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PLANS FOR THE MIDYEAR MEETING Plans for the midyear conference of the American Electric Railway Association are well toward completion and promise good results for member companies and the industry as a whole. Some friends of the association regard the midyear conference as the most effective of its functions. If not entitled to that rank, it is at least an invaluable extension of the work which strengthens and emphasizes the accomplishments of the annual meetings. The committee has selected subjects of leading importance that have not been worn threadbare by long-continued discussion and yet are of practical as well as of economic concern. The association is greatly to be congratulated on the acceptance of its invitation to speak by a State commissioner who has been so active in the development of regulative policies as has Mr. Erickson of Wisconsin. The companies have not brought themselves immediately or easily to accept regulation. They have much to learn from commissioners in regard to the policies and laws which must be enforced. The commissioners also have something to learn from the companies in regard to the real problems which hamper their operations and growth in these days. But the companies and the commissioners need to co-operate if the public is to receive the service to which it is entitled.

A STUDY IN ELECTROLYSIS ELIMINATION The report of the test on a system of insulated negative feeders which is published elsewhere is a worthy sequel to the remarkably clear discussion on methods of mitigating electrolysis presented in our issue of Jan. 3. The authors, Messrs. Rosa, McCollum and Logan, are eminently qualified for an expression of

opinion in the matter not only through professional experience but because they are in the unique position of having no axe to grind notwithstanding the wall of conflicting interests which has in the past usually obscured the essential features of the problem. In consequence their championship in general of the insulated negative feeder system must be viewed with respect, and, indeed, the results of their test show beyond doubt that, under the conditions existing at the substation in question, this system is infinitely superior to any yet proposed. It may be that at old substations or power plants where considerable uninsulated copper already exists, possibly in unknown locations, the insulated feeder system might not show such advantages. However, where a new substation is being built it seems certain that the latter system may be made practically to eliminate electrolysis damage at a cost which is, at least, not prohibitive. Apparently, its one objectionable feature, that of having a considerable difference in potential between the negative bus and the track outside of the station, involves no real difficulties aside from the fact that it is rather a startling novelty.

MR. SAGUE'S CRITICISM OF COMMISSIONS Mr. Sague, of the New York Public Service Commission, Second District, made a constructive criticism of regulating commissions at the meeting at the Stevens Institute of Technology which is reported elsewhere in this issue. Mr. Sague thinks that there are far too many laws, too many orders and too little patient study of corporations. He attributes the lack of success which has often attended the work of commissions to failure to develop along these lines and to a tendency to substitute court methods for informed study and investigation. Mr. Sague is competent to pass this criticism. He was appointed to the commission by Governor Hughes in 1907. He entered office when the country was watching with keen interest to see what New York would accomplish under its strong law and the guidance of its reform Governor. The commission developed until it was one of the strongest in the country, though the appointments of subsequent Governors deprived it of this standing. Its work has been effective in many ways, and some of its greatest accomplishments have been carried out in informal hearing or negotiation, not loudly advertised. Mr. Sague's well-founded criticisms are just as appropriate for the entire legislative situation as for regulating commissions. Laws and orders have come down in a flood. Almost all the commissions and legislatures swelled the volume. It is a fair conclusion to say that if there had been fewer laws and orders there would have been a more salutary treat-

ment of corporation affairs and troubles. The present need of the corporations is that business may have time to rest and grow strong. A long spell of relief from laws and orders will help to restore normal conditions.

PHILANTHROPIC DONATIONS BY RECEIVERS

An interesting illustration of the breadth of view that may be adopted by a federal court in dealing with the expenditure of a public utility under receivership is shown by the recent action of Judge Hook in the United States Circuit Court at Kansas City. Upon the petition of sixty-four taxpayers and patrons of the street railway system in Kansas City he authorized the receivers of the old Metropolitan Street Railway to make a contribution, not to exceed \$1,000, for the Seventh International Student Volunteer Convention. Charitable contributions by public utility corporations have heretofore been permitted under even the most stringent commission laws when they represented the exercise of benevolence for services rendered to the community as a whole. The value of such expenditures is undeniable from the standpoint of the public weal and the increased popularity accruing to the donating corporation, and when the company is under the control of the stockholders they, through the board of directors, are in general free to make outlays for charity and will receive legal sanction for so doing if the donations are really for the public benefit and do not involve any particular discriminations. When a public utility corporation has been taken out of the hands of the stockholders, however, and placed under receivership for the bondholders, the situation is changed. The property now is in the hands of the court and the receivers for operation and management, but it does not belong to them; it is held in trust for specific purposes for which they are accountable to the bondholders. For this reason the discretion in regard to philanthropic expenditures which is recognized in the case of managing officers chosen by the owners of a corporation is, we believe, rightfully limited in the case of receivers holding trust funds or operating a property in trust. No matter how much a philanthropic enterprise may meet with their personal sympathy and approval, they have no legal or moral right to dispense the property of others in support of it for purely charitable reasons. Of course, in the case of a great emergency or calamity, when it is reasonably certain that the entire body of bondholders would approve a disposition of a portion of their property for charitable purposes, an exception might be allowed.

When this question of charity, however, is viewed by the receiver from a business viewpoint, paradoxical as that may seem, a different condition arises. For instance, the petitioners mentioned above showed that the convention in Kansas City would mean an influx of about 8000 delegates and an increase of approximately \$20,000 in street railway receipts from non-resident patrons. In view of this the expenditure of \$1,000 was viewed by the court as one consistent with sound business policy. It may be repugnant to some

thus to commercialize this contribution to the Student Volunteer movement, but this one fact must be remembered: Receivers are not free agents. They are authorized to conserve the assets of a property, liquidate the liabilities and use all legitimate means to advance the business of the road, and only when a philanthropic expenditure will aid in so doing are they justified in expending any funds intrusted to them. Whether the receivers shall trust to their own business judgment to settle this point, or whether, as in this recent case, it shall be put up to the court, is another question, but inasmuch as the court must finally review and pass on the accounting of the receivers, it is not unwise policy to settle the question of business expediency before the expenditure is actually made.

PLANNING SHOP AREAS

When a company wishes to enlarge its car maintenance facilities or to create an entirely new layout it is customary to study the practices of other railways, more especially by comparing the areas used for specific purposes. Unless, however, the conditions at each installation are fully understood, this method may lead to very erroneous conclusions. For instance, since most large city systems are consolidations, the shops taken over are rarely best adapted for the conditions created by the merger. Two, three or even four buildings may be on hand, all designed as self-contained shops. The consolidation usually means the abandonment of some buildings and the reconstruction of others, but even then the net result is likely to differ greatly from what it would be if the whole car maintenance system could be laid out anew. Another very important variation in shop areas arises from differences in maintenance policy. Where the carhouses are in charge of the transportation department there is a natural tendency to keep the cars in service longer than the mechanical department considers desirable, particularly when there is a heavy demand for cars. Again, the older carhouses were not generally equipped for anything but ordinary inspection and lubrication, but many carhouses of recent years embody one bay for a variety of replacement work. A crane or even a jib hoist in such a bay permits the interchange of wheel sets, the exchange of motors, etc. Hence on a system with such carhouses the truck and other overhauling sections of the main shop are much smaller than if the car stations were merely inspection centers.

One great advantage of the maintenance carhouse policy is that the main shops may be placed in some most favorable layout far from the center of the town because dead mileage is negligible when every car comes in but once every 50,000 miles. Since the areas required for each branch of car maintenance may vary so greatly, it would possibly prove better to calculate car shop requirements by first determining appropriate inspection and overhaul mileages for each class of equipment, based on the practices of the best systems as modified by home environment. Then, for any given number of cars, it should be easy to determine, for instance, how large the paint shop must be to bring the

cars in for the normal period of ten to fourteen days. Further, the area of this particular shop would be influenced also by the adoption of some time-saving process like electric drying. On the same principle, truck shop areas could be reduced to a minimum by such means as car-transporting cranes and a large reserve stock of trucks and electrical equipment. In the shop of one company with such reserves, overhauled cars never stay in for more than twenty-four hours except for painting or special damage to car body. Finally, it should be observed that where intermittent manufacturing is carried on the amount of space set aside for such work is often too large to make manufacture an attractive proposition unless cheapness of land is a big factor in keeping down the overhead charges. The foregoing points are only a few of those which affect the question of shop area, but they will suffice to show that the space requirements should be studied along scientific lines rather than to follow heedlessly the practice of others.

ECONOMIES IN PERMANENT WATERWAYS

In the early days of electric interurban railway construction, and, in fact, on a few of the electric lines built at the present time, openings for waterways under the track, as well as highway and other overhead crossings, are provided with temporary structures. This probably was a wise policy in the past inasmuch as the earning power of projected lines was a questionable quantity. To-day, however, the construction of electric interurban railways has reached a point where it is possible to predetermine with a certain degree of accuracy the probable earnings of a line built between any two points. With figures of this kind it is possible also to determine how much may be spent for track and roadway without affecting the property as a paying investment. No doubt, this ability to anticipate probable revenue partly accounts for the more permanent character of construction used on most of the interurban roads built within the past few years. On the other hand, these predetermined limits on other lines also explain the cheaper type of construction employed by them. In either event, however, after a property has been in operation sufficiently long to show that it is a permanency, no economical reason can be offered satisfactorily to explain the continuance of temporary structures in the track after those originally installed have reached the end of their physical life. Nevertheless, many electric roads are making little or no effort to replace these structures with permanent ones. The only reason which can be advanced is that they have been so busily engaged in increasing efficiency in other departments that they have not taken time to analyze carefully the savings possible in the replacement of temporary structures with permanent ones.

By temporary structures we mean wooden trestles and bridges of various types, the life of which approximates seven to ten years. At the close of this physical life period a company must either replace

all the timber in the structure or a large portion of it. The cost of rebuilding under traffic is high; in fact, careful checks show that it is about twice the first cost of a structure. If a considerable section of an electric road was constructed during any one year, so that the periods for the time renewals in a considerable part of the temporary structures fall at about the same time or during the same year, the task of maintaining the structures in operating condition until the renewals can be made is almost impossible. That is to say, it will be found almost impracticable to employ a force of men sufficient in size to make all the renewals at the time they are required and dangerous conditions may arise before temporary repairs can be made.

On the other hand, if the temporary structures were replaced gradually with concrete arches or steel and concrete arches, their maintenance would be practically eliminated, and in time all structures would be replaced with permanent ones without unduly reducing the net during any one year. At the same time the new permanent structures would provide clear waterways which would not gorge with drift and floating ice during flood periods, and the cost of clearing these passageways would be released for further permanent improvements.

No doubt, the temporary structure serves its purpose in more ways than in keeping down the first cost when there is an element of doubt as to a road's earning power, because it permits a more careful study of waterway requirements. If it were not possible for the construction engineer to compare any waterway with another structure spanning the same watercourse near by, its size would be more or less of a guess as to what was required plus a large factor of safety. But a study of the quantity of water flowing through these temporary openings during a period of several years should permit a careful analysis of requirements, and certainly during the physical life period the maximum stream flow condition is apt to arise.

Other factors affecting the life of temporary structures include fire hazard, which results not only in the loss of the structure but in serious interruptions to traffic as well. A few electric interurban roads built within the past two or three years have adopted creosoted timber for trestles in place of the ordinary seasoned timber, and there is no doubt that a longer life will be obtained from structures built in this manner. Increased fire hazard enters as a factor in the employment of this type of material in waterways, however, and it does not appear to be seriously considered. In the hot summer months during a first few years of service of a creosoted timber structure the volatile quality of the creosote oil makes it highly inflammable. In the end, too, the creosoted timber trestle is only temporary and must be replaced. While first cost is a consideration in all betterments, ultimate economy in operation will never be attained if it is permitted to control all operating expenditures.

The 1913 Motor Cars of the Chicago Railways

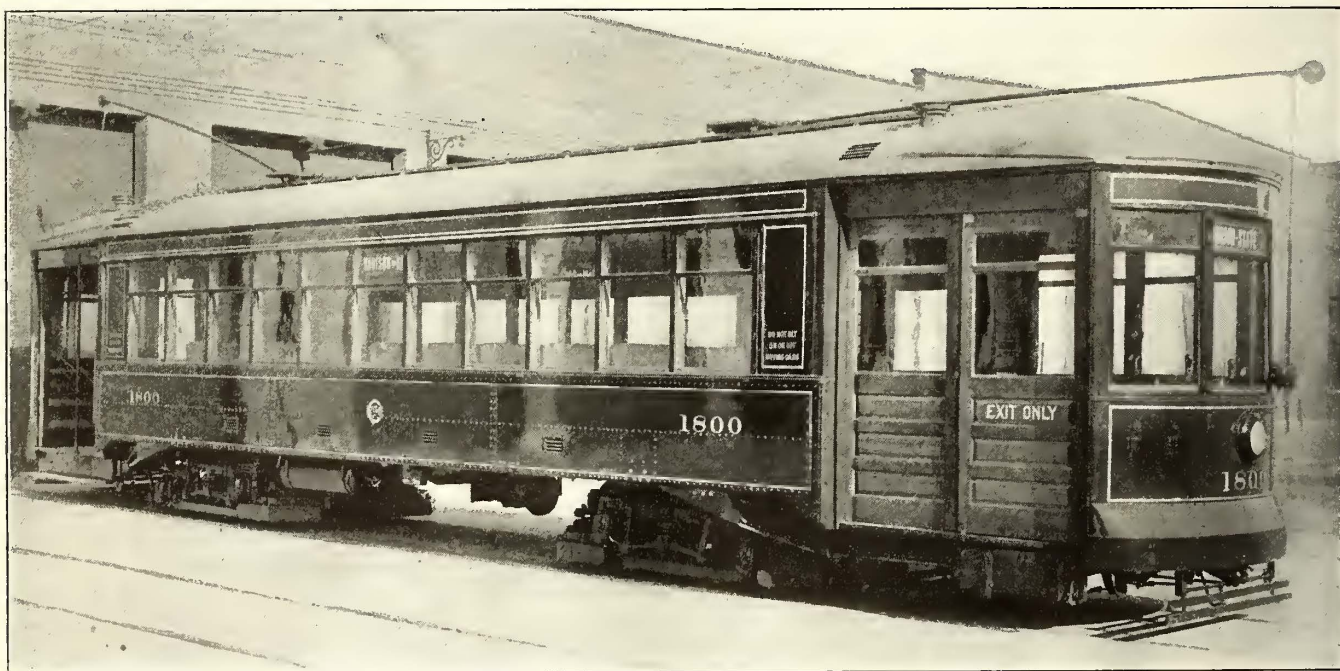
A Description of Some of the Principal Features Entering Into the Construction of These New Arched-Roof, Light-Weight, Low-Step, Double-End Cars, Which Are Now Being Delivered for Service

The first of the 200 low-step, double-end, arched-roof motor cars are now being added to the rolling stock of the Chicago Railways Company. A description of the general arrangement and some of the design details was contained in the issue of the *ELECTRIC RAILWAY JOURNAL* for Aug. 9, 1913, on page 230, but other interesting features have been added to these new cars during the process of construction which should be of general interest. A careful check of all the weights of material entering into the construction of the new two-motor car shows that a reduction in weight of more than 10,000 lb. has been made over the 1911 arched-roof four-motor car. This was done despite the fact that the new cars are 3 ft. 5 in. longer than the 1911 type, being 48 ft. 5 in. as against 45 ft. over-all length.

justment for sagging in the vestibule. Bolts are used in attaching the knee braces to the underside of the side girders so they may be readily adjusted in case the vestibules do sag, it being necessary to loosen the bolts and insert shims.

BODY CONSTRUCTION

Careful consideration was given to the design of the body to obtain wide aisles and wide seats, particularly at the passengers' hip line. The aisle width in the finished car is 25 in. between end seat plates, but further effective aisle width was obtained by offsetting the seat backs 2 in. While quite a study was being made to obtain the wide aisle, the mechanical department did not lose sight of wide, comfortable seats. These are 36½ in. over all, and this length was obtained by making



New Chicago Railways Car—General Side View

During the construction of these cars in the Chicago Railways' shops, every item entering into them was carefully weighed and the results from an average of ten cars appear on page 114.

The underframes for the 100 cars built by the railway company, the fifty built by the Southern Car Company and the fifty built by the American Car Company were furnished by the American Bridge Company's Chicago plant. The designing of these underframes was made as simple as practicable, consistent with the desired strength, to reduce the cost of fabrication to a minimum. As noted in the previous description, the underframe is of the side-girder type, with the girder plates forming the outside sheathing of the car body. One feature of the design in the underframing differing from former cars is the method of fastening the knee braces to the side girders. These braces are formed of reinforced channels swung from the bulkhead cross-sills and bolted to the bottom of the side girders. In the former designs the knee braces were riveted to the inside of the side girders. This threw the rivets in shear and at the same time did not readily permit ad-

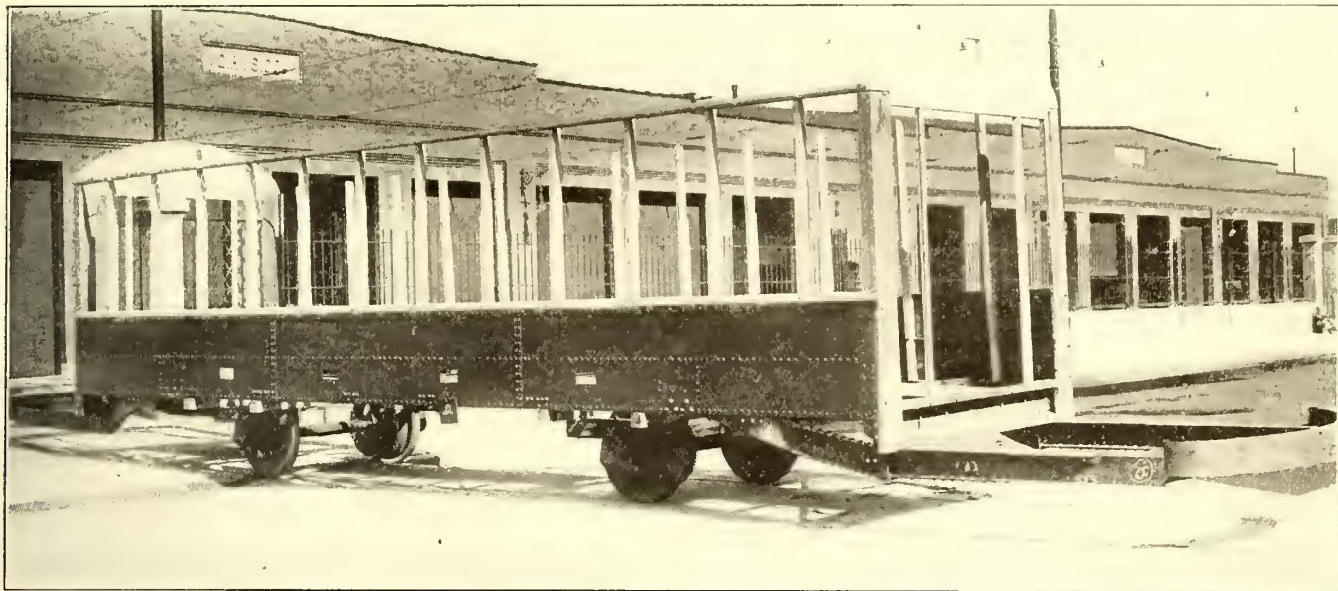
the sides of the car as compact as possible, especially to permit of a wide car at the seated passengers' hip line. To accomplish this the inside finish is set back of the post line, thus reducing the thickness of the sides of the car body to 1 7/16 in. and at the same time adding effective width to the seats. While the over-all thickness in the sides is of a minimum dimension, this did not hinder it being arranged for complete ventilation. Openings at the side sills and posts permit free circulation of air around these members to the window sill, thus removing conditions conducive to early destruction of the members by decay. This arrangement made it necessary to weatherproof ventilated areas in the car sides with heavy felt paper.

The car floor construction is also quite unusual, but this is another result of the careful study of the weight question. The car floor is built of a single thickness of 7/8-in. matched flooring under the seats, and that in the aisle is doubled in thickness by wooden floor mats. The single floor is insulated with a heavy two-ply felt paper, cleated up with light wooden strips. Over this paper a heavy coat of paint has been applied to increase

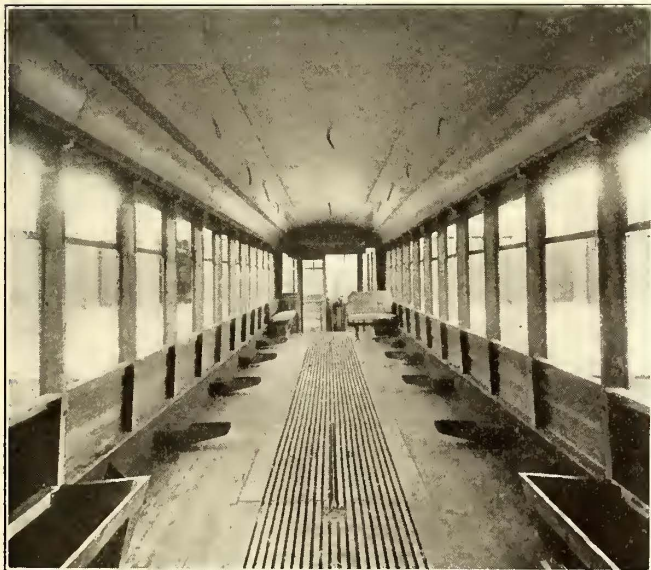
its waterproof qualities and provide extra insulation.

Other construction features in the car body include a careful study of the installation of the auxiliary equipment on the underside of the car floor. The location of each item was selected after a careful estimate of the moments so that the complete installation would balance around the longitudinal and transverse axes of the body. The small deflecting gutter over the entrance and exit doors was formed by setting a strip of poplar in a heavy coat of white lead on top of the canvas roofing. Usually this gutter is formed of metal set on the

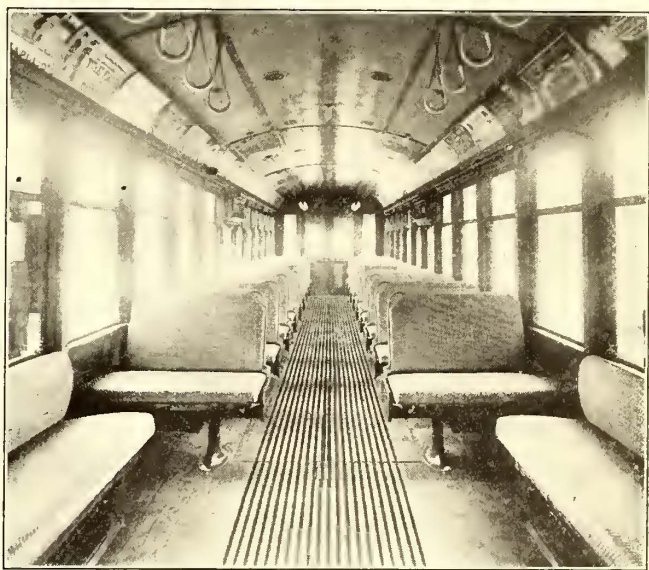
um is obtained. This was especially true of the Chicago Railways cars which have a total height at the center of the car floor of 37 in. above the rail. The height of the first step above the rail is 13 in. and that to the platform is 11 in. A 10½-in. riser at the threshold plate and a 2½-in. ramp from the bulkhead to a point in the floor over the bolsters, a distance of 5 ft., makes up this total height. The slight pitch of the ramp is scarcely noticeable to passengers entering or leaving the car. To obtain this over-all dimension, it was also necessary for the mechanical department to



New Chicago Railways Car—Side View of Framing on Temporary Shop Trucks



New Chicago Railways Car—Interior, Showing Air Ducts



New Chicago Railways Car—Interior of Completed Car

canvas. The wooden strip, however, has been found just as effective and much cheaper.

During the period these cars were under construction in the Chicago Railways' shops it was desirable that the bodies should be made portable, and at the same time the weight had to be kept down to a point where it was possible to move them by hand. To meet this requirement, the bodies were mounted upon temporary trucks composed of old wheels mounted in a wooden frame.

