those who invest permanently."

But perhaps the most interesting part of the book is that relating to the accounts of some of the early companies, including the Sixth Avenue Railroad of New York, Brooklyn City Railroad, Third Avenue Railroad of New York, Cambridge Railroad, Union Railway of Boston, Metropolitan Railway of Boston, and Malden & Melrose Railroad of Boston, all of whose reports and statements of cost of equipment are published. Among the latter are some items which are usually not associated with the earlier developments of horse railroads. Thus the Sixth Avenue Railroad includes in its cost of road and equipment "land damages," and the author speaks as if in a number of cases the railway companies, before building their lines, had to buy up the omnibus interests. Indeed, he says of the Third Avenue Railroad that "the original proprietors of this road are supposed to have bought out five lines of omnibuses at a cost of about \$400,000." Nevertheless, speaking of roads as a whole, he says that "The investments have yielded large and regularly-paid dividends, even on amounts of capital charged to construction, which was partly consumed in the purchase of imaginary omnibus rights and other expenses, amounting in total to nearly treble the actual cost for which the roads without grading and bridging can now be built." In some of the recent electric railway valuation cases before commissions, railway companies have been criticised for including in their statements of cost the purchases which they undoubtedly made of the old horse-car lines. But it seems that they were moderate in their claims and that they might fairly have included omnibus rights for which at an earlier date their predecessor horse-car lines paid substantial sums.

The rates of fare on these early lines varied, being 5 cents on the short lines, but 10 cents was charged for a long ride, as from Boston to Cambridge, and 15 cents was charged between Boston and Mount Auburn or Watertown. Even at these rates capital was not easy to obtain. As an example the author cites the Cambridge Railroad, which he says was the first horse railway built in New England. To raise the money to

pay for the construction of this road the promoters experienced great difficulty, but finally after much exertion subscriptions to the amount of \$43,000 were secured. As this was all that could be obtained the contractor agreed to receive this amount on account of his contract and to take the balance in stock and bonds. The author continues, "By the original terms of subscription each subscriber had the right to take either stock or bonds for the amount of his subscription, but so little faith had the subscribers in the success of the project that of the \$43,000 paid in cash, \$37,000 was taken in bonds and only about \$6,000 in stock."

We have quoted from this early history of street railways not only because of the curiosity of the information but because it shows that street railways even in large cities in those early days were not considered "sure investments," as some would have us now believe. They were not only speculative, but capital was raised only with great difficulty, and the roads had development expenses which are now forgotten or ignored.

AUTOS AND THE ELECTRIC CAR

A few weeks ago we published the results of a census taken in Denver of the number of persons entering and leaving the business district of that city by automobiles, on foot, by horse-drawn vehicles, on bicycles and in the street cars. The striking fact of the study was that 13 per cent traveled by autos, or just about one-fourth as many as traveled by electric cars. The automobiles were all private conveyances, as there are no jitneys in Denver. This is undoubtedly a larger percentage than would be found in most cities as the streets in Denver are well paved and there is an auto for every thirty-six people in the city, but the same condition—that is, an increasing use of the automobile for trips for which the electric car was commonly used—is evident in many cities.

The question is how to combat it, and this Mr. Beeler is doing in part by explaining the facts to the citizens of Denver. His statement, published elsewhere in this issue, discusses the higher cost of automobile transportation and at the same time impresses patrons and possible patrons of the company with their absolute self-interest in supporting and sustaining a first-class electric railway system. It is a strange coincidence that in Denver, as brought out by Mr. Beeler, the estimated annual expense of operating the automobiles, including interest and depreciation, is practically the same as the gross receipts of the electric railway company, yet the automobiles carried only about 18,000,000 whereas the tramway company carried 75,000,000. The main points driven home in the article are that no amount of automobile service can satisfactorily and completely supplant the electric car and that every person who uses an automobile in preference to the electric car does so to the detriment of himself, his neighbor and the city at large. Undoubtedly the automobile has come to stay in every city, but the facts set forth in Mr. Beeler's article are incontrovertible and ought to be realized by every automobile user.

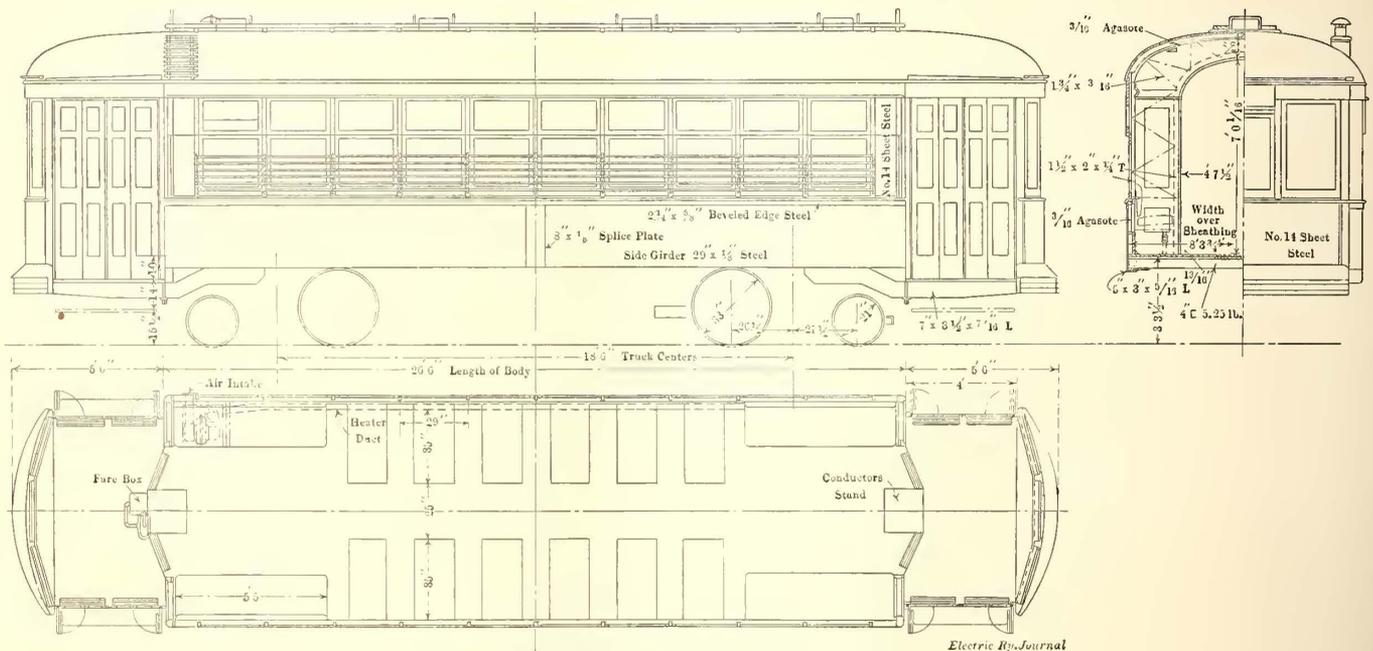
Car Design from a Service Standpoint

General Dimensions of the Cars Recently Placed in Operation by the Empire United Railways Were Established by the Maximum Weight of Body Which Could Be Hauled on a Given Schedule by Arbitrarily Selected Motors and Trucks

The semi-steel cars which have recently been placed in service by the Empire United Railways on its city lines were designed under somewhat unusual circumstances, and the methods used by the company in determining the character of the various general features of the construction possess no small degree of interest on account of their originality. Primarily the design of the car was made dependent, not upon the peculiarities of the existing service, but rather upon those of a proposed service which would give fewer stops and a higher schedule speed together with a materially lower consumption of power.

Within the last few years the urban lines in all three of the cities in which the Empire United Railways are operating, namely, Auburn, Oswego and Fulton, N. Y., were absolutely unprofitable and barely paying their

of car, and in connection with this, power consumption was a vitally important factor. The Empire Railways Company purchases power from the Niagara, Lockport & Ontario Power Company under a flat kilowatt-hour contract without a peak charge or a maximum demand of any kind. Therefore, economy of current consumption is particularly desirable, because every kilowatt-hour saved means saving the full price of the unit of energy and not merely its cost at the coal pile. The management, therefore, determined arbitrarily the size and type of the motor which was best suited to the proposed service, finally concluding to use two-motor equipments of GE 200 motors, which are rated at 33-40 hp. It was also decided to raise the voltage from an average of 525 volts to 600 volts at the car by using boosters where necessary. The decision on the motor largely



EMPIRE UNITED CAR—GENERAL PLAN OF CAR

operating cost. The city service was being taken care of by the ordinary 20-ft. single-truck closed cars and by single-truck open cars in the summer time. In order to rehabilitate the existing service it was considered of primary importance to do away with single-truck car operation and to provide a new type of car which would be of such superior construction that it would, in itself, be an invitation to ride. Furthermore, it was desirable for this car to be able to make a higher schedule speed, thereby reducing the number of cars required.

At the same time the management wanted to lengthen the headway between cars somewhat, although reducing the frequency of cars is, of course, a hard task at any time, being especially difficult in small cities. The new cars, therefore, helped to make the change more agreeable, although the new equipment alone was considered to be justified even without that.

METHOD OF GENERAL DESIGN

After the purchase of new cars was finally decided upon the first thing done was to determine the best type

determined the design of the truck, and the weights of the trucks and electrical equipment could then be estimated.

The desired schedules were then planned out in detail. No lay-overs whatever were provided and the motors were calculated to be in service practically continuously for about seventeen hours per day. The average schedule speed was established at approximately 10 m.p.h. After going over the figures several times and consulting the manufacturers it was finally decided that a car body weighing 16,000 lb. was the greatest weight that could be handled by the motor which had been selected under the conditions of voltage and schedule speed which had been agreed upon. At that it was found necessary to reduce the number of stopping points which had been rather too frequent originally, the intervals being cut down to approximately 440 ft., giving about twelve stops per mile as an absolute maximum.

When the car-body weight had been established the car manufacturers were requested to bid on the biggest

body they could build and keep within that weight. In answer to this, propositions were received which covered cars approximately 38 ft. long over all and seating forty people, and the order for such equipment was placed with the St. Louis Car Company. These cars are now in operation, and while they have not been in service long enough to prove all the contentions which were made when they were designed, it is reported that there is every indication that the conditions will be met satisfactorily.

OTHER CONSIDERATIONS

It will be noted from the illustrations that end platforms have been used, and in connection with the use of this general design as opposed to the center entrance it is of interest to note the following remarks of Ernest Gonzenbach, general manager Empire United Railways, who planned the new cars: "We seriously considered the center-entrance car, but we abandoned the idea for several reasons. One is that our overhead work is not yet in good enough condition so that we dare put the conductor in the center of the car too far away from the trolley rope. Another reason is that the center-entrance car is, according to my opinion, not so fast in loading and unloading as the end-entrance car in which the rear door is used as an entrance and the front door as an exit. Furthermore, the end-entrance car with front exit automatically distributes the standing load over the entire car, whereas with the center-entrance car a standing load is hard to move away from the door. Again, in small towns where there are many unpaved streets, and where a car must stop with the rear platform clear of the street line, the center entrance will cause the public to get in and out in the mud if the street is not paved."

In connection with the general design it may be said that the company spent a good deal of money in investigating the new types of single trucks with radial axles. These met with considerable favor, but it was not thought that the art was sufficiently advanced to put too much faith on this design with the prevailing poor track conditions in the cities in which the company operates. On the other hand, the double-truck car had

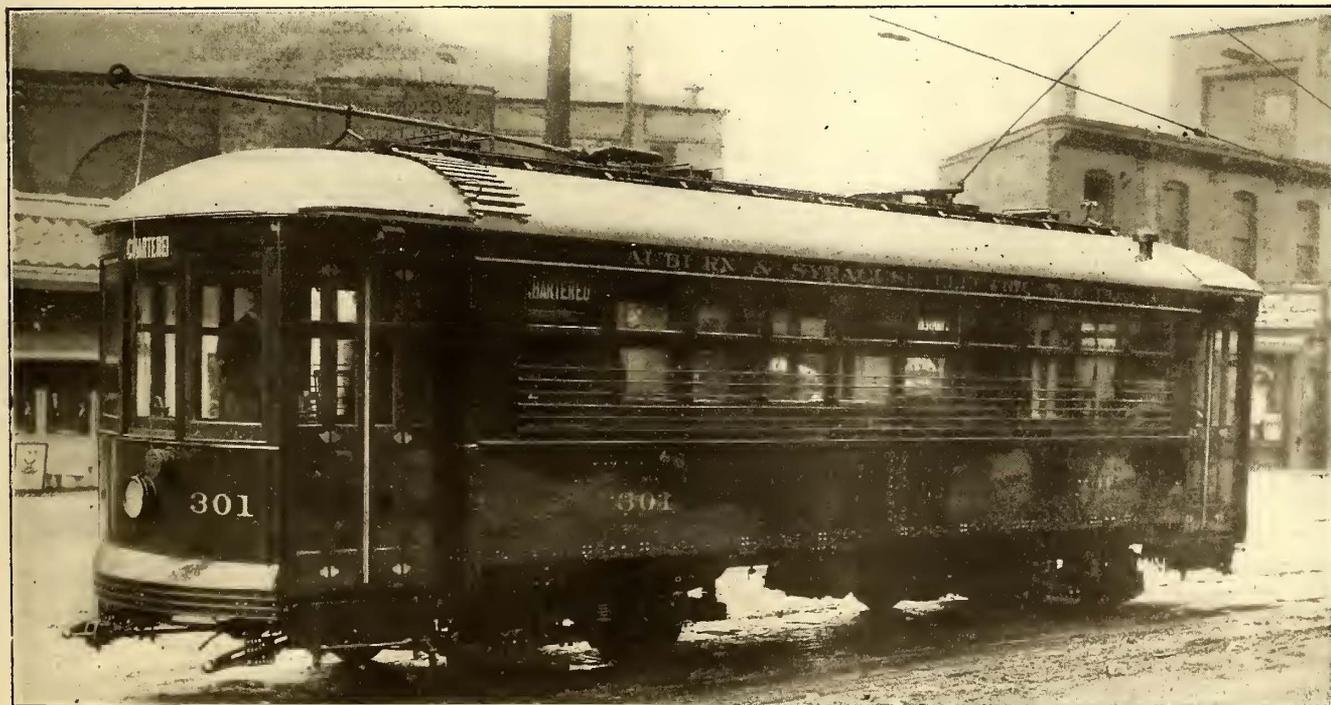


EMPIRE UNITED CAR—INTERIOR VIEW, SHOWING OPEN BULKHEAD

the faculty of smoothing out and remedying some of the track inequalities that would produce a very pronounced effect with a single-truck car.

In general, the new car may appear to be somewhat small in view of the fact that a larger car might just as well have been built. As opposed to this, however, the company would have had to put on a larger motor, and inasmuch as the rush periods in the small cities where the cars operate are exceedingly brief it was proved that it would be more wasteful to haul around the extra weight in motors and car during the non-rush hours than it would be to handle the peaks with trippers. The latter have to operate only for approximately 3 per cent of the time, as peak conditions exist for only three-quarters of an hour in the cities in question.

Simultaneously with the retirement of the closed



EMPIRE UNITED CAR—EXTERIOR VIEW, SHOWING FOLDING DOORS AND STEPS

single-truck cars, the company has retired from service all of its single-truck open cars and will hereafter run nothing in the cities except the new closed cars and double-truck fourteen-bench and fifteen-bench open cars for summer service. Every car operated in city service will be provided with air brakes. The company plans also to adopt in its city service a scheme which has turned the tide on other unprofitable city properties. Each car will be equipped with a clock in front of the motorman which will give time points, and the city schedule will be as rigidly adhered to as if it were that of the "Twentieth Century Limited." Furthermore, time-tables will be published showing the schedule time for every street corner past which the cars operate. By thus keeping the public informed, there has been built up in other cities traffic which has been two and three times what it was before such service was inaugurated, and it is fully expected that the same thing will be done on the properties under discussion.

DETAILS OF CONSTRUCTION

In general the arrangement of the car body conforms to the customary standards of the pay-within type for double-end operation. The car construction is of the side-girder type with drop platform, open bulkheads, continuous T-bar side-posts, plain arch roof with detachable bonnets and closed vestibules.

The steel framework includes side sills of 5-in. x 3-in. x 5/16-in. angles made in one piece and bent around the corner posts and spliced at the center line of the car to form the end sill. The side-sheathing which forms the steel girders is 29 in. high and 1/8 in. thick. This also is bent around the corner posts and extends inward as far as the bulkhead post. The side plates are spliced at the middle of the car, but the belt rail is made of 2 1/4-in. x 3/8-in. bevelled-edge steel in one continuous piece.

The flooring is of 13/16-in., tongued-and-grooved maple nailed to white-oak nailing pieces which are bolted to the cross-bars of the steel underframe, the floor of the car body extending out into the vestibule to form the conductor's stand. The side posts are made of 1 1/2-in. x 2-in. x 1/4-in. T-bars running in one continuous piece from side sill to side sill and forming the carlines. These are spaced on 29-in. centers and they are anchored at the side sill and girder plates below the windows and bolted to a wooden letterboard at the top. The roof and bonnets are sheathed with wood and covered with painted canvas.

The weights of the various parts of the equipment which go to make up the complete car and the general dimensions are as follows:

Weight of car body.....	16,000 lb.
Weight of trucks.....	10,500 lb.
Weight of electrical equipment.....	4,500 lb.
Weight of air-brake equipment.....	900 lb.
Total weight.....	32,000 lb.
Length of body over corner posts.....	26 ft. 6 in.
Length of body over bumpers.....	37 ft. 6 in.
Width over drip rail.....	8 ft. 6 in.
Height to top of roof.....	11 ft. 3 5/8 in.
Height of rail to floor.....	3 ft. 3 1/2 in.
Distance between truck centers.....	18 ft. 6 in.
Diameter of wheels.....	33 in.

The capacity of forty is provided for by longitudinal seats seating sixteen at the ends of the car body and twenty-four transverse seats in the center portion, the longitudinal seats having been introduced to increase the facility of entering and leaving the car, as it is intended for double-end operation. One of the longitudinal seats has a removable section so that a Consolidated hot-air ventilator stove can be installed at one corner of the car in winter time, this being sheathed with transite when in place.

The platform door openings are 4 ft. wide and the doors are of the double-folding type on both sides of

each vestibule, the upper half of each being glazed with clear glass and the lower half with wire glass. They are all manually operated, a handle at the conductor's stand controlling the rear entrance and another handle convenient to the motorman controlling the front-exit door.

Railway Signal Association Convention

Switch Indicator Practice, Economics of Signal Maintenance and Principles Governing Capacity of Single Track Discussed

The annual convention of the Railway Signal Association was held in Salt Lake City on Sept. 14-16, 1915. Reports were presented by eight standing committees and two special committees, among them being several that are of special interest to electric railways. The committee on signaling practice included in its report a statement to the effect that either conveniently located signals or switch indicators on single track may serve the same purposes as switch indicators that are installed on roads of two or more tracks. The following statements of switch indicator practice on single track were also submitted: Where signals governing movements in both directions are located so near a switch that trainmen at the switch can observe their indications, such signals will give the necessary information and switch indicators are unnecessary. Where a signal governing in one direction is located as above, and a signal governing in the opposite direction is not so located, a switch indicator may be used to give the information not obtainable from the signal. Where signals governing in both directions are not located as above two switch indicators may be used, one for each direction. Each switch indicator may, as to trains in one direction, serve the purposes and be controlled in the same way as on lines of two or more tracks. In the case of a system in which a train moving beyond one passing siding controls signals governing opposing movements between that passing siding and the next, a switch indicator may be so controlled as to indicate the approach of a train at and from the signal located adjacent to the next passing siding.

The report took up also the economics of signal maintenance, stating that, because the main controlling power of signal apparatus is electrical and because the special training required is special, a combination of signal and track forces is not to be recommended as a means of obtaining economy and efficiency in signal maintenance. Occasionally, however, it will be found practicable and economical to combine forces engaged in maintaining various electrical features on a railroad with those maintaining signals. But as a general proposition, economy and efficiency will be produced to a higher degree by co-operation and by combination, and this rests entirely with the officer in charge in the arrangement of the forces available.

An extended discussion on the laws affecting the capacity of single track was submitted also in the report. Among the several fundamental rules that were developed was one to the effect that the maximum capacity of a railroad with a given number of passing sidings is reached when the sums of the schedule times of the east-bound and the west-bound trains between each pair of passing sidings are all equal. This rule applies whether or not the speeds are uniform, and it will determine the best location for passing sidings to produce maximum capacity. Another rule that was developed was that the maximum number of trains of one class that can be run in twenty-four hours over a piece of railroad equals 2880 multiplied by the number of passing sidings plus 1, divided by the sum of the

running times of an east-bound and of a west-bound train over the road plus the number of sidings plus 1 multiplied by the delay caused by a train taking the passing sidings. This formula is expressed as follows:

$$T = \frac{2880 (N + 1)}{E + W + (N + 1)a}$$

Of course, if a single-track line is short, a greater number of trains can be moved by utilizing the road for trains in one direction only for part of the day and in the other direction for the other part of the day. This is not, however, ordinarily practical and need not be considered. If it should happen that traffic in one direction is greater than the other it is perfectly practicable, if suitable signaling is provided so that the following distance between trains is not too great, to run trains in one direction in two sections and in one section in the opposite direction. This gives the following formula in which *T* equals the number of trains per day, *W* equals the time of the west-bound train over the road, *E* equals the distance of the east-bound train over the road, *N* equals the number of sidings, *a* equals the delay caused by a train taking the passing sidings, and *f* equals the spacing between the parts of trains run in two sections:

$$T = \frac{A 320 (N + 1)}{W + E + (N + 1) a + (N + 1) f}$$

With regard to the effect of the number of passing sidings upon the capacity of the road it may be said that in a time that is equal to the sum of the running time of two opposing trains over a certain territory there will always be space on the track for two more trains than twice the number of passing sidings. But, while the capacity increases with the number of passing sidings the time required to cover the territory is rapidly increased. If trains are run in two sections in one direction the average running time per train is:

$$R = \frac{W + E + (N + 1) a + N f}{2}$$

If the trains are run in two sections in both directions the formula becomes:

$$R = \frac{W + E + (N + 1) a + N 2 f}{2}$$

All of the foregoing formulas apply only to conditions where trains are of a single class, and they assume that the sidings are so spaced as to provide equal running time between each pair of sidings all over the road. In practice, however, sidings are not equally spaced and under these conditions the traffic situation on any piece of road may be analyzed by setting down the full schedule running time (including delays due to taking sidings and other causes) in a series and adding the west-bound and east-bound schedule times between each pair of sidings. The maximum sum in the list will establish the capacity of the road. For example, if the maximum sum of the east-bound and west-bound schedule time between any two sidings is fifty-three minutes there will be two trains passing in each fifty-three minutes, or fifty-four trains per day.

It is obvious, of course, that if this maximum sum can be decreased, the number of trains moved over the line will be increased. This result may be accomplished by moving nearer together the two sidings between which the maximum running time takes place. It will not pay, however, to move the sidings more than enough to decrease the sum of the schedule times below the next highest in the list, as the next highest would then become the limiting point. To arrive at the maximum theoretical capacity, of course, it would be neces-

sary to move all sidings so that the sum of schedule times between each pair was constant, and where the actual sums of the schedule times between sidings is even approximately equal this would not pay. The report shows a case wherein the minimum sum was thirty-one minutes and the maximum forty-two minutes, but the theoretical maximum capacity is only six trains per day or about 9 per cent more than the actual capacity.

The committee on electric railway and a.c. signaling stated that Western railroads were progressing with the installation of alternating-current signaling and submitted brief descriptions of a number of alternating-current installations on steam and electric railways, all of the latter having been mentioned from time to time in the *ELECTRIC RAILWAY JOURNAL*. Specifications for reactors for line and track surface were also submitted by this committee.

A special committee on electrical testing submitted a progress report which was abstracted in the *ELECTRIC RAILWAY JOURNAL* for May 29, 1915, and requested further discussion of a constructive nature on the subject for the guidance of the committee so that its efforts toward future work might be productive of the best results. Another special committee, that on lightning protection, presented requisites for lightning arresters for signaling and requisites for choke coils for signaling, as well as specifications for vacuum-gap lightning arresters.

The Auto-Train at the Exposition Grounds

Descriptive articles of the Fadgl Auto-Train trackless system of transportation in the exposition grounds at San Francisco were contained in the *ELECTRIC RAILWAY JOURNAL* for April 17 and July 10. Twenty trains, each consisting of an automobile tractor and three trailers seating 1200 passengers in all, are in regular operation through the exposition grounds daily. Two terminals are maintained, one at the Fillmore Street entrance and the other at the Massachusetts State building at the end of the Avenue of Nations and the Avenue of States.

The schedules are worked out and operated in regular electric railway style. The fare from terminal to terminal and intermediate points is 10 cents, the schedule being such that passengers who desire to do so can travel continuously around the grounds for a rate of about 50 cents an hour, additional fares being collected at each terminal.

The high carrying capacity and economy of the Fadgl trackless train is shown by the fact that a three-car train will carry as many passengers as sixteen jitneys in one-fifth of the space with about the same expense for tires and gasoline and with but one chauffeur and one conductor instead of sixteen drivers. The seats on the train can be made crosswise, although the type in use at the exposition has longitudinal seats. This system is believed to have good possibilities for operation elsewhere than in fair grounds and parks alone. For example, one steam railroad is considering it as a feeder from cities several miles distant from the main line. Certain suburban applications also appear feasible. The Fadgl auto-train is even being considered for service in the narrow streets of Asiatic cities.

The general shop force of the Illinois Traction System at Decatur, Ill., is planning to lay out a park on the east side of the shops. A flagpole was raised recently on this plot and a baseball diamond will soon be marked out.

Electric Railway Papers at A. I. E. E. Panama-Pacific Convention

Electrolytic Corrosion of Overhead Material in Damp Locations and the Automatic Substations of the Elgin & Belvidere Electric Railway Were Among the Topics Discussed—Abstracts of Papers on These Topics Are Given

A special convention of the American Institute of Electrical Engineers was held in San Francisco from Sept. 16 to Sept. 18, immediately preceding the International Engineering Congress. Twenty-six papers were presented, including those delivered before joint sessions of the Institute and the Institute of Radio Engineers and the Institute and the American Electrochemical Society. Two papers of immediate interest to electric railway men were those on "Automatically Controlled Substations" by E. W. Allen and Edward Taylor of the General Electric Company, and "Overhead Electrolysis and Porcelain Insulators," by S. L. Foster, chief electrician United Railroads of San Francisco. Other papers of great value and interest, of a more general nature, were one by B. G. Lamme on "Physical Limitations in D. C. Commutating Machinery" and the symposium on "Inventories and Appraisals of Properties" by C. L. Cory, W. G. Vincent and W. J. Norton. On account of space limitations only the two papers first named will be abstracted here.

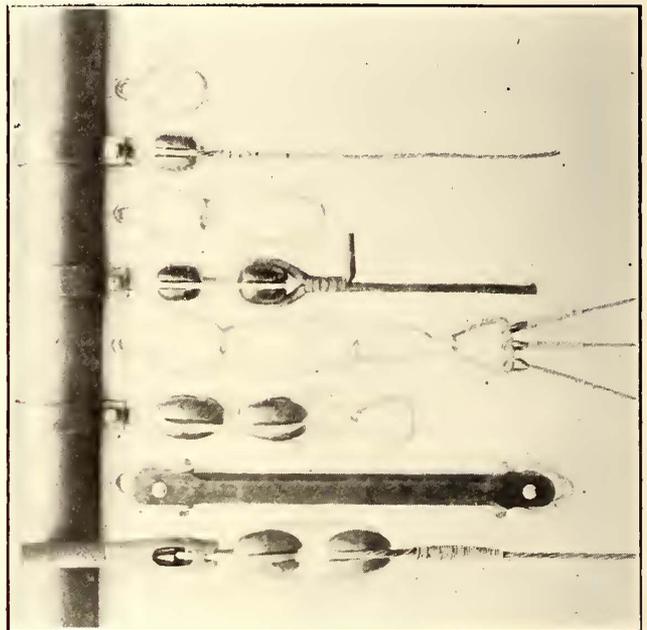
OVERHEAD ELECTROLYSIS AND PORCELAIN STRAIN INSULATORS

In his paper on the above subject Mr. Foster stated that in electric railway construction in damp climates, and more or less in all climates, there is some leakage of current from the trolley wire to the earth through the insulated supports. This current produces corrosion of span wire and insulators through the separation of water into oxygen and hydrogen, and the attacking by the oxygen of the metal immediately adjacent to the insulation. In the case of galvanized iron the zinc covering is soon removed and the iron is acted upon vigorously by the oxygen. This effect is seen on the bolt that fastens the trolley ear to the trolley hanger, the threaded lower end being badly corroded even though smeared with thick oil on installation. The electrolytic action is also seen in the film of green copper salt that spreads from the head of the brass ear over the lower surface of the cone to the iron hanger, in cap and cone construction.