Low steps in double-end cars require a very careful study of every item affecting their height if the mini-

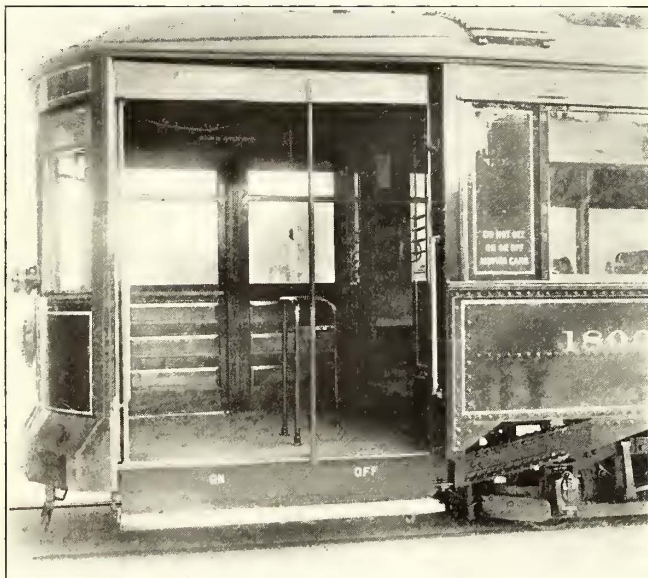
avail itself of the minimum over-all dimensions in the design of the trucks, motors and bolsters. By the use of a 32-in. driving wheel instead of a 34-in. wheel which has been standard on the Chicago Railways, an additional reduction of 1 in. in height was obtained.

The trucks are of the Brill 39-E type designed with an improved brake rigging and a new feature in the arrangement of the springs. Small coil springs, which are set between the half elliptic and the spring plank, materially add to ease in riding. With the light loads, the small coil spring is in action, but as the load increases it is compressed into a pocket casting, which in

turn transmits the total load to the half elliptic. These trucks are also equipped with McCord journal boxes cast with hardened wear pieces in the sides of the box. Renewal wear pieces are riveted to the sides of the journal box yokes in the truck side frames.

A new type of Westinghouse field control, 534 Y-1 motor was purchased for these two-motor cars. It has a less over-all height than the older types and consequently provides better clearance between the motor housing and the rail. The minimum clearance point, however, is at the gear case which is 3½ in. above the top of the rail. This motor was adopted not only because it gave proper clearance but as a result of a careful study of its adaptability to the service requirements. Before it was definitely selected sample motors from each of the manufacturers were installed on regular cars to determine just how they would meet actual operating conditions. From the data obtained in these tests the mechanical department was able to determine the exact requirements necessary to make the new two-motor equipment meet the same service conditions as the former four-motor equipment.

The field-control feature enabled the motor designers to meet all the requirements, as it permits high speed



New Chicago Railways Car—Rear Platform

on the last controller points, which under Chicago operating conditions reaches a maximum of 25 m.p.h. The gear ratio used in conjunction with these motors is 15-69 three-pitch. The motor equipment was tested not only for ordinary service conditions but was tried on the heavy grades approaching the tunnels under the Chicago River. These grades vary from 9 to 11 per cent, and tests of the two-motor equipment for starting and stopping on these heavy grades demonstrated that it was adequate from a tractive standpoint.

SAFETY APPLIANCES

Another interesting feature in the construction of these new cars is the practical application of safety-first principles in their design. A number of new departures in the design of the air-brake equipment were included to accomplish this end. They are the National Brake & Electric Company's A-6 type, a new design with an 18-cu. ft. capacity compressor, and other features in line with modern light-weight car construction. One of the innovations used in connection with this air-brake equipment is an emergency valve which makes it possible for the motorman to get an emergency application at the brake valve, the air being taken directly from the reservoir. At the same time the brakes

are applied sand is automatically deposited through air sanders. In addition to these conductors' valves are placed in each vestibule so that an emergency air application may be made by him if necessary.

A number of safety appliances were also incorporated in the foundation brake apparatus under the car body. One of these includes the pull-rods and the tie-rods, which have been boxed over at their connections to the brake levers. In case the pin connections break, the air-brake apparatus is left operative, as the loop or

TABLE SHOWING WEIGHT ANALYSIS OF 1913 CLOSED MOTOR CARS OF CHICAGO RAILWAYS COMPANY; FIGURES REPRESENT AVERAGES FOR TEN CARS

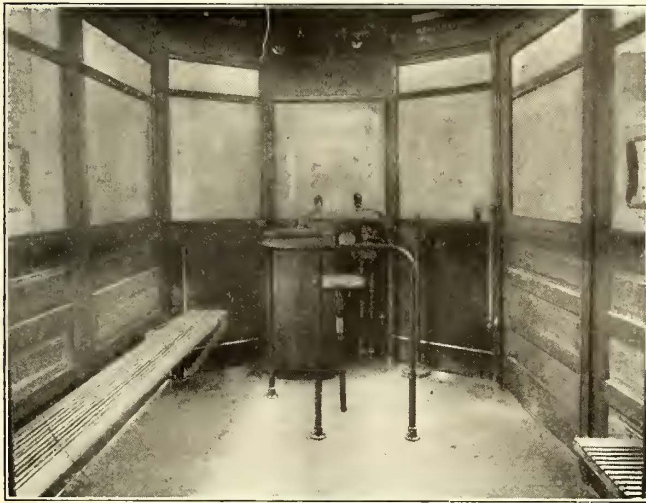
	Pounds	Per Cent
Steel Underframe:		
Body portion	3,360	9.5
Platform portion	1,290	3.6
Total	4,650	13.1
Car Body:		
Floor sills and flooring.....	1,169	3.3
Side frames, including corner posts, top plates, window guards, curtains, etc.	2,034	5.8
Bulkhead structures.....	501	1.4
Bulkhead doors, including tracks, rollers, etc.	239	0.7
Roof, trolley boards, head lining, etc.	1,230	3.5
Total	5,173	14.7
Vestibules:		
Platform sills, crown pieces and flooring	727	2.1
Posts, framing and dashers.....	1,209	3.4
Hoods	284	0.8
Doors, door and step operating mechanism, steps and platform seats	946	2.7
Total	3,166	9.0
Car Apparatus and Fittings:		
Body seats	1,634	4.6
Hand brakes, including rigging....	359	1.1
Destination signs and boxes.....	110	0.3
Ventilating motor, fan, ducts and louvers	243	0.7
Drawbars, hooks, drawhead, etc....	153	0.4
Register mechanism	71	0.2
Fenders and fender gates.....	276	0.8
Heaters, buzzers, trolley bases, poles, lights, wiring, etc.....	1,139	3.2
Conduit	216	0.6
Miscellaneous (trolley catchers, bells, ropes, gongs, etc.).....	79	0.2
Total	4,280	12.1
Electrical Equipment:		
Motor wiring	148	0.4
Conduit	271	0.8
Controllers and resistances.....	776	2.2
Motors (two), including pinions....	4,825	13.6
Gear cases	185	0.5
Total	6,205	17.5
Air-brake equipment, including foundation brake rigging and piping...	1,712	4.8
Total	1,712	4.8
Trucks:		
Truck frames, axles, wheels and boxes	9,316	26.4
Gears	475	1.3
Guards	46	0.1
Miscellaneous parts	335	1.0
Total	10,172	28.8
Grand total	35,358	100
SUMMARY		
Total car body	17,269	48.9
Electrical equipment	6,020	17.0
Air-brake equipment	1,712	4.8
Trucks	10,357	29.3
Total weight	35,358	100

boxed-over end of the rod holds it in position. In order to fix the position of the pull-rods and tie-rods on the brake levers, however, bolts are inserted in the lever on each side of the point of connection. These are so spaced as not to interfere with the normal operation of these rods and levers, but in case of a pin connection failure the rods are held approximately in their proper position on the levers. As a precaution against a broken pull-rod, stops have been placed on the foundation brake lever carrier, against which the released lever catches, thus permitting the unbroken pull-rod to be operative. Along this same line the fuse boxes which are installed on each side of the car under the sills have "Safety First" stenciled in white on the covers. This is to

remind the motorman that he must be sure of the position of his circuit-breaker or trolley before renewing the fuse.

Following the standard Chicago practice, a single sliding door is provided on the exit side of the front platform, unlike former designs, but it is connected to the step, which raises when the door is in the closed position. Another departure from former standards was brought about by the careful study of weights and their reduction. The sliding door does not recede into a pocket, but the partition forming it has been removed and the exposed door slides along the side of the vestibule. A two-piece folding door is provided on the opposite side of the platform, and this opens and folds against the controller. It differs from the design used in the older types of cars, which were four-piece. The installation of a long slatted seat, so placed and connected that when the door is in the closed position the step is raised, also represents a departure. One end of this seat is hinged to the front of the vestibule, and when it is raised to clear the doors it actuates levers which lower the steps.

The conductor and motorman's rail is about the same as those on the platforms of the older cars. It is shown in one of the illustrations. The center leg



New Chicago Railways Car—Front Platform

of the rail is equipped with a bayonet lock in the bottom casting. This locks the rail into the floor socket when it is in position and it may be unlocked by raising a sleeve set on the leg just below the rail. The other two legs are made with partial flanges at the base so that they will hook into slots in the sides of the floor sockets when the rail is in position. In order to engage the locks, it is necessary to tilt the rail to insert the two outside legs, which when raised to a vertical position are held rigid by the bayonet lock on the center leg. The hand-brake staff is set close against the front of the vestibule, and the handle is designed so it can be fastened against the vestibule to give more platform space.

The heating system is of the Consolidated Car Heating Company's design with thermostatic regulators. Car-body heaters are installed under the seats and are regulated by the thermostat. Those provided in the end-sills in the vestibule are independently connected so that they are under the control of the conductor or motorman. In conjunction with the heating equipment a Cooke vacuum ventilating system has been installed. This is of the exhaust type with fresh air intakes through 4-in. x 8-in. fixed louvers in the side girders. These are made of pressed steel, and the air from them passes through sheet-metal ducts fastened on the underside of the seat heaters. The exhaust fan motor in the

ventilating system is installed on the ceiling of one of the vestibules just outside the bulkhead, and a duct leads from the fan to a fixed louver opening in the side of the vestibule roof. Vestibule ventilation is obtained through two utility exhaust ventilators installed in the roof. The exhaust fan has a capacity of 60,000 cu. ft. of air per hour, which is sufficient to change the air in the car body every two minutes.

Each side of the car body contains eleven windows equipped with brass bottom sashes and arranged to raise into pockets provided at the top of the window opening. The top sash is built of wood and is continuous from end to end of the car body. The fact that it is continuous and is permanently attached to each post by screws materially increases the stiffness of the car sides. In order thoroughly to insulate these windows against extremely low outside temperatures, storm sashes are provided. Each side of the car is fitted with three sections of three windows each and one section of two windows. In the earlier car designs the storm sashes were of brass and one was provided at each window. The new arrangement is much simpler, it being necessary to make four large units instead of eleven single sashes. It also aided in reducing the labor charge, as only eight joints were necessary as compared with twenty-two in single sashes. The new wooden storm sashes, which weigh 15.7 lb. per window as compared with 18.7 lb., thus represent a reduction in weight of 17 per cent. They are fastened to each post with four screws, three of which are used to hold the window guards. These screws are set into brass castings fitted into pockets in each post. This manner of fastening these sashes makes them much tighter than the old metal sashes, which were attached by locks and clamps.

The curtain rolls are exposed so that the curtains may be cleaned on both sides as they pass over the rolls. They are set into shallow recesses at the top of the window openings, and the curtain fixtures are covered with neat brass caps. Another simple innovation which aids materially in cleaning the cars was included in the manner of installing the Hunter illuminated signs. These sign boxes in the vestibules and at the center windows in the car sides are hinged at the top and fastened at the bottom with catches so that they may be released and swung away from the glass to permit cleaning. In the old cars the sign boxes were permanently installed so that it was possible to wash the glass only on the outside of the car.

The mechanical department, in selecting the interior finish of the car body, endeavored to make it as light as practicable to increase the efficiency of artificial illumination. Accordingly, the headlining was finished in light buff, and the trim was finished in natural cherry. This improved the car illumination 50 per cent over the old pea-green headlining and stained-cherry finish. An actual test of the average illuminating qualities of the new as compared with the old car finish shows that the illumination at the aisle seat of the new car is 4.34 ft.-candles and the old car 2.78 ft.-candles. Birch finish was used in the first twenty-five cars for test purposes. It was not only much cheaper than cherry but at the same time was just as satisfactory for interior finish. Owing to the tendency of birch to warp, however, it was necessary to use cherry for the door stiles and cross-bars. The panels in these were made of birch and the two woods blended almost perfectly.

Among the special devices included in the construction of these new arched-roof cars are Hale & Kilburn walk-over seats, agasote headlining, Rico sanitary hand straps, Curtain Supply Company's ring fixtures, U. S. ball-bearing trolley bases and Stucki anti-friction side bearings.

An Electrolysis Test on a System of Insulated Negative Feeders in St. Louis

As a Sequel to Their Discussion of the General Subject the Authors Present the Results of a Test on a Railway Installation for Electrolysis Mitigation Made by the Bureau of Standards Under Their Direction

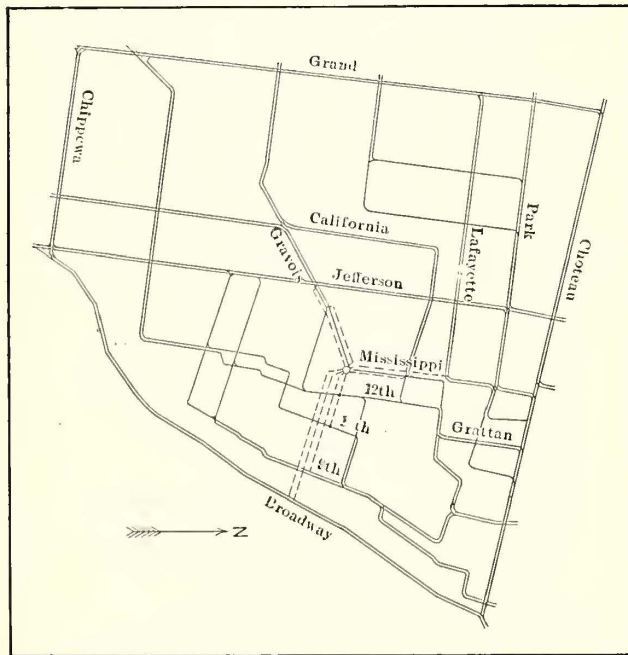
BY E. B. ROSA, BURTON M'COLLUM AND K. H. LOGAN

In connection with the general investigations of electrolysis that have been carried out by the Bureau of Standards for the past two or three years a considerable amount of preliminary work was done during the summer of 1912 in the city of St. Louis. As a result of this work an arrangement was made with the United Railways of St. Louis for the carrying out of a test at one of the substations for the purpose of demonstrating the effectiveness of the insulated return feeder system, the work of installing the negative feeders being done by the United Railways Company.

The purpose of the test was twofold—first, to demonstrate the effectiveness of the insulated return feeder system as a means of mitigating electrolysis troubles,

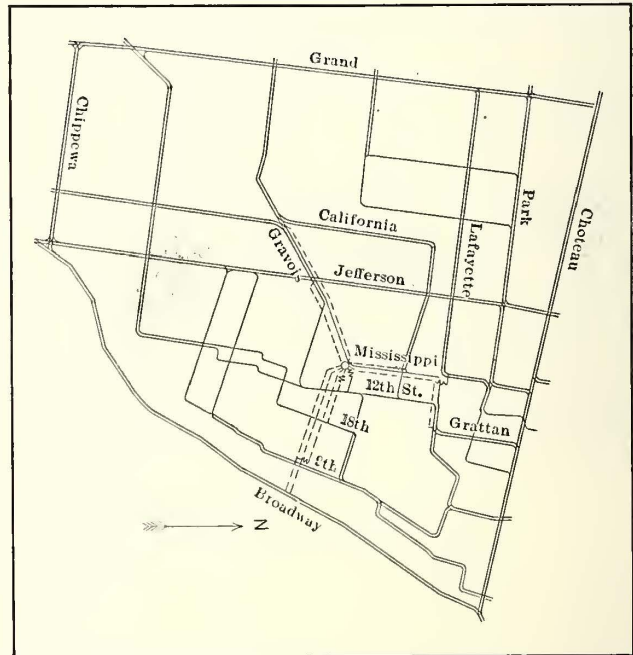
potential gradients of the tracks which they paralleled, and hence electrical conditions were the same as they would have been if the feeders had been substantially uninsulated and the relative electrolysis conditions and costs were identical.

The station selected for this experimental investigation was the new Ann Avenue substation located at the corner of Mississippi and Ann Avenues. The rated capacity of this station is 4000 kw at the present time, and the peak load (average for one hour) was at the time the tests were made about 7540 amp. The average load for twenty-four hours was 3500 amp, giving a load factor of about 46 per cent. It will therefore be seen that conditions at this station as regards size and



Electric Ry. Journal

Fig. 1—Electrolysis Test—Original Arrangement of Uninsulated Negative Feeders



Electric Ry. Journal

Fig. 2—Electrolysis Test—Final Arrangement with Insulated Negative Feeders

and, second, to determine the relative cost of securing good conditions from the standpoint of electrolysis as compared with the cost of securing the same conditions under the ordinary methods with uninsulated negative feeders. Therefore it was necessary to carry on the tests under two conditions, namely, to install a system of negative feeders complete, and in such a way that they could be converted into the insulated or uninsulated feeder systems at will. This could readily be accomplished by simply tying the busbar to the tracks near the power house for the uninsulated system and removing such ties and inserting suitable resistance taps for the insulated system. It is true that in both cases the feeders themselves were insulated from the tracks between the point at which they were tied into the tracks and the busbar, but since the feeders were at the same potential as the tracks at both ends, the potential gradients on the feeders were, of course, the same as the

character of the load are fairly representative of average conditions in a moderate-sized city substation. The track network in the district fed by the station is shown in Figs. 1 and 2. These show that only one single track passes immediately by the station and another single track passes along the street one block to the east. This is, therefore, an unfavorable location in respect to returning the current to the station, because the cross-section of rails approaching the station is unusually small. On this account a relatively large amount of copper would have had to be installed whether the insulated or uninsulated system was used, and therefore the cost per kilowatt capacity of returning current to this station would be expected to be considerably higher than the average. This fact makes the test of the system a more severe one from the economy standpoint, although it has no appreciable bearing on the effectiveness of the system in reducing electrolysis troubles.

At the time arrangements were made for the proposed tests a considerable amount of negative copper was already in place, and in designing the proposed insulated feeder system this copper was allowed to remain. Extensions were made where necessary and the current distribution was adjusted by means of resistance taps. The area of the feeders is not therefore just as it would have been if a new insulated feeder system had been installed throughout, and this also tends to make the cost run somewhat higher than would otherwise have been the case. The original feeder layout designed by the engineers of the United Railways Company for the negative return is shown in Fig. 1, and the system as finally completed for the insulated feeder layout is shown in Fig. 2.

An examination of these shows that changes were made in three cases. In one case a feeder of 1,000,000-circ. mil cross-section had been designed to run from the negative bus eastward along Ann Avenue and tied to the tracks at both Eighteenth Street and Ann Avenue and Twelfth Street and Ann Avenue. The change made here was merely to remove the tie at Eighteenth Street and Ann Avenue and install a pair of No. 0000 cables running directly from the tracks at Eighteenth Street and Ann Avenue to busbar, thus giving two separate feeders to those two points instead of one common feeder. The length of each of these No. 0000 feeders was about 700 ft. A second change will be noted on Gravois Avenue, the original feeder layout contemplated running one feeder of 1,000,000 circ. mils to Victor and Gravois, and another to Jefferson and Gravois. The feeder at Jefferson and Gravois was allowed to remain as originally installed, but the feeder running to Victor and Gravois was cut loose from the tracks at this point and extended to California and Gravois, a distance of about 2300 ft. The third extension was in one of the feeders running north on Mississippi Avenue. The original plan contemplated running two 1,000,000-circ. mil cables north on Mississippi Avenue to Geyer Avenue. One of these feeders was left at that point, but the other was cut loose from the tracks and extended north on Mississippi Avenue to Lafayette, and thence east along Lafayette to Grattan, a total distance of about 2400 ft. The total weight of copper added in the three places was therefore about 15,090 lb.

The original plan called for the installation, in addition to the above-mentioned feeders, of a 1,000,000-circ. mil cable running east on Ann Avenue to Ninth Street, a distance of 2800 ft., and two 1,000,000-circ. mil feeders running east from the power house along Ann Avenue to Broadway, a distance of 7400 ft. The total weight of copper under the original plan would therefore have been 65,630 lb., all of it in 1,000,000-circ. mil cables, while in the system as actually completed there were 80,720 lb. of copper, all of which was of 1,000,000-circ. mil cross-section except the two short No. 0000 feeders running to Eighteenth Street and Ann Avenue. The excess cost of the actual system over that of the original system was about \$3,770, figuring the cost at 25 cents per pound installed. All of the additional feeders were installed overhead, except the two No. 0000 cables, which were in fiber conduit.

ELECTRICAL OBSERVATIONS

In designing these extensions the object was to reduce the potential gradient in the rail return at all points of the system to an average value not exceeding 1 volt per 1000 ft. for one hour at peak load, which at 46 per cent load factor would correspond to an average of about 0.46 volt per 1000 ft. during the twenty-four-hour period. In making the tests the system was first arranged as an uninsulated feeder system by tying the tracks at Mississippi and Ann Avenues and Eighteenth

Street and Ann Avenue as directly to the busbar as the connecting cables would permit, and a complete electrical survey was made to determine the electrical conditions existing in the negative return and pipe systems. These measurements include the following:

(1) *Rail gradient measurements.* These for convenience comprise measurements, with a millivoltmeter, of the drop of potential on a fixed length of 4 ft. of rail, the measurements on all the rails on any particular street being taken at each point.

(2) *Current flow in pipes, including both gas and water mains.* For this purpose excavations were made at a number of points, and rubber-covered leads were fastened to the pipes 4 ft. apart, the leads being brought underground to a service box located inside the curb. These points were for the most part located within $\frac{1}{2}$ mile of the station. Measurements at these points permit the calculation of the actual value of the current flow in the pipes at those points. In addition to these, potential measurements were made between adjacent fire plugs at a number of outlying points considerably beyond the termini of the feeders. While these do not permit the calculation of the actual current flow in those localities, the measurements taken under the insulated and uninsulated systems gave values proportional to the current flow under the two conditions and thus afforded means of determining the relative current flow in the two cases.

(3) *Potential difference measurements between pipes and rails.* These measurements were taken throughout a large part of the area affected by the station, including a considerable portion of the region where the pipes were negative to rails, in order that any tendency of the insulated feeder system to extend the positive area could be determined.

(4) *Over-all potential measurements.* These measurements were made between a point on the rails adjoining the power house and a number of remote points near the extreme limits of the feeding districts. These measurements were made with the co-operation of the Kinloch Telephone Company, which connected the telephone wires to the points at which potential measurements were desired, so that all the measurements could be made at the telephone exchange.

(5) *Current in the various feeders.* These data were taken in order to determine the correctness of the current distribution and the economy with which the copper was being worked in the different parts of the system.

After all of the above measurements were completed the system was then converted into an insulated feeder system as mentioned above, and the same measurements repeated at the same points. In taking the electrical measurements at any one point the readings were taken every fifteen seconds for a period varying from five minutes to fifteen minutes according to local conditions, and the average of all these readings was taken as the reading at that particular time of day. Since readings at different points were necessarily taken at different hours of the day, when the station load differed, the readings as observed are not directly comparable, and in order to get a basis on which the readings under different conditions could be directly compared it was found most satisfactory to reduce all the readings to the average twenty-four-hour values. This was done by multiplying the average observed reading at any point by the ratio of the station load at that particular time of day to the twenty-four-hour average station load. It is this reduced twenty-four-hour average value that is recorded in the tables in each instance. Careful study of a large amount of test data shows that this affords a very satisfactory basis of comparison.

In converting to the insulated feeder system the dif-

ferent extensions outlined in detail above were installed and the feeders were adjusted for approximately equal drop by the insertion of suitable resistances where necessary. The number and location of these resistance taps are shown in Fig. 2, which gives the final layout of insulated feeders. It will be seen here that there are three resistance taps at the substation in the cables running to the tracks at Mississippi and Ann, Eighteenth and Ann and Twelfth and Ann Avenues. There is also a resistance in the feeder running north on Mississippi Avenue to Mississippi and Geyer, the resistance being at the outer end of the feeder. The feeder running north on Mississippi Avenue to Lafayette is connected to the tracks at Lafayette and Mississippi through a resistance tap designed to give about 4 volts drop at peak load. There is also a resistance tap at Ann Avenue and Ninth Street. This is not, however, in series with any feeder, but is connected between the feeder that is tied in at Ninth Street to the two feeders which run on to Broadway. It therefore affords a certain measure of paralleling between these two feeders.