The mechanical effects of the corrosion are also important, the cap and cone insulator being split in various directions and having its insulating value destroyed. This splitting of the cap has been reduced by hot-dip galvanizing of the stud before the insulation is pressed upon it in the process of manufacture.

Creepage-electrolysis effects are also seen in globe strain insulators which, when exposed in a damp climate for a few months as the only insulation between an un-insulated curve hanger and the pole, even in the case of a wooden pole, will show a heavy ring of iron rust around the shank of the eye on the end of the insulator toward the trolley wire and a white zinc efflorescence on the end toward the pole. The interior, upon crushing, will be found to be clean and intact. In time this oxidation will split the spherical composition insulation open in cracks at the end toward the trolley wire. It seems to be due to simple electrical leakage over the surface of the insulator, the current being too small to be measured with an ammeter and the leakage causing no "hot" poles or open circuit breakers.

Another phenomenon of an electrolytic character appears in connection with the leakage of current along span wires and guys. The current seems to pass off from the exterior of the live wire, first removing the galvanizing and then attacking the iron. In moist climates and especially where exposed to salt spray, extra or double-galvanized strand, when used where leakage current along it is possible, rapidly becomes denuded of its covering, gets red with rust, becomes pitted and quickly loses its tensile strength as if the wire, being positive to the earth, were discharging to the moisture of the atmosphere throughout its whole length.



STRAIN INSULATORS

In order from top down—Single link for small porcelain insulator; single link, small insulator and span wire installed on pole band; double link for small insulator; double link, small insulators and No. 0000 standard copper feed-in or tap-off cable used as a span wire; triple link with triangular link for large insulators at pull-off or strain poles, used to support overhead curves; same in position on poles; long wood strain insulator used in fog-exposed locations; double link and large insulators used in dead-ending and insulating 1,000,000-circ. mil cable.

A partial remedy for this is painting. The same kind of corrosion occurs when bare copper is used for guys and spans unless the wires are oiled or painted. That the trolley wire does not show effects of the action is supposed to be due to its being protected by a film of oil thrown upon it by the passing trolley wheels.

These points seem to teach that it is not only the ability to pass high insulation, puncture and flash-over tests of the trolley wire devices, nor the crushing strength of the composition, that is important, but the securing of a creepage distance proportional to the conditions met with, so as to stop the flow of current around the outside of the insulating parts. It seems clear that the surface exposed for creepage is not enough under fog conditions in our present standard devices. The hanger insulation should be reinforced by a generous amount of permanent creepage distance in the span-wire insulation.

The insulation of the iron pole in its concrete setting helps to neutralize the results of creepage. Leakage is not confined to iron poles, but occurs on wooden poles on which there should always be a sufficient strain insulator in the span wire at either end. In the case of iron poles if one strain insulator does not suffice two should be used, one about 2 ft. from the trolley and one 6 ft. from the pole. If two do not check the corrosion, insulators with more creepage distance, as, for example, long wooden insulators, should be used. The latter, however, lack the tensile strength and interlinking feature of the disk, cubical or "goose-egg" porcelain insulator.

Some companies give two coats of linseed-oil paint, applied by dipping, to all galvanized-iron strand intended for overhead use in connection with electric railway work. It costs far less to apply the paint by immersion than with brushes after the wire is in place. All joints made by linemen in galvanized wires or cables should receive at least one coat of paint. All overhead parts should be painted before installation, and when poles are painted all wire and cable joints, strain insulators, etc., within reach of the painters should be covered liberally.

Another form of overhead electrolytic action met with in railway work is caused by the use of dissimilar metals in contact. Galvanized-iron cables attached to the brass eyes of curve hangers, of spherical strain insulators, etc., are rusted off at the points of contact. The sulphuric acid found in the air of cities from the combustion of coal and from the escaping fumes of chemical works, the salt spray and ozone from a near-by ocean, etc., are thought to be the electrolytes that serve to start a local battery action. This action probably explains some of the corrosion at the threads of the hanger bolts which results in loose hangers in the ears. The logical remedy for this is to use similar metals in contact. Galvanized-iron parts should be used for all overhead trolley work. Applying a heavy oil to the thread of the hanger bolt is a palliative.

Still another form of probable electrolytic corrosion is seen in the wasting away of iron poles at the top of the concrete setting. Exceptionally rusty pole bases should lead to investigation of the condition of the insulation in the span wire and at the ear.

EXPERIENCE IN SAN FRANCISCO

In San Francisco problems involved in the above considerations presented themselves early and have been solved one after another, producing not only improved conditions electrically but increased strength mechanically, reducing original and maintenance costs, and yielding greater safety for the workmen and greater rapidity of work.

Electrolysis from the combination of the brass eye in the strain insulator and the galvanized-iron strand was remedied by using galvanized iron eyes. These are stronger and last longer. The failure of strain insulators formerly resulted in the first rain storm of winter being a source of dread to the linemen on account of the "hot" poles. Between the years 1893 and 1901 every kind of strain insulator on the market was tried, and in the latter year a porcelain cubical or "goose-egg" insulator was adopted, since which time there has been no trouble. Where there was little or no fog a single porcelain insulator was used at each end of the span wire, but where the fog was heavier or there was a feeding cable from a feeder used as a span wire, two insulators were used instead. On particularly exposed lines along the cliffs around the Golden Gate even two insulators of a larger size did not suffice and long wood strains had to be substituted.

The porcelain insulators used are of two sizes. In connection with them hot-dip galvanized wrought-iron welded links are used in the following form: single links for pole band attachment, double links for feeding at the pole or feeder cable dead-ends, triple links with triangular bull-rings for curved pull-off poles. The links for the small insulators were made of $\frac{3}{8}$ -in. round Norway iron and those for the large ones of $\frac{1}{2}$ -in. round Norway iron. The triangular bull-rings were made of $\frac{5}{8}$ -in. steel.

The small insulator has a diameter of $2\frac{3}{4}$ in., a length of $3\frac{1}{2}$ in. and stands a dry flash-over test, when new, of 10,000 volts. The large insulator is $3\frac{1}{4}$ in. in diameter, 5 in. long and tests dry to 30,000 volts. The small insulator is used in all spans and guys except those under extraordinary strain, such as dead-ends for trolley wires, 1,000,000-circ. mil cables, etc.

Experience has shown that for all 500-volt d.c. electric railway strain insulator work, except under extreme fog condition, it has been proved that in San Francisco practice, where there is neither snow, ice nor sleet and but little lightning, porcelain is the best material. It is incombustible, nearly indestructible, invulnerable to atmospheric action, requiring no original or subsequent preservative treatment, painting, testing or other attention and having high compressive strength combined with small dimensions, etc.

In San Francisco fog practice the size of the span wire has been increased from $\frac{1}{4}$ to $5/16$ to $\frac{3}{8}$ in., and of guys from $5/16$ in. to $\frac{3}{8}$ in. to $\frac{1}{2}$ in., in order to lengthen the life of these cables. On the cliff line the overhead strand formerly lasted only about two years. When one large porcelain insulator did not answer two in series were tried on this wood-pole construction. Then wood-strain insulators 5 in. between heads were tried, only to have the iron heads corrode off rapidly. Wood-strain insulators $15\frac{3}{4}$ in. between heads seem to increase the life of the galvanized strand, although the heads toward the trolley wires show the characteristic electrolytic action. Home-made wood-strain insulators 24 in. between conductors are now being made and are expected to insure reasonable durability of the exposed, extra-galvanized cables which had been given two coats of heavy linseed-oil paint previous to being put in place. The insulators are of maple, are boiled for twenty-four hours and cooled in linseed oil before painting, and are $2\frac{1}{2}$ in. in diameter, octagonal in section. They test to 5000 lb. without showing signs of distress.

AUTOMATICALLY CONTROLLED SUBSTATIONS WITH PARTICULAR REFERENCE TO THEIR APPLICATION TO INTERURBAN ELECTRIC RAILWAYS

In their paper under the above title Messrs. Allen and Taylor described a substation of the Elgin & Belvidere Electric Railway connecting Elgin, Marengo and Belvidere, Ill., in which substation the rotary converter is automatically started and put into service, and stopped and disconnected from the line through the agency of the variation in voltage. Automatic equipment was installed in the Union substation in December, 1914, and in August, 1915, the remaining two substations of the railway were equipped with automatic control. In rough outline the operation of the equipment is as follows: For automatic control, the main a.c. and d.c. circuits are opened and closed by contactors which are directly operated through a motor-driven drum controller, which in turn is controlled by other contactors and relays, the ultimate control residing in a contact-making voltmeter and its accompanying relays. Lowering of line voltage causes the putting of the substation into commission, while raising of the voltage shuts it



AUTOMATIC SUBSTATIONS—EXTERIOR OF UNION SUBSTATION

down. The details of the operation are described later in this abstract.

In introducing their subject the authors pointed out that there is an essential difference between an automatic equipment and a remotely-controlled system with a separate feeder to each machine. In the latter the operation of starting and stopping the machines is performed by an attendant in the station from which the power is supplied. Automatic-control devices are already in satisfactory use and electrically operated switches are reliable devices, careful inspection at regular intervals being sufficient to insure their successful operation. The authors therefore conclude that it is practicable to dispense with the services of an attendant in many railway substations and, proceeding for the moment on the assumption that it is practical to do this, they enumerated some of the effects of automatic control.

ADVANTAGES OF AUTOMATIC CONTROL

The necessity for having two or even three shifts of skilled attendants, as heretofore, influences the number, size and location of substations, and these have in turn affected the amount of feeder copper and consequently the choice of trolley voltage. It is desirable to increase the number of stations and to decrease the relative size of the machines if they are automatically controlled. If the buildings are designed with particular reference to their ability to house apparatus and without regard to the comfort and convenience of the operator, it is probable that their total cost will be no more than for fewer stations designed to meet both of these conditions.

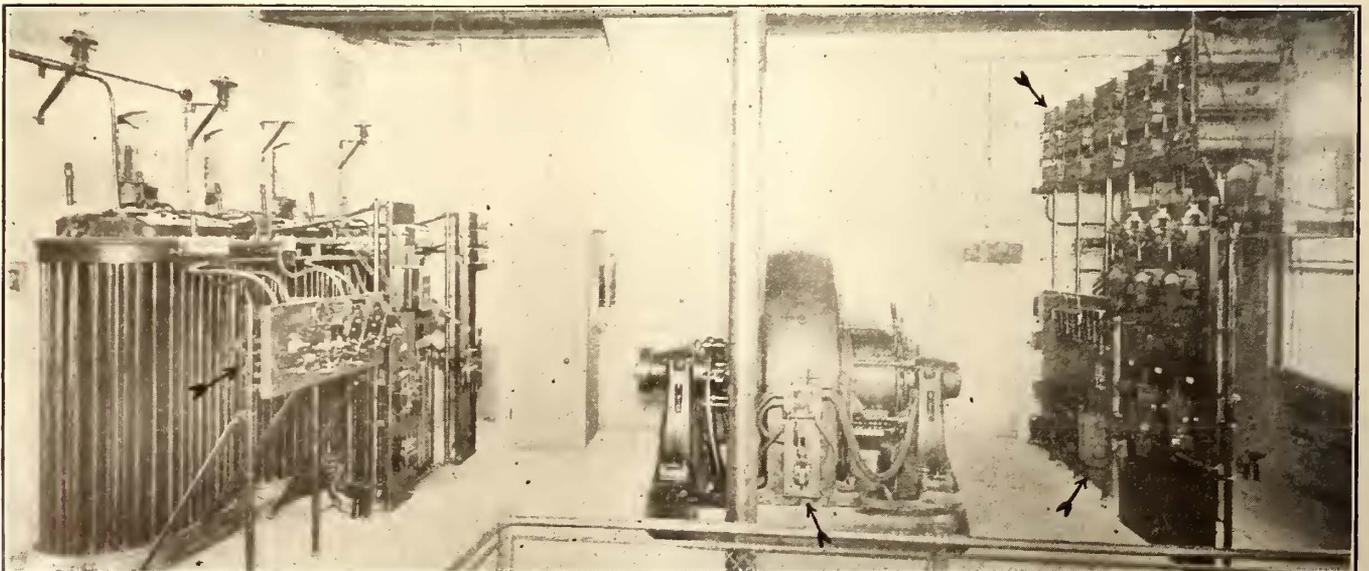
There will be a saving in feeder copper resulting from the shorter distance between substations and also from the better distribution of load. The following example illustrates this: Assume a single-track road 32 miles in length, using 40-ton cars, each equipped with four 75-hp. motors, capable of making a maximum speed of 30 m.p.h. and a schedule speed of 24 m.p.h. with one stop per mile and a rate of acceleration of 1.1 m.p.h.p.s. Assume also that the track is laid with 70-lb. rails and that a No. 0000 trolley wire is used. It is estimated that with three-hand-operated 500-kw., 600-volt stations located 12 miles apart and with 4-mile stub-end feeds, 262,000 lb. of feeder copper will be needed. If six automatically controlled substations, each of 250-kw. capacity, were used, no feeder copper would be required.

In the automatically controlled substations there are also operating advantages in connection with the short feeders, which advantages are increased by the practice of cutting resistance into the circuit to limit the substation output instead of allowing the circuit breakers to open, as is usually done. The authors state that a 500-kw., twenty-five-cycle synchronous converter may be readily started from rest and connected to the line in thirty-five seconds and a 300-kw. unit in twenty-five seconds, while induction motor-generator sets, in capacities below 1000 kw., may be started in considerably less time than is required to start synchronous converters of corresponding size..

The light-load losses are a fairly high percentage of the total energy supply to substations on a system having infrequent car service. It is estimated that $\frac{1}{2}$ kw.-hr. is required to start and connect to the line a 300-kw., twenty-five-cycle, 600-volt synchronous converter. The running-light losses of this machine are 0.34 kw.-hr. per minute. The load conditions in the substations of a single-track road having a ninety-minute car service often justify shutting down a 300-kw. synchronous converter twelve hours during each day. Automatic starting will, therefore, save the running light losses and, if the passenger and freight business at a substation requires the services of an agent, will give him more time for other duties.

DETAILS OF TYPICAL AUTOMATIC SUBSTATION

The Elgin & Belvidere Electric Railway operates a standard-gage single-track 600-volt system and purchases energy from the Aurora, Elgin & Chicago Railroad at 26,000 volts, three-phase, twenty-five cycles.



AUTOMATIC SUBSTATIONS—INTERIOR OF UNION SUBSTATION, AUTOMATIC EQUIPMENT INDICATED BY ARROWS

Each of three substations contains a standard 300-kw., 600-volt, twenty-five cycle, three-phase synchronous converter, three 110-kw. converter transformers, a reactance coil, a high-tension panel and switching equipment, and three low-tension panels. The equipment of one substation, including automatic apparatus, is shown in an accompanying illustration. The diagram reproduced herewith shows the complete electric circuits, the connections for hand operation being at the right, and those for automatic operation at the left. A double-throw switch, 8, permits change-over from one method of operation to the other, being thrown up for automatic and down for hand control.

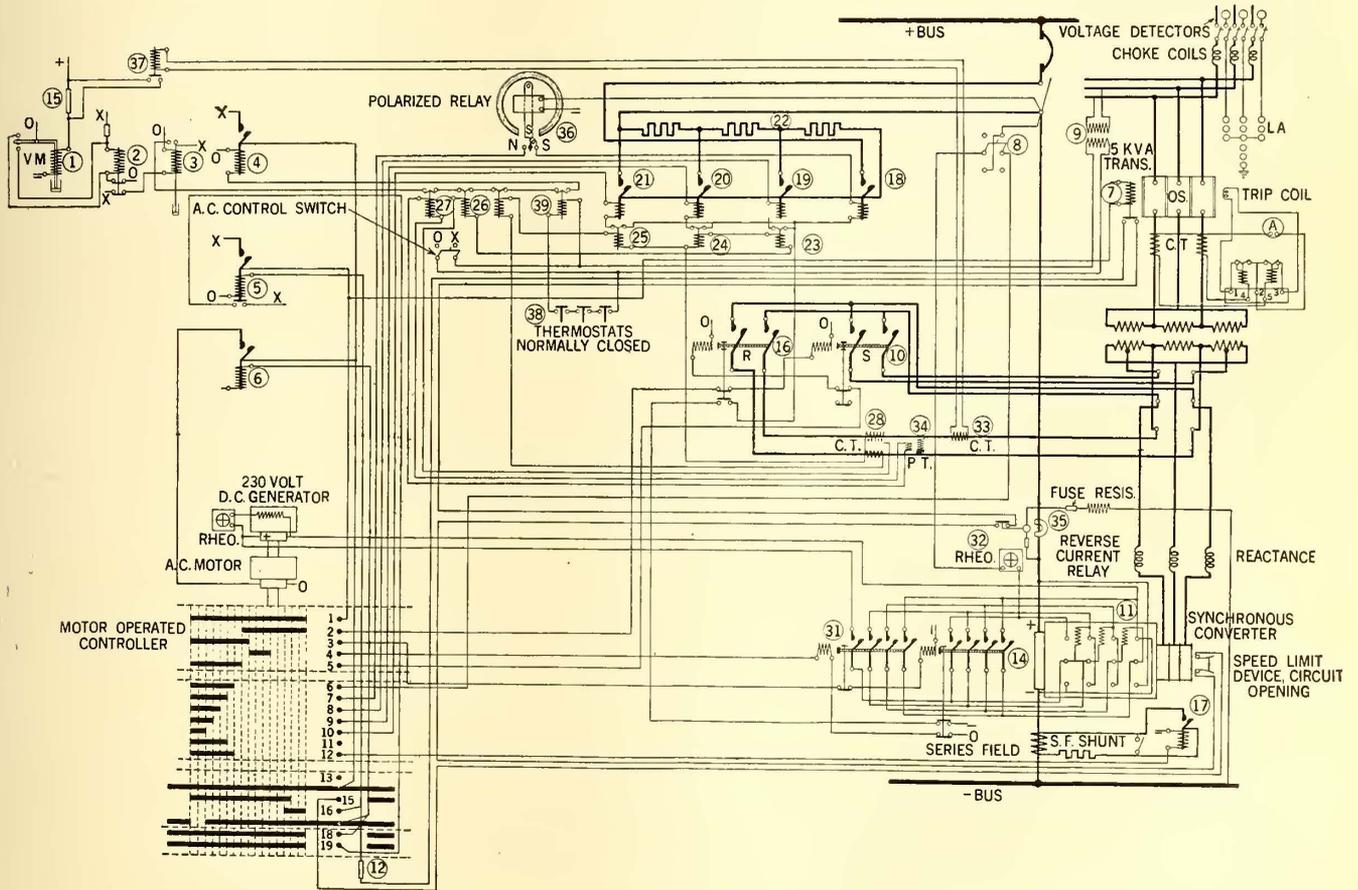
As previously stated, the ultimate control is in a contact-making voltmeter, 1 in the diagram, permanently connected from the overhead trolley line to the negative rail. It is provided with a moving plunger connected to a pivoted contact arm which moves between upper and lower studs. The contact arm touches the top stud in the low-voltage or open-circuit position, and the closing of this contact is the initial movement for starting the rotary converter. The arm does not leave the upper post until the voltage exceeds 500. The lower stud is the cut-out position and the movable arm reaches it when the trolley potential exceeds 600. The contact arm as shown in the diagram is in the mid-position and indicates approximately 550 volts. A dash pot con-

nected to this arm retards its movement about six seconds and prevents it responding to momentary fluctuations in the voltage. In circuit with the voltmeter winding is a high resistance tube, 15, normally short-circuited by the auxiliary contact of current relay 37. If more than a predetermined amount of current flows through this relay its plunger and disk are raised, removing the short-circuit from the high-resistance tube and placing this resistance in circuit with the magnet coil of the voltmeter. This action is equivalent to a condition of low voltage.

THE STARTING OPERATION

The operation of starting the substation is briefly as follows: When a car or train enters the zone of the substation the trolley potential will gradually be reduced to 500 volts. The voltmeter arm will touch the upper stud and complete a circuit through the magnet coil of relay 2, short-circuiting its contact studs. It should be noted that, in the diagram, the authors have for simplicity used the symbols X and O to indicate that the circuits return to the a.c. control switch, while the symbols + and — indicate that they lead to the rotary d.c. terminals.

The upper disk of relay 2 closes a holding circuit for its plunger, while the lower disks energize the magnet coil of relay 3. Relay 2 serves the double purpose of



AUTOMATIC SUBSTATION—COMPLETE ELECTRIC CIRCUIT DIAGRAM OF SUBSTATION

Key to Symbols. X and O refer to a.c. control switch, + and — refer to rotary d.c. terminals.

- | | | |
|---|---|--|
| 1. Contact-making voltmeter. | 14. Field break-up switch. | 27. A.C. low voltage relay |
| 2. Double contact relay | 15. 1000-ohm resistance | 28. Current transformer |
| 3. Dash-potted relay (two and one-half minutes) | 16. Main running contactor | 29. Current transformer |
| 4. Contactor | 17. Series field shunt contactor | 31. Four-pole field exciting contactor |
| 5. Master contactor | 18. Solenoid-operated line switch | 32. Field rheostat |
| 6. A.C. motor contactor | 19. Load-limiting contactor | 33. Current transformer |
| 7. Electrically operated oil switch | 20. Load-limiting contactor | 34. Potential transformer |
| 8. D.P.D.T. change over switch | 21. Load-limiting contactor | 35. Reverse-current relay |
| 9. 5-kva. transformer | 22. Cast-grid resistance (0.7 ohm) | 36. Polarized relay |
| 10. Converter starting a.c. contactor | 23. Instantaneous-current limit relay | 37. Current-holding relay |
| 11. Synchronous converter | 24. Instantaneous-current limit relay | 38. Thermostats |
| 12. 3000-ohm resistance | 25. Instantaneous-current limit relay | 39. Thermostat relay |
| | 26. Pair inverse time-limit overload relays | |

removing the arc from the contacts of the voltmeter and acting as a switch for completing the circuit for relay 3. The latter is so constructed that the plunger drops slowly for two and a half minutes without opening its top contacts so as to provide against the station being shut down when the only car in its zone ceases to take energy and stops for a short time to load freight or receive train orders. When this relay is energized the plunger rises instantly and completes a circuit through the interlocks of relays 26, 27 and 39, the functions of which will be described later. It also excites contactor 4 which supplies current to one of the main studs of contactor 6 and to finger 14 of the drum controller.

This controller drum is divided into four sections insulated from each other, the contact segments on each being electrically connected. In the off position of this controller, as shown in the diagram, finger 14 is in contact with finger 17 through which the magnet coil of contactor 6 is energized.

When contactor 6 closes, current is supplied to the a.c. motor used for driving the drum controller. This motor operates only during the time the converter is being brought up to synchronous speed and connected to the line, requiring about thirty seconds. As the controller drum is rotated toward the right, the short segment opposite finger 16 makes momentary contact with its finger and energizes the magnet coil of contactor 5. The closing of contactor 5 energizes controller finger 1 and completes the circuit for closing the high-tension switch by means of coil 7. Contactor 5 is in reality a master switch, all of the circuits required for operating the main solenoid switches being supplied through its main contacts. When it is opened all of the main solenoid switches immediately resume their normal or open positions. Contactor 5 can be closed only when finger 16 engages the short controller segment opposite. Contactor 5 may, however, be held closed, although it will not pick up through the segment which bears upon controller finger 15. It is important to note that the starting position is definitely fixed by the length and location of the short segment opposite finger 16, and that at no other position of the controller can any device be closed unless finger 16 has first been energized and coincident with this an uninterrupted circuit has been established through finger 15.

As the motor-operated controller is rotated by the motor the following operations ensue: When finger 16 was energized, finger 2 was also energized from finger 1, closing the circuit to the magnet coil of the double-pole a.c. contactor marked *S*. The closing of *S* places half voltage on the slip rings of the converter. The armature then starts, reaching synchronous speed in about fourteen to fifteen seconds. Controller finger 4 then engages its segment and energizes the four-pole contactor, 31, closing it and momentarily placing the field of the converter across the terminals of the d.c. exciter, and fixing the polarity of the converter. Segment 4 runs off in four seconds, dropping contactor 31, but finger 3 engages its segment and closes field break-up switch 14, placing the shunt field of the converter directly across its own armature. Finger 2 then disengages and finger 5 engages a segment, contactor *S* being opened and contactor *R* closed and full a.c. voltage is applied across the slip rings. Contactors *S* and *R* are electrically and mechanically interlocked.

Full d.c. voltage is now available and finger 6 of the controller is energized from the positive terminal of the converter. Contactor 17 is closed by finger 12 and the circuit closed to the series field shunt. The moving contact of polarized relay 36 closes the circuit through finger 7 and energizes the magnet coil of contactor 18. If the contact circuit is complete, contactor 18 connects

the positive side of the converter to the positive bus through a cast grid of 0.7-ohm resistance, which resistance is cut out in steps.

The drum controller has now advanced to its full running position and finger 17 has disengaged its segment and opened the holding circuit of contactor 6, stopping the motor.

PROTECTION DURING OPERATION

The diagram shows the connections of the protective devices. Relays 23, 24 and 25 open on 700, 800 and 900 amp. respectively, cutting in the resistances previously cut out. It will be observed that contactors 19, 20 and 21 take the place of the standard circuit breaker. A short-circuit in the machine operates inverse time-limit, overload relay 26, which opens contactors 4 and 5 in turn. Low-voltage, a.c. relay 27 breaks its auxiliary contact if the voltage falls more than 10 per cent below the normal value. The thermostats marked 38 afford protection from overheating. The thermostats are located in the bearings and in the air currents from the armature ventilating ducts. Reverse-current relay 35 opens master contactor 5, which is also opened by the mechanical, speed-limiting device on the converter armature shaft.

OPERATION OF SHUTTING DOWN

The substation automatically shuts down as follows: When the current decreases so as to drop the plunger of relay 37, the voltage now being 600 above, the voltmeter arm engages the lower contact short-circuiting the magnet coil of relay 2 and opening the magnet circuit of relay 3. At the end of two and one-half minutes the plunger of the latter opens the holding circuit of contactor 4, de-energizing controller finger 14 and dropping out master contactor 5. When contactor 5 opens the lower contacts close, energizing controller finger 19, which in turn energizes finger 18 and closes contactor 6, starting the motor and restoring the controller to the original position as shown in the diagram.

The Golden Gate Cover Picture

The remarkable photograph of the Golden Gate which forms the cover design of the Convention Issue of the *ELECTRIC RAILWAY JOURNAL* was taken from San Francisco Bay at a point opposite the Tower of Jewels, the central feature of the Panama-Pacific International Exposition. It is the work of Willard E. Worden, who has specialized for years in Pacific Coast marine and landscape photography. Mr. Worden's reputation as an artist has been recognized by the exposition jury of awards which has granted him the gold medal of honor for the best collective exhibit of art photographs by an individual exhibitor. This exhibit may be seen in the Liberal Arts Building, in the photographs section adjacent to the Eastman and Ansco displays. No other collection of photographs give a better conception of the rugged beauty of California.

The bureau of franchises of the Board of Estimate and Apportionment for New York City has issued a 184-page report for the year 1914. It reviews all the franchise decisions made by the board for the year and gives the present status of all unsettled questions for street railways and other utilities within the city. It also contains an appendix giving the report of the bureau of franchises to the franchise committee on the form of a motor bus franchise and proposed routes in the Borough of Manhattan, as well as the proposed draft itself of the motor bus franchise.

From Traffic Study to Time-table

In This Concluding Article Methods Are Described and Illustrated for Constructing Schedules on the Basis of the Information Collected During the Study of Traffic

BY F. W. DOOLITTLE, DIRECTOR BUREAU OF FARE RESEARCH, AMERICAN ELECTRIC RAILWAY ASSOCIATION

The previous articles under the general head of traffic studies have dealt with the need for accurate knowledge concerning the distribution of traffic over the lines of an electric railway and have discussed the systematic and accidental variations in this traffic from hour to hour and from day to day. Something has been said as to the extent of the data to be gathered and the frequency of traffic surveys, together with reference to the departmental organization which should have charge of the work. The article in the ELECTRIC RAILWAY JOURNAL of Aug. 21 discussed the problem of fitting car-miles to passenger-miles in the light of the fact that rush-hour service is more expensive than service at other times during the day. The present and concluding article relates to the methods of constructing schedules based on the information collected in the study of traffic.

On lines where traffic is light the determining factor in schedule making is, in most cases, the required minimum frequency of service. The headway may be prescribed by ordinance or may be adopted by the management as the minimum headway necessary to develop the traffic. On single-track lines as the amount of traffic increases the schedules are still controlled by a definite headway determined by the location of passing tracks

and intersections. To meet further increases in traffic trippers are run, which in effect increase the capacity of the regular cars but do not alter the headway materially. With double track lines, the schedules become more elastic but still tend to follow the form developed under single track operation. Eventually, with the growth of communities, the making of schedules outgrows the rules of practice inherited from simpler conditions, and, as has been previously pointed out, there arises the necessity for traffic studies as a means of fitting the service rendered to the demand for such service.