A comparison of the measurements taken under the insulated and uninsulated feeder systems shows clearly the relative danger from electrolysis under the two systems. While the amount of copper in the feeder systems under these two series of tests is not the same in each case, the difference was not great enough to produce any marked change in electrolysis conditions under the uninsulated feeder system. This was shown in advance by careful calculations and was borne out by experimental data determined later, so that, although some copper was added for the insulated feeder system such copper, because of its outlying location, would have exerted practically no influence when used in connection with the insulated system. The relative results show substantially the changes due to conversion from an uninsulated to an insulated system with the same amount of copper.

RAIL GRADIENTS

In determining the rail gradients, measurements were taken on a fixed length of 4 ft. of rail. The points for measurement were selected so as to give the maximum gradients that existed in each case. This meant that gradient measurements were taken on all sides of a point at which a negative cable was tapped to the tracks under both the insulated and uninsulated feeder system. It is obvious that at more remote points the gradient would tend to become less than the values recorded at these places, except under very special conditions, which did not exist in this installation. The location of the points at which potential gradient measurements were taken, and also the values obtained, are shown in Table I. By comparing the figures point by point in the columns showing average gradients under each system we get the effect produced by the change from uninsulated to insulated feeders. An examination of these columns shows that in many places the gradients have been greatly reduced, this being particularly true in the region near the power house where the gradients were rather high under the uninsulated system. In one case only has there been an increase and this is at Broadway and Ann Avenue, where considerably more current was taken off under the uninsulated system than under the insulated system. It will be noted that there is but one point with a potential gradient greater than 1 volt per 1000 ft. under the insulated feeder system, whereas the average of all points is but 0.47 volt. Since the station load factor is about 46 per cent, this means that the average potential gradient at peak load is almost exactly 1 volt, and most of the readings will not vary much from this mean value. Under the uninsulated feeder system, however, there are a considerable number of readings which run above 1 volt average, the

highest being 2.89 volts per 1000 ft., which corresponds to a peak load value of about 6.2 volts per 1000 ft. The average for all points under the uninsulated feeder system is 0.91 volt for the twenty-four-hour period, which corresponds to a mean value of 2 volts during peak load. These figures show that the installation of the insulated

TABLE I—RAIL GRADIENTS

Location	Uninsulated Feeders		Insulated Feeders	
	Direction of Flow	Gradient, Volts per 1000 Ft.	Direction of Flow	Gradient, Volts per 1000 Ft.
Grattan north of Lafayette.....	..	...	S	0.47
Lafayette east of Grattan.....	..	...	W	0.15
Lafayette west of Grattan.....	..	...	W	0.34
Lafayette east of Mississippi.....	W	1.90	W	0.59
Lafayette west of Mississippi.....	E	1.66	E	0.48
Mississippi north of Lafayette.....	S	0.90	S	0.72
Mississippi south of Lafayette.....	S	1.87	S	0.75
Mississippi south of Geyer.....	S	2.89	S	0.57
Geyer east of Mississippi.....	W	0.91	W	0.29
Geyer west of Mississippi.....	E	1.17	W	0.60
Mississippi south of Ann.....	N	1.35	N	0.21
Gravois south of Victor.....	N	1.77	W	0.17
Victor east of Gravois.....	E	0.29	..	...
Gravois west of Jefferson.....	E	1.69	E	0.03
Jefferson north of Gravois.....	E	0.69	S	0.68
Jefferson south of Gravois.....	N	0.72	N	0.22
Gravois west of California.....	..	...	E	0.59
California north of Gravois.....	..	...	S	0.33
California south of Gravois.....	..	...	N	0.15
Broadway north of Ann.....	S	0.59	S	0.71
Broadway south of Ann.....	N	0.35	N	0.90
Ninth north of Ann.....	S	0.69	S	1.20
Ninth south of Ann.....	N	1.43	N	0.39
Twelfth north of Ann.....	S	0.33	S	0.25
Twelfth south of Ann.....	N	0.80	N	0.30
Eighteenth north of Ann.....	S	0.94	S	0.80
Eighteenth south of Ann.....	N	0.75	N	0.43
Average		0.91		0.47

return feeder system has substantially fulfilled the conditions that it was designed to accomplish in the way of potential gradients, in that the mean value at peak load does not exceed the calculated value of 1 volt per 1000 ft.

While it is important that rail gradients should be kept low, this figure is only of indirect importance, since low gradients in general mean small leakage and consequently reduced current flow on the pipes. Of even greater importance, however, than low gradient is the direction of the gradient. Under the uninsulated feeder system this gradient is necessarily continuous from the outlying districts clear into the power house; whereas under the insulated feeder system the current can, if desired, be made to flow from all directions toward the points of tap of the insulated feeders to the rails, and since these points are distributed through a considerable portion of the feeding area, the direction of current flow in the rails can be frequently reversed, so that the gradient in any one direction will extend over only a comparatively short distance, and hence large differences of potential between different points in the earth cannot be set up. It will be evident, therefore, that the improvement in electrolysis conditions caused by the installation of insulated feeders will, in general, be much greater than the ratio of reduction of the rail gradient. This is borne out in a very marked manner by the data given below.

CURRENT FLOW IN PIPES

One of the best criteria for determining the relative amount of damage from electrolysis under different conditions of track return is afforded by determining the relative current flow in the pipes. Since, as in the present case, where there were no metallic connections to pipes, all the current flow carried by the pipes must ultimately be discharged into the earth, the total amount of electrolysis will be approximately proportional to the current flow on the pipes. Table II shows the current flow as measured at a number of points under the insulated and uninsulated feeder systems. The currents in all cases were calculated from measure-

ments of millivolt drop on a 4-ft. length of pipe, the resistance of the pipe being determined from the size and kind of pipe and known constants as determined from numerous laboratory tests. This method of determining current in the pipes, while not strictly accurate, because of variations in the kind and weight of the pipes, has nevertheless been shown to be sufficiently accurate for most practical purposes when used with care.

Referring to Table II, the first column, headed "Location," gives the points at which current measurements were made; the second column, headed "Size of Pipe,"

TABLE II—CURRENT FLOW IN GAS AND WATER PIPES WITH PIPES NOT DRAINED

Location	Size of Pipe, In.	K	Uninsulated System, Amp.	Insulated System, Amp.
Russell west of Thirteenth.....	30 W	54.0	46.80	3.78
Russell west of Mississippi.....	6 W	5.2	0.606	0.00
Ann west of Twelfth.....	4 G	3.5	0.16	0.17
Ann west of Eighteenth.....	6 W	5.2	3.24	1.86
Ann east of McNair.....	4 G	3.5	6.93	2.16
Ann east of McNair.....	6 W	5.2	2.35	0.05
Ann east of McNair.....	4 G	3.5	0.175	0.035
Gravois west of Eighteenth.....	6 W	5.2	11.80	1.63
Gravois west of Shenandoah.....	4 G	3.5	0.08	0.03
Shenandoah west of Thirteenth.....	20 W	31.5	9.42	0.62
Shenandoah east of McNair.....	20 W	31.5	43.10	12.50
Lynch west of Indiana.....	6 G	5.2	0.15	0.11
Eighteenth north of Shenandoah.....	6 W	5.2	6.97	3.62
Eighteenth north of Victor.....	20 W	31.5	23.40	7.48
Lemp north of Victor.....	6 G	5.2	0.11	0.05
Mississippi south of Lafayette.....	6 G	5.2	0.06	0.03
Mississippi south of Allen.....	20 W	31.5	1.40	1.70
Mississippi south of Russell.....	20 W	31.5	56.40	19.30
Mississippi south of Ann.....	20 W	31.5	19.60	3.06
Salena north of Shenandoah.....	20 W	31.5	40.20	7.02
Salena north of Victor.....	6 W	5.2	2.74	0.26
Total			275.7	48.41

gives in inches the diameter of the pipe on which the current was measured, and in each case this figure is followed by the letter W or G, indicating whether the pipe was gas or water main. The third column, headed K, gives the factor by which the millivolt reading must be multiplied to give current flow in the pipe. In the fourth and fifth columns, under "Amps," the calculated current flow average for the twenty-four-hour period is given for the two systems.

It will be seen from these figures that the total current flow at all observation points under the uninsulated feeder system was 275.7 amp, whereas the corresponding figure under the insulated feeder system was 48.4 amp, which gives an average ratio of reduction at all points of 5.7 to 1. This represents the average reduction in the rate of electrolytic corrosion throughout the system as indicated by these measurements. As an actual fact, in some localities, particularly near the power station, the reduction will be greater than this, whereas in the more remote districts it will be correspondingly less, but these figures may be taken as a fair indication of the general improvement that is effected by the insulation of the feeders.

While no attempt was made in the present investigation to install a scientific pipe drainage system, it was deemed worth while to tie in the pipes temporarily at points near the station in order to determine the effect of such tying in on the general magnitude of current flow in the pipes, and particularly the relative increase of current produced by such tying in under the insulated and uninsulated feeder systems. For this purpose temporary ties between the pipes at Mississippi and Ann Avenues and the busbar were installed, and likewise a direct tie between the pipes and tracks at Twelfth Street and Ann Avenue was installed. Measurements of current flow at the same places as shown in Table II were made with the pipes thus tied in and with the feeders insulated and uninsulated from the negative bus.

The results of these measurements are shown in Table III. Here the columns have the same significance

as in Table II. It will be seen by comparing these figures with those of Table II that there has in general been a marked increase in current flow in the pipes, and this is particularly true in the case of the uninsulated system. The sum of all the currents at different points of measurement is 847.4 amp for the uninsulated system and 86.1 amp under the insulated system, showing that under these conditions of tying in the current flow in the uninsulated system is on the average about ten times as great as is the case under the insulated feeder system.

TABLE III—CURRENT FLOW IN GAS AND WATER PIPES WITH PIPES DRAINED

Location	Size of Pipe, In.	K	Uninsulated System, Amp.	Insulated System, Amp.
Russell west of Thirteenth.....	30 W	54.0	108.00	5.02
Russell west of Mississippi.....	6 W	5.2	4.90	0.716
Ann west of Twelfth.....	4 G	3.5	0.24	0.32
Ann west of Eighteenth.....	6 W	5.2	5.04	3.15
Ann east of McNair.....	4 G	3.5	9.20	6.20
Ann east of McNair.....	6 W	5.2	4.79	0.05
Ann east of McNair.....	4 G	3.5	0.346	0.35
Gravois west of Eighteenth.....	6 W	5.2	21.60	1.98
Gravois west of Shenandoah.....	4 G	3.5	0.30	0.08
Shenandoah west of Thirteenth.....	20 W	31.5	9.00	2.12
Shenandoah east of McNair.....	20 W	31.5	83.00	20.60
Lynch west of Indiana.....	6 G	5.2	0.11	0.11
Eighteenth north of Shenandoah.....	6 W	5.2	9.26	3.37
Eighteenth north of Victor.....	20 W	31.5	42.80	2.57
Lemp north of Victor.....	6 G	5.2	0.10	0.05
Mississippi south of Lafayette.....	6 G	5.2	0.11	0.05
Mississippi south of Allen.....	20 W	31.5	8.17	1.20
Mississippi south of Russell.....	20 W	31.5	301.00	22.20
Mississippi south of Ann.....	20 W	31.5	105.40	6.94
Salena north of Shenandoah.....	20 W	31.5	128.40	10.23
Salena north of Victor.....	6 W	5.2	2.55	0.11
Total			847.43	86.11

It will also be observed by comparing the totals of Table II with those of Table III that the tying in of the pipes with the uninsulated feeder system causes an increase in the current flow in the ratio of about 3.7 to 1, whereas under the insulated feeder system the increase in current due to tying the pipes in is increased only in the ratio of 1.78 to 1. This shows that the tying in of the pipes has a much smaller tendency to increase the current flow in the case of insulated feeders than it has in the case of uninsulated feeders. The total current flow with the pipes tied in under the insulated feeder system is only 86.1 amp, whereas the current flow under the uninsulated system with the pipes not tied in is 275.7 amp, which means that draining the pipes at these two points under the insulated feeder system results in only three-tenths as much current flowing in the pipes as the flow in the pipes without such drainage under the uninsulated feeder system.

These various ratios are summarized in Table IV and show in a very striking manner the marked reduction in current flow that in every case accompanies the insulated feeder system.

The figures of Table III show the current flow in the pipes in the region within approximately 1/4-mile radius of the power station. It was deemed advisable also to determine the relative current flow under the different conditions at points more remote from the power house, and for this purpose, in order to avoid the labor of additional excavations, potential measurements were made between adjacent fire hydrants at suitable places, the relative potential differences under the insulated and uninsulated systems being taken as the relative current flow in the two cases. Under each feeder system also these measurements were taken with the pipes drained at the two points mentioned above near the station, and also with the pipes not drained, so as to show the tendency, if any existed, of pipe drainage to increase current flow in the pipes at very remote points. These data are given in Table V. In this table are shown the voltage drops between hydrants and under both the insulated and uninsulated

feeder systems. Under each system are shown also the voltage drops with the pipes drained and not drained. Under pipe drainage the difference in voltage drop is more marked, the ratio of the sums of the voltage drops being here only 0.362. With the insulated feeder sys-

TABLE IV—SUMMARY OF CURRENT FLOW IN PIPES

	Total Current, Amp	
Uninsulated system, pipes drained.....	847.43	
Uninsulated system, pipes undrained.....	275.70	
Insulated system, pipes drained.....	86.11	
Insulated system, pipes undrained.....	48.41	

	Current-Flow Ratios Pipes Not Drained	Pipes Drained
Insulated feeders	48.41	86.11 = 0.176
Uninsulated feeders	275.70	847.43 = 0.1016

	Insulated Feeders	Uninsulated Feeders
Pipes drained	86.11	847.43 = 1.78
Pipes undrained	48.41	275.70 = 3.07

	Insulated feeders, drained pipes	Uninsulated feeders, undrained pipes
	86.11	275.70 = 0.31

tems the ratio of voltage drop or total current flow with the pipes drained is 1.22. With the uninsulated feeder system the ratio is 1.56, indicating that even in these more remote points the current flow shows a marked increase when the pipes are tied in, but that this increase is much less marked in the case of the insulated feeder system than it is in the case of the uninsulated feeder system. The last ratio given in the summary of Table V also shows that at these outlying points the

TABLE V—POTENTIAL DIFFERENCES BETWEEN FIRE PLUGS

On	Location From	To	Uninsulated Feeders		Insulated Feeders	
			Pipes Not Drained	Pipes Drained	Pipes Not Drained	Pipes Drained
Mississippi	Kennett	Lafayette	0.685	0.908	0.420	0.588
Mississippi	Allen	Geyer	0.211	0.425	0.150	0.137
Gravois	Sidney	Victor	0.646	0.735	0.229	0.260
Ann	Menard	Eleventh	0.320	0.624	0.159	0.208
Ann	Jefferson	Indiana	0.132	0.308	0.060	0.023
Shenandoah	Indiana	Missouri	0.394	0.648	0.159	0.219
McNair	Lynch	Sidney	0.156	0.335	0.001	0.007
Total voltage drop			2.544	3.983	1.178	1.442

	POTENTIAL DIFFERENCE RATIOS	
	Pipes Not Drained	Pipes Drained
With insulated feeders	1.178	1.442 = 0.362
With uninsulated feeders	2.544	3.983 = 0.362

	Uninsulated Feeders	Insulated Feeders
	With pipes drained	3.983	1.442 = 1.56
With pipes not drained	2.544	1.178 = 1.224

	Uninsulated feeders with drained pipes	Uninsulated feeders with undrained pipes
	1.442	2.544 = 0.566

current flow in the pipes under the insulated feeder system combined with pipe drainage at the points near the power house is but little over half of the current flow without pipe drainage under uninsulated feeder systems.

The results as presented, while they do not show conditions that would exist under an ideal pipe drainage system, indicate, nevertheless, the tendencies which exist and demonstrate that conditions in regard to current flow in the pipes are invariably much better under the insulated feeder system than under the uninsulated system.

One point of special interest in connection with the data on current flow in the pipes should be mentioned here. By reference to Tables II and III it will be noted that those points marked W in the second column, indicating water mains, show in general a much higher current flow than the points marked G, which indicate gas mains. The reason for this is that the gas mains in this vicinity have a considerable number of cement joints, and this undoubtedly is responsible for the comparatively low current flow. It is probable that those

points which show almost no current flow are sections which contain cement joints, whereas those points that show small yet appreciable current flow are the older lead-jointed sections, since both kinds are known to exist in this territory.

POTENTIAL DIFFERENCES BETWEEN PIPES AND RAILS

Another criterion for determining the relative danger to pipes under different conditions is the potential differences between pipes and rails. Measurements were therefore made between fire hydrants and rails at a considerable number of points under both the insulated and uninsulated systems, and the results are given in Table VI. An examination of these data reveals that for the most part there has been a marked reduction in potential difference, particularly in the region near the power house where such potential differences were originally high. In order to facilitate the interpretation of these data they have been divided into three groups with subheads A, B and C. The data for all points in which original potential differences were greater than 1 volt are placed in group A;

TABLE VI—POTENTIAL DIFFERENCE BETWEEN PIPES AND RAILS
Group A—Potentials Originally More than 1 Volt

Location	Potential Difference	
	Uninsulated System	Insulated System
Twelfth and Russell.....	1.80	0.70
Eighteenth and Geyer.....	1.38	0.29
Eighteenth and Allen.....	2.02	0.67
Eighteenth and Russell.....	3.00	0.24
Eighteenth and Ann.....	2.15	0.08
Eighteenth and Shenandoah.....	2.02	0.70
Eighteenth and Victor.....	1.69	0.55
Mississippi and Geyer.....	2.14	0.86
Mississippi and Allen.....	3.45	0.37
Mississippi and Russell.....	4.22	0.17
Mississippi and Gravois.....	3.60	0.16
Gravois and McNair.....	3.20	-0.84
Gravois and Victor.....	1.13	0.53
McNair and Geyer.....	1.91	0.15
Jefferson and Ann.....	1.47	-0.14
Average.....	2.35	0.22

Group B—Potentials Originally Less than 1 Volt

Location	Potential Difference	
	Uninsulated System	Insulated System
Ninth and Lafayette.....	0.62	0.02
Twelfth and Shenandoah.....	0.56	0.59
Grattan and Lafayette.....	0.25	0.30
Eighteenth and Lafayette.....	0.38	0.05
Eighteenth and Sidney.....	0.69	0.25
Mississippi and Lafayette.....	0.62	0.37
Lemp and Victor.....	0.71	0.35
McNair and Victor.....	0.94	0.52
Salena and Victor.....	0.71	0.40
Jefferson and Lafayette.....	0.22	-0.01
Jefferson and Geyer.....	0.59	-0.04
Jefferson and Gravois.....	0.77	0.77
Jefferson and Pestalozzi.....	0.39	0.32
Average.....	0.573	0.30

Group C—Potentials Originally Negative

Location	Potential Difference	
	Uninsulated System	Insulated System
Broadway and Victor.....	-0.70	+0.48
Broadway and Russell.....	-0.01	+0.80
Ninth and Russell.....	-0.23	+0.80
Ninth and Victor.....	-0.33	+0.62
Eleventh and Park.....	-0.37	+0.33
Grattan and Park.....	-0.51	+0.35
California and Geyer.....	-0.66	+0.29
California and Gravois.....	-0.33	+0.84
Average.....	-0.39	+0.35

all those in which the pipes were positive but less than 1 volt are placed in group B, and all those points in which the pipes were originally negative but have become somewhat positive under the insulated feeder system are placed in group C.

On examination of group A, which includes the points of high original potential and therefore covers the area in which the original danger is greatest and the need for improvement most urgent, we find that there has been a very large reduction of potential differences between pipes and rails. In two cases, notably at Gravois and McNair and at Jefferson and Ann Avenues, where the pipes were originally strongly positive to rails, they have become very slightly negative, and in all the other points in this group a marked reduction is apparent. The average potential difference at all points

under the uninsulated system was 2.35 volts, whereas under the insulated feeder system this average was only 0.22 volt, giving a mean ratio of reduction of 10.8 to 1.

Referring to group B, where the original potential differences were less than 1 volt, we find there is still a very considerable reduction. The average for all of these points is 0.573 volt, whereas the average for the corresponding points under the insulated feeder system is 0.30 volt, giving a ratio of reduction of 1.91 to 1. Even here, in the intermediate region, where the danger was comparatively small under the original conditions, there has still been a considerable improvement, the average value of 0.30 volt being so small as not to involve any considerable danger to the pipes.

In group C we find that eight points which were originally negative have become more or less positive. This is to be expected in general because of the tendency to form positive areas in the region near the points where the negative feeders are tied to the track. At these eight points there existed originally a mean value of potential difference of -0.39 volt, whereas under the insulated feeder system this has been converted into a mean value of +0.35 volt. In the more remote districts the potential differences were negative under both insulated and uninsulated systems and are therefore of no consequence here.

These data show that under the insulated feeder system the reduction of danger is greatest at those points where there is greatest need for improvement, and the foregoing figures indicate very clearly that in the present instance the potential differences have been reduced to so low a value as to make the pipes comparatively safe. They also show that, while the installation of a negative feeder system does tend to increase somewhat the area of the positive zone, this tendency is so slight as to lead to no serious consequences. One of the principal objections against the installation of insulated negative feeders that have been urged by some engineers has been that it creates a large number of positive areas covering a much greater territory than is the case with the ordinary uninsulated system. While it is, of course, true that there is a tendency for the insulated feeder system to extend the positive area, and this is clearly indicated by the foregoing data, these data nevertheless show that comparatively few new positive points have been created, and that where they have appeared the potential differences are so low as not to give rise to any serious corrosion of the pipes under ordinary conditions. The figures show conclusively that this objection to the insulated negative feeder system is not valid, at least in the present case, whereas the reduction of the potential differences in the regions where the conditions were originally bad is so great as completely to overshadow the effects of the slight tendency to broaden the positive zone.

All of the foregoing potential difference measurements were taken between water pipes and rails because of the greater convenience of making such measurements, since measurements could be taken between fire hydrants and tracks. In order to determine whether or not the potential differences between gas pipes and the tracks differed materially from the corresponding voltages between water pipes and rails, a considerable number of measurements were taken between water and gas mains at accessible places. These measurements are given in Table VII, which shows the generally low potential differences between water and gas mains.

OVER-ALL POTENTIALS

Still another important factor in determining the probability of current being taken up by the pipes is the maximum potential differences occurring between the tracks near the station and remote points in the

track network. Accordingly a considerable number of such measurements were taken under both the insulated and the uninsulated feeder system. These data are shown in Table VIII. The figures are in accord

TABLE VII—POTENTIAL DIFFERENCE BETWEEN WATER MAINS AND GAS PIPES

Location	Uninsulated Feeders, 24-Hour Average Voltage
Eighteenth and Geyer	0.00
Eighteenth and Allen	0.05
Eighteenth and Russell	0.05
Eighteenth and Shenandoah	0.27
Eighteenth and Victor	0.17
Lemp and Shenandoah	0.02
Lemp and Victor	0.16
Mississippi and Geyer	0.09
Mississippi and Allen	0.16
Mississippi and Russell	0.44
Mississippi and Gravois	0.56
Salena and Victor	0.21
Gravois and Shenandoah	-0.12
Gravois and Victor	0.22
McNair and Geyer	0.02
McNair and Allen	0.04
McNair and Russell	-0.09
McNair and Ann	0.06
Missouri and Ann	0.07
Average	0.138

with all of the other data presented above, and they confirm the conclusion that a very marked improvement has accompanied the conversion of the system from uninsulated to insulated feeders.