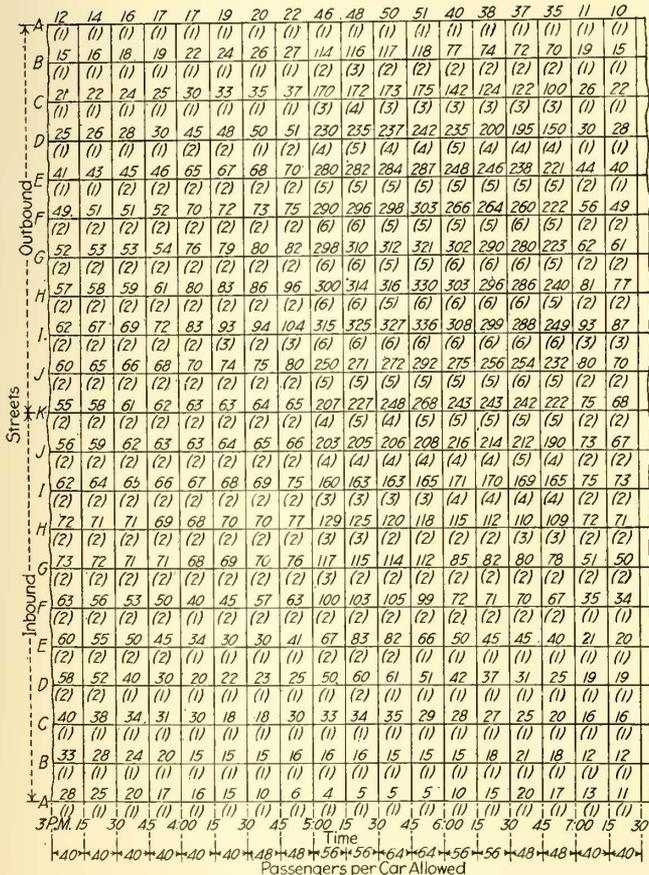
On lines of considerable traffic density, the starting point in schedule making is the determination of the number of cars required under existing service regulations to carry the passengers moving in the controlling direction and past controlling points on the line during the heavier fifteen or thirty-minute periods of the day. With these requirements determined, the next step of the process is the scheduling of the required cars for earlier and later periods, or until such a time as they are not required by traffic conditions. The cars must be scheduled back to the time when they must leave the carhouses and scheduled ahead until they can be returned to the carhouses.

The applications of traffic requirements, as measured in cars required to cars scheduled, are largely mechanical, but must be supplemented by certain adjustments made in the light of experience to permit of the practical operation of the schedule. A typical illustration, developing a schedule for a single line,* will explain the process. The illustration must be followed with important qualifications in mind. Schedule making is too complicated to lend itself to fixed or rigid rules. The location of carhouses, transfer points and traffic hazards are some of the factors that require judicious treatment in each case. The illustration deals only with general principles and only passing reference is made to certain complications encountered in a simplified application.

Assume as a typical case a line four miles long for which the traffic count has been made and for which the normal number of passengers passing a number of points during each fifteen minute of the day is accurately known.

Fig. 1 is a diagram representing, along the horizontal axis, the time of day, and along the vertical axis, distances. The horizontal lines indicate the street intersections at which traffic counts were taken, and the vertical lines divide the time into fifteen-minute periods. As originally drawn, this figure and the following ones included the entire twenty-four hours, but for larger scale and simplicity the diagrams reproduced have been abbreviated to include a few hours only. The larger numbers in Fig. 1 represent the number of passengers carried from each point during each fifteen-minute period, as determined by averaging a number of

*When cars on more than one route operate over the same track for a part of their journey, the case may be treated by considering the track used jointly as a separate line, or by dividing the local traffic over this part of the line between the two routes and then handling each route separately. Before decision is made as to the best method of handling such jointly operated track, it is well to examine the whole of each route separately to see if the controlling points do not occur elsewhere.



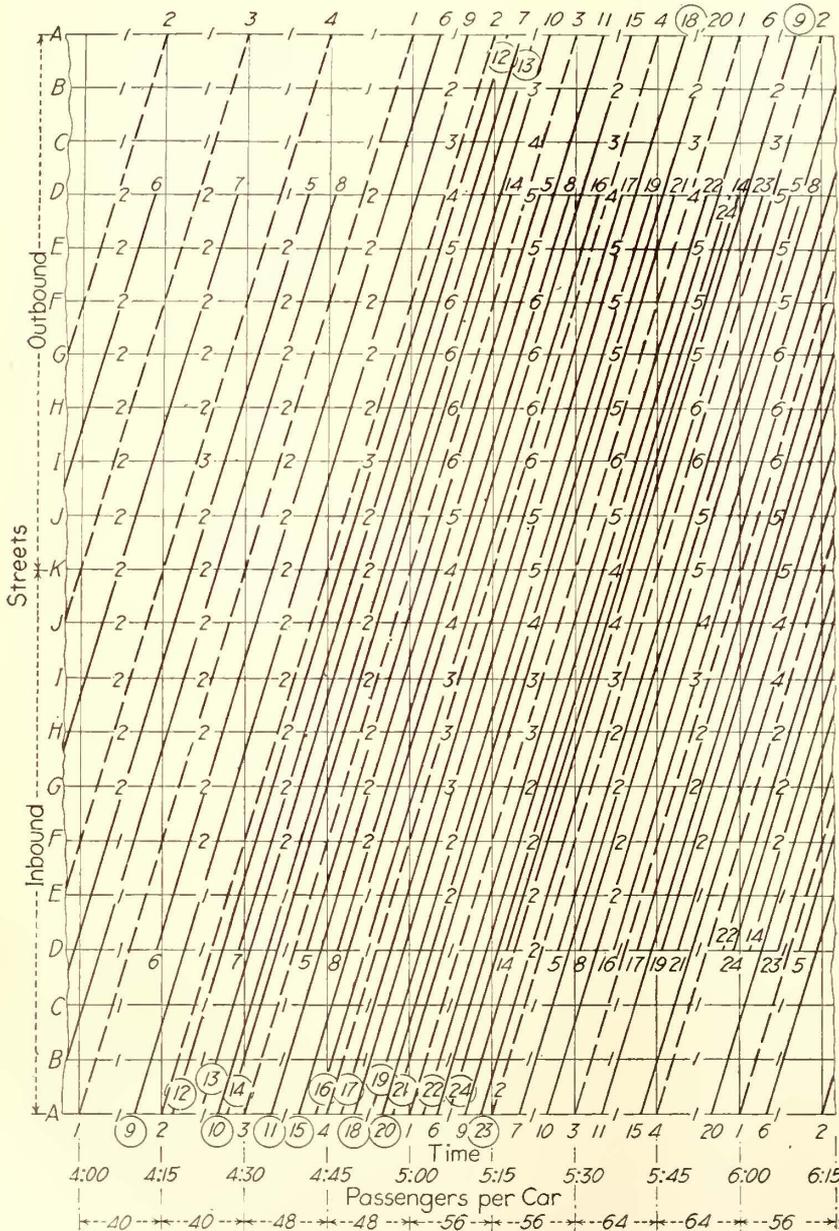
CONSTRUCTING SCHEDULES—FIG. 1—DIAGRAM SHOWING PASSENGER TRAFFIC AT CHECKED STREETS AND NUMBER OF CARS REQUIRED BY STANDARDS FOR FIFTEEN-MINUTE PERIODS

observations. The smaller numbers (those in parentheses) represent the number of cars required by the standards of service under which the company is operating. It will be noted from figures below the base line that the allowed number of passengers per car varies, the assumed service standards permitting an average of sixty-four passengers in a car seating forty-four during the rush hour, and an average of only forty passengers through the middle of the day or non-rush period. The standard permits a gradual adjustment of service to traffic during the periods preceding and following the time of maximum loading. The numbers representing the cars required in each fifteen-minute period were determined by dividing the corresponding numbers by the allowable number of passengers per car.

Fig. 2 shows in diagonal lines the second step in determining the service to be furnished. The figures inset in the horizontal lines correspond to the number of cars required under the service standards as shown in Fig. 1. The figures at the ends of diagonal lines represent runs, and when the run number is inclosed

by a circle the run begins or terminates at that time. The dotted lines represent cars run under the assumed requirements that the maximum headway on this line shall be fifteen minutes. Cross-overs are located at Streets D and I and are used to short-route cars in either direction. From Fig. 1 it is evident that five additional cars must pass Streets I, H and G during each fifteen minutes from 5 to 5.30 p. m., and these are therefore indicated in Fig. 2. The construction of the schedule is begun at this point, it being here that the maximum traffic demand is found. These cars are scheduled before and after this time to the point at which they are no longer needed and can be returned to the carhouses, which have been assumed to be located at Street A. Cars are short-routed at Streets D and I wherever possible, thus permitting the minimum mileage* for the service rendered. Short-routing occurs chiefly at Street D both in the morning and in the evening, but also at Street I during the morning rush hours.

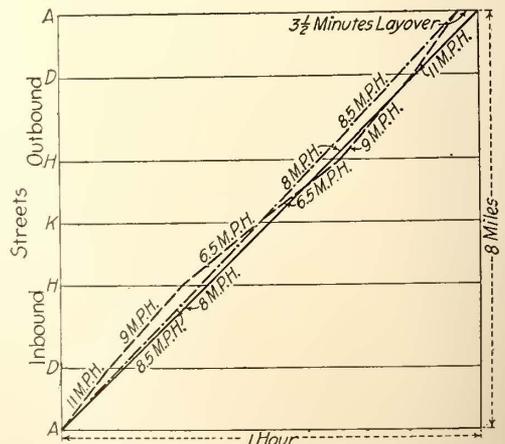
In drawing Fig. 2 an average speed of 8 m.p.h., including lay-over, was assumed as the result of experience. Speed will be different over different parts of the run, and this variation will next be taken into account. Observation and experience, it will be assumed, have indicated that while the run from Street A to Street K and return, 2 miles, can be made in one hour, the average speed between Streets A and D will be 11 m.p.h.; between Streets D and I, 9 m.p.h., and between Streets I and K, 6.5 m.p.h.† The straight diagonal lines of Fig. 2 will then have to be warped and time points and the final schedule subsequently determined. Fig. 3 indicates how the average speed of 8 m.p.h. is obtained under typical conditions. The schedule thus devised is based on traffic requirements, but modified to take into account possibilities of short-routing, ordinance re-



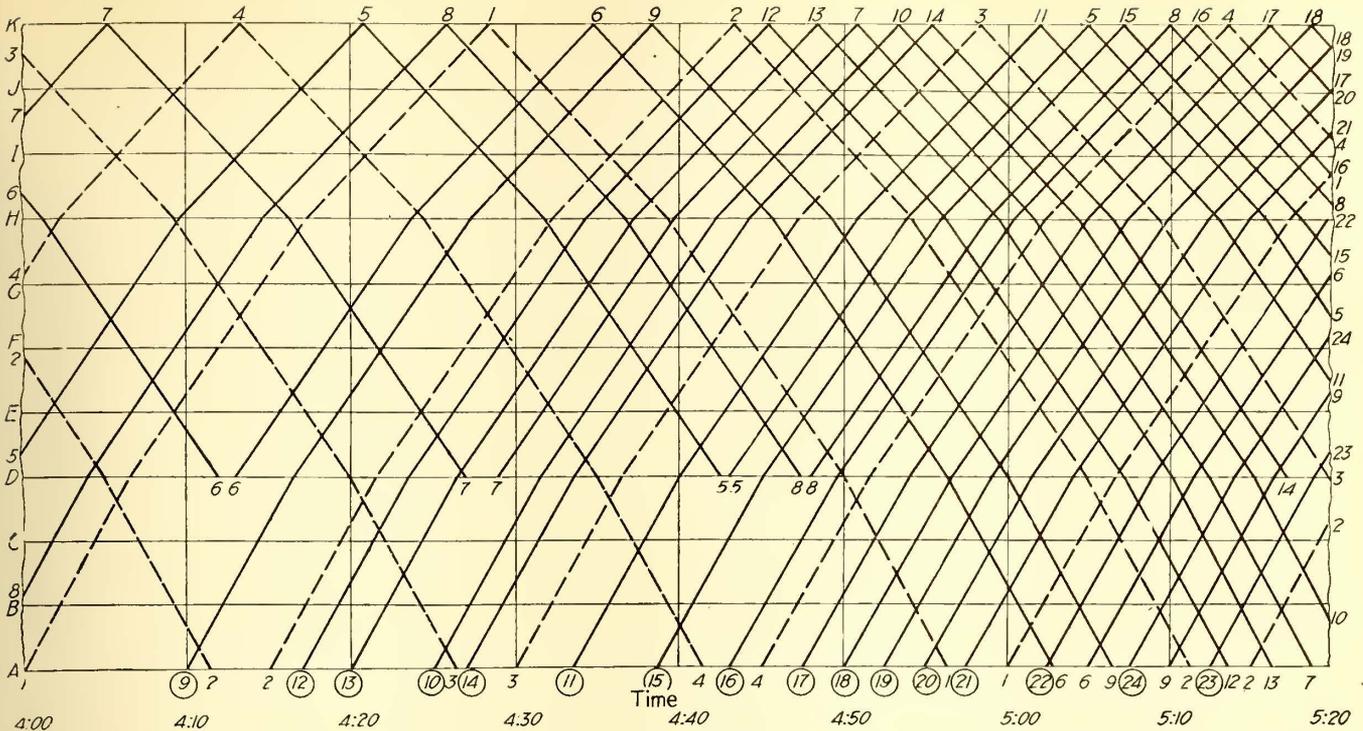
CONSTRUCTING SCHEDULES—FIG. 2—DIAGRAM SHOWING NUMBER OF CARS REQUIRED AND NUMBER ACTUALLY OPERATED DURING FIFTEEN-MINUTE PERIODS OVER DIFFERENT PARTS OF ROUTE

*It must be borne in mind, of course, that the minimum mileage here indicated cannot generally be realized completely, as it is unwise to ask passengers to transfer to the car following in all cases where that car normally would have room for them. Some consideration must be given to diversity of traffic, in addition to the consideration already given to this factor in fixing the off-peak capacity of cars at less than the number of seats.

†Variation in speed from hour to hour during the day will necessitate the use of several average and several specific speeds to complete other parts of the schedule.



CONSTRUCTING SCHEDULES—FIG. 3—DIAGRAM SHOWING HOW AVERAGE SCHEDULE SPEED IS OBTAINED



CONSTRUCTING SCHEDULES—FIG. 4—DIAGRAM SHOWING IN MORE COMMON WAY PART OF GRAPHIC SCHEDULE OF FIG. 2, ADJUSTED TO MEET OPERATING CONDITIONS

quirements as to headway, location of carhouses and variable speeds throughout different parts of the route.‡

Fig. 4 corresponds to a portion of the graphic schedule shown in Fig. 2 adjusted to meet operating conditions. In Fig. 1 and Fig. 2 the movement of a car from Street A to Street K and return to Street A is indicated by a line passing from the bottom to the top of the figure, these extreme lines representing the same street. Fig. 4 is of the type more generally used to represent schedules. In it in-bound cars are indicated by lines sloping upward to the right, while out-bound cars are represented by lines sloping downward to the right. Although Fig. 4 is the more common form, on account of the difficulty of showing thereon the number of cars required in two directions and the confusion resulting from the many intersections of lines the form used in Fig. 1 and Fig. 2 appears to be preferable for preliminary work. Time-tables of the usual types can now be taken off without difficulty, and from the graphic chart the trainmaster can at all times determine the location of all equipment in service and can see most readily the possibilities of expansion and contraction of service as traffic requirements vary.

No attempt has been made to indicate assignment of crews, as this will depend upon agreements in effect locally as to hours of service and as to the relation between "lay-over" and "running" time. The illustration shows the more important practical application of the traffic study, although it should be remembered that in addition to the construction of time-tables the traffic study serves as the basis for rerouteing of cars, adjusting transfer points and solving similar problems.

‡A very complete analysis of these factors and others which make necessary in particular cases a departure from a schedule conforming precisely to the occurrence of traffic, as determined by check, is contained in a paper read before the Public Service Railway Section of the American Electric Railway Association on April 16, 1914, by Alexander Jackson, head of the time-table department of the Public Service Railway, Newark, N. J. (ELECTRIC RAILWAY JOURNAL, April 18, 1914). Such factors as make it necessary to vary from the service indicated by a traffic count are encountered in any scheme of schedule construction and are not to be considered as discounting the value of the traffic study, but rather as emphasizing its value by fixing definitely the required service and avoiding the possibility of adjusting the service away from rather than in accordance with the requirements of the traffic.

Attractive Shelter at Glasgow

The accompanying engraving shows a very attractive waiting room and shelter recently erected for passengers at the corner of Grange Road and Battlefield Road, Glasgow, Scotland, an important junction point for the tramways in that city. After the decision that a shelter of this kind should be erected, an advertisement was published for competitive designs. Twenty-nine designs were received, and finally the one submitted by Frank Burnet of Boston was accepted.

The waiting room, which occupies the center or main portion of the building, is 45 ft. x 25 ft. Lavatory accommodation is provided at the north end of the building, and the south end is fitted up with a neat and attractive newspaper and confectioner's shop, surmounted by an octagonal tower with a gilt dome. The exterior walls are faced with Doulton's carrara wear. The roof is finished with red tile, and the woodwork is of red pine throughout. The cost, approximately, was £1,800 or about \$8,460.



VIEW OF NEW WAITING STATION IN GLASGOW

Autos and the Electric Car*

A Discussion from the Standpoint of the Public of the Advantages to the User and to the Community of Automobiles and Street Cars

BY JOHN A. BEELER, VICE-PRESIDENT AND GENERAL MANAGER DENVER TRAMWAY COMPANY

The results of the street traffic count and survey recently compiled by the Denver Tramway Company¹ disclosed many features which we believe are of interest to the company's patrons and the public generally. The most salient features of Denver's local transportation situation are briefly set forth, together with estimates of comparative cost of auto and street car service.

PASSENGER MOVEMENT.

After eliminating all traffic in connection with freight and merchandise deliveries, the total volume of passenger traffic, including pedestrians, counting each person in or out of the business section as one, then adding to this the total number of passengers carried by the tramway company within the city on this day was, in even figures:

	Persons	Per Cent
In tramway cars	184,000	51
Pedestrians	103,000	28
In passenger autos	47,000	13
On bicycles	21,000	6
In horse-drawn vehicles	4,000	1
On motorcycles	4,000	1
Total	363,000	100

Compared with a similar count taken in May last year, the startling feature is that the number of passengers carried by the auto has increased 50 per cent during the year, while the number of street car patrons has diminished 9 per cent. Other movements showed comparatively very little change, bicycle and motorcycle increasing slightly, while horses and pedestrians decreased.

NUMBER OF AUTOS AND THEIR COST

The number of passenger auto licenses for use in Denver on Jan. 1, 1915, was 5580, or a total of 6120 including dealers' licenses and trucks. The total in the State was 18,433 and in the United States 1,755,000. This is an average of one auto for every thirty-six people in the city, one for every forty-five in Colorado, and one for every fifty-two in the United States.

The average cost new of each passenger auto in the United States for the last year was approximately \$1,000. At this rate, the 5580 passenger machines in Denver cost \$5,580,000. Interest at 6 per cent and depreciation based on an average life of eight years, totaling 18 per cent, equals in round figures \$1,000,000. (The figures used here in are based upon the average of all autos in Denver last year.)

Assuming that the average maintenance and operating expense of each machine, including gasoline, tires, repairs, garage and other expenses, for city service averages \$1 per day per car, the total annual operating expense for the machines in Denver equals \$2,000,000. This, added to the \$1,000,000 interest and depreciation cited above, gives a total annual outlay of practically \$3,000,000 for Denver's passenger autos.

As shown by the traffic survey, 13 per cent of the total daily traffic is by autos, which is equivalent to about 18,000,000 passengers per annum. This, divided into the \$3,000,000 expense, would indicate that each one-way trip averaged about 17 cents per passenger.

Assuming that each auto will make annually about 5000 miles in city service (or nearly 14 miles daily), a total of 28,000,000 miles is the annual result. This, divided into the total annual cost of \$3,000,000, results in a cost of about 11 cents per mile (7½ cents for tires, gasoline, repairs and other operating expenses and 3½ cents for interest and depreciation).

Each of the 5580 cars was found to average two round trips daily. This, for 365 days, results in 4,000,000 round trips annually. Divided into 28,000,000 miles, it indicates that the average length of each round trip was 7 miles, or 3½ miles for each one-way trip, against 4.82 miles for each one-way trip on tramway cars. At 11 cents per auto-mile, the cost of the 3½-mile one-way trip equals 38 cents, or 19 cents per passenger per trip, which tallies closely with the estimate of 17 cents.

TRAMWAY PERFORMANCE

During the past year the tramway company carried 75,000,000 passengers on its city lines, for which it received a revenue of approximately \$3,000,000, or about 4 cents per passenger per trip, or less than one-quarter of the cost per each auto passenger per trip. Or the tramway, at a total cost to its patrons of \$3,000,000, transported 75,000,000, while the auto at a like total cost transported but 18,000,000 people.

Had there been no autos, and had these 18,000,000 passengers availed themselves of the tramway company's transportation facilities, the total cost to them would have been about \$700,000 instead of \$3,000,000, thereby effecting an economic saving to the community of \$2,300,000, or nearly \$400 each to the 5580 auto owners.

Four hundred dollars is a considerable annual outlay to most families, and even with the more general use of cheaper and lighter machines and a reduction of this amount by 25 per cent, or even 50 per cent, the required annual outlay for a machine should deter many from investing in an auto, especially if living in a community where good street car facilities are maintained.

The tramway plant and equipment is sufficient not only to move the entire population daily but to care for large crowds of strangers, big conventions, etc. If the auto were to supplant the street car, to take care of the entire population of Denver would require about eight times as many, or from 45,000 to 50,000 machines.

A "GIFT HORSE"

The auto owner who picks up a stranger waiting for a street car and transports him, gratis, to or from the residence section, may labor under the delusion that he is a good fellow and doing a kindly act. Possibly he knows that each pound of weight added to his machine increases his expense for gasoline, tires, etc., but does he realize that he is doing both himself and his neighborhood an injustice?

The apparent favor is in fact no favor at all, but a detriment to all concerned, for the reason that the street railway operates its cars on schedules adjusted to care for the volume of traffic on the various lines in order properly to serve the different localities. Reduced patronage eventually results in reduced car service. This is the economic sequence; otherwise, the company operating upon the narrow margin it does, could not continue to exist.

*Abstract, from advance copy, of article prepared for general circulation in Denver.

¹See ELECTRIC RAILWAY JOURNAL, Aug. 21, 1915, page 309.

With reduced car service, lower realty values follow, and increased difficulty in obtaining help and servants in the home is experienced. Therefore, the injury is not confined to the local transportation company but extends to the community generally.

With the continued increase in the use of the auto, many new problems will have to be met. The capacity of the streets may be reached. The wear and tear on the pavements will be greater than ever. More money will be required for their upkeep. The burden of the cost of construction and maintaining paving, viaducts, and other public improvements heretofore largely borne by the street railways, will of necessity have to be partially or wholly shifted to some other source, or provided for by general taxation.

SCORE FOR THE BUZZ-WAGON

The advantages claimed for the auto are:

1. Time waiting for car is saved.
2. Conveys one direct from home to office, avoiding the necessity of a walk to and from car line.
3. Intermediate stops are unnecessary, thus saving time.
4. Operation at higher speed, even though it may be contrary to law.
5. Can avail itself of most direct route and reach places remote from car lines.
6. Is more exclusive.

THE STREET CAR HAS A FEW GOOD POINTS

Some of the advantages claimed for the automobile and mentioned above are good ones; others are more apparent than real, especially when all the advantages of a first-class street car system are considered with reference to both the individual and the community as a whole. Those for the car are:

1. The more substantial car insures greater safety, there being fewer accidents to patrons and less danger to pedestrians.
2. Cheaper by about 1 to 4, or 75 cents out of each \$1 saved.
3. It is always on the job, rain or shine, snow or mud.
4. Continuous service is furnished for at least eighteen hours daily. Therefore, it is not necessary for all members of the family to go at the same time.
5. Reduces congestion. One street car is capable of handling from ten to twelve times the capacity of an auto.
6. Patrons are relieved of all responsibility for the operation of the car, the trainmen shouldering that.
7. No road troubles, blow-outs, punctures, faulty spark plugs or broken connections to annoy the rider.
8. No time required for overhauling, cleaning and repairing car (which is a considerable item where one takes care of an auto). Tramway employees attend to that while you sleep.
9. Increased comfort, less dust in summer, warm stormproof cars in winter and inclement weather, and always smoother riding.
10. No joy riding or improper behavior.
11. The street car company wears out its own rails, not the pavement as the auto does, thus effecting a saving to the economical benefit of the community.
12. If you are late, you can always blame it on the tramway, but where is the man who will acknowledge that there is anything wrong with his buzz-wagon?

FORECAST AND THRIFT

The greatest future market for the auto will undoubtedly be for the low-priced, light-weight car, for use especially in the country districts. Assuming, however, that the day should come when every family has an auto, what would be the result? The modern family

does not all go at once. They usually, except on Sundays, holidays and special occasions, go one at a time. Therefore, those who figure that all the family car fare will be saved are doomed to disappointment. The increased number of autos and increased danger in the streets will tend to check their use within the more congested districts as time goes on.

The damage done to a machine by leaving it in the street in all kinds of weather is an item of considerable expense and can be likened to that resulting from the practice of the farmer who leaves machinery out in the open the year around, subject to destruction by the elements.

There are many instances where you can save money daily by leaving the auto in the garage and patronizing the tramway company, especially when going to and from the business district, whether it be to the store, office or theater.

DIVIDENDS TO PATRONS

By patronizing the street car, you render possible the only permanent and continuous means of transportation. The less patronage the less frequent the service. Therefore, if you will ride on the tramway whenever it will serve you equally as well as your automobile, you benefit your community, and at the same time save your own money.

The community that fails to render sufficient support to a street car company to enable it to render good transit facilities will in the end suffer as much from the curtailment or withdrawal of the service as the company.

The fact that every section of the city of Denver is served by the tramway has been one of the most important features in Denver's development. That this has been no small task is illustrated when Denver's area is compared with that of other cities. Denver stands nearer the head of the list as to area than it does to population. This has required more trackage, and consequently a larger outlay on the part of the tramway, than would have been necessary had the city been smaller and more compactly built. Following is a list of the principal cities in the United States, showing number of square miles of territory within their limits, with population as per census of 1910, and miles of street railway track per 1000 population. Denver has a mile for each 1000, while the average of the other cities is less than a half mile.

	Square Miles	Population	Miles of Track per 1000 Population
Greater New York	77	4,766,883	0.10
St. Louis	61	687,029	0.50
Washington, D. C.	60	331,069	0.47
Denver	58	213,381	1.00
San Francisco	46	416,912	0.50
Cincinnati	42	364,463	0.60
Buffalo	42	423,715	0.51
Pittsburgh	41	533,905	0.52
New Orleans	41	339,075	0.55
Cleveland	40	560,663	0.39
Boston	38	670,585	0.66
Detroit	36	465,766	0.43
Baltimore	30	558,485	0.40
Milwaukee	22	373,857	0.41

CROWDED CARS

When you see the cars crowded, remember that there are many times when trip after trip is made at different periods of the day and night when the conductor is a very lonesome individual. The company would be much better off if there was a steady, even travel, only sufficient to fill the seating capacity of the cars.

The handling of the rush-hour period in most cities is not only a vexatious problem, but a costly operation. Most people ride during the daily rush hours, of course. This problem has been successfully met in Denver by the employment of large, commodious trailers, seating

more than the motor car. Thus seats are provided for the great majority of patrons, even during this period. Standing idle all of the time except for a few hours daily service, these trailers are maintained in order to provide greater comfort to the traveling public.

SAFETY FIRST

The modern street car, operating upon substantial tracks, is yet by far the most economical, safe, reliable means of city transportation, and will undoubtedly continue so, but the quality of the service and the frequency of the headway are entirely dependent upon the patronage.

Both the management and the employees extend a most cordial invitation to all to make greater use of the tramway, thus making it possible to continue to improve the service. After all is said and done, the best way to help yourself is by first helping others.

COMMUNICATIONS

Girder and High T-Rail Renewals

TWIN CITY RAPID TRANSIT COMPANY
MINNEAPOLIS, MINN., Sept. 10, 1915.

To the Editors:

Referring to article on page 179 of the *ELECTRIC RAILWAY JOURNAL* of July 31, 1915, the wear or service that can be obtained from rail in the paved streets of our cities is an important matter for all street railways. This article is the best study of the subject the writer has seen. To decide when the rail on certain streets is worn out is a common problem for all maintenance engineers, and the article will be helpful in its solution.