An examination of the preceding data on current flow in the pipes, potential differences between pipes and rails and over-all potential differences shows that under the insulated negative feeder system these values range

TABLE VIII—OVER-ALL POTENTIAL DIFFERENCES

Location	Distance, Thousands of Feet	Uninsulated Feeders		Insulated Feeders	
		Volts	Volts per 1000 ft.	Volts	Volts per 1000 ft.
Broadway and Chouteau	6.9	11.5	1.7	2.7	0.39
Broadway and Park	5.5	11.0	2.0	3.0	0.55
Broadway and Victor	2.5	11.3	4.5	0.3	0.12
Broadway and Arsenal	4.6	11.1	2.4	0.3	0.07
Ninth and Park	4.7	10.1	2.2	1.6	0.34
Ninth and Victor	2.9	10.2	3.5	-0.2	-0.07
Ninth and Pestalozzi	3.7	10.1	2.7	0.1	0.03
Twelfth and Chouteau	5.1	11.3	2.2	3.3	0.65
Twelfth and Park	4.0	9.3	2.3	2.6	0.65
Twelfth and Sidney	2.0	6.3	3.2	-0.1	-0.05
Eighteenth and Chouteau	4.6	11.3	2.5	2.7	0.59
Eighteenth and Park	3.4	8.3	2.4	2.5	0.74
Lemp and Arsenal	3.8	6.9	1.8	0.7	0.18
Jefferson and Park	4.1	11.3	2.8	2.8	0.68
Jefferson and Geyer	2.6	11.0	4.2	0.8	0.31
Jefferson and Arsenal	4.0	8.1	2.0	0.5	0.13
Jefferson and Cherokee	5.8	10.2	1.8	0.0	0.00
California and Chouteau	5.9	10.7	1.8	3.6	0.61
California and Shenandoah	3.4	10.0	2.9	1.2	0.35
California and Gravois	4.0	10.3	2.6	0.8	0.20
Compton and Arsenal	4.6	12.5	2.7	3.6	0.58
Grand and Arsenal	7.8	15.3	2.0	5.1	0.65
Average		10.4	2.6	1.7	0.35

from one-fifth to one-tenth of the corresponding values which prevail under the uninsulated feeder system. These ratios represent approximately the difference in electrolysis damage that would result in the two cases. The all-important conclusion to be drawn from the foregoing test is that, regardless of what local conditions may be as to the rate of corrosion, the rate of damage under the insulated feeder system will be reduced to a fraction of what it would be with substantially the same amount of copper used as uninsulated feeders in parallel with the tracks.

In case experience should show that an appreciable amount of electrolysis still occurred under the insulated feeder system as now installed we should not recommend pipe drainage in the present instance to take care of this residual trouble, primarily because of the large number of insulating joints in the gas mains. We think it would be much more effective to take care of any residual trouble that may exist by some slight extension of the insulated negative feeder system. As for lead-covered cables, it is probable that a certain amount of drainage will always be necessary for their adequate protection, but a much smaller amount of current will need to be drawn from them under the insulated feeder system than under an uninsulated system.

COSTS OF INSULATION

In Table IX is given a detailed statement of the amount of copper in each of the insulated negative feeders as now installed, together with their location whether overhead or underground and the estimated cost of installation. In calculating this cost we have assumed that the cost of installing overhead feeders is uniformly \$750 per 1000 ft. of 1,000,000-circ. mil cable, including the cost of copper and installation charges. For underground construction the figure of \$1,400 per 1000 ft. of 1,000,000-circ. mil cable has been used.

TABLE IX—APPROXIMATE COST OF INSULATED FEEDERS
Ann Avenue Substation

Location on Feeder Terminal	Length, Feet	Size in 1,000,000 Circ. Mil.		Character	Total Cost Installed
Lafayette and Grattan...	3600	1		Overhead	\$2,700
Mississippi and Geyer...	1300	1		Overhead	975
Gravois and Jefferson...	2300	1		Overhead	1,725
Gravois and California...	3900	1		Overhead	2,925
Ann and Broadway.....	3900	2		Underground	10,920
Ann and Ninth.....	2900	1		Underground	4,060
Ann and Twelfth.....	1450	1		Underground	2,030
Ann and Eighteenth.....	720	.42		Underground	590
Total					\$25,920
Rated capacity of station.....				4000 kw	
Cost per kilowatt.....					\$6.48

These figures will, of course, vary somewhat according to conditions, but they represent fair average values. It will be seen from an examination of Table IX that the total cost of the negative feeders installed for this station is \$25,920, the rated capacity of the station 4000 kw, giving a cost of \$6.48 per kilowatt of rated capacity as the cost for the negative feeder system. Based on the same unit cost, however, we find that the cost of the original uninsulated feeder system amounted to \$22,150, so that the extra cost properly chargeable against the insulated feeder system in this case is the difference between these, or \$3,770. In addition to the cost of copper we must also consider the value of the energy lost in the negative return.

On an examination of the data given above on the over-all potential measurements in the negative return, we find that under the uninsulated negative feeder system the mean voltage drop on the negative side was 12.2 volts, while under the insulated negative feeder system, with the present amount of copper, this negative drop is increased to 18.9 volts. The net increase in negative drop has therefore been 6.7 volts. The twenty-four-hour average current for this station is 3500 amp, and multiplying this by the increase in voltage drop we find a net increase of power loss on the negative return of 23.4 kw. Multiplying this by 8760, the number of hours in a year, we get a total of 204,980 kw-hr. per year, which, at 1 cent per kw-hr., has a value of practically \$2,050. The excess cost of installing the insulated feeder system over the uninsulated system was found to be \$3,770, and, figuring the annual cost, including interest, depreciation, taxes, etc., at 10 per cent, this amounts to \$377, which added to the \$2,050 representing the value of energy losses gives a total annual cost of \$2,427 which is chargeable against the insulated system as it now stands. It should be emphasized, however, that this increase in cost is not a necessary increase and results only from the plan that was followed of keeping the initial investment as low as possible until the experimental tests could be made.

It should be pointed out that the amount of copper now in the feeder system is such as would give a maximum economy for a station output of about 3000 kw, whereas the actual maximum output of the station is about 4500 kw, or 50 per cent in excess of that for maximum economy. In order to get the most economical negative return system, therefore, we should increase the cross-section of the present feeders by approxi-

mately 50 per cent on the average, and this would require a total increase in installation cost of approximately 50 per cent, or \$12,960, which added to the excess cost of the present system over the uninsulated system as given above—namely, \$3,770—gives a total increased installation cost properly chargeable to the insulated feeder system of \$16,730, and 10 per cent annual charge on this gives an annual cost on the feeder installation of \$1,673. At the same time, since the cross-section to the feeders would be increased about 50 per cent., the drop in the negative return would be reduced to two-thirds of its present value of 18.9 volts, giving a negative drop of 12.6 volts. This is substantially the same as the drop under the uninsulated system, so that there would be no appreciable change in the energy losses. Consequently the above annual charge of \$1,673 on the installation cost represents the only actual annual cost properly chargeable against the insulated feeder system.

It will be seen that the addition of \$12,960 worth of copper to the present insulated feeder system would save \$2,050 per year in energy losses, or about 16 per cent on the investment. It is apparent, therefore, that it would be very desirable from an economic standpoint to make this increase in negative copper. In point of fact, it would probably be desirable to add even more than this amount of copper, since by so doing the saving in energy loss would, up to a certain point, almost balance the increased annual cost of the installation and thus the total annual cost would be but slightly increased. At the same time a large reserve capacity for future growth would be had in the negative feeder system.

It is also very instructive to make a comparison on the relative cost of the two systems based on identical voltage conditions in the track return. Under the insulated feeder system the average gradient in the tracks has been reduced to 0.46 volt per 1000 ft., and if this same condition is to prevail under the uninsulated feeder system it will be necessary to have the same current distribution in the track. Consequently we must run feeders to the same point and take off the same number of amperes from the tracks at each point, and since feeders will be in parallel with the tracks we must further give the feeders sufficient cross-section, so that they will carry this current back to the busbar with an average potential gradient not exceeding 0.46 volt. In order to determine the amount of copper required to produce the same conditions under an uninsulated system as we have under the insulated system, it is only necessary to determine the average current carried by each feeder under the present insulated system and to calculate the amount of copper that will be required in that feeder to carry the same current with an average gradient of 0.46 volt. Calculation of this sort has been made and the data are given in Table X.

This shows that for the same voltage conditions it would require eleven and two-tenths times as much copper for the insulated feeder system as is required in the present uninsulated system. Since the cost of the present system is \$25,920, the cost of the uninsulated system using the same unit cost would be eleven and two-tenths times as great, giving a total of \$290,304, which is \$264,384 in excess of the total cost of the present insulated feeder system, and, figuring as before 10 per cent as the annual cost on the copper installed, we get \$26,438 per year as the excess annual charge on the investment in uninsulated feeders. If such a system were installed, however, it can be shown that it would reduce the potential drop in the negative return to about 3 volts. This would be a reduction of 16 volts below that which prevails at the present time, which corresponds to an annual saving in energy of

490,560 kw-hr., worth \$4,905 at 1 cent per kw-hr. Deducting this from the annual charge of the copper, we get a net annual charge on the uninsulated feeder system of \$21,533 in excess of the annual charge on the present system.

Of course, it does not follow that if the uninsulated system were to be installed the location of the feeders would be just the same as here assumed, but the

TABLE X—RELATIVE COST OF INSULATED AND UNINSULATED FEEDERS FOR THE SAME VOLTAGE CONDITIONS

Feeder	Present Amount of Copper (Thousand Feet of Million Circ. Mil. Cable), Insulated System	Average Current, Amp.	Amount of Copper Required for Av. of Gradient of 90.46 Volt per 100 Ft., Uninsulated System
Lafayette, between Mississippi and Grattan	1.30	166	4.73
Mississippi, between Ann and Lafayette...	2.30	512	25.90
Gravois, between Mississippi and Jefferson	3.30	701	35.46
Gravois, between Mississippi and California	3.90	445	33.43
Ann, between Mississippi and Broadway...	2.80	1200	102.96
Ann, between Mississippi and Ninth.....	3.90	586	37.40
Ann, between Mississippi and Twelfth....	1.45	162	5.17
Ann, between Mississippi and Eighteenth.	0.30	272	1.79
Totals	22.25	...	251.86
Ratio of copper required: $\frac{\text{Uninsulated system}}{\text{insulated system}} = \frac{251.86}{22.25} = 11.2$			

assumption is nevertheless approximately true, and the estimated costs are of the correct order of magnitude. They show the impossibility from an economic standpoint of securing with the uninsulated feeder system approximately the same voltage conditions as can be obtained with a system of insulated feeders.

When the advantages from both the electrolysis and economic standpoints are fully weighed, it seems rather surprising that insulated feeder systems have not been more widely used in the past, and we are confident that when the advantages are fully appreciated such systems will be adopted as the standard of practice, to the practical exclusion of uninsulated feeders, except in special cases where the load is so light that neither electrolysis conditions nor economic considerations require additional conductivity over that furnished by the tracks themselves.

In conclusion, the writers desire to express their appreciation of the co-operation extended to them by the officials of the United Railways Company, the Laclede Gas Company, the city Water Department, and both the Southwestern Telephone Company and the Kinloch Telephone Company, all of whom did everything possible to assist us in our work. In particular we wish

to commend the generous attitude of the officials of the United Railways Company, who willingly incurred considerable expense in connection with the installation of the feeder system in order that the experiments might be carried out under satisfactory conditions.

ELECTRIC RAILWAY REPORTS OF BUREAU OF CENSUS

Preliminary figures of the forthcoming quinquennial report on the electric railways of the District of Columbia, Delaware and Maryland have been given out by Director W. J. Harris of the Bureau of the Census, Department of Commerce. The statistics relate to the years ended Dec. 31, 1912, and June 30, 1902. The totals include electric-light plants operated in connection with electric railways and not separable therefrom, but do not include reports of mixed steam and electric railroads or railways under construction during the census year which had not begun operations.

The detailed figures as presented in the accompanying table for the District of Columbia show that during the decade 1902-1912 there were general gains in the industry. The decrease of the seven operating companies reported in 1912 from 1902 was one, or 12.5 per cent. The track mileage was increased 42.29 (32.3 per cent), and the number of revenue passengers

CONDENSED INCOME STATEMENT OF OPERATING COMPANIES FOR DELAWARE, DISTRICT OF COLUMBIA, AND MARYLAND

	1912	1902	Per cent. of increase, 1902-1912
Number of operating companies	25	21	19.0
Gross income*	\$17,318,667	\$8,393,872	106.3
Operating expenses	8,718,499	4,231,128	106.1
Gross income less operating expenses	8,600,168	4,162,744	106.6
Deductions from income (taxes and fixed charges)	6,031,007	3,314,632	82.0
Net income	2,569,161	848,112	202.9

*Income from sale of current for light and power included: 1912, \$622,393, and 1902, \$67,795.

carried was 47,937,297 more in 1912 than in 1902, an increase of 72.5 per cent.

The figures as presented for Delaware show substantial gains during the decade 1902-1912. The increase of the four operating companies reported in 1912 over 1902 was one, or 33.3 per cent.

The Maryland figures show that during the ten years ended in 1912 there were substantial gains in the electric railway field in that State. The increase of the fourteen operating companies reported in 1912 over 1902 was four, or 40 per cent.

In order to avoid disclosing the financial statistics of individual companies, the figures for Delaware, the District of Columbia and Maryland have been combined in one table, reproduced herewith.

COMPARATIVE OPERATING STATISTICS FOR ELECTRIC RAILWAYS IN DISTRICT OF COLUMBIA, DELAWARE AND MARYLAND

	District of Columbia		Delaware		Maryland	
	1912	1902	1912	1902	1912	1902
Number of companies	7	8	8	3	17	12
Operating	7	8	4	3	14	10
Lessor			4		3	2
Miles of line	112.27	82.68	74.37	71.55	418.58	258.78
Miles of single track	214.23	161.97	90.37	85.61	694.56	437.84
Miles of single track in state	(a)188.46	(a)146.17	(d)110.37	(d)85.61	(e)721.79	(e)455.44
Cars, number	1,454	1,010	200	163	2,186	1,589
Passenger	1,353	977	183	151	1,892	1,487
All other	101	33	17	12	294	102
Persons employed	2,663	(b)	600	251	5,290	(b)
Salaried employees	224	(b)	78	15	490	(b)
Wage earners (average number)	(c)2,439	(b)	(c)522	236	(c)4,800	(b)
Power plant equipment:						
Steam and gas engines, including turbines—						
Number	14	22	20	18	38	47
Horse-power	23,366	11,050	20,250	5,725	71,075	27,100
Kilowatt capacity of dynamos	15,850	7,852	13,200	3,408	48,330	18,505
Output of station, kw-hr.	75,970,354	23,391,015	22,428,459	7,730,899	13,129,229	42,811,678
Current purchased, kw-hr.	8,921,124	(b)	83,801	(b)	121,221,045	(b)
Passengers carried	153,887,045	90,203,941	21,881,379	11,440,702	259,978,572	135,625,650
Revenue	114,099,618	66,162,321	18,023,562	9,956,559	186,828,016	99,989,552
Transfer	39,078,631	24,041,620	3,498,863	1,484,143	69,914,407	35,636,098
Free	708,796	(b)	358,954	(b)	3,236,149	(b)
Car mileage (passenger, express, freight, etc.)	18,558,418	16,139,141	3,967,217	3,006,798	34,438,526	24,832,662

(a) Excluding track lying outside of District of companies within District and including track in District owned by outside companies.
 (b) Figures not available.
 (c) Number employed Sept. 16, 1912.
 (d) Including track in state owned by outside companies.
 (e) Excluding track lying outside of state of companies within state and including track in state owned by outside companies.

Factors Determining a Reasonable Charge for Public Utility Service*

BY PROF. M. E. COOLEY, DEAN OF ENGINEERING DEPARTMENT, UNIVERSITY OF MICHIGAN

The principal cause of the difference of opinion between the public and the public service corporation, as I have come to see it, lies in the failure of the public to comprehend all of the elements of cost entering into the construction of a public utility plant. Not only that, but a failure also to understand all of the elements of expense which must be incurred in operating the property and maintaining its integrity, once the plant has been built and the business established. The corporation itself is only beginning to understand some of these things. Its officers intrusted with the management of the property have been obliged to make the best of things, striving on the one hand to earn the dividends called for by the stockholders and on the other to maintain the property so as to give satisfactory service. Without in any way excusing the corporation from its sins of the past, or of the present where they still exist, the trouble is now understood by the corporation, partly at least; and it must be conceded, I think, that just at present the fault lies more with the public than with the corporation.

Assume, for instance, that you are one of a number of men brought together to consider the building of a public utility property. Naturally you will all want to know whether the project is feasible. This will always involve preliminary investigations, the sounding of public sentiment to know to what extent the proposed service would be demanded, what concessions would have to be obtained in the matter of property consents and the conditions under which a franchise could be obtained. If these inquiries have resulted favorably, the next step would be to employ engineers to look over the field and make preliminary estimates of cost and determine upon the feasibility of the project.

All of this preliminary investigation has involved expense which must be borne by some one. It may run from 0.2 to 0.5 per cent of the cost of the proposed property. In case of failure to go further it would fall upon the individuals taking part in the investigation. They have gambled and lost. But should the future promise be great enough to interest capital mildly, let us say, then the bankers might be induced to gamble a bit and, should they get sufficient odds in the way of discount on bonds and blocks of capital stock depending for their value on future earnings, they might be induced to come in.

If, finally, the preliminary work has resulted in the determination to proceed, there comes the organization of the company, the employment of legal counsel to draw up the necessary papers, the procuring of the franchises, the obtaining of the necessary property consents, the securing of the right-of-way by purchase or otherwise, the employment of engineers to make the final surveys and prepare the plans and specifications, the bidding and award of contracts. The actual work of construction then begins.

It is at this point that the public conceives the cost of the property to begin, and for the reason that the average citizen, skilled as he may be in the work of his own pursuit, has little or no knowledge of the skill required in another's pursuit. First of all, let this average citizen be educated to understand the require-

ments which must be met if he is to be furnished with these necessities of our modern civilization. The average citizen is fair-minded and asks for only the square deal.

There is, however, another type of citizen who, however much explaining there may be, persists in seeing things his own way. He may be self-appointed guardian of the people's interest, sincere enough and honest enough, but too often his zeal results in confusion of understanding, if not perniciousness. Another type belongs to the political class. He sees gain in one form or another, if he can keep alive the troubles between the public and the public service corporation.

NEWSPAPERS CAN RENDER SERVICE

There is no greater service to be rendered the people of our country to-day than that which could be rendered by the newspapers if they would but go at this matter with the idea of acquainting their readers with the facts on both sides. I mean that they should not treat the quarrels between the public and public service corporations as items of news merely, but detail men on their staffs to make a study of the questions involved. Such a work by our newspapers would not only add to the sum total of our happiness but promote the prosperity and welfare of the communities which they serve. I sometimes wonder why the proprietors of newspapers do not see that their own business is in the nature of a public utility, morally, at least.

The plans and specifications of a utility plant having been completed, proposals for its construction are invited. The contractor figures the cost of every item as nearly as possible, adding various percentages to cover contingencies. Happily there no longer is any question of allowing the necessary percentages to cover contingencies, insurance, contractors' profits, engineering and superintendence.

In amount the contingency percentages, varying on the different things from 2 to 20 per cent and upward, may be assumed to average not less than 10 per cent. One-half is usually applied directly to the items themselves, the other half as a percentage on the total cost of all the items. Insurance varies from 0.5 to 1 per cent. The contractor's profit should be estimated at not less than 10 per cent. Engineering and superintendence, like contingencies, varies with the different items from 2 to 10 per cent and over, an average being, say, 5 per cent. One-half is applied directly to the items themselves, the other half as a percentage on the total cost of all the items, including contingencies and contractors' profits. If the insurance has not been included with the contractor's costs, it should follow after engineering and superintendence, and may then be combined with taxes in a percentage varying from 0.5 to 1.5 per cent. In the application of these percentages only the general engineering percentage should be applied to land the cost of which embraces its own particular expenses of acquiring, including damages, deeds of transfer and the like.

Another method in vogue is to place all building operations in the hands of an engineering firm which makes all surveys, prepares the plans and specifications and superintends the work from start to finish, making a charge therefor of 10 per cent on the actual cost of the work.

*Abstract of an address before the Western Society of Engineers, Chicago, Ill., on Jan. 7, 1914.

Taxes during the construction period are an item usually overlooked by the public. The item of taxes is, in an appraisal, frequently combined with insurance, the amount varying from 0.5 to 1.5 per cent.

The item of organization, administration and legal expenses usually follows insurance and taxes and precedes interest during construction. It is usually expressed as a percentage varying from 2.5 to 5 per cent, being applied to the sum of all preceding costs, including lands.

As to a promoter's profit, the propriety may possibly be decided by considering to what extent one would be willing to contribute to a project, independent of its construction cost, to procure its establishment. Obviously no percentage could be given for promoter's profits, but appraisals in which the costs of promotion have been ascertainable indicate that a proper charge may be as much as 2 per cent. Its allowance must depend on circumstances, and if included in a separate item, must be excluded from administration costs.

Interest during the period of construction is an important item often overlooked in the past. The rate of interest is applied to one-half the total cost, or one-half the rate is applied to the total cost. A rate of 6 per cent per annum is usually assumed.

In large properties, street and steam railways particularly, the offices, furniture and fixtures are frequently items of considerable expense.

Certain necessary stores and supplies must be provided ready for use in emergencies before the property can be put into operation. The interest on this investment becomes a proper charge against earnings. The amount is usually an average taken from the books.

A working capital is as necessary an expense as any other in the production of a public utility property.

OPERATING EXPENSES

With a working capital to hand, the property has been put into operation. It begins to earn, but a considerable time must elapse ordinarily before the earnings from operation suffice to meet all of the expenditures. During this period of insufficient earnings money must be borrowed to make up deficits; not only that, but interest must be paid on this borrowed money until the time that the earnings suffice to meet all expenses. This accumulated deficit constitutes what may be termed the cost of procuring a going concern; in other words, the cost of establishing the business. It is a difficult element of cost to determine satisfactorily, in the absence of well-kept accounts, starting with the property itself.

These deficits are real costs, and necessary if the utility is to be had at all. The utility being a necessity, it must be supported by the public the same as any other necessity. This cost, if incorporated in the interest-bearing capital, becomes less of a burden against earnings than if carried as a floating debt.

DEPRECIATION

In the very nature of the property, it is impossible after it is once started to have present in it the full 100 per cent represented by all new elements. It can, however, be maintained in some condition less than 100 per cent, and it is usual and necessary to maintain it at a point which will enable the most satisfactory service to be rendered with the smallest expense consistent with satisfactory service. This point may be anywhere between 80 and 90 per cent, depending on the kind of property.

It is commonly believed by the public that a utility property should not be permitted to earn on more than the so-called present value of its physical elements, that is, their cost new, less depreciation, say 80 per cent of the cost new or less. The property which by means of a proper depreciation fund can be maintained at

some definite percentage which enables it to render satisfactory service has cost 100 per cent. That is, the 80 per cent property cannot be had at all without expending the 100 per cent. Thus, in order to have an 80 per cent physical condition, we must have a capital charge of 100 per cent.

SINKING FUND

If, however, it be insisted that only that percentage of the total cost which is represented by the maintained condition of the property can bear an interest return, the loss of capital and interest thus incurred must be provided for out of earnings in another way, namely, by a sinking fund.

In the case of a limited franchise under which the utility company must cease operations and close up its business at the end of a definite period, the company must earn enough during its life to pay back whatever part of the principal has to be sacrificed, as well as the interest on the principal, in addition to maintaining and operating the plant satisfactorily during the franchise life.

DISCOUNTS ON SECURITIES

No bond house will even consider financing a public service corporation without a bond discount. I refer particularly to utilities built and operated under a limited franchise. It will have to be a good property to secure better than 15 per cent discount. It is an excellent property which commands as low as 10 per cent discount. The best discount I have ever come across in my own investigations is 8 per cent. This does not apply to municipalities, however, at least not to the same extent.

It will surprise everyone not familiar with the cost of building public utility plants to learn that the so-called overhead charges are in the aggregate a large percentage of the costs of labor and the material things entering into their construction. Omitting preliminary costs of investigation as to the feasibility of the project, general contractors' profits, cost of promotion and promoter's profits, interest on floating debt and cost of establishing the business and assuming that the individual contingencies of construction, special engineering charges and contractor's profits are embraced in the cost of physical property, the total percentage may vary from 12 to 25 per cent, and if these inside percentages be added to the outside, or general, percentages, the total percentage may vary from 30 to 60 per cent.