While the construction of joints has been improved, the writer believes that it is still true that the condition of the joints is a large factor in deciding the remaining wear life of the rail. In the case of T-rail the maximum amount of wear that can be obtained theoretically will be when the rail is worn so far that it is no longer strong enough to sustain the weight of the cars. In practice the observation of the writer is that before this theoretical limit is reached generally some parts of the rail are worn, either from joint troubles, corrugation, flange wear, or defects that develop in the rail, so far that it is considered reasonable to renew it if the finances of the company will permit.

It often occurs that where track needs to be rehabilitated the rail is taken up, the ends cut off to remove poor and worn parts, after which it is relaid when the street surface is renewed, or in some instances, the old rail is relaid on lines in outlying districts with lighter traffic, if the company has such new track extensions where it may be used. Some companies find that taking up and relaying rail after cutting off the ends is entirely practical. In this way the theoretical amount of wear that can be obtained from the rail will be approximately reached. The wear of the rail head does not take place uniformly to a level line across the head, as shown on some of the diagrams, but to a sloping surface. Considerable wear usually takes place along the gage line that appears to be caused by irregularities developing in grade of rail or surface of track, by nosing of car trucks, difference of hardness at different spots in the rails and other reasons. Corrosion of web and base of rail may affect the life of rail, but in paved track it is the experience of the writer that this is not a determining factor.

The point is well made in the article under consideration that the question of pavement renewals will often decide the question of rail renewals. If a new and expensive pavement is to be constructed in the

place of a worn-out pavement, it will often be economy to renew the track even if the rail has several years of life remaining. To leave the old rail in place would, in many instances, hasten the deterioration of the adjoining pavement, and the expense of maintaining paving and track would be more than the saving in rail to obtain its extreme life. In this connection it must be also considered that public authorities are demanding a higher standard of track maintenance, especially in connection with new and expensive pavements.

The author's method of arriving at the annual charge of maintenance of old rail and annual cost of new rail is ingenious, but it will seldom occur that the time of renewal can be fixed by these mathematical considerations alone. Such information is of value to assist in making a decision as to renewals and is one of the conditions to be considered. The main factor in arriving at a decision will be the financial situation. When there is necessity for small expenditures, rail and track will be worn as long as possible. When finances will warrant and the company and public desire tracks and pavements to be kept in first-class order, rail renewals will be made sooner and the wear obtained will be less than the possible maximum indicated in the article.

Many companies, if financially able, put down new, expensive track, while the actual maximum life of the old rail has not been reached. The writer has seen many instances where good rail was removed from the track and scrapped, and new rail substituted. This change usually takes place when new pavements are constructed, and in fact it might be said that a very large part of the wear remaining in rails of street railway tracks when the rail has been scrapped, has been lost on account of the civic improvements and the desire of companies to comply with the request of public authorities that the tracks shall be renewed when new pavements are installed. The actual maximum life of the rail in connection with the modern and expensive type of track has not yet been determined.

GEORGE L. WILSON,
Engineer Maintenance of Way.

NEW YORK STATE RAILWAYS
SYRACUSE, N. Y., Sept. 2, 1915.

To the Editors:

I have read with much interest the article on "Girder and High T-Rail Renewals" in the issue of the *ELECTRIC RAILWAY JOURNAL* of July 31, 1915. The principal causes for rail renewals are clearly presented and a formula derived which should give results in many cases. There will be, of course, many instances where other considerations will enter the problem, such as city ordinances which will render any mathematical calculations of no real value.

I consider the assumption of an average life of thirty years for track in paved city streets of over 100,000 population to be entirely too high. Sixteen to twenty years would be nearer correct in small cities, and fifteen years in larger ones. The life of the rail, I believe, will ultimately be determined by that of the joint, and this will, of course, depend on how well the joint is maintained. It has been my experience with the older types of 9-in. and 7-in. girder rails that after fourteen or fifteen years' service under heavy traffic, even though the joints may still have considerable life left, or it is possible to cut off the ends to make new joints, the rails are generally surface bent and kinked so that a good paved track cannot be built. It might be possible on light traffic lines to obtain thirty years' life by maintaining the joints as long as possible, and when this no longer can be done because the rail ends have been ground thin on the head, the ends can be cut off

and new joints installed. I have done this on several light traffic streets but have not attempted it under heavy traffic.

To estimate the average life of rail for the next twenty years based on rails laid fifteen to twenty years ago is erroneous. In general, rails laid twenty years ago did not carry heavy double-truck cars until about ten years later, and the number of cars operated and speeds have also increased rapidly since then. I have observed track that was in almost perfect condition after ten years' operation with light single-truck cars practically fail after five years more service with heavy double-truck cars operated at a closer headway. Hence, in spite of improved rails and joints, I do not believe our modern rails will last any longer, if as long, as those laid fifteen years ago, due to the increasing weight, speeds and headways in our city streets. Moreover, municipal authorities are requiring a higher degree of paving maintenance than ever before. I believe that some of the older rails gave twenty years' service simply because the streets were not paved and maintenance consisted only in keeping the track safe for operation.

As regards the modern 7-in. T-rails now being so widely used, I believe that the life in paved streets will be determined by the joint and surface bending and not by the amount of metal worn off the head between joints. What has happened to a rail in the past ten years I do not believe can be used as a basis to determine, with any degree of accuracy, what will be its condition at the end of the next ten to twenty years, except, possibly, the amount of metal which will be worn off the head.

E. P. ROUNDEY,

Engineer Maintenance of Way.

The Vienna-Pressburg Electrification

VIENNA, AUSTRIA, July 31, 1915.

To the Editors:

I notice the author of a letter published in the Communications Department in your issue of May 22 refers to the 15,000-volt, single-phase overhead line of the Vienna-Pressburg Railway as apparently fitted with the Fischer-Jellinek suspension. This is incorrect, but the writer is correct in stating that this form of suspension involves wear of the trolley wire at the clamps. I would refer you to the extended statement in Nos. 32, 33 and 34 of the 1914 issue of *Elektrische Kraftbetriebe und Bahnen* and to my article entitled "Ueber Hochspannungs-Leitungsanlagen für Bahnen" (Concerning High-Tension Transmission Systems for Railways) published in Nos. 8 and 9 of the *Electrotechnische Zeitschrift*, Berlin. These show the feature of the A. E. G.-Union-Vienna systems is to secure theoretically correct regulation without the defects of the Fischer-Jellinek suspension mentioned.

I must deny absolutely, however, that it is indifferent whether the trolley wire hangs in a series of festoons or whether it is carried as close to a perfect horizontal plane as possible. The long life of the bows on the Vienna-Pressburg Railway, up to 42,000 locomotive-kilometers, proves that the best results are obtained with the trolley wire in a horizontal plane.

I also notice the letter from W. K. Archbold in the same issue of your paper and would be glad to become better acquainted with the Northern Ohio Traction & Light Railway's system, as mentioned by him.

The triangular arrangement of the A. E. G.-Union system has the advantage that it permits no pulling or pressing out from its proper position of the working conductor, a condition which is unavoidable where vertical hangers are used.

The tower construction used on the Vienna-Pressburg

Railway is in accordance with the calculations and factors of safety required by the Austrian Railway ministry, and they offer ample safety.

DR. ING. E. E. SEEFEHLNER,

Director A. E. G.-Union Elektrizitäts Gesellschaft.

Permissible Difference in Wheel Diameter

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA., Sept. 13, 1915.

To the Editors:

Supplementing my article which appeared on page 452 of the issue of the *ELECTRIC RAILWAY JOURNAL* for Sept. 11, the following statements may be of interest.

In any given case the permissible difference in car-wheel diameter depends upon a number of factors. Several of these are as follows:

1. The margin in temperature rise which the motors have, if all the motors divide the load equally. If the motors are running quite cool a certain difference in heating is not so objectionable as when the motors are running hot.

2. The relative number of motors on the car with the large and small wheels. If a car has three motors with large wheels and one with smaller wheels, the condition is not as serious as though the car was equipped with three small sets of wheels and one larger set.

3. The speed at which the car operates most of the time. If the service is such that the motor operates much of the time at heavy loads, the difference in wheel diameters permissible will not be as great as though the motors were in service where most of the running is at high speed.

4. These curves are based on the assumption that the motors have identically the same speed curves but in commercial production due to variation of materials, machinery, etc., the speeds of different motors may vary as much as 5 per cent. If the motor which is mounted on the larger wheel rotates at higher speed for the same amperes than the motor on the smaller wheel the difference in loading and heating will be in excess of that given by the curves.

Figs. 2 and 3 reproduced with the article will be found useful in arriving at a solution.

A. L. BROOMALL,

Railway Engineering Department.

Picnic Park as Traffic Accelerator

In spite of the cool summer the Louisville & Northern Railway & Lighting Company, New Albany, Ind., which operates Glenwood Park, near New Albany, reports excellent success with the property. The annual Chautauqua brought out large crowds, while other special events have proved successful in developing traffic. Louisville people have been educated to use Glenwood Park for picnic purposes. On Labor Day an especially large picnic was held, and on the following day a musical event out of the ordinary drew several thousand people.

The success of the park, as a traffic proposition, is indicated by the fact that while many of the regular amusement resorts in the Louisville district closed late in August, Glenwood was expected to close on Sept. 15.

A company in Cuba, reported as the Oriente Fruit Company, according to unconfirmed information is said to be considering plans for the construction of a 20-mile heavily graded electric railway in Cuba for the transportation of bananas and coffee, the motor equipment to be of the three-phase induction type. Inquiries for certain accessory car equipment for 253 cars have been received in New York City.

ANNUAL CONVENTION
SAN FRANCISCO
OCTOBER 4 to 8, 1915

American Association News

ANNUAL CONVENTION
SAN FRANCISCO
OCTOBER 4 TO 8, 1915

Additional List of Reservations for the "Red Special"—Change in Los Angeles Program of Entertainment—Award in Accountants' Course—Manila Company Section

THE "RED SPECIAL"

H. G. McConaughy, director of transportation of the American Electric Railway Manufacturers' Association, reports that the "Red Special" train, which will leave New York on Sept. 23 for the San Francisco convention, is now oversubscribed. There will be twelve cars in the train and it will weigh more than 1000 tons. Two cars will come from Boston, one car from Cleveland and one car from Chicago. The other cars will leave from New York. The train will be made up of all standard steel Pullman equipment, all sleeping cars being stateroom and drawing-room cars only.

The following are some of the additional reservations for the train, made since the publication of the list in the issue of Sept. 4.

Miss Annie R. Almy	John M. High, Jr.	Miss F. E. Stanley
F. W. Coen	Miss Florence Hedley	Miss B. Tompkins
J. J. Dempsey	C. B. Keyes	H. R. Trainer
Mrs. Dempsey	T. P. Kilfoyle	Mrs. Trainer
C. R. Ellicott	J. C. McQuiston	W. S. Twining
A. H. Ford	W. B. Potter	Charles S. Waring
Mrs. Ford	Mrs. Potter	Mrs. Waring
W. G. Gove	E. O. Shyrook	Miss Edith Waring
Mrs. Gove	John J. Stanley	T. Walley Williams
Mrs. John M. High	Mrs. Stanley	

CHANGE IN LOS ANGELES PROGRAM OF ENTERTAINMENT

Owing to the fact that the special train will arrive at San Fernando at 9.30 a. m. on Tuesday, Oct. 12, instead of on Oct. 13, as expected by the committee, a slight change has been made in the program of entertainment at Los Angeles from that mentioned on page 446 of the issue of last week. In consequence, Transportation Day at Universal City will be Tuesday, Oct. 12, and Catalina Day on Santa Catalina Island will be Wednesday, Oct. 13. Oct. 14 will be an open date at Los Angeles so far as the morning is concerned, giving the members and their families an opportunity to visit any special places of interest in the city, which they will leave at 3 p. m. for San Diego. The San Diego days will be Friday, Oct. 15, and Saturday, Oct. 16, and the party will leave San Diego at 1 a. m. on Sunday, Oct. 17, for Riverside.

AWARD IN ACCOUNTANTS' COURSE

As announced last year provision was made in planning the educational course of the Accountants' Association for the awarding of a prize of \$50 for the best paper on the eighth lecture submitted to the instructor, Prof. J. R. Wildman. This award will be made at the Monday (Oct. 4) session of the Accountants' Association at the convention, immediately following the presentation of the report of the committee on education by George G. Whitney.

The fortunate recipient of the \$50 in gold will be E. C. Stothart, auditor Charleston Consolidated Light & Power Company, Charleston, S. C. First honorable mention will be accorded to Albert L. Good, civil engineer Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., and second honorable mention to H. F. Van Wye, clerk American Railways, Philadelphia, Pa. The announcement of this award will be a reminder to those who have not yet registered for the 1915-1916 courses.

MANILA COMPANY SECTION

The eighth monthly meeting of joint company section No. 5 was held in Manila on Aug. 3. H. P. L. Jollye, assistant auditor Manila Electric Railroad & Light Company, spoke on "The Essentials of Fare and Bill Collecting." Most of the discussion centered in the second part of the topic.

Mr. Jollye said that the conditions in connection with fare collection in Manila are quite different from those of other countries as there are nineteen grades of cash fares, ten first-class and nine second-class, ranging from a scholar's ticket of 2½ cents on the suburban line to the first-class cash fare of 12 cents. In addition there are first-class and second-class complimentary employee's tickets. For a street railway with 52 miles of track this produces accounting complications. Both the old type and the pay-as-you-enter type of cars are used, and the latter is preferred as giving the most accurate check upon conductors, with less opportunity for conductors or passengers to defraud the company.

After quoting at length from the report of the 1913 committee of the association on fares and transfers, to show the unsettled condition of the fare collection situation, Mr. Jollye emphasized the importance of the conductor in determining the success of any system, as follows: "The conductor is the representative of the company, the one who comes in contact with the public more than all others, and by him and his conduct toward the public will the company be largely judged. A conductor must be a man courteous by nature, with the patience of Job, always ready to assist the passengers in any difficulty, to be able to firmly but politely refuse a transfer a week old, or a scholar's ticket from a man in his second childhood. During the busy hours of the day he has to work at high speed and any mistakes he makes he has to pay for, and all this time he gets little consideration from the public and is expected to give much."

Purpose of American Association of Engineers Outlined

At a booster dinner of the American Association of Engineers, an organization drawing members from all branches of the engineering profession, Prof. F. H. Newell, head of the department of civil engineering at the University of Illinois, outlined the purpose of the new association. The organization is designed to promote the interest of the average engineer by affording means for the interchange of information, maintaining a service clearing house, furnishing advice on patent and legal matters and supervising legislation by proper publicity.

A national convention of this association is to be held at the La Salle Hotel, Chicago, on Dec. 10 and 11, 1915. The offices of the association are at Room 1056, 29 South La Salle Street, Chicago, Ill.

Promoters of the extensive club grounds, amusement park and speedway plans for Overland Park, on the Kansas City-Olathe Electric Railway are urging upon federal officials the designation of Overland Park as the site for a military aviation station. Aviation exhibitions are held at Overland Park now each Sunday.

Equipment and Its Maintenance

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

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

New Method to Determine Railway Motor Speeds with Varying Voltage

BY A. M. BUCK, ASSISTANT PROFESSOR OF RAILWAY ELECTRICAL ENGINEERING, UNIVERSITY OF ILLINOIS

It is frequently desirable to obtain characteristics of railway motors when operating under abnormal conditions, as, for example, when a certain amount of resistance is inserted in the circuit, or when the motors are working at pressures differing from the standard. A method by which the desired characteristics can be found from the normal performance curves furnished by the manufacturer is of considerable value in the engineering department of any railway company, even though it be only a moderate-sized road.

One way of getting the performance of the series motor under varying conditions has been suggested by F. Castiglioni, in an article in the *ELECTRIC RAILWAY JOURNAL* for March 13, 1915, page 515. His method, in brief, consists in using the well-known relation

$$\frac{S_2}{S_1} = \frac{E_2 - Ir}{E_1 - Ir} \quad (1)$$

to plot a series of charts giving the relation between S_1 and S_2 for a large number of values of terminal potential, currents and motor resistances. It is evident that any such chart becomes quite complicated if it is to cover more than a limited range of conditions.

In the issue of Feb. 13, 1915, the writer presented an article on the determination of railway motor resistances, giving a volt-ampere diagram for facilitating the calculation. This same chart can be used, with a slight modification, for finding the speed under abnormal conditions of potential and resistance in the motor circuit, so that it makes available a simple graphical method for computing motor speeds under nearly all variations which are liable to be met with in practice.

In order to make this clear, the portion of the diagram referred to is reproduced in Fig. 1, to show the relation between the current and the Ir drop in a motor under ordinary conditions of service. Inspection of the figure will show that the total pressure at the terminals is divided into two parts, the counter-emf. and the Ir drop. The sum of these two must always be equal to

the constant terminal voltage. Suppose that the line pressure is changed to some abnormal value, as to one-half (for example, when two motors of an equipment are placed in series). This alters the terminal voltage, but, as shown in the figure, does not affect the Ir drop. The ratio between the two values of counter-emf. is likewise the ratio between the two speeds. If, then, we can get a graphical method of establishing a proportion between the two quantities, the speed under the abnormal conditions can be found directly.

One arrangement for doing this is given in Fig. 2. At the right is shown the volt-ampere diagram of Fig. 1, and beside it is drawn the speed curve for the motor, as determined from test, the axes of abscissae being in the same line. The current scales need not, however, bear any definite relation to each other. Consider the speed S_1 of the motor at the terminal pressure E_1 . It is desired to find the speed S_2 at the same value of current. Through A , corresponding to this current on the right-hand scale, and through S_1 draw a straight line cutting the axis of abscissae at K . From K draw the line KB , intersecting the current value on the speed diagram at S_2 . This locates a point on the new speed curve corresponding to the current I . This must be true since, by similar triangles,

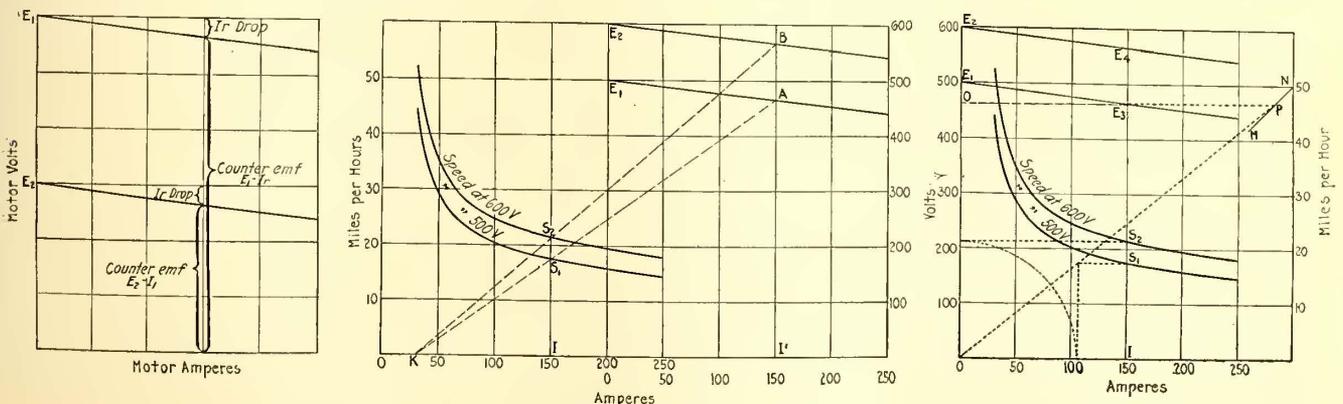
$$\frac{IS_1}{IS_2} = \frac{AI'}{BI'} \quad (2)$$

It has already been shown that AI' and BI' are the values of counter-emf. for the corresponding pressures E_1 and E_2 respectively.

The diagram is equally good if it is necessary to find the performance with external resistance in the circuit. The only change is to locate the correct slope for the Ir line at the proper terminal pressure and use intercepts on this for drawing the lines as AS_1K .

It is, perhaps, unnecessary to state that a different point K is located for each value of current.

In some cases it is convenient to make the construction complete on the speed-current curve itself. This is shown in Fig. 3. Here the volt-ampere diagram is drawn to the same scale as the speed curve, and the proportion is obtained by swinging one of the values of counter-emf. through an angle of 90 deg., that is,



RAILWAY MOTOR SPEEDS—FIG. 1, DIVISION OF VOLTAGE BETWEEN COUNTER-EMF. AND Ir DROP; FIGS. 2 AND 3, NEW GRAPHICAL METHOD OF SPEED CALCULATIONS

$OP = E_1$. The intersection of the two projections of counter-emf. will be at some point, such as P , and a line connecting this with the origin will divide the ordinate and abscissa at any place along it proportionally to them. If then the speed at E_1 volts is projected on this line, the speed at E_2 volts will be given by the corresponding co-ordinate, and may be swung back through 90 deg. to be plotted on the original scale. This is, of course, simply a geometrical device for locating S_2 so that $S_2:S_1 = E_2:E_1$.

An inspection of the diagram shows that the values of P for all possible values of current will lie along the line MN , which makes an angle of 45 deg. with the axes. This relation must be correct, since the I_r drop is the same, no matter what the terminal pressure. It is, therefore, unnecessary to swing the values of counter-emf. through 90 deg. to locate the points P . Draw the line MN through the intersection of the lines corresponding respectively to E_1 and E_2 at zero current (i.e., without any I_r drop). The projection of the I_r drop line on MN will then give the point of intersection P without going through the preliminary construction.

In case the performance must be found when an external resistance is inserted, the slopes of the two I_r lines will not be the same and the line MN will be at a different angle. Since the drops are proportional in the two cases this will merely mean the determination of the proper slope of the straight line MN after which the procedure is as before.

The principal advantage of these methods of calculating speeds under abnormal conditions is that they are so simple that there is little chance of making an error in the computation; and, since the construction can be repeated for any desired conditions, the application is not limited to a comparatively few cases for which charts have been figured out. It is believed that they will be of considerable aid in the solution of such problems.

The two methods of calculating speeds graphically were worked out independently, the one shown in Fig. 3 by the author, and that in Fig. 2 by S. Sekine, a graduate student at the university, working under the writer's direction.

Turntable for Painting Car Sash

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

The scheme illustrated in the accompanying halftone was devised by an old practical painter in the employ of the Southern Pacific Company. In order to facilitate the painting of sash two turntables are located on the main table, making it possible to work two men at sash painting when necessary.

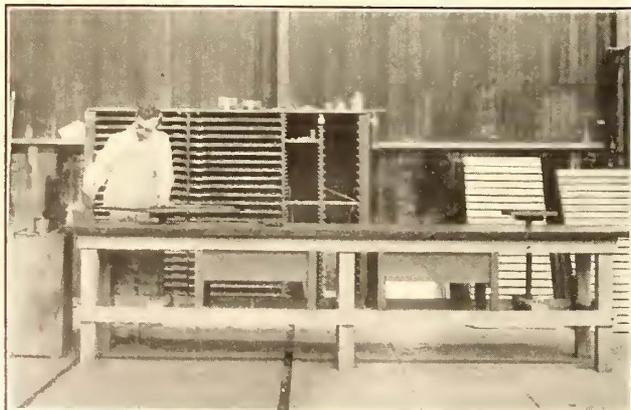


TABLE WITH TWO TURNTABLES FOR PAINTING SASH

The sash is laid on the top of the turntable and turned around until all four sides are painted, then it is turned over and the other side is painted. Directly behind the painter is a cabinet for storing the sash until dry. It will also be noted in the illustration that there are beveled strips nailed fast to the partitions of the cabinet parallel to one another. This method of support makes it possible to slide the painted sash in with the extreme edges of the latter only touching the strips.

The tops of the turntables are 12 in. square and faced with $\frac{1}{4}$ -in. felt, glued on. The openings in the top of the main table through which the shafts of the turntables pass are bushed with pipe of suitable diameter. Should the main table be required for any other work the turntables can be removed by simply lifting them out.

Timekeeping and Cost Records for Way Department

BY S. GAUSMANN, BROOKLYN, N. Y.

Too much care cannot be exercised in the selection of timekeepers for the maintenance of way department, and the payment of a sufficient wage to them to guarantee their honesty. With the class of men generally employed in gangs, if the timekeeper is paid insufficiently for his services he will endeavor to make a little extra when the opportunity so easily presents itself. This opportunity is afforded in many ways and no matter what the system loopholes will occur.

The only remedy is in checking the men from independent sources and by involving as many in the checking of their time as possible, all such checks being entirely separated from each other. The more checkers involved the less the chance of making a questionable transaction.

While the introduction of time clocks has done much to correct abuses of this kind where men are continually employed, or start and end the day's work at the same time, the use of clocks in track gangs is impracticable on account of the quantity required, their liability to injury outdoors, the frequent shifting of gangs, and the expense of maintaining clocks owing to impossibility of obtaining suitable locations and the rough handling they would receive.

The practice of having a foreman check the time of his gang, except in the case of small section gangs, should not be considered, as it takes too much of his time, diverts his mind from his regular work and is unsuitable for the average foreman, who, although he may be a first-class man in his chosen vocation, is not adapted for clerical work.

More territory is usually assigned to a timekeeper than he can properly cover. While he should check his men at least twice a day he is often unable to do so more than once under these conditions. This might do for regular work and with gangs in which no changes occur, but it will not do for the usual large construction or reconstruction gangs, where a different class of men are employed and are changing daily. A timekeeper should not be expected to keep the time of more than 200 men unless the gangs are close together, where too much time is not employed in traveling from one to the other. One general timekeeper should be employed who has jurisdiction over all the others and who should check the gangs, but intermittently, varying his routes daily so that the other timekeepers and men will never know just when he may appear. Timekeepers should not be expected to do too much clerical work. Keeping a timekeeper on one route continuously breeds too much familiarity. These routes should be varied, the oftener the better, so that every man employed would

ELECTRIC RAILWAY COMPANY												
										PAY CHECK		
1	2	3	4	5	6	MONDAY	D	N	N	N	N	No 486 Week Ending May 15, 1915
7	8	9	10	11	12	TUESDAY	D	N	N	N		
13	14	15	16	17	18	WEDNESDAY	D	N	N	N		
19	20	21	22	23	24	THURSDAY	D	N	N	N		
25	26	27	28	29	30	FRIDAY	D	N	N	N		
31	32	33	34	35	36	SATURDAY	D	N	N	N		
37	38	39	40	41	42	SUNDAY	D	N	N	N		
										Totals		
										Hrs.		
										Rate		
										Amt. \$		

(FRONT)

INSTRUCTIONS

This card to be punched by foreman for starting and stopping time and by Timekeepers, when checking, daily. Time must be filled in by Employee for each day, as well as total time for week, with rate and total amount due and turned over to Paymaster on pay day.

(BACK)

SAMPLE PAY CHECK FOR WAY DEPARTMENT EMPLOYEES

be checked by every timekeeper at some time throughout the week.

While the brass check system, much in vogue, is simple, it is very unsatisfactory. Without some further check, it is not at all certain that the timekeeper visits the work as expected. A card check system, where too much information is desired on the time card, to cover distribution of labor, etc., requires that a clerk be made of the timekeeper, and takes much of his time on work not entirely in keeping with his intended duties. If he is kept at timekeeping as long as he should be he will be employed at this other work long after hours, he will consequently be dissatisfied and, regardless of accuracy, will get through with it as soon as possible.

The use of daily individual time cards serves no purpose whatever, but necessitates the employment of an unnecessary clerical force to prepare the cards and distribute thereon the account numbers to which the various classes of work are charged, to say nothing of the number of cards required when there are 500 to 1500 or more employees.

Timekeeping and the distribution of labor and cost records should be kept separately and in such a manner as to be a mutual check on each class of work. In the larger gangs a checker should be employed continuously in each gang, working with the foreman and independent of the timekeepers, and rendering each day a report, to be described later, which should be checked against time turned in by timekeepers. These reports should be taken care of by foremen in the smaller gangs, assisted by a checker who should cover several of these gangs instead of being kept with one, as in the case of the larger construction or reconstruction gangs. Any clerical work in connection therewith should be done by a clerk in the office, thereby leaving the timekeeper to take care of timekeeping only.

The pay card furnished the men should be of a different color for each week of the month to facilitate the work of paymasters and so arranged that it will show the time of the daily checks of the timekeeper by punch marks with a verifying punch mark of the foreman for the starting and stopping time. All these

punches should be of a different character so that the user could be easily identified. The card should have a space for the total hours each day and should be turned in to the paymaster, with extensions filled out by the employee, when pay is drawn.

A card suitable for this purpose is illustrated herewith, on which the sequence of the days of the week can be changed to conform to the payroll week of any company. The "D" and "N" shown are to be punched out to indicate the period the man worked, whether day or night. The instructions on the back should be printed in both English and Italian, or such other language as is most generally spoken by the men employed.

The timekeeper should distribute these pay cards on the first day of the week to all men working, thereafter using them for identification only, and entering time daily in his own time book. On the last day of the week he should verify the total time as punched on the cards and turn in his book with the total time entered for the purpose of making up the payroll.