It is to be regretted that engineers and others who have had experience in building properties and valuing them afterward have not done more toward disseminating knowledge of the actual conditions found in such work. We should then be much further along toward the mutual understanding which must exist before the public and the public service corporation can get together on common ground. But engineers have many times hesitated to use the larger percentages, fearing to be accused of favoring the corporation. They have preferred instead to secure the equivalent of them by using larger units of costs, or have used the smaller percentages, influenced by the feeling, unconsciously perhaps, that, all things considered, the results were fair enough. In combining the judicial with the engineering function, they have unwittingly only obscured the issue. All too frequently engineers have felt obliged to exert themselves to the utmost in favor of their client, leaving the interests of the other side to be fought for with equal solicitude by an opposing engineer. Thus they have become advocates. This, in my opinion, is not the best way to handle these momentous problems. It would be far better in these troublesome times to throw open the blinds and let in all the light, our motto being, *Verites vincat.*

The Engineer's Part in Regulation of Public Utilities

Report of a Discussion at the Stevens Institute of Technology Which Urged Responsible and Active Participation by Engineers as Members of Commissions—The Commission Viewpoint Is Presented by Mr. Sague, of New York

A discussion on the "Engineer's Part in the Regulation of Public Utilities" was held at the Stevens Institute of Technology, Hoboken, N. J., on Jan. 9. Those who took part in the discussion were Dr. Alexander C. Humphreys, president of the institute; James E. Sague, member of the New York Public Service Commission, Second District; John W. Lieb, Jr., vice-president New York Edison Company; Newcomb Carlton, vice-president Western Union Telegraph Company, and George Gibbs, consulting engineer Pennsylvania Railroad. The remarks of Messrs. Humphreys, Sague and Gibbs follow in abstract form:

REMARKS OF DR. HUMPHREYS

If those of us who are or have been directly concerned in the management of public utilities sometimes give expression to the indignation which we experience at the tendency of the public to reckon us all as public enemies and at the injustice of some of the decisions rendered against us by the commissions and courts, then by many we are charged with being reactionaries. On the other hand, if we passively submit to unjust accusations and confiscatory decisions, we confirm in those who are responsible therefor the opinion that we have no adequate defense.

The way which is most effective in meeting the criticisms of to-day is to show the public that there is nothing to conceal, that we are conducting our business honestly, that we can give the maximum of service for a given rate of charge only by securing the confidence and good-will of the public and its representatives, and that we shall do all in our power honestly to gain that good-will and co-operation. Thus, openly we should do our utmost to educate public opinion to the belief that the interests of buyer and seller are common and that we and our stockholders are also of the "people."

While making every possible effort along these lines, we should not submit meekly to the domination of those who are ignorant and sometimes vindictive and those who regard property as not to be protected under the law unless the property is theirs. Here we have to remember that the daily and other journals do not propose to ignore us and our activities. That being the case, let us give their representatives the facts rather than leave them at liberty to write from partial or misleading information supplemented by the imaginings and inventions of the trouble makers. I confess I am here recommending a course which has many difficulties in its way. One prominent difficulty is that some of those high in authority in our government to-day say openly that men who are financially interested in a question are thus disqualified as advisers therein. And yet, in a few cities of the United States the course I have so inadequately outlined has been employed successfully, and the utilities which have been so fortunate as to be managed in this spirit have gained the support and co-operation of the public.

I am aware that my position with regard to the control of public utilities by public service commissions may be misunderstood. By some I am supposed to be opposed *in toto* to all such control, and this because I have been forced to oppose the action of cer-

tain commissions in certain cases and because I am opposed to giving these commissions unlimited power. My personal relations with the members of our public service commissions have generally been most pleasant. As a rule I have been treated with respect, and I can claim that I have taken advantage of every opportunity to be helpful to the commissions and I have not infrequently been thanked therefor. But I have had experiences which have been nothing short of disgusting and disheartening.

Particularly I hold that a commission or any other one government authority should not be placed in office to exercise the three functions of government which, according to our bill of rights, should be kept separate and distinct from each other—namely, the legislative, the executive and the judicial. If we are to permit this condition to continue, let us cease to claim that our form of government is of the people, for the people and by the people.

Because there should be some measure of such control it by no means follows that national and state commissions should therefore have a free hand in the management of these properties. Those responsible to the owners must be permitted to manage the properties if efficiency and economy are to be obtained and maintained.

I am in favor of a proper measure of control and regulation, so much as will tend to insure to the public efficient and economical service and respectful attention to legitimate complaints and demands, together with a just and discriminating control over return on investment. Certainly the public utilities should not be held to any cast-iron rule as to "fair return" when what would be a fair return in one case would be wholly inadequate in another case. Nor should the public utilities when, as a last resort, they appeal for protection to the United States Supreme Court find that the protection there accorded to them is only that of relief from actual confiscation. If it is replied that this is all that lies within the power of this court, then I say that this is an insufficient protection from injustice, and other means of relief must be found.

In a country like ours we cannot blind our eyes to the facts as to how appointments to office are too often obtained. They are part of the spoils of party victory and control. Those of us who have come into close contact with these commissions know that too often the men appointed are not qualified to exercise the great power placed in their hands. The honest men among them recognize this and apply themselves diligently to fit themselves for the responsibilities for which they were not fitted when they assume office. In too many cases this process might be likened to a surgeon, or a would-be surgeon, getting his first training by operating upon the body of some unfortunate victim. If he is permitted to operate on a sufficient number of subjects, maiming and killing as he goes, he may finally acquire skill to carry through an operation with a minimum risk to the poor patient. It goes without saying that there are men on these commissions who are well equipped to meet their grave responsibilities.

Many of the questions which these commissions are called upon to determine require for their solution the highest engineering training and experience. And yet it is the exception when an engineer is appointed as a commissioner. The engineering profession is most often represented not by membership on the board but by employment by the board, and so with no vote. Frequently the engineers so employed as subordinates to the commissioners are not qualified for an authoritative position in any of the companies over which they thus receive, indirectly it is true, a large measure of authority. I hold that on every one of these commissions the engineering profession should be adequately represented in the persons of men educated in the science of engineering and later trained in the hard school of experience, these men to be voting commissioners. Whether the commissioner is engineer, lawyer, accountant or business man, he should be broadly trained and he should have had experience in the exercise of administrative functions.

The engineers as a class are themselves in part to blame for not taking a more active part in the administrative side of life and for not deliberately and advisedly equipping themselves for administrative responsibilities. By no means do I suggest that there are not a sufficient number of engineers in the country, specifically and broadly trained, to do their full share on the commissions of the country; but they should be selected with regard to their breadth of training quite as much as to their special training. May I not take advantage of this opportunity to suggest that the same rule should be applied in the selection from the ranks of other professions, and particularly that of the law?

The tendency has been to have lawyers largely in the majority in the membership of these commissions. I see no reason why a board composed, say, of five broadly trained engineers, with a competent lawyer to advise them, should not be able to render quite as efficient service as five well-equipped lawyers as commissioners with one competent engineer to advise them. If we must confine the membership of a commission to a single profession, then the commission of five broadly trained engineers with competent legal assistants on the staff would give far better results than, on the average, have so far been obtained.

The best results, I believe, would be obtained by selecting the majority of commissioners from the profession of law and engineering, no commissioner to be selected unless he has working experience and has been successful under the test of that experience. This would exclude the man who has spent his life on the development of fine-spun theories, and if applied to those now in office, I fear, would create not a few vacancies.

As a general proposition, the great corporations which by some are thought to be a menace to the country have not won their successes by financial legerdemain. In some cases manipulation of finances has had an influence, though not always detrimentally. Great problems were to be solved, physical and financial, and they were solved only by the patient, persistent, determined prosecution of plans boldly conceived by promoters and generally carried through temporary failures to final success by the united efforts of bankers, men of affairs, engineers and others, not forgetting the small investor. These pioneer labors have been for the benefit of the country as a whole, and therefore it ill becomes the representatives of the people to-day to deny to these pioneers and their successors a rightful participation in the fruits of these hardly won successes.

With regard to the public utilities, the legislation and regulation which in the final analysis will stand the test of time and will accord justice to the producer and

the consumer must take full account of the inherent physical and financial limitations within which these properties are forced to operate. To this end men technically trained in all branches of public utility construction and operation must have their full share in the formulation of the regulatory laws and the administration and enforcement of these laws.

REMARKS OF COMMISSIONER SAGUE

James E. Sague, member New York Public Service Commission, Second District, said in part:

To my mind there are far too many laws passed, too many orders and too little of patient study by experts of the finances, general conditions and service of the corporations which are supposed to be under control. Such study with proper publicity in doubtful cases would, I think, go far to remedy bad conditions which have grown up in the past and much farther to prevent the development of such conditions in the future. I think the lack of success which has often attended the work of regulating commissions is due to failure to develop along these lines and a tendency to substitute instead the methods of the court for those of informed study and investigation.

If we look back over the period of perhaps twenty-five years since the original Interstate Commerce Commission law was framed, we will see, however, that there has been great progress at least along two lines: first, in complete publicity of all railroad rates and consequent elimination of rebates and discrimination, and, second, in the publicity of railroad accounts and the reporting of the results of these accounts on the same basis, so that they can be properly compared and analyzed. The success of the Interstate commission along these lines has been astonishing and would be a full justification for the creation and maintenance of the commission if nothing else had been accomplished, although we know that much more has been done in the settlement of controversies between shippers and the railroads. This example has been followed by most of the state commissions. As a result the balance sheets and income accounts are beginning to tell the truth. We all know that few balance sheets have told the truth in the past and that the item "cost of property" has usually only represented the amount necessary to balance the liabilities and surplus and often bore no close relation to the amount of money invested. It is also well known that some companies have shown a tendency to capitalize replacements regardless of the fact that the result is the padding of the income account. It is curious that many of the accounting examinations of the commissions have resulted in improving the company's standing in rate cases, while at the same time the necessity of increased conservation in the payment of dividends has been indicated.

In other respects, however, the work of the average commission, as compared to that of the best, leaves much to be desired. Too much time is taken in the investigation of minor complaints, and in the effort to obey the directions implied by the word "reasonable" too much delay in decisions often ensues. Accidents should, of course, be investigated even with the utmost desire to be fair. It is the most serious condition which the railroads have to meet, and public excitement and the tense situation thereby created are apt to result in biased reports, in the desire to hurry investigations unduly and in the making of orders affecting some elements of operation without proper consideration of other elements which may be fully as important.

For instance, the demand for steel cars due to recent accidents appears to be almost universal and a number of bills have been framed and in some cases recommended by commissions looking to the final replacement

of all wooden cars now in service. No proper consideration is given in such proposals to the enormous cost involved or to the increased average weight of the new equipment. The cost of conducting passenger transportation is constantly increasing, owing largely to the greater weight of cars and the consequent increase in weight and power of locomotives. No exact figures are at hand, but I am inclined to think that during my experience with railroad affairs the average weight of through trains for passenger carriage has increased almost 40 per cent. The weights upon locomotive driving wheels have increased in equal proportion with consequent increase in strain upon track and structures.

As a result of this the conditions of strain on the tracks of our railroads have grown to an amount for which there is no precedent. Over 3000 rails per year break in the State of New York alone when the conditions are favorable. When they are unfavorable because of a severe winter, the breakages exceed 5000 rails. Upon the divisions of some railroads carrying heavy traffic so many breakages occur in the coldest weather as to be a serious source of delay to trains. Of course, protection is given by the electric track circuit and the signal system which engineers have developed to provide safety against this and other conditions so that the situation is not especially alarming. It, however, indicates the need of careful engineering investigation before weights are farther increased or expenditures made in ways that will give no adequate net return in safety.

I may be much behind the times in this matter, but it seems clear to me that progress in the installation of steel cars is rapid enough without legislation and that proposals to force all wooden cars out of service are extravagant and unnecessary and will result eventually in increased cost and diminished service to the public. Other things are needed more than steel cars and the money available for improvements is limited. Of course, increase in safety to travel is to be striven for constantly, but we may pay too great a price for it, especially when safety in one direction may mean danger in another. In many sections there is need for local increased passenger service, and yet I recently heard a commissioner of one of the Western States say that he believed the time would come when legislation would, in the interests of safety, prevent the building of any but double-track railroads. He evidently did not consider that such laws would prohibit the construction of thousands of miles of light feeder lines all over the country.

One result to be hoped for from the systematic inspection of railroad lines is that when accidents occur commissions will be willing to bear their fair part of the responsibility and refrain from sweeping blame directed against operating officers for defects and conditions which should be detected by adequate state inspection. Commissions should do all in their power to stop the demand for indictment of railroad officers in connection with accidents. As a matter of fact, indictments of this kind never amount to anything. There is reason to think that they are sometimes sought by prosecuting officers with full understanding that no tangible result will be reached.

MR. GIBBS ON ORGANIZATION OF COMMISSIONS

George Gibbs, consulting engineer Pennsylvania Railroad, said that an engineer in the position of business manager or commissioner on a public utility board soon, on account of his multifarious duties, got out of touch with the details of professional progress, and unless he was willing to delegate the investigation of engineering matters to subordinates who were specialists, his decision must rest upon general knowledge, which

was not always a true guide. The matter of proper commission organization was fundamentally one of selecting faithful men of sound judgment and organizing ability, previous specialized training being a matter of less importance. Another consideration of very great importance in commission organization was that of the proper term of office. If the selection of commissioners was of the character mentioned, a long office tenure would undoubtedly work to the great advantage of the community.

The internal organization should include a permanent engineering staff headed by a chief engineer of eminence in his profession and the retention of outside engineering consultants specializing in the various lines of engineering advice needed and called in as occasion required. This organization presupposed that the commission would be willing to accept the advice of its staff.

Mr. Gibbs added that the commissions had very important and useful functions to perform and were becoming increasingly solicitous of performing their duties well. The railroads believed in thorough and impartial investigation of matters affecting the public interest and were co-operating with the commissions. Staff engineers of commissions were frequently more highly paid men than the commissioners themselves. The added honor of holding the title of "commissioner" was, of course, attractive, but was not essential to the dignity of the engineering profession, nor would the field opened up by the employment of a few engineer commissioners add materially to the opportunities of men of that profession in securing positions of high honor and remuneration.

EXECUTIVE COMMITTEE REPORT OF GERMAN STREET & INTERURBAN ASSOCIATION

The following particulars are taken from the report made by the executive committee of the German Street & Interurban Railway Association upon the work of that organization for the years 1912 and 1913. The association had as of Aug. 1, 1913, 152 street railway members, operating 207 properties with a total of 2698 miles. The non-member systems of Germany comprised only forty-three systems with the very small total of 105 miles. These figures do not include Germany's 6169 miles of narrow-gage railways. In all, 96 per cent of the street railway mileage and 78 per cent of the narrow-gage mileage are represented in the association, an increase of 8.2 per cent and 5.8 per cent respectively over two years ago.

The study of rail corrugation received a temporary check owing to a misunderstanding with Dr. Puppe, who had published in a metallurgical journal, without permission, the results of the rolling mill tests which he was to have transmitted to the association as its investigator. The committee points out, furthermore, that the association does not agree with the conclusions reached by Dr. Puppe. It is making arrangements to continue the investigation through others and will also try to secure the co-operation of the Prussian State Railways. The usual co-operative buying arrangements have been made with the rail and carbon lamp manufacturers, but no contract has yet been made for the similar purchase of metallic-filament lamps owing to the developing state of the art.

Among the new subjects which have been suggested to the association members for study is that of fare boxes and automatic ticket-printing machines. This subject has been assigned to Director Stahl of the Düsseldorf Street Railways for report at the next meeting.

ELECTRIFICATION TO DATE

BY E. P. BURCH, CONSULTING ENGINEER, MINNEAPOLIS, MINN.

An engineer's review of railroad electrification work is necessarily incomplete, yet certain prominent facts are impressed on the mind by his practice, observation, inspection trips, analysis of engineering records, and by operating data and financial statements.

Many of the impressions received in 1913 were gloomy headlines. First came the report of the committee on heavy electric traction of the New York Railroad Club, the introduction to which was to the effect that there had been no steam railroad electrifica-

Then, too, 1913 was a lean year. The railroads lived from hand to mouth; they did not get sufficient revenue to compensate them for the increased cost of coal, labor, supplies, etc., and therefore they did not develop new work which could well be put off. It is therefore the more wonderful that so much was done in railroad electrification, all over the civilized world, in 1913.

Evidently the Mallet locomotive is not always satisfactory, because some roads which have a large number of these are making up electrification programs. Evidently the directors of some of the railroads do not believe that Mr. Hill is right. Evidently the Pennsylvania Railroad, in deciding to electrify its suburban and main-line services near Philadelphia in 1914, was not influenced by Mr. Baer or by the wretched finan-

TABLE I—PRINCIPAL MAIN-LINE ELECTRIFICATIONS IN SERVICE

Name of Railroad	Miles of Road	Miles of Track	No. of Locomotive	Explanation, or Name of Division
New York, New Haven & Hartford	88	500	100	New York to New Haven and switching yards.
Spokane & Inland Empire	168	187	12	Main line; excludes local lines.
Butte, Anaconda & Pacific	27	90	17	Largely mine switching.
French Southern	165	205	16	Partly equipped.
Baden State	10	31	34	Basel-Säckingen.
Prussian State	19	50	13	Dessau-Bitterfeld.
Italian State	104	156	84	Valtellina, Giovi and Savonna lines.
St. Pölten-Mariazell	63	68	14	
Rätische Mountain	46	48	11	
Bernese Alps	52	55	16	Lötschberg line.

tion during the year 1912 because none was needed. Second, James J. Hill, whose company has had some experience in steam railroad electrification on a 4-mile section of the road through the Cascade tunnel, has been repeatedly quoted to the effect that the great capacity of the Mallet locomotive has set back railroad electrification for at least a decade. Third, came President Baer of the Reading Railroad, who, being

oak showing of the Southern Pacific Company on its Oakland suburban electrification.

From a review of several technical papers and from other sources, the accompanying tables have been made up to show the present status of the principal railroad electrifications. They represent the actual development and speak for themselves.

A list of the ten principal electric sections of main-

TABLE II—PRINCIPAL TERMINAL OR PASSENGER SERVICE ELECTRIFICATIONS IN SERVICE

Name of Railroad	Miles of Road	Miles of Track	No. of Locomotive	Explanation, or Name of Division
New York Central	50	240	47	Terminal service; no freight service.
Pennsylvania	15	72	35	Terminal service; no freight service.
Long Island	100	250	0	Motor-car trains only.
West Jersey & Seashore	75	150	0	Motor-car trains only.
New York, Westchester & Boston	19	63	0	Motor-car trains only.
Southern Pacific	50	100	0	Motor-car trains only, largely on Oakland streets.
Metropolitan Railway, London	35	70	20	Main-line and suburban trains.
London, Brighton & South Coast	60	160	0	Motor-car trains only.
Paris-Orleans	14	46	11	Main-line and suburban trains.
Hamburg-Ohlsdorf	17	41	0	Motor-car trains only.

asked for some real improvement in the suburban service furnished by his company, replied: "There will be no electrification while I live. Electrification has been a failure wherever tried." And recently the Southern Pacific Company, which has electrified its suburban service from Oakland harbor to and through the streets of Alameda and Berkeley, reported to the California Railroad Commission that electrification had been un-

line railroads in ordinary freight switching and passenger service, as of January, 1914, is shown in Table I.

A list of the ten principal electric sections of main-line railroads in passenger service only, or for terminal service only, as of January, 1914, is given in Table II.

A list of the ten principal electrified tunnel sections of steam roads includes the Baltimore, Hoosac, Sarnia, Detroit, Cascade, Mersey, Hamburg, Mount Cenis,

TABLE III—MAIN-LINE ELECTRIFICATIONS TO BE COMPLETED IN 1914 AND 1915

Name of Railroad	Miles of Road	Miles of Track	No. of Locomotive	Notes or Explanation.
Norfolk & Western	30	85	25	Bluefield-Vivian division.
Pennsylvania	20	90	0	Philadelphia suburban.
Canadian Pacific	30	43	4	Rossland-Castlegar grades.
Chicago, Milwaukee & Puget Sound	113	168	14	Rocky Mountain division.
North Eastern, England	18	44	10	Freight service.
Swiss Federal	93	100	20	Chiasso-Lucerne section of St. Gotthard division.
Swedish State	80	93	13	Kiruna-Riksgränsen division.
Prussian State	81	124	44	Lauban-Königszell division.
Italian State	32	60	16	Milan-Lecco division.
Vienna-Pressburg	42	50	8	Main-line service.

successful from all financial viewpoints. Finally, the steam locomotive representatives have spread broadcast the fact that fire-brick furnace arches, superheaters and mechanical stokers now provide an improved unit which is quite smokeless, is more efficient, and has ample capacity for the modern ten-car passenger train and the heaviest freight train.

Simplon and Lötschberg. A list of the ten principal electrified switching yards, not tabulated, shows an increased use of electric locomotives.

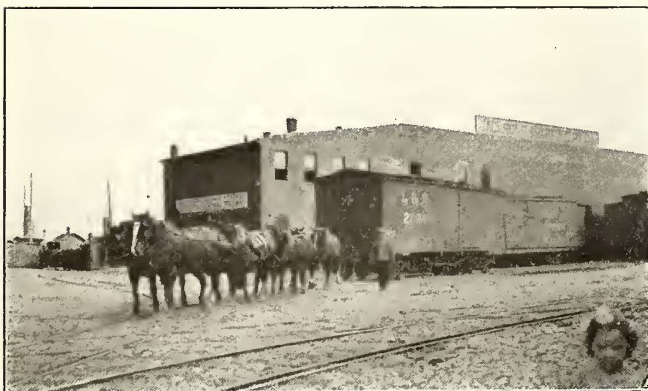
A list of the ten principal steam roads in which electrification is to be completed in 1914 and 1915, and which with one exception will use electric locomotives for main-line traffic, is given in Table III.

In 1914 old suburban steam roads will be electrified for the heaviest motor-car service at London, Paris and Melbourne. Electric locomotives are to be added in 1914 to the existing equipment of the New York Central and on the New Haven roads; also on the electrically operated State railroads of France, Germany, Switzerland and Italy.

The developed electric engine is now competing with the modern superheated steam engine and is offered on its merits as an economic factor in railroad transportation, to facilitate the haulage of heavy and dense traffic and to reduce the expenses of operation.

ELECTRIC TRACTOR FOR SWITCHING SERVICES IN CITY STREETS

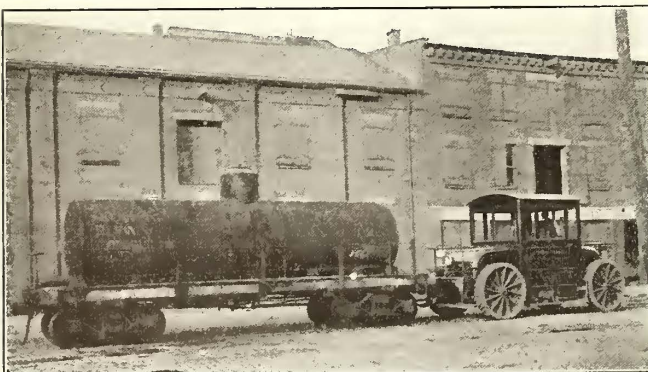
An unusual electric tractor for switching service on city streets was described in the ELECTRIC RAILWAY JOURNAL for April 26, 1913, page 768. The machine was placed in service last winter in Jersey City by the Pennsylvania Railroad, and records of its operation



Moving Cars in City Streets by String Teams of Horses

have now been given out by T. V. Buckwalter in a paper read on Jan. 6 before the Society of Automobile Engineers.

The tractor was built in the Altoona shops of the Pennsylvania Railroad and was completed Jan. 14, 1913. After the selection of a chauffeur, practice service within the limited confines of the Jersey City



Moving Cars by Electric Tractor Which Replaces String Teams

freight yard was maintained until Feb. 4, when the machine was placed in regular service. The average daily service by months is shown in the first table accompanying this article.

The costs of maintenance and operation are given in the second table. These are based upon the average results of the seven months' service in the Jersey City yards.