While this system would permit the men to know the amount of time turned in each day by the timekeeper, which is objected to by some companies, it would prevent many errors in keeping the time and would more easily verify any claim for shortage, as well as prevent any overpayment. Otherwise whenever the ordinary laborer is supposed to state the amount of time worked by him without any verification by the timekeeper he will invariably ask for more time than he is entitled to, and a considerable amount is lost to the company in this manner.

The question as to who should have jurisdiction over timekeepers and timekeeping is one worthy of discussion, as there is no doubt a diversity of opinion on this subject, but the most reasonable solution is that the auditing department should assume all responsibility for the proper taking of the time, the making up of the payrolls, the checking on the work and obtaining of unit data, as well as the distribution of the labor taken care of by representatives under the head of the way department. This method clearly defines the work of each and furnishes the independent check required without providing useless data for one department which is of value to the other.

While this method may have some disadvantages these are reduced to a minimum if each department will keep in touch with the other so that the correct locations of all gangs will be known, otherwise much confusion and inaccuracy in payrolls will soon result.

While many may believe that the head or sub-head of the way department should assume responsibility for timekeeping he should not be expected to do so unless he takes charge of it in its entirety. Much better results can be obtained by adopting the plan as suggested making the general timekeeper, with headquarters in the way department office, the representative of the auditing department.

Although unit labor costs for the various operations of track work are directly connected with the distribution of labor, still more information is required to make these units of any value, and where but one item will suffice in the distribution to cover an account number this will at times include as many as fifteen or more units for this one account. To expect a timekeeper to keep this, as well as the time, accurately is unreasonable. It is therefore advisable to have checkers, as previously mentioned. Since checkers are only required during the busy season good results are obtained by the use of young men from schools and colleges, who are of a class to take an interest in obtaining the results desired. These checkers render daily reports, which show the number of men employed on

ELECTRIC RAILWAY COMPANY													
DAILY GANG REPORT													
Street.....		from.....		to.....		Job No.....		Date.....					
Character of Work.....				Corpn. Inspr. from.....				AM to.....		AM P.M.			
DISTRIBUTION													
EMPLOYEES													
CK. No.	OCCUPATION	HRS.	RATE	AMT.	HRS.	AMT.	HRS.	AMT.	HRS.	AMT.	HRS.	AMT.	
TO TOTALS													
CONSTRUCTION OR RECONSTRUCTION						TRACK REPAIRS							
Ft Track Laid.....						Ft Track Repaired.....						No Joints Bonded.....	
" " Concrete.....						" " Corrugation Ground.....						" " Ground.....	
Sq Yds Paved.....						No Joints Required.....						" " Paved.....	
Type of Construction.....						Type of Construction.....							
Remarks.....													
Signed.....						Correct.....						Foreman	
						Checker							

SAMPLE WAY DEPARTMENT CHECKER'S REPORT

the work, the rate of pay of each, the hours put in at any particular class of work, with the total hours per day. While printed forms may be supplied for this purpose they cannot show all of the information desired without containing it on a large and bulky form, but the most frequent jobs can be shown, leaving blank columns for the others to be filled in as required.

Much better results, however, can be obtained by leaving the headings of all columns blank, to be filled in by the checker, the items either being designated by a full description or a number for each item desired, these numbers to be obtained from a key to be furnished each checker. A key of this character in any event is necessary, as hardly any two checkers would use the same description for a piece of work. They would often so word a description that it might apply to more than one class.

In obtaining unit costs there are practically six general divisions of labor to be considered; preparing, handling material, laying, concreting, paving and miscellaneous, which may be designated as 1, 2, 3, 4, 5 and 6 respectively. These may be subdivided under various units as follows:

1.—Preparing.	4.—Concreting.
1-A. Removing and loading old pavement.	4-A. Handling material to machine.
1-B. Excavating and loading dirt or concrete.	4-B. Mixing.
1-C. Removing and loading track material.	4-C. Placing in track.
1-D. Grading.	4-D. Ramming.
2.—Handling Material.	5.—Paving.
2-A. Loading and unloading new track material.	5-A. Handling material to pavers.
2-B. Loading and unloading new paving material.	5-B. Laying pavement.
2-C. Loading and unloading concrete material.	5-C. Mixing and placing rail filler.
2-D. Transportation of material to work.	5-D. Mixing and placing grout.
2-E. Transportation of material from work.	5-E. Tar and graveling.
3.—Laying.	6.—Miscellaneous.
3-A. Laying and spacing ties.	6-A. Corporation inspection.
3-B. Laying and spiking rail.	6-B. Miscellaneous inspection.
3-C. Installing joints.	6-C. Watchmen and flagmen.
3-D. Installing tie rods.	6-D. Tool repairs.
3-E. Installing or repairs to special work.	6-E. Temporary crossings for vehicle and foot traffic.
3-F. Installing bonding.	6-F. Installing temporary cross-overs for diversion of car traffic.
3-G. Surfacing and lining track or special work.	6-G. Switchmen and maintenance of cross-overs.
3-H. Grinding or rasping joints.	

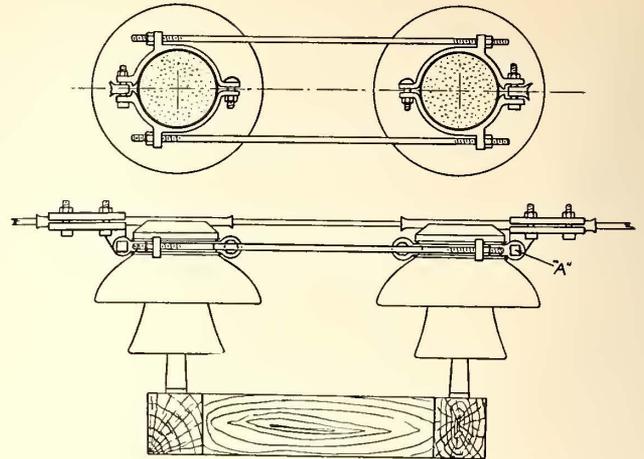
While the above cover the units most required many of these may be combined without particular detriment to the results desired.

For obtaining these results a form similar to the one illustrated herewith is desirable.

While the keeping of the time and unit costs by this method naturally entails some expense and more than would be the case where there is no check on the time-keeper and he makes up the distribution the results obtained more than warrant any additional cost.

Overhead Straight Line and Angle Protective Crossing Clamps

The accompanying illustrations show types of straight line and angle protective crossing clamps manufactured by Edwin G. Hatch, engineer, New York, N. Y., which are designed to meet the precautions necessary to prevent telephone, telegraph or other lines falling on railroad right-of-way that they cross. The clamps are especially constructed so as not to strain or injure the line or insulator, and two insulators are located each side of the crossing, the extra insulator being used to provide a factor of safety. As a further precaution the crossing insulators should preferably be designed for considerably higher operating voltages than the ordinary line insulators.

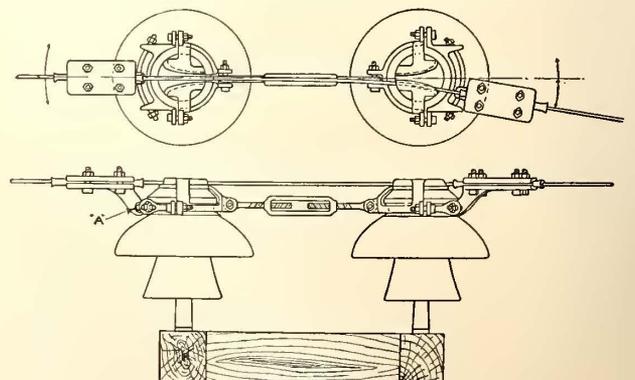


OVERHEAD STRAIGHT-LINE CROSSING CLAMP

In the case of the clamps illustrated herewith, the line-gripping parts are not rigidly connected to and do not form part of the insulator-gripping part, but are capable of independent action and adjustment and are free to float with the line and assume any vertical angle the line may take. This prevents likelihood of kinks forming, of the "working" or "crystallizing" of certain sections and of breaks. The line-gripping parts are pivoted at A, so that they will always take the line angle readily and without straining the line. There is also provided at A a slot to allow for any small variation in the size of the insulator head, and to make certain that the weight of the line will come directly on the top of the insulator head as it should.

Where clamps consisting of two rigid members bolted together and fastened directly to the line and insulator have been used it sometimes happens that the line is carried entirely above the insulator top, or else the line may be carried by the insulator top but may be badly pulled down into the gripping members and kinked. Either occurrence is likely to prove injurious to line or insulator, or possibly to both. Furthermore, in the type of clamp described, which is meant to fit both the line diameter and the diameter of the insulator neck, it has been found that either one or other thread will be tight while the other will be naturally loose. If the line is not firmly gripped the value of the clamp is lost. At best, owing to the fact that neither the hard metal insulator-gripping clamp nor the insulator presents a uniform section, the clamping stress is likely to be exerted at a few points only. This tends to injure the porcelain. To prevent this it is well to insert a thin strip of lead or rubber between the two, assuring a good tight fit and a much more even distribution of stress over a greater surface.

In all clamps there should be an easy means of tightening up or adjusting the distance between the two



ANGLE PROTECTIVE CROSSING CLAMP

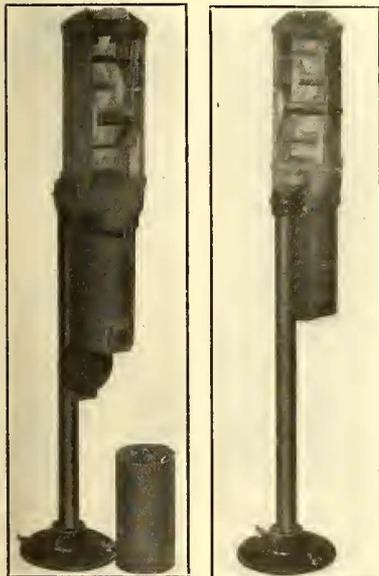
insulators. In most cases the turnbuckles shown in the illustrations afford a quick and effective means of doing this.

Split bushings are provided to prevent any possible abrasion of the line by the gripping members. The clamping bolts straddle the line, which assures good clamping action. The line-gripping parts, extending well out beyond the insulators, act as arcing shields and protect the conductor in case of flash-over. Provision is made against these members falling down against the insulator when the line breaks.

In the case of the clamp for use where the line crosses at an angle, shown herewith, wherever this angle is considerable it is good practice to divide the angle so that one-half will be handled at each end of the clamp. The clamp shown will take a total angle of very nearly 90 deg. without any special construction.

Safe Deposit Fare Box

The latest fare box manufactured by the Ohmer Fare Register Company, Dayton, Ohio, contains certain marked improvements over the earlier type of Ohmer



NEW FARE BOX

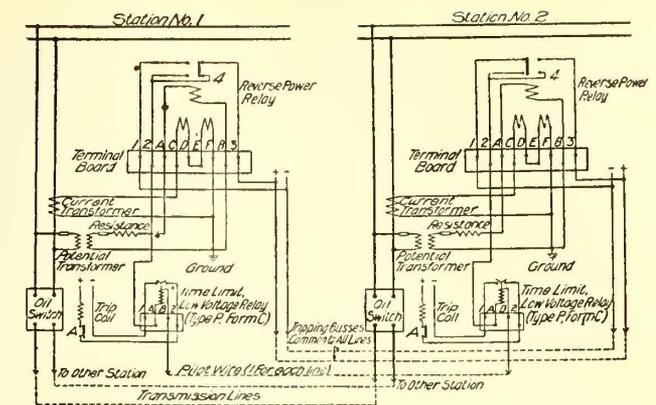
fare box, while all the good points of the latter have been retained. In developing the new type, the ideas and suggestions of electric railway men who have devoted much attention to the subject have been carefully considered, this being shown by the position and shape of the hopper which add materially to the efficiency of the machines. The locking devices for preventing the removal of the insert until all the fares have been dumped into it has been improved, and all interlocking parts have been strengthened

so that the box is strictly foolproof. The upper part is square, while the insert is cylindrical in shape. The box is 26 in. high and 5 in. square at the top. It will be found to meet every possible requirement where a non-registering box is desired.

Relay for Protecting Single A. C. Tie Lines

Single-pole, double-throw relays of the type illustrated have recently been developed by the General Electric Company to provide a simple and effective means of isolating trouble automatically on a single tie line joining parts of an a.c. system. Two relays connected together by pilot wires are required on each end of a three-phase tie.

Under normal conditions, irrespective of the direction of the power, which may reverse at any time over the entire tie line, depending on the distribution of the load and the characteristics of the system, the relays have no effect on the oil switches. When the energy reverses over the entire line the relay contacts of the relays on both ends of the line swing over but do not trip the oil switches, because in each oil-switch tripping circuit there is included a low voltage time delay relay con-



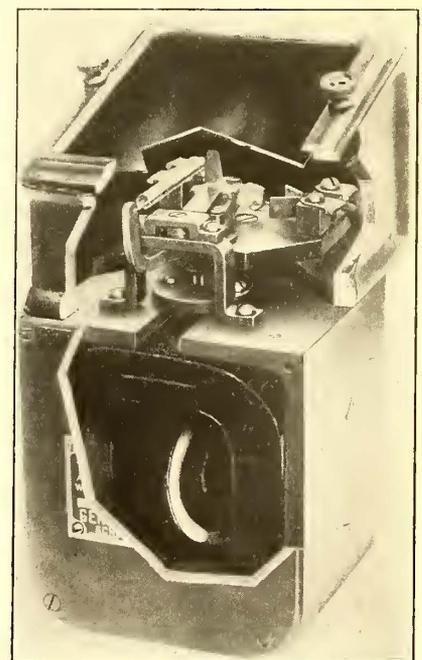
SINGLE-PHASE CIRCUIT DIAGRAM SHOWING PRINCIPLE OF APPLICATION OF REVERSE POWER RELAY

nected as shown in the wiring diagram given directly above. The time delay feature is introduced to insure sufficient delay to allow the reverse power relay contacts to swing over on the occurrence of a normal reversal of energy in the tie line.

If, however, a short-circuit occurs in the tie line while power is being fed from one part of the system to the other, this power will go directly into the "short," while the power in the tie between the "short" and the part of the system previously receiving power will reverse and also feed into the "short." This will operate the contacts of the relay in the reversed portion of the line, which will result in opening the circuit of the time-limit low-voltage relays, the falling of whose plungers will close the oil-switch tripping circuits and cause the oil switches on both ends of the line to trip and isolate the line from the rest of the system. After the reverse power relay has operated by reason of a fault, the contacts will remain in the position which caused the switch to open, and before the oil switches are again closed this set of contacts should be reset by the knurled button on the front of the relay.

The accompanying half-tone shows the general construction of the relay. The contact arm is operated by a crank on the rotating shaft through a tension spring, which normally maintains contact, and also snaps the wedge to the other side when the crank moves past the center. The thumb nut on the center of the relay provides a means for throwing manually the contacts to either side.

The rotating shaft is pivoted on an adjustable ball bearing, which greatly reduces friction. The fixed current coil consists of two coils which are usually connected in series, while the movable potential coil is fastened to the rotating shaft and operates the contacts on the re-

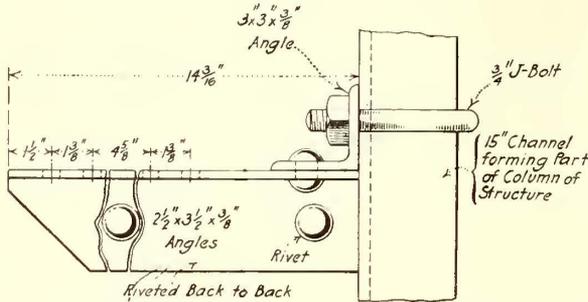


REVERSE POWER RELAY, SHOWING PRESSURE AND CURRENT COILS AND CONTACT MECHANISM

reversal of power. The relays will not operate on overload or on trouble on other lines unless accompanied by a reversal of power only on one end of the line which they are meant to protect. They will, however, operate on very little reverse power, even at low voltage and low power factor.

Flexible Support for Lead-Covered Cable

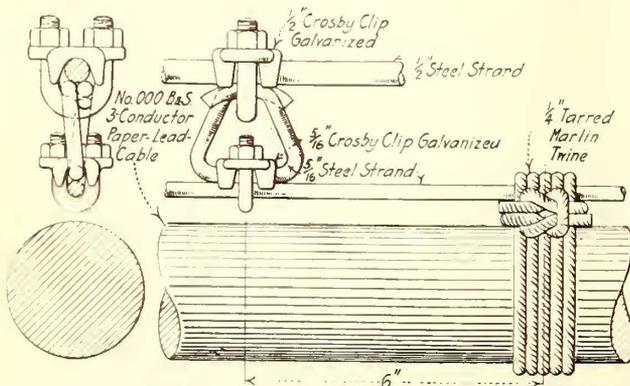
Recently the Transit Development Company, Brooklyn, N. Y., installed on the elevated structure on Pitkin Avenue, Euclid Avenue and Liberty Avenue, from Shepherd Avenue to Ocean Avenue, No. 000, three-conductor, 11,000-volt, paper-insulated, lead-incased cable, weighing approximately $8\frac{3}{4}$ lb. per foot. The



FLEXIBLE CABLE SUPPORTS—SAMPLE BRACKET AND METHOD OF ATTACHING IT TO ELEVATED STRUCTURE

cable was hung from angle-iron brackets attached to the elevated structure at the transverse girders, approximately 50 ft. apart, by means of a catenary messenger cable. The messenger cable was a 1/2-in. Siemens-Martin steel strand, composed of nineteen No. 8 wires and having a breaking strength of 11,000 lb. It was attached to the brackets by means of Crosby clips. Details of a sample bracket are shown in an accompanying diagram.

Hung from the messenger wire at 10-ft. intervals by means of hangers like those shown in the second illustration was a 5/16-in. steel strand composed of seven No. 10 wires, to which the lead-covered cable was lashed at 12-in. intervals by means of five strands of 1/4-in. tarred marlin twine.



FLEXIBLE CABLE SUPPORTS—CATENARY HANGER AND TWINE LASHING

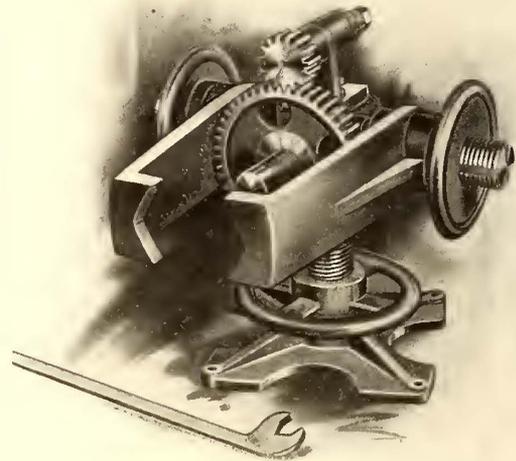
Each hanger except the middle one consists of two Crosby clips of appropriate sizes connected by a loop of 5/16-in. steel strand, as shown in the second illustration. The support at the center span is a single clip, hangers like those shown in the illustration being used 10 ft. on each side of the center and still longer ones 20 ft. on each side of the center.

This method of support affords a very flexible suspension and minimizes the liability of damage to the lead sheath of the cable on account of the vibration to which the structure is subjected during train operation.

New Pinion Pulling Machine

The Electric Service Supplies Company, as exclusive selling agent, has placed on the market a new pinion-pulling machine of the Peerless type, which is designed to overcome all objectionable features found in many of the designs now in use. As shown in the accompanying illustration, the jaws are adjusted to suit the size of the pinion by means of hand wheels having square threads and are therefore locked in position. The pull is always in a straight line.

A very desirable feature of the machine is found in the operating head which can be raised or lowered to bring the center of the plunger level with the center of the armature shaft instead of blocking up the armature, a frequent necessity in machines without this feature. Other features are found in the plunger which



NEW PINION PULLER

does not revolve and thus prevents any injury to the armature shaft or its center. The plunger nut is back geared $3\frac{1}{2}$ to 1 so that only a short wrench is necessary for easy and rapid operation. Every part of the machine is steel except the plunger nut, which is phosphor bronze, and the base, which is cast iron.

Canadian Railway Employees Purchase Machine Gun

The *News-Telegram* of Calgary, Alta., has received a check for the sum of \$800 from the employees of the Calgary Municipal Railway, with which to purchase a machine gun for the Fifty-sixth Battalion. This contribution was raised from the employees of the Calgary Street Railway under the auspices of the Calgary Municipal Railway Social Insurance & Sick Benefit Association. In these days the street railway men are working, in many cases, on short time and upon a reduced schedule. Many of the former colleagues of the street railway men are wearing the king's uniform, especially in the Fifty-sixth Battalion, and when the subject of a machine gun was mentioned the campaign for funds was carried on by a committee of the men.

News of Electric Railways

SAFETY PRECAUTIONS IN NEW YORK SUBWAY

Extended Report on This Subject Made to the Mayor by the City Fire Department

An extended report on means to prevent fire in the subway and to suggest other fire precautions has recently been made by the Fire Department of the city of New York at the request of the Mayor following the fire which occurred in the subway near Fiftieth Street on Jan. 6, 1915. The report is signed by John Kenlon, Putnam A. Bates and Joseph O. Hammitt.

Among the recommendations made under the heading of "Fire Prevention" are the following: the substitution of steel cars for combustible cars; the isolation of all buildings in the subway by fire walls, with standard fire doors at all openings and all show windows in the subway stations cut off by fire walls in the stores back of them and equipped with automatic sprinklers; electric wiring installed in a fire-proof manner throughout and oil-filled transformers of the signal system kept free from oil on the exterior; the replacement of wooden switch cabinets by metal cabinets; the use of a slow burning wood in the third-rail guard when renewed; the use of metal for all news stands with self-closing doors in the lower portions and automatic covers held by fusible links over the upper or display portions; the covering with metal of all wooden doors to toilets, porter and transformer rooms; the use of metal for lockers; the use of waste cans in workshop and locker rooms with good house-keeping conditions; careful safeguarding of all highly inflammable liquids and solids kept in the subway, and the filling of buried kerosene tanks from the streets.

Under the subject of "Segregation of Electric Wiring Systems" the report recommends the following: a source of current supply for lighting, power, ventilating, signaling, fire-alarm and telephone systems independent of the source of power current; the complete isolation of the electric wiring of each system from that of all others; the installation of a system of emergency of pilot lights preferably fed from storage batteries; the duplication of the source of current supply of the general lighting system, so that in case of the failure of one source of supply, an emergency source will automatically be utilized; the installation of a fire alarm system connecting with fire headquarters; the installation of a telephone system separate from that now installed in the ticket office at each station with a series of telephone stations located every 500 ft.; a suitable form of signal lights to show the location of each fire alarm station, telephone station and exit, the circuit being independent of the general subway lighting system and capable of connection to the emergency source; adoption of vapor-proof type of rigid fixture for all electric lights throughout the subway except at stations; reconstruction of splicing chambers to secure complete segregation of electric wiring systems and prevent the escape of smoke or gases in the subway; a careful system of battery inspection and of the emergency lighting in each individual car, and the equipment of each car with portable electric lamps.

Under the heading of "Adequate Means of Escape" the report recommends the following: the division of the subway into two or preferably four separate tubes by longitudinal walls wherever the space between the tracks admits of such construction without seriously increasing the danger to gangs of trackmen and others whose duties require them to work in the subway, with openings through the walls for exits every 500 ft. and an exit to the street at each station from each tube thus formed; additional openings to the street at several locations with fans to increase rapidity, of ventilation in case of emergency; two 5-ft. iron stairways to be placed at each ventilating chamber, and where gratings are used over ventilating chambers they should be so designed as to be easily opened either from the chamber or from the street.

Under "Training of Employees" the committee recommends the following: train crew should test emergency lighting of trains before each trip; they should become familiar with the use of the portable electric lights, ladders,

extinguishers, fire alarm, and telephone systems, and location of exits; the Fire Department should be called immediately in case of fire.

REPORT OF PUBLIC UTILITY COMMISSIONERS OF NEW JERSEY

The Board of Public Utility Commissioners of New Jersey has issued its fifth annual report, for the calendar year 1914. A summary of the board's activities for this period was published in the *ELECTRIC RAILWAY JOURNAL* of Jan. 16, 1915, page 148. The volume contains a record of the commission's decisions with respect to applications for approval of securities, ordinances, leases, mergers and sales. Full details are also published of the inspections made of utility properties during the year. No decision upon the hearing of complaints are included, for these will be included in a separate volume. The record of accidents on electric railways for the year showed a total of twenty-two killed and 272 injured, as compared to 333 killed and 544 injured on steam railroads during the same period.

AMALGAMATED IN CONVENTION IN ROCHESTER

The fourteenth biennial convention of the Amalgamated Association of Street Electric Railway Employees of America was opened at Rochester on Sept. 13. The first day was given over largely to the work of organizing and to the presentation of the address of President W. D. Mahon. Much had been said in regard to the attitude of certain factions with respect to arbitration. Mr. Mahon said:

"In some cases of arbitration we have been sadly disappointed and our membership affected by the awards very much dissatisfied. And, because of these disappointments and dissatisfaction, there are those who advocate the repeal of our laws on this subject and the abandonment of arbitration entirely. Upon this proposal I would request you to consider well every phase of the proposition before you take any such action."

On the evening of Sept. 14 the delegates attended a dinner at the Powers Hotel. On Sept. 15 the jitney bus and the question of relations with the Brotherhood of Locomotive Engineers were considered. A report was also presented on wages in Europe. The only session on Sept. 16 was in the morning. The question of strike arbitration was referred at that session to the committee on law. A resolution was adopted by the convention providing that the Amalgamated use its influence with legislatures against measures aiming to establish a State constabulary.

FIRST REPORT OF PENNSYLVANIA COMMISSION

The Public Service Commission of Pennsylvania has issued its first annual report, for the year from July 27, 1913, to June 30, 1914, together with the report of the preceding State Railroad Commission from Jan. 1, 1913, to July 26, 1913. Of the fifty-one pending cases turned over to the Public Service Commission, forty-five were finally closed by the latter commission after its organization. Since June 30, 1914, 251 complaints have been filed with the new commission, of which 129 have been finally decided. Nearly all of the remaining ones await the filing of pleadings or the convenience of parties and counsel in arranging times for the hearings. On account of the newness of the commission, the report does not contain any financial statistics of electric railways, but it does include all complaints and orders received and issued during the year.

On the street railways 3161 persons were injured, of which number 170 were killed, the fatalities including fifteen employees, nineteen passengers, twenty trespassers and 116 others. These figures compare with 10,190 persons injured on the steam railroads, of whom 991 were killed. Included in the total number of accidents are twenty-nine persons killed and 222 injured at grade crossings of steam railroads and two killed and seventy injured at grade crossings of street railways. The commission abolished entirely sixty-one grade crossings and in six cases established undergrade crossings and in eight overhead crossings.

SUPERVISOR VOGELSANG AND PRESIDENT LILIENTHAL ON MUNICIPAL OWNERSHIP

The Question of the Purchase of the United Railroads Discussed by the Supervisor—Mr. Lilienthal's Attitude

Supervisor Alexander Vogelsang, chairman of the public utilities committee of the City Council of San Francisco, Cal., was quoted in part as follows in the *San Francisco Examiner* of Sept. 1:

"I believe that the city should take over not only the United Railroads but the California Street line. Let us have it all and have a thorough experiment in municipal ownership. We could do it if the people were willing. We have no definite plan now, but will get together after the election.

"The plan, of course, will take a lot of sound business judgment. We are bound to have trouble. I have had ideas on this subject for a long time. We should have one system in the city. It will save us much trouble in the long run, as the franchises run out in fourteen years, and we will have to prepare to do something then.

"I have no idea of issuing bonds for this project. It will take a charter amendment to permit the city to enter into an agreement with the United Railroads whereby the city might take over immediate operation. It would be my proposal, in a general way, to pay for the system out of the earnings of the lines.

"We might have a commission appointed to determine the value of the physical properties that the city would need and try to determine the value of the unexpired franchises. The aggregate would be the purchase price. If we could get control we could pay off this principal and interest out of the money taken in. We could not permit the road to become a burden to taxpayers."

Jesse Lilienthal, president of the United Railroads of San Francisco, was quoted on the same day in the same paper as follows:

"I have said before that a street railroad is a natural monopoly. I know the city would not feel inclined to sell out to the United Railroads. The alternative is for the United Railroads to sell to the city. As a private citizen I have favored the purchase, just as I favored the Spring Valley purchase. I believe a price could be fixed by some agreement acceptable to both parties if the question were properly approached. There is bound to be trouble as long as the present arrangement is in existence. It would be bad taste for me to offer the United Railroads for sale to the city. But, when the people of San Francisco actually want to go ahead and purchase the United Railroads they will find my door wide open."