TABLE I—AVERAGE DAILY PERFORMANCE OF ELECTRIC TRACTOR BY MONTHS

	Months, 1913							Avg.
	Feb.	Mar.	Apr.	May	June	July	Aug.	
Hours on charge.....	8.2	7.3	7.9	7.27	6.7	6.0	5.5	6.98
Hours in service.....	8.5	8.5	9.5	8.45	8.6	7.7	6.7	8.28
Discharge in ampere-hours	616	508	518	510	494	410	344	486
Miles run	12.1	12.6	13.7	14.8	13.1	14.4	10.3	13.0
Number of cars handled, in.....	14.8	15.3	15.7	17.0	15.7	14.4	11.4	14.9
Number of cars handled, out.....	14.8	15.0	16.5	17.0	15.9	14.4	11.4	15.0
Total	29.6	30.3	32.2	34.1	31.6	28.7	22.8	29.9
Total weight, tons.....	992	1032	1100	1118	1057	962	763	1003
Number of internal movements	19.5	19.4	20.9	17.3	14.0	13.6	14.3	17.0

These two tables indicate that the machine has handled a total of 4935 cars in the seven months from February to August, inclusive, at a cost of \$4,627, including all capital, maintenance and operating charges.

TABLE II—DETAILED COST OF OPERATION FOR SEVEN MONTHS

Repairs	\$1,816
Supplies	42
Lubrication	17
Chauffeur labor	961
Current	674
Total cost of maintenance and operation, seven months.....	\$3,510
Interest at 6 per cent on \$13,400, seven months.....	476
Depreciation on \$13,400 (less tires and battery, \$4,200 = \$9,200), at 5 per cent, seven months.....	268
Depreciation on battery, \$3,200, at 20 per cent for seven months	373
Total charges for seven months.....	\$4,627
Total charges if horses had been used (4935 cars, at \$1.86).....	9,179
Saving by electric tractor, seven months.....	\$4,552
Saving over investment by electric tractor.....	58.5 per cent
Saving including investment, 58.5 + 6 per cent.....	64.5 per cent
Cost of service per car (\$4,627 ÷ 4935).....	\$0.938
Cost of service per ton (\$4,627 ÷ 165,524).....	\$0.028
Average number of cars per mile.....	2.4
Cost of service per ton mile (\$0.028 × 2.4).....	\$0.067
Total number of cars handled (4935 + 2788).....	7723
Number tons handled per hour.....	121
Cost of service by electric tractor per working day.....	\$27.87
Cost of service by team per working day.....	\$55.29

The cost of handling this number of cars by horses would have been \$9,179, thus indicating a saving by use of the electric tractor of \$4,551, or 64.5 per cent on the investment of \$13,400.

CINCINNATI COLLEGE STUDENTS IN ELECTRIC RAILWAY SHOPS

For about two years the Cincinnati Traction Company has been employing, with marked success, about thirty co-operative students in its shops and carhouses. These young men are students at the University of Cincinnati who are taking five-year courses in mechanical or electrical engineering, and they are required to spend one-half of their time in actual work and the other half with their studies. The school term is eleven months, and the students are divided into two groups that alternate in shifts of two weeks each at the shop work.

Work is given to each student in the shops according to his ability, but all must start with drill press and vise work. From this they are advanced to laying out templets, in which work they are very accurate. In the beginning the students are paid 15 cents per hour, and as they become more expert and are advanced it is possible for them to make as much as 28½ cents per hour. In the carhouses the students do the truck and motor repair work, and in all cases they have been found to be very proficient. This is probably due to the fact that they are very much interested in their work. In so far as the company has been able to ascertain there has been little or no jealousy on the part of the old employees where these have not been replaced by the students because of inefficiency. On the other hand, the men who continue in the service are spurred to a more strenuous effort to meet this high-class competition.

Business Prospects for 1914

Expressions of Opinion from Representative Manufacturers as to Business Outlook in the Electric Railway Field During the Coming Year

In the issue of the ELECTRIC RAILWAY JOURNAL of Jan. 3, 1914, statistics were presented showing the general trend of the electric railway industry during 1913. It has been deemed advisable to supplement these statistics for the past year with expressions of opinion from prominent manufacturers of electric railway apparatus as to the business prospects for the coming year and the effect which important changes in the business or technical improvements in apparatus made during the past year will have on business in 1914. Accordingly letters were sent out to the entire field, and the following replies have been chosen as best expressing the generally prevailing optimism:

THE O. M. EDWARDS COMPANY, SYRACUSE, N. Y.: "We are inclined to be very optimistic regarding the business outlook for 1914. Our factory is running full time, and our unfilled orders and prospective business show no indication of a 'lean year'."

CLEVELAND ARMATURE WORKS, CLEVELAND, OHIO: "Our business is not a very good barometer for trade conditions, for it is almost exclusively that of repairing electrical machinery. It is somewhat in the position of a grocery store. People must eat; likewise electrical machinery must have repairs. The outlook for 1914, however, is very encouraging. In fact, we find at this time that we are rushed with orders for repair parts for electrical machinery."

FEDERAL MOTOR TRUCK COMPANY, DETROIT, MICH.: "There is no question in our mind that 1914 will be by far the best year since the organization of this company. The adoption of motor trucks is simply a step toward economy and efficiency, which works in excellently with the present tendency toward cutting the cost in every way possible. This is particularly true as regards street railways, inasmuch as experience shows there is absolutely no question concerning the economy of federal trucks in the departments in which they are used by these companies."

GRIP NUT COMPANY, CHICAGO, ILL.: "Better times are coming. If there is one thing that can be depended upon more than another, it is that history will repeat itself. The fact that we have a slight period of depression only makes our demands of the immediate future that much more acute. The fact is that the railroads are secretly placing orders with car builders, and as cities are growing rapidly and street cars are wearing out we must have a general increase in business. The fact that it has not occurred during the past year makes it more certain that it will come now."

THE HOLLAND TROLLEY SUPPLY COMPANY, CLEVELAND, OHIO: "From the orders received up to this date the outlook for 1914 is good and we are sure that when we come to the close of the year our optimism will be verified by the results. The basic position of this country is sound. Stocks of merchandise in all lines of business are low. Railways cannot serve the public unless they keep up their equipment, and although they may not be buying just at present, conditions will oblige them to do so at an early day. There is no reason that we can see for the pessimism exhibited by some bankers and stockbrokers."

THE ELECTRIC RAILWAY IMPROVEMENT COMPANY, CLEVELAND, OHIO: "The business situation as far as the Electric Railway Improvement Company is con-

cerned is very good. During the past year this company has placed twenty-four cars on various roads in the United States and Canada, representing a total mileage of 4618 miles, and there is considerable new business in sight for the year 1914. Taking everything into consideration, there should be a marked improvement in all lines of business, beginning with Feb. 1. The intervening month of January will be quiet, owing to the taking of inventories, the compiling of statements and the annual meetings of corporations. The present year should be the banner year of all since 1907."

THE WHEEL TRUING BRAKE SHOE COMPANY, DETROIT, MICH.: "As far as the business outlook for 1914 concerns us it is very good. We have noted that during periods of business depression in the railroad field there is a considerable demand for wheel truing brakeshoes, which we believe results from a desire on the part of the consumer to get the last mile of service out of his wheels. As to improvements or changes in our product—we try to adapt ourselves to various changes in conditions, such as the increased braking power made necessary by increased weight and speed of cars, which has led to a heavier and stronger shoe. Variation in material and texture of wheels must be met with certain changes in composition, temper, etc., of the abrasive material in the shoe."

THE VALENTINE-CLARK COMPANY, MINNEAPOLIS, MINN.: "The demand for cedar for telegraph pole purposes for the year 1914 will undoubtedly exceed the actual business secured in the year of 1913. Almost every engineering company or operating company has considerable work in contemplation to be carried out when money matters are adjusted. What is worrying the cedar telegraph pole producer is the weather conditions in Michigan, Wisconsin, Minnesota and the West. Up to this writing we have had no winter whatsoever, no snow and very little water with which to make ice roads. This means curtailed production and a higher range of prices than has existed for some time. We do not look for any great demand or increase in sales until after March 1, but after that business will be better than it has been for some time."

MORE-JONES BRASS & METAL COMPANY, ST. LOUIS, Mo.: "The prospects for 1914 appear good to us. Orders are being placed more freely than in November and December, 1913. It is our opinion that trade will be quite fair the first six months, and that the volume will then show a steady increase, resulting very probably in another era of general prosperity for the whole country. The disturbances of 1913 are largely over. The passing of the currency bill supplies a long-felt want, the good effects of which will become more apparent as time goes on. The new tariff bill affected some lines adversely, but it is in process of adjustment and will no doubt work out satisfactorily. If now the railroads obtain a 5 per cent increase in freight rates, it will be hard to gage accurately the favorable results that will accrue to the entire business community."

WALTER A. ZELNICKER SUPPLY COMPANY, ST. LOUIS, Mo.: "We do not expect 1914 to be a boom year but look forward to a steadily increasing volume of substantial business. We base our opinion upon the facts that for the last several years purchases of materials of

all sorts have been on a hand-to-mouth basis, that outlays for maintenance have been made only when absolutely necessary, and that such extensions as were built were absolutely certain to show immediate and large returns. We feel that there must be an increased amount of buying to cover replacements that are absolutely necessary and that suburban residence districts are going to demand extensions of urban lines. Sooner or later, too, suburban and steam lines must make extensions that are certain to show good returns on the investment, and under the law of averages that time cannot be far away."

NAUGLE POLE & TIE COMPANY, CHICAGO, ILL.: "December was an exceptionally good month with our company. We heard so much depressing talk that we naturally thought we would do a poor business ourselves, but when we came to take off our monthly trial balance we found the month's trade unusually good. We actually shipped more cars of poles in December, 1913, than we did in December, 1912. Inquiries, however, are much lighter now than they were thirty days ago, although there are a number of big inquiries awaiting the result of our recent money legislation. There are two or three propositions in the electric railway field that are about ready to be taken up again, after some delay, and it looks as if there would be a considerable amount of this work done the coming year. In fact, the outlook for the year is bright, although now we do not see any immediate results."

THE NATIONAL LOCK WASHER COMPANY, NEWARK, N. J.: "Our ideas regarding business conditions for 1914 are predicated on the consideration which the steam railroads will have from the Interstate Commerce Commission, particularly the present request of the Eastern railways for an advance of 5 per cent in their freight rates. We are constantly aiming to improve the efficiency of our lock washers, curtain and window fixtures, not only the articles themselves, but the method of manufacturing, and have no doubt that we will obtain our share of whatever business is offered during 1914. We strongly believe, however, that business will not start forward with any sustained impetus until the very high wages now paid practically all classes of workmen are brought down to a fair level, and that workmen as a class must realize that they must give a fair day's work for a fair day's wage."

R. D. NUTTALL COMPANY, PITTSBURGH, PA.: "As manufacturers of gears, pinions and trolleys for electric traction works, we are pleased to say that the prospects for improved business during the coming year are unusually bright and we are more than hopeful that we shall show an increase over the 1913 business. Orders on hand, business in prospect and the number of legitimate inquiries being received all indicate a healthy condition of affairs in this line of work. There is a widespread interest in high-grade materials which is certain to develop more or less business in the near future. During the past year we have developed a new design of gear for street railway work. We have also experimented largely with chrome vanadium and other special steels in our efforts to meet the ever increasing demand for better products. The older methods of heat treatment and the apparatus used in heat-treating work have been improved so that almost absolutely uniform results are obtainable, which was out of the question a short time ago."

ELECTRIC SERVICE SUPPLIES COMPANY, PHILADELPHIA, PA.: "We believe that as business quieted down very perceptibly during the final three months of 1913, it is not likely to reach normal proportions much before the middle of this year. Unquestionably there is evidence since the first of the year of a considerable increase in

orders and a very decided increase in inquiries. It is hoped that the Interstate Commerce Commission will grant the increase in freight rates asked for by the railroads. This, with the settlement of the currency question, should rapidly bring the business volume up to normal. In our own business the recently added lines of manufacture are showing such a substantial growth that we expect a greater proportionate increase than will probably occur in the general business of the country. We are preparing now for an 80 per cent addition to our present plant and will begin building in the early spring. All in all we are much more optimistic on the business situation than we were in the latter part of the year just closed."

RAILWAY TRACK-WORK COMPANY, PHILADELPHIA, PA.: "We feel very optimistic in regard to the prospects for the sale of our grinding machines during the present year. During the past year our sales far exceeded our greatest expectations; yet we believe that the practice of rail grinding is in its infancy and will broaden rapidly. At the recent A. E. R. M. A. convention in Atlantic City we interviewed electric railway representatives from all over the country and the increased interest in rail grinding expressed by these men far exceeded our expectations. Indeed, interest was shown by many of the very small roads which we thought would not feel justified in purchasing high-class grinders. We have added many important features to our reciprocating track grinder, tending to produce a machine which will withstand very severe usage in the hands of the common class of labor needed for its operation and to reduce the cost of up-keep without affecting the excellent quality of work turned out by the machine."

THE NICHOLS-LINTERN COMPANY, CLEVELAND, OHIO: "The growing demand throughout the country for transportation and the conscientious work of the electric railway fraternity for better equipment and safer methods indicate a prosperous year for material manufacturers and dealers. Orders now on our books are above the average of last year, and we look into the future with confidence. We find a growing demand for complete equipments of sanders and are now furnishing more equipment completely assembled, with hoppers, traps and all accessories, than at any time in our experience. Our ventilators, both roof and deck sash, have been improved during the past year, and the demand is very satisfactory. Our special selector switch for use in connection with high wattage car lighting lamps is growing in favor. We are placing on the market a special dry-cell battery for the operation of continuous signal lights, etc. It can be used as a substitute for storage batteries and ordinary dry cells and is designed to be connected direct to a high voltage line. We are also placing on the market the Lintern tail-light and indicating signal, a device that indicates the operation of the controller of a car to the operator of a following car and to the driving public."

PREPAYMENT CAR SALES COMPANY, NEW YORK, N. Y.: "It being conceded that the prepayment principle has been exceedingly beneficial to the various traction roads as evidenced by its widespread adoption, in our opinion the year 1914 should show a considerable expansion in the street car building industry and consequently in the business of the Prepayment Car Sales Company. The center-entrance prepayment car, especially the low-level stepless type, has been well tried out and proved very satisfactory for city service. For end-entrance cars it is generally agreed that those having inclosed platforms with mechanically operated outward folding doors and folding steps are the best, safest and most economical. Indeed, this latter type of

car, with a fare box, seems to be about the 'last word' in car design, and many roads are using this type for interurban and zone fare work. Statistics show that 5514 new cars were built in 1913. Having regard to the growth of the population and actual requirements of the various roads, we believe that 1914 will show a substantial increase in this figure, as many of the smaller roads throughout the country are considering the conversion of their old type of cars to the more economical and more profitable prepayment type."

INTERNATIONAL REGISTER COMPANY, CHICAGO, ILL.: "We expect a record-breaking year, partly owing to conditions peculiar to our business. Our fare register business has held its own notwithstanding radical changes in the methods of fare collection, for fare registers are used more extensively than formerly for tickets and transfers and also for cash fares in connection with fare boxes. Our new coin registers and fare boxes, the output of which was limited last year to several large orders, we shall now endeavor to introduce generally. With hundreds of prepayment cars in use not yet provided with money-counting fare boxes and with our machines now thoroughly standardized, we look for a year of good business and steady growth. We expect to put out soon a coin register capable of taking tickets, for which there is considerable demand."

STANDARD MOTOR TRUCK COMPANY, PITTSBURGH, PA.: "As builders of trucks for electric railway service, we are firmly convinced that the decrease of 8 per cent in the number of cars purchased in 1913 as compared to 1912, as noted in the ELECTRIC RAILWAY JOURNAL of Jan. 3, 1914, is very slight in comparison with previous presidential years. We confidently expect the year 1914 to be as good as any of our previous years in the truck business, as general conditions seem to be gradually getting back to normal. We did slightly less business during 1913 than in 1912, but in a large measure this was due to the fact that we advanced our selling prices. During the past year we made a number of changes in the manufacture of our motor trucks, such as improving the designs and making the trucks of stronger construction yet lighter in weight, as is evidenced by our pressed frame channel type of truck. Electric railways in the past have equipped their roads with very heavy cars and trucks, which are expensive to operate as well as to maintain. The present trend is toward lighter equipment. In many instances, cars now being ordered are from 30 per cent to 40 per cent lighter than formerly, as is evidenced by the trail cars now operating in Pittsburgh. Some of these were equipped with smaller motors, yet they are able to maintain the same schedule as heavier cars with larger motors."

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.: "The indications point to an early resumption of normal business. Even at the present time our orders for electric car equipment are fairly satisfactory, and approximately four months' output is now booked. During the past few weeks, also, the number of inquiries has largely increased. The damages caused by the floods in the great interurban districts have been largely overcome, and many purchases delayed by the destructive action of the elements last spring should be made during the coming year. The tariff and currency questions have been definitely settled, and a reasonably early decision as to freight rates seems probable. Constructive adjustments, therefore, should now take the place of lingering uncertainty. Initial contracts for the electrification of mountain grades have opened a new field for the electric locomotive, and, with the beginning of two new terminal electrifications, seem to foretell a wider activity in heavy electric railroading. Large numbers of equipments

with simple forms of train control, such as type HL, were sold during the past year as well as many field control motors. The reliable operation which these have given and the economies which they have effected lead us to look for increasing adoption of such devices. These conditions seem to predict a satisfactory volume of business during the coming year."

THE TOOL STEEL GEAR & PINION COMPANY, CINCINNATI, OHIO: "We have already the renewal of our largest 1913 contracts, together with a number of new contracts for large properties, and we believe that our business for 1914 will be much larger than for any of the previous years. There is a decided tendency to increase the horse power of motors and the weight and speed of cars, and this of course works very strongly in favor of better gears. Moreover, a number of companies are adopting the maximum traction truck with only two motors instead of four, which, of course, doubles the work that the gearing must do. The fact that many cities are now using trailers in the rush hours also adds another feature demanding high-grade gearing. So acute is this situation becoming that in many cases our gears and pinions have been specified during the past year on new motors, this applying to a considerable extent in the case of companies that have been ordering equipment in the United States and in the case of several large electrifications in England. We have just completed the erection of a new shop several times as large as our old building and have purchased a considerable amount of new machinery. Our capacity in the new location will be at least 50 per cent greater, and we shall have much more convenient methods of handling, which will not only increase our output but also add to the quality of our product."

UNITED STATES ELECTRIC SIGNAL COMPANY, WEST NEWTON, MASS.: "At the opening of 1914 all indications are pointing toward a continuance for a time of the slacking-off tendency which has existed in electric railway construction and improvement for months past as well as in most other lines of business. The cause does not appear to be a falling off in the actual business done by the electric railways so much as the difficulty of financing new projects or increasing the capital accounts. This condition is perhaps brought about as much by the state of the public mind as by actualities and is but temporary. Undoubtedly as soon as the country becomes adjusted to the new conditions confidence will be restored and ample funds will be seeking investment. The particular classes of material manufactured by this company are such that its business will not be as seriously affected as will some other lines, because in times of retrenchment like the present the necessity of machines and devices the installation of which makes operation more economical is more evident. Another reason peculiar to this company's business is the impetus lately imparted by 'safety first' campaigns throughout the railway world. While estimates for the present should be conservative, we are looking forward very optimistically to the near future. By the taking over of the business of the American Automatic Switch Company, formerly of New York, late in 1913, the scope of our business has been considerably enlarged. The material now offered railways comprises not only automatic block signals for all purposes but also automatic track switches, interlocking, tower and curb controls, derails and crossing protections."

DIAMOND STATE FIBRE COMPANY, ELSMERE, DEL.: "It is difficult for us to give an intelligent expression of opinion as to prospects for business with electric railways during the coming year. This company manufactures vulcanized fiber in sheets, rods and tubes, used

principally for insulating purposes but also used very extensively in many mechanical lines into which the question of insulating properties does not enter. All electric railways use more or less vulcanized fiber; but many of them do not carry a stock, and, as a matter of fact, do not purchase direct from the manufacturer but from local dealers. Vulcanized fiber could be used advantageously in many places where inferior and sometimes more costly materials are now used. Many concerns are using fiber which really know very little about its actual merits; and, in our opinion, an educational campaign would help them to solve satisfactorily problems that rise and convince them that fiber should be more generally used."

DOSSERT & COMPANY, NEW YORK, N. Y.: "We have just closed the most successful year in the history of our company and look forward with confidence to a continuing steady growth in the volume of our business in 1914. We believe there is basis for the hope that public sentiment toward the larger business interests of the country will take on an aspect during the year that will make for returning confidence on the part of investors, so that capital needed for expansion of transportation facilities, manufactures and trade will be available in greater volume and at lower rates of interest. As regards changes or technical improvements in our product during the past year, the most important are the adaptation of our connectors for the wiring of section-alizing cases and other apparatus in the latest block signaling system and in junction boxes on the lighting systems of all-steel cars, and for the connections for switch gear, busbar equipment and generating, converting and transforming apparatus in the power and sub-stations."

THE OHIO BRASS COMPANY, MANSFIELD, OHIO: "Business, as a whole, is showing improvements already, and we confidently expect a good year. In 1913 we received the largest business in our history, despite a lull during the last two months of the year. We are going ahead with very active sales and advertising plans for this year and have made a number of improvements in our line and added a number of new devices, which we believe will help toward greater sales. Briefly outlined, the additions and improvements to our line of railway hangers and several new schemes of catenary construction; a new design of round-top railway hanger and two others for mine work; a pressed-steel trolley clamp; a new flexible trolley ear; the adaptation of our patented extruded metal runner piece on metropolitan strain plates and other overhead devices; a new type C trolley wire splicer, which permits installation without bending wire; a new line of live adjustable cross-overs with cammed tips that have proved so popular on our Type D frogs; a new lighting regulator for regulating lighting circuits in cars, and an automatic electric air and car coupler. We have made several improvements affecting a number of our materials, among them being the substitution of steel for all of our coupler body castings, the increase in the sizes of set screws on various devices, etc. In our porcelain business we have added a considerable number of devices to our line of hardware to be used in connection with suspension insulators. We also have designed a new porcelain strain insulator and are developing many new types of efficient wall and roof bushings for extremely high working voltages."

GOLDSCHMIDT THERMIT COMPANY, NEW YORK, N. Y.: "The prospect for business in the street railway field, in our opinion, seems to be particularly good for the coming year, especially in regard to rail welding and the sale of appliances used in connection therewith. While the late fall and winter months usually constitute a dull

season for us in rail welding, such has not been the case this year. Our welding gangs have been busily engaged in the Southern States and on the Pacific Coast, where the climatic conditions permit of welding rails the year round. There is a growing demand among the street railway companies for a better and more permanent rail joint than can be obtained by any mechanical means. Much pressure, too, is being exerted on street railway companies everywhere by municipal and other authorities for the installation of effective bonding systems so as to minimize stray currents and thereby reduce the possibility of damage by electrolysis. The installation of the fully welded rail joint seems to be the only sure means of attaining these ends. In regard to important changes in our process, the perfection of our new insert method of welding probably represents the most important technical improvement, as it permits of welding rails together throughout their entire section but without in any way affecting the composition or wearing quality of the metal in the head of the rail. To make this possible many improvements were necessary in our equipment. Probably the most interesting of these was the making of our only large tool—the rail grinder—in the form of a one-man machine."

OHMER FARE REGISTER COMPANY, DAYTON, OHIO: "The more or less intermittent operation of the business pendulum during the past two years has undoubtedly been adjusted to more uniform action since the tariff and currency bills have been disposed of, and business confidence will naturally follow. We have already received an unusual number of contracts for registers for so early in the year, and prospects for new business during 1914 are very flattering, not because of any anticipated increase in rolling stock but for three other distinct reasons. In the first place, the men who operate railways are appreciating the value of the Ohmer system; they know, by experience, that it is vastly better to operate with a system which obliges the conductor to turn in all he collects than with one which permits him to turn in only an amount equal to the amount registered. Secondly, practical experience with fare boxes has demonstrated more than ever the necessity of using in railway cars a detail recording register. The third reason for favorable projects lies in the fact that our new totalizing register for city service and our automatic fare-counting boxes are fully developed and our facilities for filling orders promptly have been improved. We have worked a full force all winter and are now adding extra men to the regular number of employees."

WAGES ON BRITISH AND AMERICAN RAILWAYS

The Bureau of Railway News and Statistics has recently compiled some comparative figures of the wages paid British and American railroad employees.

DAILY RATE AWARDED BRITISH EMPLOYEES COMPARED WITH 1912 AVERAGE PER MAN IN THE UNITED STATES

	Great Britain		United States Average
	Minimum	Maximum	
Enginemen	\$1.15	\$2.18	\$5.02
Firemen	0.73	1.46	3.03
Conductors	0.77	1.42	4.29
Trainmen	0.63	1.42	3.02

The bureau says: "According to latest determinations, \$1.86 daily was the average earnings for engineers, \$1.11 for firemen and \$1.26 for passenger guards in Great Britain.