NEW YORK LEGISLATIVE INQUIRY

The Thompson legislative investigating committee, which adjourned over the summer, resumed its work of inquiry into the Public Service Commissions of New York on Sept. 8. On that day the members formulated their plan of procedure and began the examination of witnesses on Sept. 9. Referring to the plans of the committee, Senator Thompson, the chairman, said: "We have come here to continue the investigation for which we were appointed, to make an examination of the public service law and transportation acts in order to report to the Legislature. The public service idea of supervision and regulation seems to be an established function of the State. The only way our act has been amended has been by adding new subjects for regulation. Whether public service regulation has been a success is very important to the State. We are anxious to make clear to the public just what our real function is—that it is to give as perfect regulation of public service corporations as is possible."

On Sept. 9 Chairman McCall of the Commission for the First District was questioned about the details of the construction and operating contracts under the dual system. Referring to the extent of the new system Mr. McCall expressed doubt about a 5-cent fare proving adequate. While the present Interborough lines were highly profitable, with the new system in operation the maximum haul would be three times as long as in the present subway. He thought that within five years after the completion of the

present extensive system, the city would again begin to feel the inadequacy of the transportation means in some sections.

DISTRICT OF COLUMBIA POWER ORDER

As a result of the hearings conducted by it on Aug. 25 and 26 into the inter-corporate relations of the Washington Railway & Electric Company and the Potomac Electric Company, the Public Utilities Commission of the District of Columbia is of the opinion that, pending the complete returns from the valuation of the properties now under way, the Washington Railway & Electric Company should among other things be ordered to discontinue the sale of power and the appropriation of revenues therefrom; that the company be ordered until further notice to pay the Potomac Electric Company a reasonable compensation for the power used by it in the operation of its railways based on the contract between the companies dated 1906; that the Potomac Electric Company be ordered to file with the commission rates for the sale of power to all other utilities than the Washington Railway & Electric Company; that the Potomac Electric Power Company be ordered to charge to railways other than the Washington Railway & Electric Company the scheduled rates for power furnished to them, collect the revenue therefrom, and include it in their revenues under the prescribed accounts; that the Potomac Electric Power Company be ordered to reduce its rates to consumers other than public utilities by an amount that will offset the increased amount received from the public utilities under the present proposed order.

It was the opinion of the commission that both companies should have an opportunity at a further public hearing to show cause why orders in conformity with the opinion in the case should not be made by the commission. It was voted by the commission to serve a copy of the opinion on the companies on Sept. 4 and to set a date by Sept. 15 for a further hearing.

WORK BEGUN ON NEW PHILADELPHIA SYSTEM

On Sept. 11 Mayor Blankenburg of Philadelphia turned the first shovelful of earth in the excavation for the Broad Street subway. In the course of his speech the Mayor said:

"We are making history here to-day. The turning of the first shovelful of earth, and thus taking the initial step in the development of our new subway system, appeals to me as one of the most important acts of my official life, for this great engineering work which we to-day inaugurate begins a new era in the life of Philadelphia."

A Merritt Taylor, Director of City Transit, said in part:

"We are gathered here formally to begin the construction of a complete system of rapid transit lines for Philadelphia. The city is committed to the construction of this Broad Street subway and the Frankford elevated by contracts which have been executed. Public necessity will require proper terminal facilities for the gathering and distribution of Broad Street subway traffic, which can only be provided by the construction of a delivery loop.

"The city is committed by force of public necessity and by the requirements of fairness to the people of two important sections to build: A subway leading from the City Hall station of the Broad Street subway northwesterly beneath the Parkway connecting with the North Twenty-ninth Street elevated to be extended to Roxborough. An elevated railway from Thirty-second and Market Streets in West Philadelphia southwestwardly through the Woodland Avenue district.

"You will vote upon the proposed constitutional amendment relating to the city's borrowing capacity at the forthcoming election on Nov. 2. The question of how and by whom these lines will be equipped and operated must soon be determined. It is our plain duty first to offer the right to equip and operate these lines to the Philadelphia Rapid Transit Company upon terms which will protect the existing net income of that company against loss resultant from its co-operation with the city. One great machine will thus be established which will transport passengers quickly and conveniently between all points on the combined system in Philadelphia by the joint use of the surface system and the high-speed system for one 5-cent fare."

PROSPECTS OF NEW DES MOINES GRANT

Final settlement of the Des Moines street car franchise question now seems likely. The question of capitalization, a rock which wrecked the ship of negotiations several times before, is to be left out of the new franchise. The city has agreed to approve a franchise and submit it to the people without fixing the total amount of capitalization if the company will put in the franchise a clause guaranteeing service equal to the best in the country for a city of the size of Des Moines, regardless of whether or not the company can pay dividends.

Emil G. Schmidt, president of the Des Moines City Railway, made a verbal proposition of this nature while in conference with the City Council, and Mayor Hanna, who has fought the franchise, immediately declared it would be satisfactory if such a clause could be inserted. Mr. Schmidt said the franchise already made such provision and, such being the case, the settlement requires only the insertion of a specific clause covering ground already provided for in the present draft. The new grant was recommended to the City Council by a committee of the Des Moines Chamber of Commerce and is in many essentials like the draft which the company proposed to submit to the people last winter but was not voted upon because Mayor Hanna confused the issue with so many technicalities that the legality of the election would have been in question.

It is expected that the Council will be ready to submit the new franchise to the voters within a few weeks. Mr. Schmidt announces that business fell off during the State Fair this year as compared with last. The jitney practically has disappeared from the streets of the city and that institution has passed into history at Des Moines after a checkered local career of about six months.

RHODE ISLAND ARBITRATION HEARINGS

The Rhode Island Company has continued the presentation of evidence in its behalf in the arbitration hearings conducted at Providence. R. Roscoe Anderson, superintendent of transportation, discussed the cost to the company of guaranteeing a seven-hour day for extra men at the minimum rate demanded by the union. The difference in hours between the actual platform time for all extras and trippers and seven hours is 1086.5 hours daily. This at the minimum rate demanded would amount to \$325.95 a day, or \$118,971.75 a year. It is estimated by the transportation department that from 10 to 15 per cent of this increased outlay could be eliminated with revision of assignment schedules, making \$101,126 the net increase in yearly cost on the basis of 15 per cent reduction.

The difference between the amount of work for "report" men and a guaranteed seven-hour daily minimum is 507.5 hours a day. This at the minimum rate demanded would amount to \$152.25 a day, or \$55,892.51 a year. By rearrangement it is estimated that this increase could be reduced 75 per cent or to \$13,892.81, making the total minimum yearly cost to the company in granting the union's demands for a seven-hour daily guarantee for extras, trippers and report men, \$115,019.

C. A. Babcock, controller of the company, submitted a statement showing that in 1915 the motormen and conductors were paid in wages 24.7 per cent of the passenger receipts as compared with 20.98 per cent in 1908. Another exhibit showed that the average wage of 107 power house employees for the year ending June 30, 1915, was \$16.23 a week, compared with \$15.07 for 109 men in 1912. The average weekly pay of fifty-four linemen in 1915 was \$17.81, compared with \$14.38 in 1912 for forty-nine men. The average pay of motormen and conductors of all classes for the week ending Oct. 9, 1914, was \$14.62 for conductors and \$13.95 for motormen. The same comparison as of April 9, 1915, showed \$15.24 for conductors and \$14.83 for motormen. Mr. Babcock stated that the company's operating revenue for 1915 was much lower than for the two previous years, while its operating expenses were practically the same as in 1914. The surplus was \$116,000 less in 1915 than in 1914. Since 1908 the company has expended \$4,518,200 in the improvement of its physical property. Another statement showed a reduction in traffic on the Pawtucket division by 230,000 revenue passengers from 1913 to 1914, although the trans-

fer passengers had increased by 157,000. On this division, in 1915, there were 7,335,142 revenue passengers and 1,609,701 transfer passengers, so that in the past two years on that division alone the revenue passengers have dropped off by 317,000 and the transfer passengers have increased by 200,000.

In the last fiscal year the company gave its employees 2,199,260 free tickets, a substantial factor in their living cost. An exhibit was also presented showing increased earnings for spare conductors and motormen on thirteen divisions. For the week ended Oct. 9, 1914, 164 spare conductors earned an average of \$11.25 and 168 spare motormen earned an average of \$11.10. For the week ended April 9, 1915, 151 spare conductors averaged \$12.82 and 142 spare motormen \$14.18. The passenger income fell off \$267,000 this year and freight earnings dropped \$9,000. The percentage of freight revenue paid motormen, conductors and trainmen in that department was higher in 1915 than ever before, and the wages paid other employees of the freight and express department are the highest in the company's history.

REPORT OF GEORGIA RAILROAD COMMISSION

The Georgia Railroad Commission during its forty-second year of activity, ended Dec. 31, 1914, made final disposition of 598 petitions, complaints or subjects requiring formal action or order, this record showing a decrease of twenty cases as compared to the preceding year. This decrease is said by the commission to be caused by two factors—namely, the lessened volume of business done by utilities during the last four months of 1914 on account of the general business depression brought about by the European war, and to the much improved and more cordial relations now existing in Georgia between public utilities and the people served.

The net earnings of all public service corporations in Georgia for 1914 exceeded those of 1913 by \$1,773,713. The depressing effects of the European war were appreciably felt by all public service corporations, although not to the extent experienced by steam railroads. The financial returns of street railway, power, gas and electric light companies for 1914 showed an improvement, although the extent to which these companies shared in the general improvement is not capable of determination on account of the lumping of the statistics.

The street railways in the State carried 105,585,000 passengers during the year, without one passenger or employee being killed. Nine other persons were killed and 302 injured, however, while 994 passengers were injured and 129 employees injured, a total accident list of 1434, as compared to 1435 in 1913. The total number of persons killed and injured on steam railroads during 1914 was 1281 as compared to 2713 in 1913.

Seattle City Railway Transfer Plan Vetoed.—Mayor Gill of Seattle, Wash., has vetoed the ordinance offering transfers between Division A of the municipal car line and a private auto bus line running beyond the outer end of the line. The Mayor declared that the scheme would only add to the losses of the city car line, and make the city liable for damages incurred on the buses.

Alexandria Line Formally Taken Over by City.—The city of Alexandria, La., which recently purchased the Alexandria Electric Street Railway from the receiver has assumed charge of the system, which will be under the immediate supervision of Commissioner of Streets and Parks Irving McGinnis. Superintendent I. B. White, who has heretofore had the management of the system, will be retained as manager.

Automobile Chamber of Commerce on Jitneys.—At a meeting of the Automobile Chamber of Commerce in New York the traffic committee rendered a report of the shipment of cars during August, indicating that almost double the number of the previous year left the factories in that month. The figures were 15,141 carloads for last month, as compared with 8352 in August of last year. One account of the meeting says: "It was shown that the so-called jitney bus is a convenience that the public appreciates and a number of the street car companies are themselves organizing jitney bus lines as feeders to their regular traction business.

Conditions in Mexico City.—The New Orleans *Picayune* says that Francisco Villavicencio, Constitutionalist consul in

that city, has received a cablegram from Mexico City, Mex., as follows: "The employees of the Mexico City Tramway have been granted an increase of 31 per cent in wages and all cars in the city are now being operated. The Constitutional government advanced the company the funds necessary to meet the increase in wages for one month. The government will examine the company's books to ascertain if a permanent increase in wages is warranted by the revenues. Credit for the settlement of the strike is due entirely to Gen. Pablo Gonzales."

Municipal Ownership of Ontario Lines Recommended.—Definite steps for the acquisition of the street railway lines in Windsor, Walkerville and Sandwich, Ont., by the municipal interests will shortly be taken if a recommendation of the Ontario Hydroelectric Power Commission meets with the approval of the Councils of the three townships. The commission recommends that no further franchises be granted, and has urged that the construction of additional lines on streets where no franchises exist be commenced as early as practicable, these lines to be used at hydro-radials until the existing system has been taken over.

Massachusetts Companies Ordered to Give Notice of Changes in Signal Practice.—The Massachusetts Public Service Commission has ordered each railroad and street railway within its jurisdiction to give the board formal notice whenever such a company (1) purposes to install interlocking, block or special signals at any point on its lines in Massachusetts, stating the location and type of signal proposed; (2) whenever it is proposed to make any change in the location or type of interlocking, block or special signals, stating the location and change proposed; (3) when it is purposed to make any changes in the rules or regulations governing the use and operation of interlocking, block or special signals.

Supplementary New Haven Bill.—A supplementary bill of particulars has been filed by Assistant United States Attorney General Frank M. Swacker, in compliance with Judge William H. Hunt's order of Aug. 24, in the Federal District Court. The supplementary bill was requested by William Rockefeller and twelve other officers and directors of the New York, New Haven & Hartford Railroad so as to enable them to answer the indictment charging them with engaging in a conspiracy to monopolize interstate trade and commerce in violation of the criminal provisions of the Sherman anti-trust law. It is said that the government expects to bring the case to trial at the October term of the criminal branch of the United States District Court.

Toledo Rail-Light Team Holds Brooklyn Scoreless.—The fast Toledo Rail-Light Club, composed of employees of the Toledo Railway & Light Company, Toledo, Ohio, had the distinction on Sept. 10 of holding the pennant-chasing Brooklyn National League Club to an eleven inning scoreless tie. Jimmy Baxter, who pitched for Toledo, went the entire distance. He allowed only four hits and had eight strike-outs to his credit. Twice when the Brooklyns had men on third base with two out, Baxter whiffed the third man. Toledo was given a chance to see the veteran Coombs in action for Brooklyn. He pitched three innings. Dell and Appleton also were on the mound for Brooklyn. Nearly all the Brooklyn regulars were in the line-up.

Service on Electrified Philadelphia Line.—Regular electric service on the main line of the Pennsylvania Railroad between the Broad Street station, Philadelphia, Pa., and Paoli, was successfully inaugurated on Sept. 11. The first passenger train in the new service left Paoli at 5:55 o'clock in the morning, reaching Broad Street three-quarters of an hour later, on schedule time. Only one electric train will be operated on the line for the present. It will make four round trips every day. Electrification of the Chestnut Hill Line will begin immediately. The training of men for the Paoli service was described and illustrated in the *ELECTRIC RAILWAY JOURNAL* of May 22, 1915, page 970, while the installation itself was dealt with in an illustrated article which appeared in the issue of this paper for April 18, 1914, page 860.

Cleveland Smoke Abatement Report.—E. P. Roberts, engineer and former smoke inspector of Cleveland, Ohio, reported to a Council committee on smoke prevention re-

cently that it would require between \$20,000,000 and \$30,000,000 to electrify the railroads in and near Cleveland. P. T. White, division superintendent of the Big Four Railroad, told the committee that the smoke nuisance was due more to industrial plants than to the railroads. While Cleveland was a growing city, the railroads could not authorize the expenditure of such a vast sum of money as would be required to electrify them. S. D. Robertson, division superintendent of the Pennsylvania Railroad, said there are three industrial locomotives to one road locomotive in Cleveland. J. J. McNeil, representing the Erie Railroad, stated the attitude of that company.

Light Signals for Chicago, Milwaukee & St. Paul.—The Chicago, Milwaukee & St. Paul Railway has recently awarded a contract to the Union Switch & Signal Company for 130 miles of single-track, a.c., track-circuit signaling in Montana between Lennep and Three Forks, and between Piedmont and Finlen—these being portions of the new 3000-volt electrified territory. The signal transmission line is to be 4400 volts, 60 cycle, and will be supplied with power from three substations in the Lennep-Three Forks section, and from two substations in the Piedmont-Finlen section. Light signals with the lowest lens 16 ft. above rail level will be employed, these being of the Model 14 type with 10-in. lenses, giving indications by colored lights. Of the signals, 109 will have three lenses, and fifteen will have two lenses. The impedance bonds will have a capacity of 500 amp. per rail except at special locations where 1500-amp. bonds are to be used. The track relays will be of the new two-element, Model 15 vane type. Preparations for the installation of this material are now under way.

Trainmen Participate in Cash Distribution.—J. R. Harigan, general manager of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., announced in July that \$100 would be distributed to trainmen from whose cars no accidents were reported during August. During the previous months the business of the company suffered through excessive rainfall and high water; but in August, with fair weather, the gross receipts were \$65,525, the largest in the history of the road. Despite this large business there were only four minor accidents. All but eight of the trainmen, therefore, participated in the distribution of the \$100, which was divided under a plan based on the number of days each trainman had worked. The amounts received varied from \$1.24 to \$2.53—not very much, perhaps, but gratefully received, and a definite reward for extra care. A standard of accident-avoidance was set, to which the attention of the trainmen was called in September, with the suggestion that certainly they could do as well again. The distribution of money was confined, however, to August.

Pacific Electric Railway's Attitude Toward Elevated.—Paul Shoup, president of the Pacific Electric Railway, Los Angeles, Cal., asked the Board of Public Utilities for sixty days in which to ascertain whether he can raise the money to build the proposed elevated track from Los Angeles to San Pedro Street. The cost of the proposed elevated is estimated by the company at \$250,000. Mr. Shoup said that the company now faces obligations for street improvements amounting to \$514,000. Before the end of the year he declared this amount would probably be swelled to \$700,000. That the earnings of his company were but \$6,875,000 for the fiscal year ended June 30, 1914, as against \$7,328,000 for the year ended June 30, 1913, was stated by Mr. Shoup as proof of the concern of the company about making outlays for improvements. The Board of Public Utilities has issued what is in effect an ultimatum to the Pacific Electric Railway to build the elevated track from the rear of its station at Sixth and Main Streets, extending from Los Angeles to San Pedro Streets, to connect with the municipal railway, which the board wants the railway company to use more freely for an outlet for its interurban lines now run over Main and Hill Streets.

\$860,000 Station Finish Contract.—The Public Service Commission for the First District of New York has awarded the contract for station finish on the Jerome Avenue and White Plains Avenue rapid transit lines to the Altoria Realty & Construction Company, the lowest bidder,

for \$860,636. The Jerome Avenue line is a three-track elevated railroad branching off from the Lexington Avenue subway at 138th Street and Park Avenue and running north through River Avenue and Jerome Avenue to Woodlawn Road. It will also be connected with the west side elevated system by a line to be built through 162nd Street and eventually will be operated both by trains from the elevated lines and trains from the Lexington Avenue Subway. The White Plains Road line is a three-track elevated extension of the Lenox Avenue branch of the existing subway and runs from Bronx Park or 180th Street north through White Plains Road to 241st Street, near the northern boundary of the city. The steel structure on both lines is more than half completed and ready for the station finish. Both lines will be operated by the Interborough Rapid Transit Company under the dual system contracts. The contractor is allowed six months to finish each station, but must begin work within thirty days after notification by the commission's engineer that a station is ready for the finish.

Yonge Street Case Decided.—The Ontario Railway & Municipal Board has handed down a decision in favor of the Toronto Railway in the Yonge Street extension case. The board issued an opinion to the effect that the company had the right to extend its Yonge Street tracks north from the present terminal to the much contested point above the Canadian Pacific Railway tracks. The chairman, in the judgment, states that the opinion of the board will be backed up by an order requiring the company to lay tracks on Yonge Street to cover the space caused by the removal of the Metropolitan Railway tracks by the city. The board finds that as a fact that the equipment, appliances and service of the Toronto Railway in respect to the transportation of persons along the portion of Yonge Street shown on the plans filed are inadequate, and the board is of the opinion that the Toronto Railway should be required to construct, maintain and operate an extension of its existing lines northerly on Yonge Street with facilities for branching at Woodlawn Avenue, as shown on the plans filed. On June 29 the Board of Control of Toronto instructed Works Commissioner Harris to tear up the remainder of the tracks of the Toronto & York Radial Railway's Metropolitan Division on Yonge Street south of Farnham Avenue, claiming the franchise had expired and that the sale of the Metropolitan to the Toronto Railway included only physical property. The case was referred to at length in the *ELECTRIC RAILWAY JOURNAL* of July 3, page 36.

PROGRAMS OF ASSOCIATION MEETINGS

Illinois Electric Railways Association.

The regular meeting of the Illinois Electric Railways Association which was to have been held on Sept. 17 has been postponed until a date not yet fixed, but which will be after the San Francisco convention of the American Electric Railway Association. It is planned to review at the Illinois association meeting some of the subjects discussed at the national convention.

Colorado Electric Light, Power & Railway Association

The following program of papers of interest to electric railways has been announced for presentation at the meeting of the Colorado Electric Light, Power & Railway Association at Colorado Springs on Sept. 23, 24 and 25:

"Valuation of Public Utility Properties," by F. J. Rankin, engineer of the Colorado Public Utilities Commission, Denver, Col.

"A Uniform System of Accounting," by Fred W. Herbert, auditor of the Colorado Public Utilities Commission, Denver, Col.

"The Indeterminate Franchise and the Certificate of Public Convenience and Necessity," by M. H. Aylesworth, member and attorney of the Public Utilities Commission of Colorado.

"Depreciation as Affecting Valuation and Assessment," by Daniel W. Knowlton of Smith, Knowlton & Hatch, attorneys, Colorado Springs, Col.

"Present-Day Street Railway Problems," by W. N. Casey, Denver (Col.) City Tramway.

All of these papers will be presented at the sessions on Sept. 24.

Financial and Corporate

ANNUAL REPORTS

Third Avenue Railway

The consolidated comparative statement of income, profit and loss of the Third Avenue Railway, New York, N. Y., for the years ended June 30, 1914 and 1915, follows:

	1915	1914	Change
Operating revenue:			
Transportation	\$10,565,027	\$10,456,705	+\$108,322
Advertising	95,250	103,000	—7,750
Rent of equipment	16,470	27,280	—10,809
Rent of tracks and terminals	73,441	72,882	+558
Rent of buildings and other property	84,710	85,447	—736
Sale of power	50,959	112,900	—61,941
Total operating revenue...	\$10,885,859	\$10,858,216	+\$27,643
Operating expenses:			
Maintenance of way and structures	\$925,973	\$1,012,646	—\$86,672
Maintenance of equipment...	678,573	713,003	—34,429
Depreciation accruals	562,958	511,250	+51,708
Power supply	779,458	779,130	+327
Operation of cars	2,914,525	2,849,929	+64,595
Injuries to persons and property	602,798	614,609	—11,810
General and miscellaneous expenses	511,890	526,466	—13,576
Total operating expenses...	\$6,976,179	\$7,006,035	—\$29,855
Net operating revenue.....	\$3,909,680	\$3,852,180	+\$57,499
Taxes	731,034	730,784	+250
Operating income	\$3,178,646	\$3,121,396	+\$57,249
Interest revenue	81,127	75,215	+5,912
Gross income	\$3,259,773	\$3,196,611	+\$63,161
Deductions from gross income	2,565,730	2,570,305	—4,575
Net income	\$694,043	\$626,306	+\$67,737

NOTES:

Interest on certificates of indebtedness of the Dry Dock, East Broadway & Battery Railroad has not been included in the accounts since Feb. 2, 1908.

Operations of the Mid-Crosstown Railway are included for the entire fiscal year ended June 30, 1915, and from April 17 to June 30, 1914.

Operations of the Pelham Park & City Island Railway are included in the fiscal year of 1915 only.

The net earnings for the last two years have been less than could have been reasonably anticipated. First, because in the last two years there was an abnormal series of snow storms, which cost the company at least \$300,000, and in the year which has just expired there has been a decrease caused by the general depression of business and the necessity which the people feel for economy. This is further evidenced by the fact that the applications for employment during the year were at least twice as large as during any previous year in the present administration and as a whole from a better class of men. Nevertheless, the fact that the earnings should have reached in these two unpropitious years so large a sum justifies the conclusion that the interest on the adjustment bonds may be considered hereafter as certain to be earned and paid by the company.

The report contains interesting statements showing the amount of expenditures which can be immediately foreseen, nearly the whole of which should theoretically be expended during the year 1916. They aggregate a very large sum and only a small part of the expenditures put down for 1915 have as yet been made, though it must be added that ultimately all of them must be made. An examination of these budget statements will show that they embody (a) the cost of certain extensions, \$560,000 for upper Broadway and \$250,000 for an extension of the City Island line. (b) The cost of certain new cars. (c) The cost of repaving and relaying the tracks in certain streets under which the city has been building subways. (d) The cost of relaying the track and repaving part of Third Avenue and Fifty-ninth Street, which has been or will be ordered by the Public Service Commission, and, like the previous item, is compulsory. President Whitridge includes these figures because it is not generally understood how powerless a street railway company is to control its own expenses and because so much has been said about dividends.

In regard to dividends President Whitridge says:

"If those budget statements were to be taken literally it would seem to be impossible that the expectations the stockholders have entertained in respect to dividends should

not be disappointed. They are not, however, to be taken literally, because they are based, in a large part, upon the work proposed to be done by the city, and what the city officials say they are going to do and what the city actually does are found to be quite different things. In the long run the company would probably be better off if all of these expenditures were paid out of the earnings of the company and if no more money were borrowed through the issue of bonds. In last year's report it was said that dividends should only be paid when the money is in the bank with which to pay them, and there is no immediate prior claim upon it. I think that this condition will be met within a measurable time, and I hope and expect that if there be no material decrease in net earnings it will therefore be possible to declare and pay a dividend within the next twelve months."

The benefit association after six years of existence has to its credit in cash and securities \$86,198. During the year ended Dec. 31, 1914, there was paid out to 625 members for relief \$13,702, and during that period the association physician treated more than 1300 cases. Since the insurance feature of this work went into effect on Dec. 25, 1913, there have been twenty-six deaths, the beneficiary in each case receiving \$1000.

Interborough Rapid Transit Company

The comparative statement of income, profit and loss of the Interborough Rapid Transit Company, New York, N. Y., for the years ended June 30, 1914 and 1915, follows:

	1915	1914
Gross operating revenue.....	\$33,433,742	\$33,515,395
Operating expenses	12,941,314	12,902,053
Net operating revenue.....	\$20,492,428	\$20,613,342
Taxes	2,133,980	2,081,948
Income from operation.....	\$18,358,448	\$18,531,394
Non-operating income.....	623,631	612,852
Gross income	\$18,982,079	\$19,144,246
Income deductions	10,913,595	11,119,666
Net corporate income for the year.....	\$8,068,484	\$8,024,580
Surplus, June 30, 1914, and June 30, 1913	15,214,403	13,072,956
Tax refunds and other credits.....	17,477	23,059
Totals	\$23,300,364	\$21,120,595
Taxes prior years, amortization, capital retirements and other charges.....	\$791,255	\$656,192
Dividends	7,000,000	5,250,000
Total appropriations	\$7,791,255	\$5,906,192
Profit and loss—surplus.....	\$15,509,109	\$15,214,403

The gross earnings for the fiscal year ended June 30, 1915, were substantially the same as last year. The present year witnessed the first interruption in the annually recurring increases in the gross earnings since the opening of the subway for operation. This was caused by the general business depression of the country. The gross operating revenue for the year was \$33,433,742, as compared to \$33,515,395 last year, a decrease of \$81,652, or 0.24 per cent, the result of a gain on the subway division of \$283,237, or 16.1 per cent, and a loss on the Manhattan Railway elevated division of \$364,889, or 2.29 per cent. The increase in the earnings of the subway division was largely caused by a substantial gain in traffic in that portion of Bronx Borough served by this division, and also by the increased business in the shopping and amusement district at Grand Central and Times Square Stations. The decrease in the earnings of the Manhattan Railway elevated division was caused by the general depression in business conditions throughout the city; the curtailment of activities among manufacturing establishments along the Second and Third Avenue lines and the falling off of foreign travel which especially affected the Ninth Avenue line.

The operating expenses were \$12,941,314 as compared to \$12,902,053 last year, an increase of \$39,261, or 0.30 per cent, the result of an increase on the subway division of \$31,252, or 0.50 per cent, and an increase on the Manhattan Railway elevated division of \$8,008, or 0.12 per cent. The amount charged to operating expenses and credited to depreciation reserve was \$230,719 more than the previous year, whereas the expenditures for maintenance showed a decrease of \$152,467, resulting in a net increase in charges for both depreciation and maintenance of \$78,252. Owing to the changing conditions in the distribution of the density of traffic,

throughout the non-rush hours on both the subway and elevated divisions, it was found necessary and expedient in furnishing service amply sufficient to meet the needs and comfort of the traveling public to increase the car mileage on the subway division to the extent of 2,010,943 car miles, and on the elevated division by 551,202 car miles. This increase in car mileage was responsible for an increase in the cost of transportation amounting to \$89,142.

The net operating revenue was \$20,492,428, as compared to \$20,613,342 last year, a decrease of \$120,913, or 0.58 per cent, the result of a gain on the subway division of \$251,984, or 2.21 per cent, and a loss on the Manhattan Railway elevated division of \$372,898, or 4.04 per cent. The total amount of taxes was \$2,133,980, as compared to \$2,081,948 last year, an increase of \$52,031, or 2.50 per cent, the subway division showing an increase of \$56,183, or 14.55 per cent, and the Manhattan Railway elevated division a decrease of \$4,151, or 0.24 per cent. The long litigation involving the constitutionality of the State tax law, which had been held to impose a tax upon the company with respect to its subway operation, measured by a percentage of its earnings from that operation, was concluded this spring by a decision of the United States Supreme Court upholding the statute in question as constitutional and confirming the assessments. The taxes due under the disputed provision had been paid, however, so that this adverse decision made no unexpected drains upon the treasury.