"It is from the graduated scale, however, that one best appreciates the slow, laborious ascent which marks the British railway servant's rise in the wage scale. Beginning at the set minimum, his advance almost universally is at the rate of 1 shilling (24 cents) per week annually toward the maximum of the grade."

Plans for the Midyear Conference

Arrangements of the American Electric Railway Association and Manufacturers' Association for the Meeting and Dinner to Be Held in New York on Jan. 29 and 30—Many Committee Meetings Called

The fifth midyear conference of the American Electric Railway Association is to be held at the headquarters of the association in New York on Jan. 29 and 30, and full arrangements are being made for a successful gathering. At the same time meetings of a number of committees of the various associations will be held. While full announcement has not yet been made concerning the committees that will meet at this time, it is expected that a number will take advantage of the opportunity to combine attendance at the conference and banquet with the work of planning committee reports for the 1914 convention.

The idea of the midyear conference has been carried out from year to year with increasing attendance and success. It has provided a different kind of meeting from what has been found practicable at the annual gathering in October. It was designed originally to appeal especially to the executives of companies, and while there has been no definite departure from this plan, the program has been of such a nature as to appeal also to all who are interested in the larger problems of the industry. No other events of similar interest conflict with attendance at the midyear conference as at the time of the annual meeting, when various reports and papers are presented before the different associations, while other attractions are provided in the exhibits and informal conferences, all of which combine to attract attention.

Supplementing the information published in last week's issue in reference to the speakers at the annual dinner to be held at the Hotel Waldorf-Astoria on Jan. 29, Secretary Burritt of the association has issued an announcement in regard to the subject and speakers for the conference to be held on Jan. 30. This announcement appears below. It is expected that a further announcement in reference to the programs will be made by the association before the time of the meeting.

DATE OF THE BANQUET

The midyear dinner is to be held in the grand ballroom at the Waldorf-Astoria Hotel at 7 o'clock on Thursday evening, Jan. 29. Tables will seat eight guests. H. G. McConaughy, secretary and treasurer of the Manufacturers' Association, in his letter regarding the dinner, says that application blanks for tickets must reach his office at 165 Broadway, New York, not later than Jan. 26, in order that names and seating arrangements can be printed.

The dinner committee is composed of C. Loomis Allen (chairman), T. S. Williams, Frank Hedley, L. S. Storrs, George J. Roberts, W. L. Conwell, C. R. Ellicott, B. A. Hegeman, Edwin H. Baker and H. G. McConaughy.

CIRCULAR LETTERS BY SECRETARY BURRITT

Two circular letters outlining the subjects selected for consideration at the midyear conference have been sent out by E. B. Burritt, secretary of the association. The first of these, which is dated Jan. 10, 1914, and which is addressed to the executives of all member companies, is in part as follows:

"The dates of the annual midyear conference are Jan. 29, 30 and 31. The meeting of the American Association (the conference proper) will be held on Friday, Jan. 30. In its scope and in the importance of the subjects to be considered this meeting ranks above any yet held by the association. The endeavor of the committee on subjects is to bring about a thorough discussion

of certain vital topics, such discussion to be inaugurated by authorities.

"These subjects are: 'The Economic Aspects of Regulation Compared with Profit-Sharing with Municipalities'; 'The Effect of Rate of Fare on Riding Habit'; 'Inherent Hazards of the Electric Railway Industry,' and 'Present-Day Influence of Labor on Legislation.' Although it is not possible at this time to announce all of the speakers, the quality of the program is indicated by the fact that among them are the Hon. Halford Erickson, of the Railroad Commission of Wisconsin, and F. W. Hild, general manager Portland Railway, Light & Power Company.

"In addition to the addresses mentioned, the conference will consider the most important report of the joint committee on the joint use of poles, a subject of the greatest importance to every railway as combining features relating both to public policy and to economies of operation.

"As has been customary, the meetings of many of the committees of all affiliated associations will be held during the period of the conference, and on the evening of Thursday, Jan. 29, at the Waldorf-Astoria, will be held the annual banquet of the association, this time under the joint direction of a committee from the American and Manufacturers' associations. The speakers at the banquet are men of prominence and will handle subjects vital to electric railways, and there is every reason to believe that this affair will not only be one of the most enjoyable but also one of the most profitable functions which the association has yet held.

"The attendance of all possible delegates from your company is urged, and it is especially desirable that the men of authority and influence in your company's affairs be in attendance. The subjects to be considered are those closely connected with the policy of your organization, and the attendant discussion should have the weight of authority possible only when participated in by the leading men of the industry.

"Inclosed is a registration card, and it is requested that this be filled out with the names of those expecting to attend the conference and returned as early as possible.

"In again urging upon you the desirability of having in attendance as large and representative a delegation from your company as possible, the secretary is actuated by the belief that the welfare not only of the association but also of the industry is greatly forwarded by the success of these meetings, both in their direct effects upon the interests of the member companies and in the impression created upon the public.

"Please fill out and return registration card now."

The second letter, dated Jan. 13, is addressed to the members of the American Association. It covers briefly the plans for the midyear conference as given above, and states that during the three days meetings of many of the committees of all associations will be held. The individual members are especially urged to be present not only because of the direct value of participation, but also because a large attendance will show that the electric railway men of the country are acting as a unit in the movement to secure better conditions for the industry. It is the opinion of those in charge of the meeting that this cannot fail to have a wholesome effect upon the public in general.

Convention of Wisconsin Electrical Association

The Sixth Annual Meeting Was Held in Milwaukee Jan. 15-16 and an Account of the Proceedings of the First Day's Sessions Are Published, Including an Abstract of the President's Address, Which Reviewed Conditions During the Past Year in the State of Wisconsin

The sixth annual convention of the Wisconsin Electrical Association was held at the Hotel Pfister, Milwaukee, Jan. 15-16. President W. H. Winslow, of Superior, Wis., presided at the first session, fifty members being in attendance. Following registration, roll call and the reading of the minutes of the previous convention, the president presented his annual address, which was in part as follows:

ANNUAL PRESIDENTIAL ADDRESS BY WILLIAM H. WINSLOW

Judging from the somewhat scanty figures which it has been possible to obtain, the operations of the electric light and power utilities of the State for the last fiscal year show a considerable improvement over the year ended June 30, 1912, gross earnings having increased upward of \$1,000,000 and gross income more than \$400,000, as compared with increase in the same items of less than \$500,000 and \$50,000, respectively, for the earlier period.

As, however, most of the increase in gross income is attributable to the comparatively few "Class A" plants, it is apparent that there are a very large number of companies in the State that are making little or no real progress.

While it is true that it is difficult largely to increase sales in small communities of very slow growth, it is also true that wonders have been accomplished under such conditions, and that in every town in the State there are latent possibilities which it should be one of the chief functions of this association to assist in developing.

From the equally meager figures which are available covering the electric railway operations in the State for the year ended June 30, 1913, it is very difficult to draw any very cheerful or reassuring conclusions. Total gross earnings increased less than \$60,000, while gross income actually decreased well over \$250,000. It is possible that when the detailed figures are available it may be found that increased depreciation appropriations in part account for this discouraging showing, but it seems more probable that the constantly rising cost of supplies, wages and taxes is mainly responsible. With rates of fare largely limited to the 5-cent piece, whose exchange value in terms of wages and material has been shrinking year after year, and with none of the manifold ways of increasing business open to the light and power companies, it would seem that the street railway companies have a very difficult problem on their hands. Some method of charging by which compensation will be received for the constantly increasing distances to which people are being carried seems inevitable, if the companies are to continue properly serving the people, as otherwise funds needed for extensions will not be procurable.

SESSION OF THE LEGISLATURE

A large part of the activities of your association and the major portion of its expenses during the past year have been in connection with the protracted session of the Legislature, which lasted from January until August. It may seem strange that such should be the case, when the association neither seeks any special favors nor attempts to defeat any reasonable regulative measures, but here are the facts:

During the last session there were 2100 bills and

resolutions introduced, or an average of about eleven for each week day from Jan. 8 to Aug. 9. Among them were a very considerable number affecting our interests, most of which fell into one or the other of the following classes: first, bills based on the real or supposed needs of some particular town or city, and framed without any regard to the possible effect on the State at large, and, second, bills which, drawn in more or less complete ignorance of utility operations, would, if enacted, have produced results entirely different from those expected by their authors.

In addition to such bills, nearly every session has one or more important and frequently complicated bills, with which we are concerned only in seeing that they are made workable and fair. To cope properly with this situation, your advisory committee employed a firm of Madison attorneys, who examined all bills as fast as introduced, kept our secretary advised of all measures of interest to us and of all hearings on such measures, and appeared for us before committees. In addition to this, we were represented at numerous important hearings by officers and attorneys of member companies. Most of the work of arranging for these hearings—at many of which he appeared—fell on our secretary, and the thanks of the association are due him for the ungrudging way in which he sacrificed what should have been his leisure hours. It is, I think, true that the committees of the Legislature, and the Railroad and Tax Commissions as well, at whose hearings our association has been represented, have found the practical suggestions made by our members helpful and valuable and animated by a spirit of fairness and justice.

CO-OPERATION OF ASSOCIATIONS

To some extent, at least, the work outlined above is of value to the other utilities of the State, and it is probably true that were they acting in concert with us, a very slight additional expenditure would protect the interests of all.

At the last meeting of the Wisconsin Gas Association its executive committee was authorized to co-operate with us on legislative and other matters of common interest, and I would recommend that a committee be appointed at this meeting to confer with it on the subject and also to consider whether or not a consolidation of the two associations or the formation of a general utility association would be practicable and desirable. It would seem that the combining of the electric light, power and railway, the gas and the water utilities of the State in one strong organization might possess very great advantages.

UTILITIES AND STOCK AND BOND LAWS

Sufficient time has now elapsed since the passage of the original public utility and stock and bond laws to permit of forming a reasoned judgment on their results and tendencies.

As regards established utilities, their effect has, I believe, been, on the whole, beneficial—both from the standpoint of the public and that of the utilities. Certainly the belief that excessive profits were being received by public service companies must have been dissipated, as it is doubtful if in a single case returns have been disclosed more than equal to the minimum which a bank, factory or trading concern must earn in order to be called successful.

It has been said of these laws that they have taken

the utilities of the State out of the field of speculation. As regards existing companies, this is perhaps both true and proper. Applied to new enterprises, however, it would be more nearly correct to say that they have made their financing difficult or impossible, and it is to this phase of the situation that it is desired to call particular attention. No laws can make hazardous enterprises (and all new ventures are more or less so) anything but speculative, and it is becoming apparent that the laws in question are stifling development and will continue to do so unless modified. This is a matter of fully as much importance to the people of the State at large as it is to the utilities; possibly even more so, for, while capital can find other outlets, the loss to the State resulting from arrested enterprise is positive and unescapable.

The plain facts of the matter are that in most cases money cannot be obtained from new ventures in the utility field, either by the sale of capital stock at par or by the sale of bonds, or any combination of the two. That this is so is due to a number of conditions peculiar to quasi-public businesses—among them the very large initial investment needed and small early returns received and the fact that increases in investment are governed, not by the desires or convenience of their owners, but by the demands of the public. What is required is that to speculatively inclined investors, who alone are attracted to such enterprises, there be offered both a first lien on the property and a share in the profits over a mere interest return, when—and if—such profits are earned. This was formerly accomplished by the issuance of bonus stock, and very many people who were formerly violently opposed to such issues now realize that they were an economic necessity and entirely different from “watered stock” properly so-called. While bonus stock issues were economically sound and, within proper limits, in the public interest, rather than the reverse, they were open to the objection that they did not clearly show that their value was based on earning power only. For this reason they cannot be—and possibly should not be—revived.

How, then, can the deadlock which appears to exist be broken? Apparently, only by legalizing the issuance of stock without par value, or profit-sharing certificates, as they are sometimes called, such as are now permitted by the laws of several of the states. Not only would such issues facilitate the financing of new enterprises, but they would make possible the consolidation of many small and necessarily inefficient plants, with great resulting advantage to the community served. The head of one of the large companies that has combined scores of plants in other states has stated that were issues of profit-sharing stock without par value permitted in Wisconsin, his concern would enter the State and, through the well known economies resulting from the substitution of a few large plants for many small ones, be enabled in many cases largely to reduce present rates.

While this is a matter that does not directly affect most existing utilities, we are all vitally interested in the progress and development of the State, and should, I believe, do what we can to further such an amendment of the stock and bond law as will relieve the present situation.

CONVENTION PROCEEDINGS

The next order of business was the report of the secretary-treasurer, which showed the association to be in excellent financial condition. Following this President Winslow directed attention to the request of the Wisconsin Railroad Commission accounting department in the form of a letter recently sent out for information

concerning the policies of different public utilities as to extensions, billing discounts and collections. H. G. D. Nutting, of the Clement C. Smith properties, Milwaukee, led the discussion and after this he read his paper entitled “A Practical Accounting System for Small Central Stations.” This was a description of methods and forms and their practical application. Continuing the program after a brief discussion of the foregoing paper, J. B. Sanborn, attorney, of Madison, Wis., read a paper reviewing the new laws affecting public utilities.

The afternoon session opened with the final report of the committee on train dispatching, of which E. W. Hammett, superintendent Sheboygan Railway, was chairman. This committee recommended the standard code of interurban rules, a telephone system and written train orders. Owing to the wide divergence of opinion expressed by different members as to the necessity for adopting written train orders on all interurban lines regardless of speed or size, the report of the committee was not approved. J. P. Pulliam, general manager Eastern Wisconsin Railway; Ernest Gonzenbach, president Sheboygan Railway; R. B. Stearns, vice-president Milwaukee Electric Railway, and Dean Treat, of Green Bay, Wis., took part in the discussion of this subject.

C. M. Larson, chief engineer Wisconsin Railroad Commission, presented a paper entitled “Street Railway Traffic Surveys in Relation to Railway Operation, Management and Regulation.” This will appear in a later issue of the ELECTRIC RAILWAY JOURNAL. The paper developed considerable discussion, much of which was complimentary to the work that the commission has done. Mr. Stearns stated that the paper should be recognized as a distinct contribution to the business. The commission had devoted much time and study to railway operating conditions, and consequently it had been enabled to promulgate principles of fairness which enabled the railway managers to cope with local prejudices. Each community had imposed restrictions on its local railway company both as regards service and fares. Unequal haul for the same fare was demanded and this was advantageous neither to the public nor the companies. As a result many of these restrictions had become vicious and wholly inconsistent with traffic demands. As an example, before the coming of the commission it had been almost impossible to short-loop cars. The patience exercised by the commission in its study of these difficulties had resulted in solutions which aided both the public and the railway companies. It had formulated definite standards as regards service which were applicable to any property.

Continuing, Mr. Stearns said that there was some question as to the necessity of providing more seats for passengers during the off peak hours, but it was a problem that would ultimately solve itself. Traffic delays would affect the extra per cent of seats furnished as well as local weather conditions. In closing he described the new system of fare collection which would become effective on The Milwaukee Electric Railway & Light Company's suburban and interurban lines on Jan. 18. He also summed up his discussion with the statement that service regulation was largely dependent on the riding habits of the people and that each situation required a special study. With regard to the Wisconsin Railroad Commission he said that regulation along the lines advanced by it were sound, sane and proper, and should be accepted by the railway companies and public alike.

C. M. Rosecrantz, general counsel Milwaukee Electric Railway, continued the discussion of Mr. Larson's paper by stating he had had considerable experience in trying to solve the street railway difficulties prior to the coming of the commission. To argue for a service commensurate with traffic demands which would be profitable to

the railway company was of no avail. But the commission, as a disinterested body, had overcome this local prejudice to the extent that its decisions were acceptable both to the companies and to the public. In concluding Mr. Rosecrantz suggested that the commission should also consider speed regulation. Ordinances in many cities limited speeds so that the railway companies had to break the law continually to meet public demands for rapid transportation. M. C. Ewing, general manager Wausau Street Railway, closed the discussion by stating that electric railway construction had practically been at a standstill for the past few years. This condition was largely due to too much local regulation. In fact, at the present time street railways were among the poorest paying investments. The managers were as capable as those engaged in other enterprises, but were so over-regulated that they could not make their properties a paying investment. Much money had been expended unjustly in settlement of claims and through other unfair burdens such as paying for paving and sprinkling the streets. The street railways had also been assessed for heavy taxes. Practically every electric line that was built increased the value of the abutting property, in some cases even to an amount where the increase would pay the whole cost of building the railway line. But the company did not share in this increase, neither was it benefited by the paving. On the other hand, it was taxed just as high as the property owner and in addition had to maintain the pavement within the track allowance.

Thursday's sessions closed with the report of the committee on revision of electric service rules by the chairman, F. A. Vaughn, consulting engineer, of Milwaukee, and the report of the committee on co-operative advertising and publicity by Chairman G. B. Wheeler, general manager Chippewa Valley Railway.

MESSAGES OF THE GOVERNORS

The only states in which regular legislative sessions are held this year are Kentucky, Maryland, Massachusetts, Mississippi, New Jersey, New York, North Dakota, Rhode Island, South Carolina and Virginia. While most of the sessions in these states began early in January, the regular sessions in New Jersey and Virginia did not begin until Jan. 14 and Jan. 13 respectively. The message of Governor Martin H. Glynn of New York dealt almost entirely with the question of state finance. Extracts from the messages of the Governors of Rhode Island, New Jersey, Maryland and Massachusetts follow:

GOVERNOR ARAM J. POTHIER OF RHODE ISLAND

"The 2018 establishments in the State which filed acceptances of the workmen's compensation act with the commissioner of industrial statistics during the first twelve months of its enforcement gave protection in the form of assured compensation, in case of death or accident, to more than 140,000 wage earners.

"There are three matters in connection with this law which are deserving of serious consideration on the part of the General Assembly. The first is that of the immediate reporting of all accidents to the commissioner of industrial statistics upon uniform blanks, not too burdensome in character, in order that a careful study may be made of the causes of the same, which may be productive of results beneficial to employer and employee alike. It is found that those employing the greatest number of wage earners are in favor of such a plan, by reason of the fact that it may lead to the adoption of methods which will lessen the liability to accident, the resultant loss of time to employers and both suffering and wages to employees. I recommend the passage of a law giving the commissioner of indus-

trial statistics authority to require employers of labor to report all accidents within three days of their occurrence, upon uniform blanks to be furnished by the State.

"I believe that the commissioner of industrial statistics should have authority not only to study and report upon the results of the workmen's compensation act in Rhode Island but also to follow up the law with regard to its strict enforcement. At the present time there is absolutely no one who has authority to advise either employers or employees in regard to the provisions of the act or to see that they are properly lived up to. Rhode Island is acknowledged to have one of the best workmen's compensation laws in force in the twenty-two states which have adopted such acts to date, and its enforcement in a proper manner is as important as was its enactment."

ACTING-GOVERNOR LEON R. TAYLOR OF NEW JERSEY

"The members of the Legislature are undoubtedly awake to the responsibility which the people have, by their suffrage, cast upon them. They demand that progress be continued, that progressive legislation be not retarded or forgotten. They look to you for the accomplishment of good government and expect a continuance of the new order of things that has been begun. Governor Fielder in his inaugural address to you will call your attention to the things that he believes will require your attention."

GOVERNOR PHILLIPS LEE GOLDSBOROUGH OF MARYLAND

"For several years it has been distinctly felt that Maryland should follow the lead of many of our sister states and place upon her statute books a law that would provide compensation to the workmen injured in the course of their employment and at the same time not bear unjustly upon the employer. That this was not impossible has been generally believed for some time. At your last session there were numerous bills introduced and considered. One of them passed, but because it did not seem to suit our conditions has proved ineffectual. In order that the matter might be carefully considered as an independent subject, I appointed a commission, composed of gentlemen of high standing and ability, who have given the State a rare order of service. The report of their considerations will be sent you. When the bill which they have prepared shall have been introduced it will be made the subject of a special communication on my part."

GOVERNOR DAVID I. WALSH OF MASSACHUSETTS

"Certain corporation taxes now collected by the commonwealth are distributed to various municipalities in accordance with the ownership of stock of such corporations by the residents of such municipalities, namely, the taxes paid by railroad, telephone and trust companies. It is suggested that a law be enacted to provide that the franchise taxes paid by railroads, telephone companies and trust companies shall all be retained by the commonwealth, as they are state-wide companies. The result of such changes as are here suggested would increase the revenue of the commonwealth by about \$1,600,000 and cause a corresponding reduction of the state tax.

"The workmen's compensation act has now passed the experimental stage in operation and has demonstrated the wisdom of its enactment. I recommend the following amendments to the act:

"First—That compensation paid under the act be increased from half wages to 65 per cent of the average weekly wage of the injured employee, the minimum and maximum payments to remain as at present.

"Second—That payments to dependents in fatal injury cases be extended to cover a period of five hundred weeks from the date of the injury, the maximum payment not to exceed \$4,000.

"Third—That payments on account of partial incapacity be extended to cover a period of five hundred weeks from the date of injury.

"Fourth—That in the payment of compensation by a lump sum the Industrial Accident Board may receive the power to fix the sum to be paid, so that the matter of agreement as to payment of compensation by a lump sum shall not be a matter of bargaining between the employee and the insurer.

"Fifth—That the act may be amended so that it may be given extraterritorial effect by express legislative intent.

"Sixth—That the Industrial Accident Board have the power to require the payment of bills for medical, surgical and hospital attendance beyond the first two weeks after the injury in cases in which in its judgment such attendance is required.

"Seventh—That compensation and payments be so readjusted that a youth who loses an arm or suffers a serious impairment of like nature shall receive such compensation as shall enable him to provide for his future by receiving a training in a self-sustaining occupation.

"Eighth—That the board shall have the same power to fix rates and the same supervision over liability insurance companies as the Public Service Commission now has over the railroads of the State, and that the board have the necessary power to obtain all information required by it from such insurance companies.

"I believe that paid boards should be reduced in number wherever possible. The work of such paid boards as the Boston Transit Commission, the Directors of the Port of Boston, the Board of Labor and Industry, the Public Service Commission and the Industrial Accident Commission could be performed with increased efficiency by three members, and a substantial saving made in salaries to the taxpayers of the State.

"The Public Service Commission should be reorganized by making its membership three instead of five. With one exception the salaries received by the members of this commission are the largest paid to the members of commissions in the commonwealth. For years the duties of this same commission were performed by three members at a much reduced salary. The recommendation for five members was based upon the assumption that all public service regulation should be performed by this commission, but the law as finally enacted left an important part of such regulation with another commission.

"An increase of \$200,000 has been added to the fixed expenses of the State by the change in the law last year placing the expenses of the Public Service Commissions on the State. One year ago the expense of the Railroad Commission, when borne by the corporations, was \$80,000. This year the State will not only pay this sum, but an increase of over \$120,000 has been asked for because of reorganization and changes in this department. I am decidedly of the opinion that the method formerly pursued by which the railroads and telephone and telegraph companies paid the expense of their regulation was sound, and I urge that the provisions of law by which the cost was assessed upon the companies be restored to the statute books.

"There is no spirit of confiscation in Massachusetts. The owners of the securities of public utility corporations may rely on being permitted to draw a full and fair return upon all capital honestly and prudently invested in the public service. But so long as our public utilities are privately owned that private ownership must assume and bear the responsibility of management and also pay the penalty for mismanagement. The commonwealth may and does regulate, both for the benefit of the ratepayer and to some degree for the benefit of the

investor; but regulation is not management, and the main responsibility for the soundness of the investment rests and must continue to rest upon the management chosen by the stockholders.

"Before the New York, New Haven & Hartford Railroad can acquire the right to purchase those street railroads in the western part of the State mentioned in the so-called trolley merger act passed last year, it must satisfy the Public Service Commission that it is financially able to carry out the provisions of that act. If the Public Service Commission decides that the financial condition of the railroad will not warrant undertaking the cost of carrying out the provisions of the act, the right which is given to the railroad under the act is lost to it. Other action may then be considered to provide transportation facilities for the western towns. I shall await the action of the Public Service Commissioner before making any recommendation in this matter."