The income from operation decreased \$172,945, or 0.93 per cent, there being a gain on the subway division of \$195,801, or 1.78 per cent, and a loss on the Manhattan Railway elevated division of \$368,746, or 4.90 per cent. The non-operating income increased \$10,778, or 1.76 per cent, principally because of the increase in interest on bank balances and loans. The gross income decreased \$162,166, or 0.85 per cent, the result of a gain on the subway division of \$127,166, or 1.10 per cent, and a loss on the Manhattan Railway elevated division of \$289,333, or 3.81 per cent. Income deductions decreased \$206,070, or 1.85 per cent, a variation incident to the refunding operations effective Nov. 1, 1913.

The surplus over dividends of 20 per cent (including extra dividends of 10 per cent) on the capital stock was \$1,068,484. On the basis of 10 per cent dividends for one year the surplus for 1915 would be \$4,568,484, as compared with \$4,524,580, a gain of \$43,904 in surplus over the previous year. The directors declared extra dividends amounting to 10 per cent during the year payable out of surplus, notwithstanding which there was an increase of \$294,705 in the profit and loss surplus during the year.

The number of passengers carried was 647,378,266 compared with 651,886,671 last year, a decrease of 4,508,405, or 0.69 per cent, the result of a gain on the subway division of 5,172,646, or 1.52 per cent, and a loss on the Manhattan Railway elevated division of 9,681,051, or 3.11 per cent. The subway division continues to reap the benefit of real estate development along streets and avenues contiguous thereto, while the traffic on both divisions reflects the prevailing business depression.

For maintenance of the structures and roadway of both divisions the sum of \$1,545,949 was expended. This compares with \$1,758,051 thus expended in 1914. The expenses for maintenance of equipment totaled \$2,002,095 for the last year as compared to \$1,942,461 for the preceding year. The total maintenance appropriation, including depreciation, was \$4,109,260 in the last year and \$4,031,008 the year before. Expenditures for additions and betterments during the last year aggregated \$24,274,028, including payments made during the year on account of construction and equipment of new subways and elevated third-tracking, extensions and power plant improvements.

In an interesting summary the annual report states that since 1908 the gross earnings have increased from \$24,699,505 to \$33,433,742 in 1915, or \$8,734,237, equal to 35.36 per cent. The net operating revenue has increased from \$13,976,810 in 1908 to \$20,492,428 in 1915, or \$6,515,618, equal to 46.62 per cent. The net corporate income has increased from \$3,700,659 in 1908 to \$8,068,484 in 1915, or \$4,367,825, equal to 118 per cent. For 1908 the ratio of net corporate income to gross earnings was 14.99 per cent. For the year 1915 it was 24.13 per cent, a gain of 9.14 per cent. Expressed in terms of dollars and cents this means that in 1908 out of

each \$100 of gross earnings \$14.99 was saved for net corporate income, while in 1915 out of each \$100 of gross earnings an amount of \$24.13 was saved for net corporate income.

This result has not been attained at the expense of "up-keep" of the property and rolling stock, for the following table reflects the amount of money appropriated for this purpose out of each \$100 of gross earnings for each fiscal year since 1908.

1908.....	\$12.75	1912.....	\$14.27
1909.....	11.56	1913.....	13.85
1910.....	11.00	1914.....	12.03
1911.....	13.92	1915.....	12.29

The large appropriation for maintenance for 1911, 1912 and 1913 was caused by the fact that during this period \$1,005,050 was absorbed in the operating expenses of the subway division for the installation of electro-pneumatic brakes, new drawbars, coasting recorders and for reinforcing copper sheathed cars, and \$286,000 was spent on the elevated lines for installing line switches, conductors, emergency valves and coasting recorders. In addition to taking care of these extraordinary expenditures in maintenance expense, there has been set up a reserve for depreciation out of operating expenses, since 1909, amounting to \$2,292,637.

During this period of eight years the cost of production, as measured by the ratio of transportation expense to gross earnings, has been reduced as follows:

	Per Cent		Per Cent
1908.....	25.89	1912.....	23.50
1909.....	24.43	1913.....	22.80
1910.....	23.24	1914.....	22.46
1911.....	23.89	1915.....	22.79

This reduction in relative cost of operation has been accomplished notwithstanding that during this period the rate of pay of practically all employees was substantially increased, while the cost of material has also shown a general upward trend. This improvement resulted from improved train service and the economies which have followed the installation of improved machinery and certain improvements to the physical property, making possible the operation of ten-car trains.

The ratio of fixed charges (including taxes) to gross earnings has been reduced from 43.95 per cent in 1908 to 39.02 per cent in 1915, as follows:

	Per Cent		Per Cent
1908.....	43.95	1912.....	41.54
1909.....	44.57	1913.....	40.58
1910.....	42.45	1914.....	39.39
1911.....	42.32	1915.....	39.02

This reduction in relative fixed charges was, in a large measure, caused by the increasing density of traffic with its resultant increased earnings per train and car mile. When such reduction, however, is considered in conjunction with the marked reduction in cost of production, as measured by transportation expenses, it illustrates that such additional capital expenditures as have been made for improving the property and equipment have contributed their full quota of economies to the general result that has been obtained.

The payments in claims, suits and judgments were \$320,660 in 1915 and \$296,414 in 1914, while the expenses of the claim department totaled \$195,056 and \$160,148, making the respective totals \$515,716 and \$456,563. The increase over last year (\$59,153) is approximately the same amount as the decrease (\$58,995) of 1914 under 1913. The total disbursements for 1915 (\$515,716) were exactly \$158 more than the total for 1913 (\$515,558). The number of actions against the company continues to increase notwithstanding the policy of settlements without litigation. While the plaintiffs in these suits were successful in even a smaller percentage of the cases tried this year than last, the expenses necessarily increase in proportion to the volume of cases tried. The disbursements for claims, suits and judgments amounted to 0.96 per cent of the gross operating revenue and the expenses were 0.58 per cent, making an aggregate for the year of 1.54 per cent as compared with percentages amounting to 1.36 last year and 1.58 the year before.

EARNING POWER ESTIMATED

United Railways Investment Company Shows Increased Earnings as Based on Equities in Estimated Surplus of Subsidiaries

As the annual report and other statements of earnings of the United Railways Investment Company, San Francisco, Cal., include in income only the actual dividends received on securities owned, the real earning power of the company is not actually shown as would be the case were it an operating instead of a holding corporation. It owns the entire equity in the United Railroads of San Francisco, but as this company pays no dividends, the earnings being used to pay off underlying bonds, the surplus earnings do not show in the income statement of the holding company. The United Railways Investment Company also owns a large part of the equity in the Philadelphia Company, Pittsburgh, Pa., and its subsidiaries, but in this case also there is shown only the amount actually received in dividends, and not the large equity in the annual surplus of the Philadelphia Company remaining after dividends have been paid.

As an indication of this earning power, an income statement of the United Railways Investment Company has been prepared for the year ending March 31, 1916, based on its equity of approximately 62 per cent in estimated earnings of the Philadelphia Company, as follows:

	1916	1915
Earnings on Philadelphia Company stock owned*	\$3,146,000	\$2,347,400
Other dividends, interest, etc.	176,510	176,510
Total income	\$3,322,510	\$2,523,910
Expenses	77,737	77,737
Net earnings	\$3,244,773	\$2,446,173
Interest charges	1,182,168	1,182,168
Preferred dividends	800,000	800,000
Balance for United Railways Investment Company common stock	\$1,262,605	\$464,005

*Partly estimated. Includes four months' actual earnings.

This would indicate that from its equity in the Philadelphia Company and the latter's subsidiaries and other dividends and interests, the United Railways Investment Company would earn on its \$20,400,000 of common stock for the year ending March 31, 1916, about 6.2 per cent. The large gains shown in the earnings accruing from the Philadelphia Company and its subsidiaries arise from the increased revenue coming to these companies from the material improvement in the industrial situation in the Pittsburgh district. It is stated that if the equity in the earnings of the United Railroads of San Francisco were included in the above estimate, the showing for the stocks of the United Railways Investment Company would be much larger. It is believed that its securities have an intrinsic value well in excess of their present market value, and that in time a plan will be evolved which will permit funding of the dividends now in arrears on the company's preferred stock, so that it may be placed in position again to receive regular dividends.

PRELIMINARY STATEMENT ISSUED

A preliminary income statement of the Aurora, Elgin & Chicago Railroad, Wheaton, Ill., for the year ended June 30, 1915, shows a decided falling off in revenue as compared with the preceding fiscal year. The annual meeting of the company will be held Oct. 19, when a complete report of the operations for the year will be presented. For the fiscal year the gross earnings decreased \$130,483, and the net earnings were lower by \$92,248. Taxes and interest charges increased \$13,038 and the charges for amortization and depreciation were \$45,569, as compared with \$4,236 the preceding year. There was a balance for dividends of \$165,565 as compared with \$312,184 for the preceding year. The balance was equal to 5.34 per cent on the \$3,100,000 of preferred stock, on which quarterly dividends of 1½ per cent are being paid, so the company had to encroach slightly on its accumulated surplus to provide for the distribution on the preferred.

GALVESTON-HOUSTON PASSES DIVIDEND

Generally Unsatisfactory Business Conditions, Jitney Competition and Damage Done by Recent Storm Lead Company to Conserve Cash Resources

The directors of Galveston-Houston Electric Company, Galveston, Tex., have declared a semi-annual dividend of \$3 per share on the preferred stock, payable on Sept. 15, 1915, to stockholders of record on Sept. 11, 1915. The dividend normally payable on the common stock on the above date, however, has not been declared. Since March, 1914, semi-annual dividends of \$3.50 per share have been paid on the common stock.

According to an official statement from the board of directors, the passing of the dividend on the common stock at this time is chiefly caused by the loss in earnings on account of the operation of jitney buses in Houston during a period when business conditions have been generally unsatisfactory. Another burden has been added by the recent storm which swept the Texas gulf coast cities, causing an interruption of service which will be reflected in a temporary reduction of the company's earnings and necessitating unusual expenditures for rehabilitation.

In the directors' opinion a careful study of jitney operation throughout the country gives every indication that such cars, under fair and reasonable regulation, cannot be operated permanently and profitably in competition with street railways. Jitney operation in Galveston has been negligible and a regulatory ordinance is being enforced. In Houston jitneys have been operating without regulation for about nine months, rapidly increasing in number until during the last three months more than 750 automobiles have been in operation. A regulatory ordinance was passed in June, but was not enforced until Sept. 1, since which date the number of cars in operation has decreased materially.

In regard to the recent storm, the directors state that the damage was more serious to the interurban line than to the properties in Galveston and Houston. Service in Galveston and Houston is now practically normal. On the interurban line, while the concrete arched section of the causeway across Galveston Bay remained intact, about a mile of that portion constructed of concrete side walls with sand filling was destroyed. This caused a suspension of through service into Galveston for sixteen days. A two-hour schedule, however, is now being maintained over temporary trestles, and it is expected that normal hourly service will be re-established shortly. Reconstruction is progressing as rapidly as possible.

The company is said to be at present in a strong position financially and it has a substantial cash balance and practically no floating debt. With the enforcement of the regulatory ordinance in Houston and the resumption of normal through service on the interurban line, the earnings should show gradual improvement. Under present conditions, however, the directors felt that the cash resources should be conserved.

Ashland Light, Power & Street Railway Company, Ashland, Wis.—The Wisconsin Railroad Commission has authorized the Ashland Light, Power & Street Railway Company to sell \$100,000 of first mortgage 5 per cent bonds at not less than 75 to defray the cost of building a 1500-kw. turbine plant in Ashland.

Electric Investment Company, New York, N. Y.—On Sept. 1 a deed was filed in the office of the county recorder at Boise, Idaho, conveying the property formerly owned by various subsidiaries of the Idaho Railway, Light & Power Company to the Electric Investment Company, into which all the large power, light and transportation interests in Idaho except the Boise Railroad were recently merged. The Electric Investment Company was incorporated under Delaware laws in January, 1915, with \$50,000 of authorized capital stock, all of which is owned by the National Securities Corporation. This latter company, which is controlled by Electric Bond & Share Company interests, is the one that was authorized by the Idaho Public Service Commission to effect the amalgamation of the various properties in Idaho, as mentioned in the *ELECTRIC RAILWAY*

JOURNAL of June 19. The property of the Idaho Railway, Light & Power Company was sold under foreclosure sale in Boise on June 14 for \$4,542,759, the upset price, to the Electric Investment Company, the purchasing corporation for the National Securities Corporation. Among the properties now transferred by deed are the Boise Valley Railway properties, the Boise & Interurban property, the Nampa-Caldwell extension and the Caldwell offices, station and grounds.

Hudson & Manhattan Railroad, New York, N. Y.—The Hudson & Manhattan Railroad has been authorized by the Public Service Commission for the First District of New York to issue \$615,000 of first lien and refunding mortgage bonds of 1913 to reimburse the treasury for expenditures made for additions and betterments, \$212,000; to retire underlying mortgages, \$50,000, and to make payments on rolling stock, \$255,000. The commission closed the hearing on this petition and reported favorably in the record time of half an hour.

Phoenixville, Valley Forge & Stafford Electric Railway, Phoenixville, Pa.—At a meeting on Sept. 4 stockholders representing 75 per cent of the shares agreed to the sale of the Phoenixville, Valley Forge & Stafford Electric Railway to the Philadelphia & Western Railway, Upper Darby, Pa. It is said that work will be begun soon on the building of a line from Valley Forge to Bridgeport, where it will connect with the Philadelphia & Western Railway's line to Sixty-ninth Street.

Portland Railway, Light & Power Company, Portland, Ore.—Completion of the refinancing plan of the Portland Railway, Light & Power Company, whereby \$1,250,000 of new capital is obtained by the withdrawal of common stock and the issue of preferred in its place, was marked by a certificate issued on Sept. 2 by Corporation Commissioner Schullerman, authorizing the plan. A. T. Huggins, treasurer of the company, stated that all the holders of common stock had completed their payments of \$25 per share on the stock canceled, and had received the like amount of preferred at the premium stated. "The commissioner's certificate is the final step," said Mr. Huggins. "The negotiations for the new money were practically completed on June 30, but about \$200,000 of stock was still outstanding. This was taken up by a syndicate, however, which allowed the program to go forward until all the stock to be retired was sent in." The readjustment plan was described in detail in the *ELECTRIC RAILWAY JOURNAL* of May 1. The plan involved the cancellation of \$5,000,000 of the \$25,000,000 common stock issue and the authorization of \$5,000,000 of first preferred and \$5,000,000 of second preferred stock, half of each to be now retained in the treasury.

Tulsa (Okla.) Traction Co.—The Tulsa Traction Company, incorporated in August with \$100,000 of capital stock to succeed the Oklahoma Union Traction Company, which as stated in the *ELECTRIC RAILWAY JOURNAL* of Feb. 13 was sold at receiver's sale on Feb. 5, has completed its reorganization of the city lines in Tulsa, according to A. J. Biddison, vice-president of the company. In the charter obtained by the reorganized company it is set forth specifically that the main purpose of the corporation is to extend the lines of the company to Sapulpa, Collinsville and Okmulgee. The line to Okmulgee will go by the way of Bixby, and from there a branch line will be extended to Broken Arrow. By the terms of the charter the company also is authorized to operate street car lines in Sapulpa, Okmulgee and Collinsville. The company now operates 6 miles of single track and reaches Orcutt Lake. The officers are G. C. Stebbins, president; A. J. Biddison, vice-president; I. F. Crow, secretary, and B. C. Redgrove, superintendent.

Union Traction Company, Santa Cruz, Cal.—W. R. Porter, W. J. Dutton, Fred Beaver, all of San Francisco; W. T. Netherton, San José, and J. W. Forgeus, Williams, have been appointed as the protective committee for the bondholders of the Union Traction Company. A previous item regarding this company was published in the *ELECTRIC RAILWAY JOURNAL* of Aug. 28. It is reported that the company defaulted in the payment of interest on \$613,000 of bonds, due the first of this month.

Wilmington Southern Traction Company, New Castle, Del.—It is reported that E. Clarence Jones has again

assumed control of the Wilmington Southern Traction Company. Three years ago Mr. Jones sold this property to the Wilmington, Newcastle & Delaware City Railway, but the terms of the contract of sale were not complied with and it now reverts to its former owner. In the future the two companies will be operated independently, although an arrangement for the exchange of traffic which is now operated will be continued. The Wilmington Southern Traction Company comprises 6.7 miles of line between Wilmington and Newcastle, while the Wilmington, Newcastle & Delaware City Railway operates a 10.5 mile line between Delaware City and Newcastle.

DIVIDENDS DECLARED

- Brockton & Plymouth Street Railway, Plymouth, Mass., 3 per cent, preferred.
- California Railway & Power Company, San Francisco, Cal., 1 3/4 per cent, prior preference.
- Capital Traction Company, Washington, D. C., quarterly, 1 1/4 per cent.
- Duluth-Superior Traction Company, Duluth, Minn., quarterly, 1 per cent, preferred.
- Galveston-Houston Electric Company, Galveston, Tex., 3 per cent, preferred.
- Illinois Traction System, Peoria, Ill., quarterly, 1 1/2 per cent, preferred.
- Manila Electric Railroad & Light Corporation, Manila, P. I., quarterly, 1 1/2 per cent.
- Philadelphia (Pa.) Traction Company, \$2.
- Twin City Rapid Transit Company, Minneapolis, Minn., quarterly, 1 3/4 per cent, preferred; quarterly, 1 1/2 per cent, common.
- West End Street Railway, Boston, Mass., \$1.75, common.

ELECTRIC RAILWAY MONTHLY EARNINGS

AURORA, ELGIN & CHICAGO RAILROAD, WHEATON, ILL.		Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., July, '15	'15	\$187,488	\$116,815	\$70,673	\$40,440	\$30,233
1 " " '14	'14	216,747	121,007	95,740	40,013	55,727
BERKSHIRE STREET RAILWAY, PITTSFIELD, MASS.						
1m., July, '15	'15	\$91,244	\$62,182	\$29,062	\$17,021	\$12,159
1 " " '14	'14	97,654	80,929	16,725	16,921	†187
CLEVELAND, PAINESVILLE & EASTERN RAILROAD, WILLOUGHBY, OHIO.						
1m., July, '15	'15	\$44,653	\$21,780	\$22,873	\$11,087	\$11,786
1 " " '14	'14	45,282	21,945	23,337	11,095	12,242
7 " " '15	'15	224,392	128,190	96,202	76,811	19,391
7 " " '14	'14	232,351	123,755	108,596	77,028	31,568
CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY, CLEVELAND, OHIO						
1m., July, '15	'15	\$113,039	\$75,868	\$37,171	\$27,651	\$9,522
1 " " '14	'14	117,667	72,992	44,675	27,351	17,324
7 " " '15	'15	696,181	474,259	221,922	192,411	30,206
7 " " '14	'14	714,513	472,822	241,691	191,239	50,452
COLUMBUS RAILWAY, POWER & LIGHT COMPANY, COLUMBUS, OHIO						
1m., July, '15	'15	\$239,594	\$146,303	\$93,291	\$40,232	\$53,059
1 " " '14	'14	241,965	156,675	85,290	37,741	47,549
12 " " '15	'15	3,057,558	1,816,271	1,241,287	470,860	770,427
12 " " '14	'14	3,065,759	1,966,740	1,099,029	482,188	616,841
CONNECTICUT COMPANY, NEW HAVEN, CONN.						
1m., July, '15	'15	\$806,482	\$474,989	\$331,493	\$98,265	\$256,409
1 " " '14	'14	798,767	571,741	227,026	97,329	151,582
NEW YORK & STAMFORD RAILWAY, PORT CHESTER, N. Y.						
1m., July, '15	'15	\$49,783	\$30,801	\$18,982	\$8,000	\$11,053
1 " " '14	'14	49,667	30,940	18,727	7,876	10,918
NEW YORK, WESTCHESTER & BOSTON RAILWAY, NEW YORK, N. Y.						
1m., July, '15	'15	\$42,612	\$43,288	†\$676	\$8,346	†\$6,677
1 " " '14	'14	37,199	42,357	†5,158	5,000	†\$3,310
PORTLAND (ME.) RAILROAD						
1m., July, '15	'15	\$115,100	\$63,272	\$51,828	\$20,166	\$31,662
1 " " '14	'14	116,551	92,740	53,811	20,462	33,349
12 " " '15	'15	1,042,284	648,128	394,156	261,434	132,722
12 " " '14	'14	1,043,214	646,655	396,559	249,998	146,561
RHODE ISLAND COMPANY, PROVIDENCE, R. I.						
1m., July, '15	'15	\$472,148	\$319,415	\$152,733	\$120,284	\$33,749
1 " " '14	'14	535,578	354,101	181,477	116,264	67,608
WESTCHESTER STREET RAILROAD, WHITE PLAINS, N. Y.						
1m., July, '15	'15	\$26,016	\$22,718	\$3,298	\$1,590	†\$1,738
1 " " '14	'14	27,198	23,456	3,742	1,198	†2,554

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

Traffic and Transportation

JITNEY JOTTINGS

The Jitney Before the Pennsylvania Commission—Developments in Houston and Dallas

Steps to settle immediately the status of jitneys as public utilities in comparison with the rights of incorporated common carriers are to be taken at once by the Public Service Commission of Pennsylvania. The decision as to whether jitney service may be started without first receiving permission from the commission in the form of a certificate of public convenience will be State-wide in effect. The Scranton Railway, of which C. L. S. Tingley is vice-president, raised the issue in three cases, alleging that M. J. Walsh, Forest City; S. Wilson and F. Williams, Vandling, and W. H. Owens, Scranton, are illegally operating jitney lines between towns covered by its system. It is charged that they cover the same road as the electric railways; that they divert business from the electric railways, and that they cause loss to the company besides operating without State approval. Chairman Ainey of the commission directed that the persons complained of be notified and asked if they desire to join issue. If answers are filed, hearings will be held soon, probably in Scranton.

The provision of the jitney ordinance of Houston, Tex., requiring an indemnity bond has been eliminated and the petition for a referendum election has been withdrawn. The ordinance requiring a license fee of \$72 went into effect on Sept. 1 and there are now only about half the number of jitneys in use as were formerly in operation. There has been some agitation in favor of placing a reduced bond requirement in the ordinance, but the City Council opposed this. Commissioner Pastoriza, who recently returned from the Pacific Coast where he studied the jitney, said that bonds had a tendency to increase the recklessness of the drivers, as they seemed to feel that there was no necessity for careful driving as long as the bonding companies paid for the damage inflicted. Mayor Campbell stated that since the present ordinance had been accepted by the jitney men in good faith he did not favor any change unless the measure should prove inadequate after trial.

The jitney drivers of Dallas, Tex., members of the chauffeurs' union, have given to the press for publication a set of resolutions containing a general denouncement of the so-called compromise ordinance and claiming that the destruction of the petition bearing the names of more than 4000 voters for an initiative election on a new ordinance was never agreed to by the jitney drivers. The work of getting the necessary number of signatures on a petition for a new ordinance will be undertaken at once.

A suit to break the newest jitney ordinance was filed with the County Clerk of Multnomah County, Portland, Ore., recently by A. A. Theilke, et al, against Mayor Albee. The complaint asks a temporary injunction restraining the city officials from enforcing the ordinance during the pendency of the suit. It is contended among other things that the measure is void because an emergency clause was attached, doing away with the right of the people to submit it to a referendum vote, and that it is class legislation because it requires a license fee, whereas taxicabs, hotel buses, sight-seeing cars, private automobiles and street cars do not pay a license and are not required to be examined regularly. Mayor Albee of Portland, Ore., has instructed the police department to enforce the provisions of the new jitney ordinance prohibiting the carrying of more than one passenger in the seat with the driver and prohibiting any person from riding on the running board, steps or doors of the cars.

Ordinances prohibiting the jitney buses from operating in the district bounded by Fourth, C, Sixth and E Streets, requiring them to maintain regular schedules and to stop on the far side of street intersections to let off and take on passengers, have been approved by Mayor Capps of San Diego, Cal. Being emergency ordinances, they became effective immediately. At the time he signed the ordinances mentioned the Mayor still had under consideration the ordinance requiring jitneys to operate eighteen hours a day six days a week.

The Auto Transit Association of Spokane, Wash., composed of jitney bus operators of the city, propose to test in court the city ordinances compelling jitneys to maintain a regular run for eight consecutive hours a day.

A new jitney ordinance is pending in Topeka, Kan., with additional restrictions which experience has indicated are necessary for the regulation of traffic and the protection of the public interests. Under this ordinance the license fee of \$10 payable semi-annually will be increased to \$25 for a five-passenger car, \$35 for a seven-passenger car and \$50 for cars seating more than seven. The fee must be paid in advance, and no part will be returned if the owner ceases business. No bond will be required. The windshield must bear indication that the car is a jitney, and must show the rates to be charged, which cannot be exceeded except by special agreement with passengers. Each licensed jitney must operate twelve hours a day. Any violation of the regulations of the license ordinance may cause revocation of the license.

CITY'S POWERS BROADER THAN COMMISSION'S

So Holds the West Virginia Public Service Commission in the Charleston Jitney Case

The Public Service Commission of West Virginia has dismissed without prejudice the petition of James Smith et al. charging certain jitney operators of Charleston with unlawful discrimination in the carriage of passengers, and has also similarly dismissed the petition of the Charleston Interurban Railroad charging the same defendants with unlawful discrimination, etc., and asking supervision and regulation of the jitney business in Charleston. In concluding its opinion the commission said in part:

"There is no just reason why the jitney bus business should not be subjected, like other common carriers of persons, to reasonable regulations.

"The Council of Charleston passed the jitney ordinance on June 28. Said ordinance makes it unlawful for any person, firm or corporation, either as principal, agent or employee, to use or occupy any public street in Charleston, with a motor vehicle, in the manner defined in the ordinance, without a permit or license. It imposes an annual license tax of \$24 for each vehicle, requires bond in the penalty of \$2,500, conditioned that the operator will not violate any of the provisions of the ordinance and that he shall pay any and all lawful claims for damages for injury to persons or property sustained by passengers in such vehicles, or by any other person or persons that may be killed or injured or suffer damages to property by reason of the operation of said motor vehicles. It requires the vehicles to be operated by experienced drivers; designates the section of the city where said vehicles shall operate, requires them to operate certain hours of the day and not less than six days in each week, and requires them to carry any and all persons, indiscriminately, that offer themselves for carriage and tender the fare. Said ordinance contains many other requirements and restrictions not hereinbefore enumerated, which said ordinance under the provisions of the charter of said city became effective July 28, 1915—five days after the hearing of these cases before the commission.

"The powers of regulation over the operation of the business under consideration, granted by the Legislature to the city of Charleston, are much broader than those granted the commission. In addition to this fact, the municipal authorities, under whose constant observation a business is being operated, can regulate, control and supervise said business far more effectively than can a board or commission not so situated. The petitions in this proceeding were both filed after the passage of the said ordinance but before it went into effect and before it could possibly be known whether or not the provisions of this ordinance would operate so as to furnish proper and adequate regulation of the jitney business. It should not be, and it is not, the intention of the commission to interfere with the local authorities in the regulation of purely local matters, over which the local authorities have full and complete jurisdiction and control.

"It would appear that inasmuch as the matters in controversy are purely local, and that the local authorities have ample regulatory powers over the operation of the business in question, and are now regulating said business, that this

commission should not interfere with the operation thereof, and that it should remain, for the present at least, under the supervision and control of the municipal authorities of Charleston.

"In regard to the complaint against defendants in refusing to carry passengers who were members of the colored race, the defendants by their answers have admitted that this was an unlawful discrimination and agreed to carry thereafter all persons, regardless of race, color or previous conditions of servitude. So, having conceded the relief asked for in this particular, it is unnecessary to enter into a discussion of this question.

"The commission is, therefore, of the opinion, for the reasons hereinbefore stated, to dismiss the petition of James Smith et al., and of the Charleston Interurban Railroad, without prejudice to the said petitioners to apply at any time in the future to said commission for redress of any grievances affecting them, or either of them, and it is accordingly so ordered. The commission does not deem it necessary at this time to promulgate any rules relative to the regulation of the jitney bus business."

COMMISSION WITHOUT POWER TO MODIFY FRANCHISE FARE PROVISIONS

The Public Service Commission for the Second District of New York has decided, in an opinion by Commissioner Frank Irvine, that it has no power to modify the terms of a franchise granted by a municipality. The New York & North Shore Traction Company, Flushing, Long Island, applied to the commission, asking that it determine that the just and reasonable fare between Mineola and Port Washington was 15 cents instead of 10 cents, to which the road is limited by the terms of its franchise granted by the Supervisors of Nassau County and the Highway Commissioners of the town of North Hempstead. The attorneys for the road contended that the power to grant franchises in a municipality was but a power delegated to the municipality by the Legislature and that the Legislature itself, or the commission, to whom the Legislature has delegated general power over rates, could amend the franchise. Judge Irvine in his opinion cited a clause in the constitution providing that no law granting a street railway franchise can be passed without the consent of the local authorities and the abutting property owners. He said that if the language of the public service commissions law giving the commissions power over rates were to be construed as giving the commission power to change the terms of a local permission, it would undoubtedly be unconstitutional.

SUCCESS OF BROOKLYN INSURANCE PLAN

More than 5200 employees of the Brooklyn (N. Y.) Rapid Transit Company had applied up to Sept. 15 for insurance under the plan of group life insurance which was announced to all the employees of the company on July 30. A notice has been sent to all employees that by arrangement with the Travelers Insurance Company, Hartford, Conn., through which the group contract is placed, the insurance will be effective upon all those who have applied for it at noon on Sept. 15. Out of approximately 8000 employees eligible for the group insurance, about 65 per cent filed applications within six weeks of the original announcement of the plan. Inasmuch as more than 5000 employees have applied for the insurance, there will be no necessity of the physical examination of these applicants. An arrangement has been made with the insurance company whereby those who are now eligible for the insurance as the result of having served two years in the employ of the company will be allowed until Jan. 1, 1916, to come into the group without physical examination. After Jan. 1, 1916, any employee who was eligible for the insurance prior to Sept. 15, 1915, will be admitted to the group only upon a physical examination. In the case of employees who become eligible for the insurance hereafter by the completion of their two years of service, the arrangement between the railroad company and the insurance company provides that such employees may be admitted to the group without physical examination if they apply for the insurance within six months after the date upon which they

become eligible for the same. Any who do not apply within six months after the date on which they become eligible for the insurance will be admitted to the group thereafter only upon physical examination. The applications received up to Sept. 15 which constitute the initial group involve an aggregate premium of more than \$56,000 a year. One-half of this is paid by the employees and one-half by the company. The terms of the insurance offer of the company to the employees were reviewed in the *ELECTRIC RAILWAY JOURNAL* of Aug. 7, page 252.

Safety First League for Louisville.—Plans for the organization of a safety first league, to be affiliated with the National Safety First Association, have been made in Louisville. Coroner Ellis Duncan started the movement, and railways, automobile and municipal authorities are participating in it. At a meeting held to discuss organization Coroner Duncan called attention to the great decrease in the number of accidents since the Louisville Railway began its safety-first work.

Electric Railway Scenarios Wanted.—The publicity department of the Illinois Traction System, Peoria, Ill., has announced the intention of having a moving picture made on the cars and in the stations of the company. In order to secure a plot that will work up into a good picture a contest will be held with prizes for the best stories submitted. The only thing taken into consideration will be the idea. If the scenarios warrant they will be turned over to some of the large picture houses to be worked up into a completed plot. A committee of Springfield newspaper men will pass on the stories and the announcement of the winners will be made after the State Fair. The successful stories will be published in papers throughout the State.

Collision at Corte Madera.—An electric train of the Northwestern Pacific Railroad consisting of three coaches and a steam train made up of three baggage cars with the engine reversed collided on Sept. 9 near the north portal of the tunnel at Corte Madera, Cal. Four persons were seriously injured and twenty others were slightly hurt. W. S. Palmer, president and general manager of the company, issued a statement in which he said: "The collision occurred on the only piece of single track on our suburban system. It is protected by automatic signals of the most approved type. The signals worked perfectly. The freight train got the signal that gave it the right of way through the tunnel, but for some inexplicable reason the motorman ignored the warning and went crashing into the freight train."

Mr. Dempsey Not Guilty.—Magistrate Dodd in the Adams Street Court in Brooklyn decided on Sept. 11 that John J. Dempsey, superintendent of transportation of the New York Consolidated Railroad (Brooklyn Rapid Transit System) was not culpable for disobeying an order of the Public Service Commission issued in 1912. On that date Mr. Dempsey was not manager of transportation and there was no evidence to show that any copy of the order had ever been served on him, was the basis for the ruling under which the official was freed on the misdemeanor charge. Mr. Dempsey was brought to the Fifth Avenue Court on June 5 last. Public Service Commissioner Hayward personally appeared against him. On Sept. 16 Mr. Dempsey was indicted by the Kings County Grand Jury on a misdemeanor charge in connection with his alleged failure to obey the order of the commission.

Pittsburgh Railways Folder at Pittsburgh Exposition.—The Pittsburgh (Pa.) Railways is distributing an extremely interesting folder at its exhibit space at the Pittsburgh Exposition. The scope of the folder is perhaps illustrated best by the table of contents which contains the following: "Some Things the Company is Doing to Improve Service," "Route Numbers," "Points of Interest in Pittsburgh and How to Reach Them," "Trolley Trips in and Near Pittsburgh," "Map of Pittsburgh and Vicinity, Showing Territory Served by the Company," "How to Reach Boroughs and Outlying Districts," "Washington and Charleroi Schedules," "Items of Cost," "Two Pittsburgh Railways Problems—the Rush Hour Traffic and Should Every Car Go to the End of the Line?" "Some Things the People Can Do to Improve the Service" and "Pittsburgh Railways Data in Round Numbers."

Personal Mention

Mr. Thomas B. Smith, candidate for Mayor of Philadelphia, appointed a month ago as a member of the Public Service Commission of Pennsylvania, has announced his resignation from the commission.

Mr. F. J. Stevens, formerly master mechanic of the Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., has been appointed master mechanic of the Lansing division shops of the Michigan United Traction Company, Jackson, Mich.

Mr. Ralph W. Emerson, who recently assumed his new position of assistant superintendent of the Cleveland (Ohio) Railway, is a son of Mr. Frank A. Emerson, sales agent of the same company. He received his preliminary education at Lincoln High School, Cleveland, and was a member of the class of 1906 at the Case School of Applied Sciences, Cleveland, having taken a combined mechanical and electrical engineering course. Immediately after his graduation he secured a position in the power department of the Cleveland Railway and in 1910 he was sent to Long Island to install and operate the power plant of the New York & North Shore Traction Company. Later on he was made general superintendent of the road, a position which he held until he assumed his present post on Sept. 1 last.

Mr. Herbert Markle, the newly-elected president of the West Virginia Public Utilities Association, which is made up of the electric light, power and traction, artificial-gas, water and telephone companies of West Virginia, is a native of Indiana and a graduate of the school of electrical engineering of Purdue University, class of 1895. Following graduation Mr. Markle spent a number of years with the Jenney Electric Company of Indianapolis and later went with the Northern Electric Manufacturing Company as district sales manager, with headquarters at Chicago. For a few months he also served with the Fort Wayne Electric Company after the consolidation of the Fort Wayne and the Northern Electric companies' interests. Six years ago Mr. Markle joined the Byllesby organization and for three years was stationed at Stillwater, Minn., as manager of some of the Northern States Power Company's properties. For the last three years he has been general manager of the Appalachian Power Company, stationed at Blufield, W. Va.

Mr. Edward J. Haines has been appointed assistant superintendent of equipment of the Bay State Street Railway, Boston, Mass. Mr. Haines was graduated from Columbia University in 1905 with the degree of E. E. After spending four months in studying electric railway work in Europe, in which he traveled 25,000 miles and visited the principal installations in Great Britain and on the continent, he was employed in the shops of the Brooklyn (N. Y.) Rapid Transit Company for a year. Prior to graduation he worked in the offices of Mr. C. O. Mailloux, consulting engineer, New York, and was also employed by the General Electric Company. Mr. Haines entered the employment of the Bay State company in 1906 as inspector at the Campello (Mass.) shop. He was later transferred to the main offices of the equipment department at 84 State Street, Boston, and has since had an active share in the engineering work of the office, including tests, expert testimony in court cases, investigations, and supervisory duties in close association with the head of the department.

OBITUARY

Sir William C. Van Horne, a leading figure in transcontinental railroad development in Canada, died at Montreal on Sept. 11. He was in his seventy-third year. Sir William was born at Joliet, Ill. He received his title and was created a Knight Commander of St. Michael and St. Gregory in 1904. He was instrumental in making the Canadian Pacific one of the greatest railway systems in the world. After the close of the Spanish-American war he caused 300 miles of railroad to be built in Cuba. In addition to his many Canadian interests Sir William was president of the Cuba Company and the Cuba Railroad. Among the positions from which he had retired recently were directorships at the Rio de Janeiro Tramway, Light & Power Company, Ltd., the Equitable Life Assurance Society, New York, and the Winnipeg (Man.) Electric Railway.

Construction News

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

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

RECENT INCORPORATIONS

***Fort Wayne, Decatur & Southern Railroad, Decatur, Ind.**—Incorporated in Indiana to construct and operate an electric line between Fort Wayne, Decatur, Monroe, Berne, Ceylon, Geneva, Bryant, Portland, Winchester, Lynn, Fountain City, Richmond and all intervening towns. It is stated that this company has been organized to take over the property of the Fort Wayne & Springfield Railway. Capital stock, \$10,000. Incorporators: Charles Oetting, Martin Gerke, Charles Dirkson, Henry Aumann and John H. Koenig.

***Chester & City Point Railway, Chester, Va.**—Incorporated in Virginia to construct an electric line from Chester to City Point and Hopewell, crossing the Appomattox River at or near Point of Rocks. Capital stock, \$100,000; minimum, \$1,000. Officers: H. D. Eichelberger, Chester, president; A. C. Buchanan, Chester, secretary, and Willis B. Smith, Richmond, general counsel.

***Richmond & City Point Transportation Company, Richmond, Va.**—This company will soon be chartered to operate a trolley, steam and ferry line between Richmond and Hopewell. No new line will be built or equipment purchased. The Virginia Railway & Power Company operates a car from Richmond to Chester and the company has agreed upon terms of contracts with the Tidewater & Western Railway which operates between Chester and Bermuda Hundreds and with the Furman Steamship Line which will operate a ferry between Bermuda Hundreds and City Point.

FRANCHISES

Sacramento, Cal.—The Pacific Gas & Electric Company has received a franchise from the Council to construct an extension on T Street, Upper Stockton Road, Cypress Avenue, Lower Stockton Road, Curtis Avenue, Whiskey Hill Road, Palmetto Avenue, Fifth Avenue and East Avenue, Sacramento.

Waukegan, Ill.—The Chicago & Milwaukee Electric Railroad has received from the Council a ninety-day extension of time on its franchise, pending the preparation and accepting of a new franchise.

Georgetown, Mass.—The Bay State Street Railway has asked the Council for a franchise to relocate its tracks on West Main Street from the entrance to York Grove to the Boston & Maine crossing on West Main Street.

Albany, N. Y.—The United Traction Company has asked the Council for a franchise to construct and operate a single track line on Madison Avenue from Trinity Place to Grand Street and on Grand Street to Hamilton Street, Albany.

El Paso, Tex.—The El Paso Electric Railway will ask for a franchise to construct an extension of its lines on Piedras Street from Alameda Avenue to the Boulevard.

Seattle, Wash.—The Council has adopted resolutions directing Corporation Counsel Bradford to instruct the holders of the franchise of the Seattle-Tacoma Short Line to comply with all its terms, and in the event of failure to proceed with the construction, to forfeit \$13,500 deposited by them at the time their franchise was granted. (Sept. 4, '15.)

TRACK AND ROADWAY

Edmonton (Alta.) Radial Railway.—About 6400 ft. of permanent track is being laid by this company on Portage Avenue, Edmonton.

Phoenix (Ariz.) Railway.—An order has been issued by the corporation commission granting this company an extension of time until Nov. 1 to complete the construction of its railway loop on Monroe Street to Fourth Street and thence to Washington Street, and to abandon the Indian school line from a point between Third and Fourth Streets to the connection with the First Street line at Pierce Street.

Pacific Electric Railway, Los Angeles, Cal.—The Hermosa Beach Chamber of Commerce has taken steps to obtain a 5-mile right-of-way to build a railroad to connect with the line of the Pacific Electric Railway at Belvidere, thus leading into Los Angeles over the Gardena route. It is the intention of the Chamber of Commerce in case it is successful to donate the right-of-way to the Pacific Electric Railway for building the line. The proposed road would give two direct lines from Hermosa Beach into Los Angeles.

Quebec Railway, Light & Power Company, Quebec, Canada.—The Quebec City Council is considering steps to compel this company to extend its lines in Limoilou, Beauport and Charlesbourg.

Bristol & Plainville Tramway, Bristol, Conn.—This company will be asked to raise its tracks on North Main Street to conform to the grade necessary for the pavement about to be put down.

Connecticut Company, New Haven, Conn.—The Connecticut Company has awarded the contract for the grading for the new North End trolley line in Hartford to Lathrop & Shea, New Haven. The line will extend on Main Street, Grove Street, Broad Street, Washington Street, Farmington Avenue and Commonwealth Avenue.

Chicago, Ottawa & Peoria Railway, Joliet, Ill.—This company has awarded a contract to the Joliet Bridge & Iron Company for the construction of a bridge over the Vermillion River. The bridge will consist of two 26-ft. spans. The cost is estimated at \$3,800.

Peoria (Ill.) Railway.—Work has been begun by this company on the double-tracking of its line on Frye Avenue from Wisconsin Avenue to Pacific Avenue and Adams Street from Abingdon Street to Camblin Street. The tracks will be of heavy steel and laid in concrete. New track is also to be laid on North Monroe Street. The company has completed the work of laying new tracks on Second Avenue from Franklin Street to State Street.

Kankakee & Urbana Traction Company, Urbana, Ill.—Work has been begun by this company on its 5-mile extension from Ludlow to Paxton. It is expected to extend the line from Paxton to Kankakee.

Keokuk-Jefferson City Electric Railway, Keokuk, Iowa.—Surveys have been completed of this company's line from Keokuk to Jefferson City and right-of-way secured as far as Shelbyville. As surveyed, it will pass through Kahoka, Williamstown, LaBelle, Newark, Bethel, Shelbyville, Shelby, Paris, Long Branch, Mexico and Fulton. H. W. Knight, Chicago, is interested. (June 5, '15.)

Salina-Northern Railroad, Salina, Kan.—This road has been completed from Salina to Lincoln Center, 35 miles. An extension is being built to Corinth and Downs, 43 miles, and a branch from Corinth to Osborne, 10 miles. (Aug. 21, '15.)

Idlewyld Park Railway, Baltimore, Md.—Work will soon be begun by this company on the construction of its 1-mile line on Regester Avenue from the York Road to Idlewyld Park. This road will connect with the line of the United Railways & Electric Company. Harry E. Gilbert, 2 East Lexington Street, Baltimore, president. (July 31, '15.)

Springfield (Mass.) Street Railway.—Plans are being made by this company to relocate its tracks on Mill Street, Springfield, from West Silver Street to Court Street, from the center to the west side of the street.

American Traction Company, Minneapolis, Minn.—It is announced that the street and interurban railway connecting International Falls with Ranier, South International Falls and other points in the district has just been completed. A. L. Sorter, Minneapolis, president.

Electric Short Line Railway, Minneapolis, Minn.—This company has awarded a contract to H. F. Balch & Company, Minneapolis, for the construction of its 45-mile extension from Winsted to Hutchinson, via Silver Lake.

Nevada, Lebanon & Eastern Railroad, Nevada, Mo.—Plans are being revived for the construction of this company's proposed line between Lebanon and Nevada. Plans for financing the enterprise were interrupted when the St.

Louis & San Francisco Railroad went into receivership, several of its stockholders having been interested in furnishing capital for the new road. Several counties raised large bonuses, the notes being dated to expire in July, 1916. The subscribers will be asked to renew their pledges. S. W. Thompson and Andrew Thompson, Kansas City, are interested. (Jan. 25, '13.)

St. Louis, Lakewood & Grant Park Railway, St. Louis, Mo.—Members of the Lakewood Improvement Association of Lakewood, a suburb west of Gravois Avenue, are considering the question of urging this company to resume operating its cars between Gravois Avenue and Lakewood. The railroad has not operated since the flood of Aug. 20, which undermined the tracks in places along the River des Peres.

***Nye, Mont.**—Surveys have been begun for a proposed electric railway from Nye to Cooke City to provide transportation for minerals. Mayor E. A. Gerhart, Billings, is interested.

New York Consolidated Railroad, Brooklyn, N. Y.—This company has notified the Public Service Commission for the First District of New York that it will be ready to place in operation by Sept. 17 the local tracks in the Fourth Avenue subway from Fortieth to Fifty-ninth Streets. If the commission orders the use of the local tracks the operation from Fortieth Street on will be over them instead of the express tracks as heretofore and this will allow stops at the local stations at Forty-fifth and Fifty-third Streets. Through operation over the express tracks is still prevented by the reconstruction work at the DeKalb Avenue station where crossovers between express and local tracks are being installed.

***Catskill, N. Y.**—Plans are being considered by a Brooklyn syndicate for the construction of a railway from Catskill to Richfield Springs, via Middleburg.

Federal Light & Traction Company, New York, N. Y.—E. H. Sanderson, president of this company, which operates the local urban and interurban lines in Hoquiam and Aberdeen, Wash., states that the company contemplates the construction of a line between Willapa Harbor and Grays Harbor. It is estimated that the cost of this improvement will be about \$1,000,000.

New York State Railways, Rochester, N. Y.—During the current year this company has expended \$147,819 for betterments, renewals and replacements. The sum of \$27,181 was spent in August for the same purposes.

Troy & New England Railway, Troy, N. Y.—This company, operating between Troy and Averill Park, suspended operations on Sept. 7. The road is leased by the Delaware & Hudson Company.

Tiffin, Ohio.—A bond issue of \$2,000 has been asked from the Chamber of Commerce of Tiffin toward the cost of making a preliminary survey for the electric railway to be built between Tiffin and Bucyrus. A. W. Nyquist is interested. (July 17, '15.)

Cleveland, Painesville & Eastern Railroad, Willoughby, Ohio.—A report from this company states that it expects to rebuild 2½ miles of track. An order has been placed with the Lackawanna Steel Company for 500 tons of 70-lb. A. S. C. E. rail, 300 tons to be delivered at once.

Youngstown & Southern Railway, Youngstown, Ohio.—In return for certain right-of-way along its tracks for the southern district sewer, this company has asked the city to allow it to lay a double track from South Avenue to its station on Front Street, east of Market Street. The Council is in favor of permitting the double-tracking, but claims it has no authority to grant such permission, which must be gained from property owners along the right-of-way.

Southwestern Power, Light & Railway Company, Oklahoma City, Okla.—W. T. Croslen, president of this company, which is to build an interurban railway from Oklahoma City to Denison, Tex., via Sulpher, Okla., has announced that work on the hydraulic electric plants will begin in October. Work was begun on the line some time ago, but, after considerable grading, was discontinued. Three large water plants will be constructed at a cost of \$1,000,000. The power plants will aggregate a total of 75,000 hp.

***Tulsa (Okla.) Traction Company.**—This company, which was recently incorporated in Oklahoma with a capital stock of \$100,000 to succeed the foreclosed Oklahoma Union Traction Company, reports that a line will be built from Tulsa to Sapulpa, Collinsville, Bixby, Broken Arrow and Okmulgee. The company operates 6 miles of single track and reaches Orcutt Lake. Power is purchased from the Public Service Company of Tulsa. Officers: G. C. Stebbins, president; A. J. Biddison, vice-president; I. F. Crow, secretary, and B. C. Redgraves, superintendent, all of Tulsa.

Johnstown & Somerset Street Railway, Johnstown, Pa.—According to Engineer Wilbor of the J. A. Vandergrift Company, New York, which is financing and building the line from Johnstown to Rockwood, the catenary overhead system will be used to operate the road. Rails of not less than 70-lb. will be used. A block signal system will also be installed. [July 17, '15.]

Chambersburg, Greencastle & Waynesboro Street Railway, Waynesboro, Pa.—It is reported that this company is contemplating the construction of an extension from Blue Ridge Summit to Thurmont or Emmitsburg, 8 or 10 miles.

Chester & City Point Railway, Chester, Va.—Preliminary surveys have been made of this company's line from Chester to City Point and Hopewell and it is expected to have the line completed by next spring. H. D. Eichelberger, Chester, president.

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—A contract has been let by this company for a new freight depot on F Street, between Second and Third Streets, San Bernardino. The structure will be of reinforced concrete and will contain offices for the various freight and passenger officials. The cost is estimated at \$20,000.

Norwich & Westerly Traction Company, Norwich, Conn.—This company has removed its main carhouse from Hallville to the one on Beach Street, Westerly. All the repairing will be done at the carhouse on Beach Street, the one at Hallville being used only for painting and storage.

Chicago & Milwaukee Electric Railroad, Chicago, Ill.—This company will build a new station in Waukegan where the new city line joins the west tracks of the through line.

Interborough Rapid Transit Company, New York, N. Y.—The contract for station finish on the Jerome Avenue and White Plains Avenue lines, Bronx, has been awarded by the Public Service Commission for the First District of New York to the Altoria Realty & Construction Company for \$860,363.

POWER HOUSES AND SUBSTATIONS

Menominee & Marinette Light & Traction Company, Menominee, Mich.—A report from this company states that it expects to purchase a feeder panel for its power house and material for 6 miles of transmission line.

Elmira Water, Light & Railroad Company, Elmira, N. Y.—A report from this company states that it expects to place contracts during the next three weeks for three 500-kw., 6600-230-volt transformers, three 1500-kw., 6600-230-volt transformers, two complete substations and lead-covered cable.

New York State Railways, Syracuse, N. Y.—This company reports that it has purchased one 1000-kw., six-pole, 600-volt, d. c., 25-cycle, 500-r.p.m. rotary converter from the General Electric Company; also three 350-kva., 11,000-430-volt O. I. S. C. transformers to be used for its Tracy Street substation.

Salt Lake & Ogden Railway, Salt Lake City, Utah.—This company will purchase a 400-kw., d. c. motor generator set for installation at its substation at St. Joseph.

Charleston Interurban Railroad, Charleston, W. Va.—A report from this company states that it plans to purchase three 300-kw., 750-volt rotary converters.

Ashland Light, Power & Street Railway, Ashland, Wis.—Plans are being made by this company to construct a 1500-kw. turbine plant in Ashland. The Wisconsin Railroad Commission has authorized the sale of \$100,000 of first mortgage 5 per cent bonds at not less than 75 per cent to defray the cost of building the plant.

Manufactures and Supplies

ROLLING STOCK

Brantford (Ont.) Municipal Railway expects to purchase one snow sweeper.

Port Arthur (Ont.) Municipal Railway is building a combination snow plow and broom in its shops.

United Traction Company, Albany, N. Y., expects to issue very shortly specifications for fifteen new cars.

Springfield (Mass.) Street Railway has ordered one prepayment car from the Wason Manufacturing Company.

Charleston (W. Va.) Interurban Railroad expects to purchase within the next thirty days one 45-ft. express and freight car.

Havana Central Railroad, Havana, Cuba, has ordered an additional 60-ton electric locomotive from the General Electric Company.

Lincoln (Neb.) Traction Company, Lincoln, Neb., has purchased one single truck snow plow from the McGuire-Cummings Manufacturing Company.

Cassville & Western Railroad, Cassville, Mo., expects to purchase within the next few months a passenger and baggage car and possibly an electric locomotive.

San Francisco-Oakland Terminal Railways, Oakland, Cal., is working on specifications for twelve new cars for its Key Route. The date on which bids will be called has not yet been decided, but probably will be about Oct. 1. The cars are to be of the pay-as-you-enter type with side entrance and low step.

Cleveland (Ohio) Railway Company has ordered from the G. C. Kuhlman Car Company eighty new cars of the front-entrance, center-exit type, equipped with Westinghouse motors. The cars are duplicates of the fifty cars recently purchased. This company is also rebuilding fifty cars which have front and rear platforms, into the front-entrance, center-exit type. The new and the rebuilt cars, together with those now in service, will make a total of 180 cars of the front-entrance, center-exit type operated by this company.

TRADE NOTES

M. H. Hovey, Consulting Signal Engineer, has changed his address to 119 West Main Street, Madison, Wis.

Pyrene Manufacturing Company, New York, N. Y., has received a gold medal award at the International Exposition at San Francisco.

Arthur E. Duclos has been made representative in charge of the new Chicago office of the Standard Woven Fabric Company, 327 South La Salle Street, Chicago, Ill.

E. R. Mason Company, Inc., New York, N. Y., announces that it is no longer acting as Eastern sales representative for the Hunter Illuminated Car Sign Company, Flushing, N. Y.

American Steel & Wire Company, Chicago, Ill., has been awarded a Grand Prize by the Panama-Pacific International Exposition for the superiority of its products and the high character of its exhibit.

F. B. Cutter Company, 50 Church Street, New York, announces that it has been appointed exclusive selling agent for the many double and single truck open and closed cars recently retired from service by the Third Avenue Railway, New York, N. Y. F. B. Cutter, general manager, was formerly with the General Electric Company and has been for a number of years engaged in the machinery business.

Western Electric Company, New York, N. Y., has received an order from the Ogden, Logan & Idaho Railway, Ogden, Utah, for one complete train-dispatching system, including thirty way-station equipments, dispatcher's outfit and attendant telephone sets and material. The railway company feels that the new system will solve its dispatching problems and serve to increase its transportation facilities.

Roller-Smith Company, New York, N. Y., has added to its list of agents the Conant Electric Company, Equitable Building, Baltimore, Md. The Conant Electric Company will handle Roller-Smith instruments and circuit breakers and Columbia meters in the territory comprising the States

of Maryland, Virginia, North Carolina, part of West Virginia and the District of Columbia. Associated with S. M. Conant is C. L. Ball, both of whom are well known in this territory.

U. S. Metal & Manufacturing Company, New York, N. Y., has appointed Walter H. Evans of Chicago as Western railroad department manager. Mr. Evans was recently manager of the motor gear department of the Edgar Allen American Manganese Steel Company, Chicago, and previous to his connection with this company was connected with several electric and steam roads in the capacities of master mechanic and superintendent of motive power. Mr. Evans will make his headquarters in the McCormick Building, Chicago, Ill.

Westinghouse Electric Export Company at a meeting of its board of directors in New York on July 28 elected the following officers: President, E. M. Herr; vice-president, L. A. Osborne; vice-president, Calvert Townley; managing director, Maurice Coster; secretary, J. C. Bennett; treasurer, H. D. Shute; auditor, F. E. Craig; assistant secretary and assistant treasurer, W. H. Jones. In addition the president announces the appointment of the following officers: Manager, E. D. Mills; European manager, E. R. Ellis; assistant export manager, H. F. Griffith.

Monarch Refillable Fuse Company, Buffalo, N. Y., has purchased 150 ft. of frontage on Leslie Avenue, running north from East Ferry, Buffalo, for the construction of a new factory, which includes a new experimental laboratory for the electrical devices which this company will manufacture. The new factory will not only give the company ample space for taking care of the greatly increased refillable fuse business, but will also give enough space to install its new machinery and equipment to manufacture, under recent patents issued to the vice-president of the company, the new Monarch soldering iron.

Esterline Company, Indianapolis, Ind., manufacturer of "Golden Glow" headlights, has secured a complete equipment order from the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind. These headlights are of the recessed dash interurban type with flange which enables them to be mounted in the present headlight cases on the hood of these cars, without making any construction change whatsoever. They will use 6-volt, 18-amp. Mogul base concentrated filament bulbs, which in test enable observers to see a man on the track at a distance of from 950 to 1100 ft. and pick up signal and whistle posts at a distance of nearly one-half mile.

S. K. F. Ball-Bearing Company of Hartford, Conn., with a capitalization of \$2,000,000, was incorporated on Sept. 4 for the manufacture and sale of ball bearings. The S. K. F. ball bearing has been handled in this country since 1910 by the American S. K. F. Ball Bearing Company, a selling organization for the Aktiebolaget Svenska Kullagerfabriken, Gothenburg, Sweden. An 8-acre site has been secured in Hartford and the erection of the first building will be shortly begun. It is intended to start the plant with about 300 men who will be able to produce only a part of the bearings sold in this country, the remainder for a time being imported. The Swedish factory has grown since 1907, when 100 men were employed, until at present 3000 are employed in the home factory exclusive of employees in European branches. The special Swedish crucible steel, known as S. K. F. steel, used by the parent concern, will be imported for use in the American-made bearings. The parent concern is placing its experience, special machines and all manufacturing facilities at the disposal of the American company.

NEW PUBLICATION

The Railway Library, 1914.—Compiled and Edited by Slason Thompson. Bureau of Railway News and Statistics, Chicago, Ill. 370 pages. Cloth, \$1.

This volume contains the sixth series of addresses and papers on railroad subjects, delivered or published during 1914. The articles cover such topics as valuation, taxation, railway mail pay, government ownership, and the like. Considerable space is devoted to the part railroads are playing in the present European war. The concluding section consists of the annual report of the Bureau of Railway News and Statistics, in which is presented the latest financial and statistical information in regard to American and foreign railroads.