TEAM WORK AND TRACK MAINTENANCE DISCUSSED AT MEETING OF PUBLIC SERVICE A.E.R.A. SECTION

The regular monthly meeting of the Public Service Company section of the American Electric Railway Association was held at the Public Service Building, Newark, N. J., on Thursday evening, Jan. 15, at 8:15. Eighty-five members of the section were present. The meeting was devoted to an address on team work by J. M. Wakeman, general manager Society for Electrical Development, Inc., and to a paper on maintaining the way by P. F. McGuire, cadet engineer of the company.

Mr. Wakeman pointed out the value of team work and its absolute necessity in the case of a public service company, the many opportunities afforded of co-operating with the public itself, the greater efficiency given to the service when everyone in the company's employ co-operates, the way in which such co-operation is recognized and responded to by the public and the valuable asset that such team work must be to the company. He also commended the section idea and referred to the good work which had been done throughout the country by similar branches of the National Electric Light Association.

The paper of Mr. McGuire was illustrated by some fifty-two stereopticon views. He said that one of the first most important steps in the line of economy, after the type and details of construction had been selected, was to standardize materials and designs. The enormous increase in the weight and size of electric cars, together with the much shorter headway, now called for heavier construction with creosoted treatment to prevent decay of ties, the use of stone ballast, concrete paving foundations and much better paving, so that the total cost of modern track was approximately twice as great as that of old track. Mr. McGuire illustrated the progress of track design from the construction used as early as 1716, consisting of a flat piece of iron spiked to a longitudinal stringer, to the latest and numerous forms of girder rails. He also described briefly the bessemer, titanium, manganese and other special rail processes and compositions. Following this, Mr. McGuire showed the different kinds of mechanical and welded rail joints. The next series of views presented various forms of cars and equipment for track construction such as stone crushers, steam rollers, rail-handling cars, rail benders and grinders, steel dump cars, cranes, sand-drying outfits, etc. In conclusion, he described the organization of the company's 856 miles of track into five divisions and the methods of inspection and accounting.

After a discussion, the meeting was adjourned.

Louisville Center-Entrance Car

This Is a Center-Entrance Trail Car with 28-in. Wheels, Center Well and 14-in. Entrance Step—The Estimated Weight Is 28,000 Lb.

The Louisville (Ky.) Railway Company has recently completed ten arch-roof, low-step, center-entrance trail cars. These are the first cars of this type to be used in Louisville, and their introduction also inaugurates trail-car operation on the lines of this railway. The rapid increase in congestion in the downtown district of Louisville during rush hours made trailer operation advisable, and if the success of these new cars is demonstrated, others will be added to the service.

In general appearance and arrangement these single-end trailers resemble the center-entrance, double-end motor cars built by the Brooklyn Rapid Transit System during 1912 and 1913. They are much shorter, however, as they are only 36 ft. 4 in. over all in length. They seat forty-two passengers. The low step was made possible by the use of a shallow, all-steel underframe with 28-in.-diameter wheels, an entrance well 15½ in. below the car-body floor and a 2½-in. main-floor ramp.

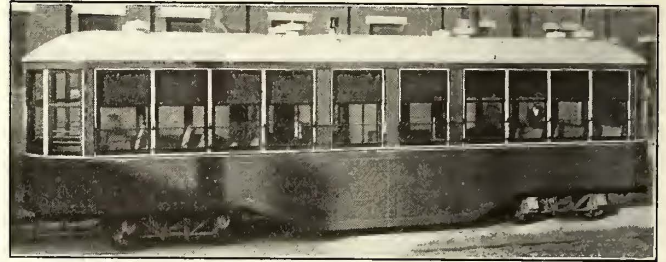
The general dimensions of these center-entrance cars are as follows:

Length over all.....	36 ft. 4 in.
Extreme width.....	8 ft. 3½ in.
Truck centers.....	22 ft. 0 in.
Truck wheelbase.....	4 ft. 6 in.
Diameter of wheels.....	28 in.
Height top of rail to top of roof.....	11 ft. 2 in.
Seating capacity.....	42
Width of entrance.....	6 ft. 6 in.
Height first step.....	14 in.
Estimated weight.....	21,000 lb.

The underframe is of structural-steel angles, plates and channels, with the side sills on both the entrance and blind side of the car formed of 5-in. x 3-in. x 5/16-in. angles. These side sills are made continuous from end post to end post, at which points they are spliced to 4½-in. x 3-in. x 5/16-in. angles, which form the buffers. These angle-iron side sills are reinforced around the entrance opening by the 5/16-in. side sheath-

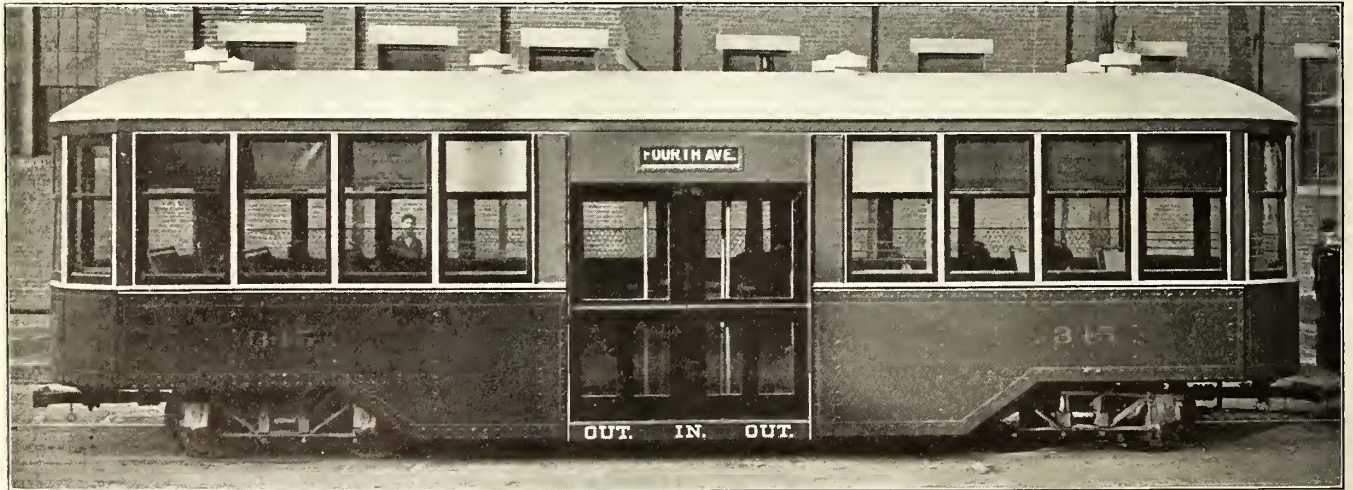
ported on a 5-in. x 2-in. x 5/16-in. angle riveted to the lower edge of the steel sheathing on the blind side and to the side sill on the entrance side of the car. The 2½-in. ramp of the car-body floor extends from the truck centers to the edges of the entrance well.

Two sliding doors, 3 ft. 3 in. wide, are provided at one side of the well. This space is divided by pipe



Louisville Center-Entrance Trail Car—View of Blind Side

rails into three aisles. Of these, the center one is 29 in. wide and forms the entrance aisle, and two side aisles, each 24 in. in width, serve as exits from each end of the car body. People who board the car pass forward through the center aisle to the conductor's stand opposite the center-entrance where they deposit the fare in a box. Then they may move to either end of the car body by ascending one 8-in. and one 7½-in. step to reach the main-floor level. Should it be necessary for a passenger to wait for change or for any other reason, he may step from the center aisle in the well into a pocket at the left of the conductor's stand. The conductor's space is cut off on each side of the well by a pipe rail, which also serves as a guide to passengers as they enter or leave the car body. The uprights in these



Louisville Center-Entrance Trail Car—View of Entrance

ing, which is made continuous from the end post to the entrance and is carried around the door opening and is reinforced with structural-steel angles. The entrance well is formed by offsetting the angle side sill on the entrance side of the car and by extending the sheet-steel side sheathing below the side sill on the blind side. The 4-in. I-beam cross sills in the well are sup-

ported on a 5-in. x 2-in. x 5/16-in. angle riveted to the lower edge of the steel sheathing on the blind side and to the side sill on the entrance side of the car. The 2½-in. ramp of the car-body floor extends from the truck centers to the edges of the entrance well. Two sliding doors, 3 ft. 3 in. wide, are provided at one side of the well. This space is divided by pipe rails into three aisles. Of these, the center one is 29 in. wide and forms the entrance aisle, and two side aisles, each 24 in. in width, serve as exits from each end of the car body. People who board the car pass forward through the center aisle to the conductor's stand opposite the center-entrance where they deposit the fare in a box. Then they may move to either end of the car body by ascending one 8-in. and one 7½-in. step to reach the main-floor level. Should it be necessary for a passenger to wait for change or for any other reason, he may step from the center aisle in the well into a pocket at the left of the conductor's stand. The conductor's space is cut off on each side of the well by a pipe rail, which also serves as a guide to passengers as they enter or leave the car body. The uprights in these

ductor's stand is occupied by a forced-draft, hot-air heater of the Peter Smith Heater Company.

Each section of the car body is equipped with six 33-in. walkover cross seats, two 36-in. longitudinal seats in the corners adjoining the entrance well and a semi-circular built-in wooden seat in the end of the car body. Hand rails on the seat backs as well as numerous hand straps on each side of the aisle provide for a full standing load during rush hours. Car illumination is provided by tungsten lamps installed in two rows and centered approximately over each row of seats. The

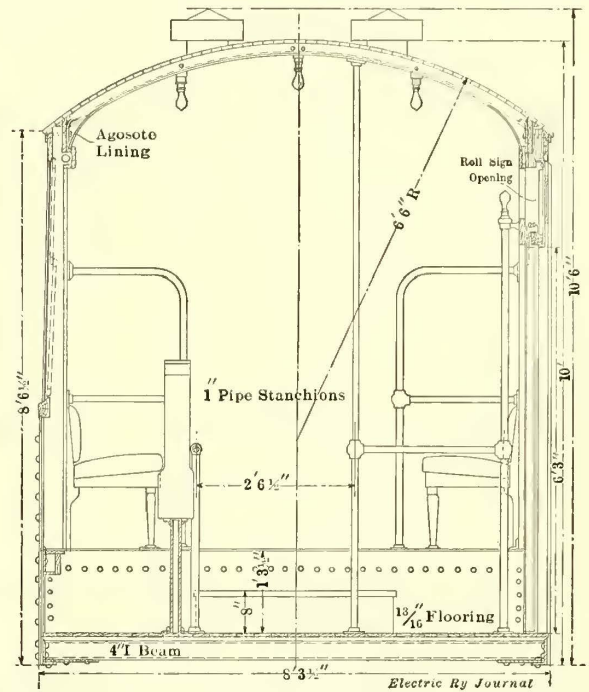


Louisville Center-Entrance Trail Car—Interior View

entrance and exit well has additional light from a lamp in the center of the car ceiling and two lamps which project from the car side over the inner side of the entrance doors and behind the route sign. This arrangement avoids special construction for sign lamps. Ventilation is obtained through eight Globe type ventilators with adjustable registers set in the ceiling of the car body. The sliding doors, which are operated by air, are controlled from the stand of the conductor. This door-operating mechanism is of the company's own design, and its air is obtained by a connection to the train line. A through train-line connection is furnished between the motor and trail car, and air-brake operation on the latter is by way of two brake cylinders, one installed on each side of the entrance well.

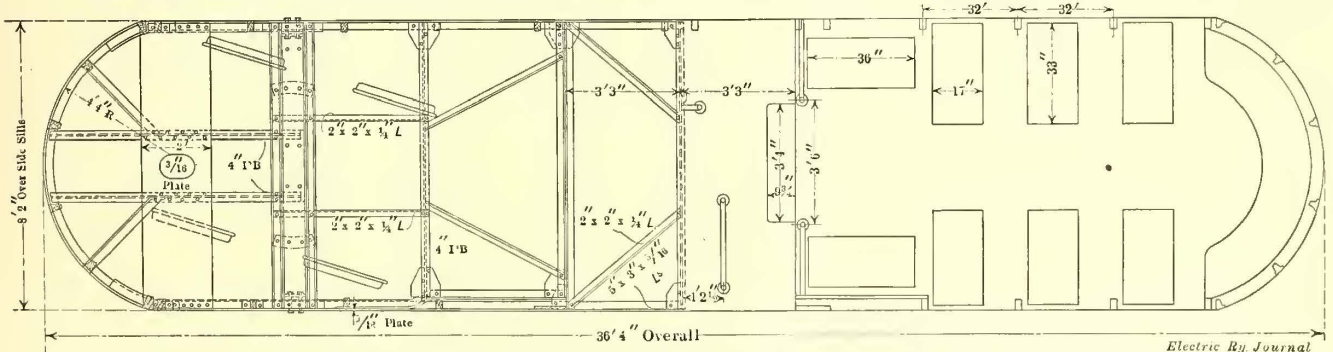
CAMP ORGANIZATION IN CONSTRUCTION WORK.

During the construction of the Stevens Creek Development, a new hydroelectric project about 8 miles from Augusta, Ga., about 800 men were employed, who, with their families, made a total population to provide for of about 1200 people. Bunkhouses were furnished



Louisville Center-Entrance Trail Car—Section

for unmarried laborers, and houses having from one to five rooms were built and rented to the married men from \$2 to \$12 per month. Four permanent houses were built on each job for the future use of the power house operators and were used during construction by the superintendents and engineers. Boarding houses, a butcher shop, bake shop, refrigerating and ice plant and commissary were built. Pure filtered water and sewerage systems were provided, as well as a hospital, fully equipped, with a resident physician always in attendance. As the Stevens Creek camp was only about 2 miles from the intake of the Augusta water works, additional precautions had to be taken to safeguard Augusta. For this reason incinerators were provided, and a filter bed was used to purify wash



Louisville Center-Entrance Trail Car—Half Plan of Seating Arrangement and Half Plan of Framing

Other special equipment included in the construction of these center-entrance cars is as follows: axles, Standard Steel Works; bolsters, St. Louis Car Company; couplers, Tomlinson automatic; curtain fixtures, Curtain Supply Company; destination signs, Keystone; seats, Hale & Kilburn Manufacturing Company, and 101-E trailer trucks, St. Louis Car Company.

water from the sewerage system. The wisdom of these precautions was proved by the remarkable freedom from sickness in the camp. Malaria had been very prevalent in the vicinity, but because of methods similar to those found effective at Panama no trouble was experienced except for the first few months, before the camp site could be properly cleaned up.

Equipment and Its Maintenance

Short Descriptions of Mechanical and Electrical Practices from Every Department of Electric Railroading

(Contributions from the Men in the Field Are Solicited and Will Be Paid for in Accordance with Our Regular Rates.)

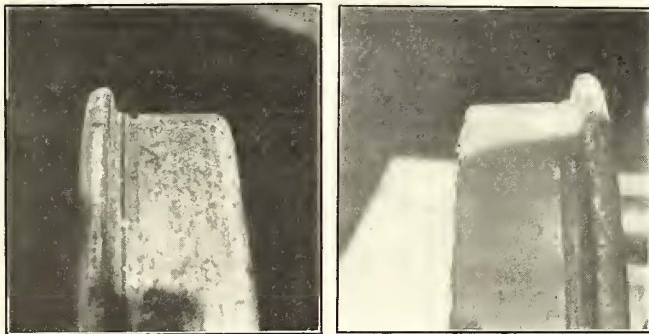
STEEL WHEEL MAINTENANCE IN THE TWIN CITIES

About two years ago the mechanical department of the Twin City Rapid Transit Company, Minneapolis, Minn., decided that much time could be saved and the average life of steel wheels greatly prolonged if the company discontinued the practice of turning new flanges on wheels which came into the shop with one thick and one thin flange. The records indicated that by far the larger portion of wheels were worn in this manner, the difference in the thickness of the flanges being due to crowding. In a few instances this character of wear was increased by variations in the hardness of the wheels or the brakeshoes or both, but as a general rule it was caused by track special work.

In order to be positive that there was no variation in the diameter of new wheels and no eccentricity in the centering on the axle the company taped and ground

position and made trailing wheels if they were leading, or vice versa. No effort, however, is made to replace the wheels under the same car from which they were removed. This makes it possible to conform to the rule of reversing the wheels at all times, but as a general rule, if a pair of wheels is brought into the shop as No. 1 wheels, they are replaced in service as No. 2 wheels. In some instances the trucks are turned and placed at the opposite end of the car from which they were removed. This interchange of trucks restores the wheels to the same position under the car as they were before removal for turning. Wheel removals for thin flanges after receiving the foregoing treatment are rare.

In further explanation of the $\frac{1}{4}$ -in. by $\frac{1}{8}$ -in. groove turned in the tread of the wheel with a thin flange, it might be stated that this groove has no effect on wheel-wear in service. The size and the location of the



Figs. 1 and 2—Twin City Wheels—No. 1 Wheel Before and After Grinding



Figs. 3 and 4—Twin City Wheels—No. 2 Wheel Before and After Grinding

the wheels sufficiently to remove any inaccuracies. After considering the problem and the effect of its solution on operation, it then decided that each pair of wheels removed for re-turning which had one thick and one thin flange should be treated as follows: Each pair of wheels is taped and sufficient metal is turned from both the flange and tread of the larger wheel, which as a rule is the one with the thick flange, to mate it roughly with the wheel of smaller diameter. At times it is necessary also to turn slightly the outside of the tread of the thin-flanged wheel to true it. Then a groove $\frac{1}{4}$ in. wide by $\frac{1}{8}$ in. deep is turned in the tread of the thin-flanged wheel, at the point where the throat of the renewed flange should begin to form. After the treads of both wheels have been rough-mated in the foregoing manner, they are set in the wheel grinder where the treads are brought accurately to the same diameter. This grinding process is continued until the treads are perfectly polished and true, except at the groove in the thin-flanged wheel, which may or may not be removed, depending on the depth of grinding necessary to true the wheels.

When wheels treated by the new process are replaced in the truck they are reversed from their original

groove serves only as a guide to the workman doing the grinding as it defines the tread width. The existence of the groove also makes it easy for a workman to bring the grinding tool close up to the proper place for the root of the flange, with the result that the tread is ground true. In consequence wheels readily adjust themselves to the right position on the track, and at least the immediate tendency to continue the cutting of the flanges after they have been restored in service has been eliminated.

Although the depth of the groove in the tread is $\frac{1}{8}$ in. after the wheel has been turned, the grinding process practically removes all evidence of it from most wheels. That portion of the groove remaining on some wheels after the grinding process has been found not to affect the wear in any way. This is probably due to the fact that it is turned at a point on the tread—namely, the throat of the flange—which under ordinary conditions does not come in contact with the rail or, at least, does not come in contact with it until the wheel has been in service for some time.

At first there was considerable apprehension as to the effect of the grooves in operation. Records show, however, that they have not been responsible for de-

railments, either at switches or curves. Records from Jan. 1, 1912, to Oct. 1, 1913, for 760 cars at the beginning of the period—and this number was increased to 835 at the close of the period—showed a total of 975 calls for the wrecker on all the lines of the Twin City Rapid Transit. This total necessarily included everything, such as fires, obstructions, broken vehicles, etc. Out of the 975 calls, however, only six were on account of defective wheels. Three of these were broken steel wheels, one a broken cast-chilled wheel, one a loose wheel on an axle, and one was on account of a broken flange. All six of these calls for the wrecker due to wheel trouble occurred during the winter months. Consequently, it was quite evident that the new method of turning steel wheels had in no way injuriously affected car operation.

In practice the new method of turning steel wheels has worked out well and has resulted in a very material reduction in the cost of labor in the wheel shop. It has also decreased the number of wheels used, as only the high places are turned off the treads, after which they are ground only a sufficient amount to make them true and mated. Hence the useful mileage has been increased by the reduction in the quantity of metal removed in turning. At the present time 835 cars are equipped with steel wheels, and the maintenance of these requires only two men to operate the wheel grinders and one man for the lathe. Although this company operates all its cars single-end, it is believed that the same results would be obtained if cars were operated double-end.

In the accompanying illustrations, Fig. 1 shows a wheel with a thin flange and the tread slightly high near the base of the flange. This wheel has been placed in the lathe and the 1/4-in. x 1/8-in. groove turned in the tread at the point where it is desired that the new flange shall begin to form. Fig. 2 is the same wheel after it has been ground. Fig. 4 is a good illustration of first-class work done by the grinder. The groove has been practically obliterated, leaving the flange approxi-

be quite small. The examples shown in the illustrations were not photographed especially for this article but are representative of the steel wheels picked from lots going through the shops.

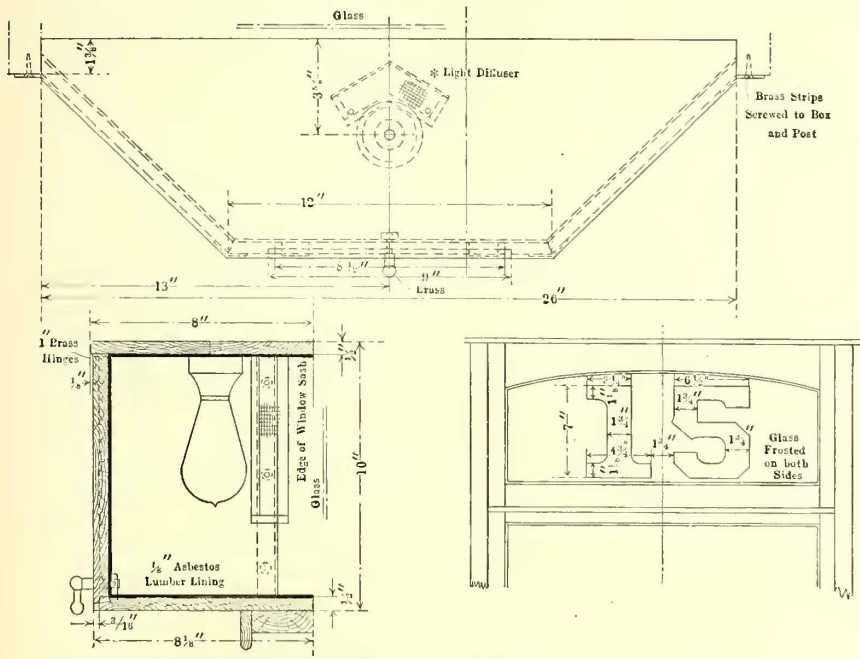
ALBANY TRUCKS LENGTHENED TO STOP NOSING—
OTHER IMPROVEMENTS

The United Traction Company, Albany, N. Y., has been operating for some years a number of Brill trucks of 4-ft. 6-in. wheelbase. On account of this short length these trucks gave much trouble when used for the high-speed service between Albany and Troy. In fact, the nosing was sometimes so severe as to throw passengers off their feet. This bad feature has now been removed by lengthening the trucks to a wheelbase of 5 ft. by the oxy-acetylene welding of metal at an intermediate point in the frames. The favorable results from this change confirm the company's belief that for high-speed service the wheelbase of a truck should not be less than the gage of the track. The cost of lengthening a pair of trucks and of adding new steel bolsters of cored type was about \$200.

The Albany company buys all axles in the rough and turns them up at home. It is now changing from an axle diameter, gear seat and wheel seat of 4 in. to an axle of 4 1/2-in. diameter, gear seat of 5 1/2 in. and a wheel seat of 5-7/16 in. The former axles were oil-treated, but the new ones are of Carnegie hammered steel. Scrapped axles are cut down to armature shafts. All brake rigging is now furnished with case-hardened bushings made by the Bemis Car & Truck Company, Springfield, Mass. Manganese steel has also proved very satisfactory in journal boxes, hangers and similar parts.

BALTIMORE ROUTE NUMBER SIGN BOX

It has long been the custom on European street railways to indicate the car routes by numbers or letters which are large enough to be read at a distance of several hundred feet. Car signs of this type have recently been adopted by several American electric railways but with important betterments in their illumination for night service. Among the latter companies is the United Railways & Electric Company of Baltimore, which is now installing such signs over the middle sash of the vestibule in addition to its Hunter illuminated destination signs which are carried in the sides and ends of the monitor deck. The use of a route number is a natural evolution from the Baltimore system of numbering cars on given routes by hundreds. Thus, if a car is numbered 401 the corresponding route number is marked 4. The route number is 7 in. high and is painted on ground glass. It is illuminated by means of a lamp which is placed in a wooden box lined with asbestos lumber. A most effective distribution of light is obtained by using the diffuser of fine wire mesh which is shown in the drawing of the sign box. The route number sign has been welcomed by the Baltimore public, especially on streets where more than one route is operated.



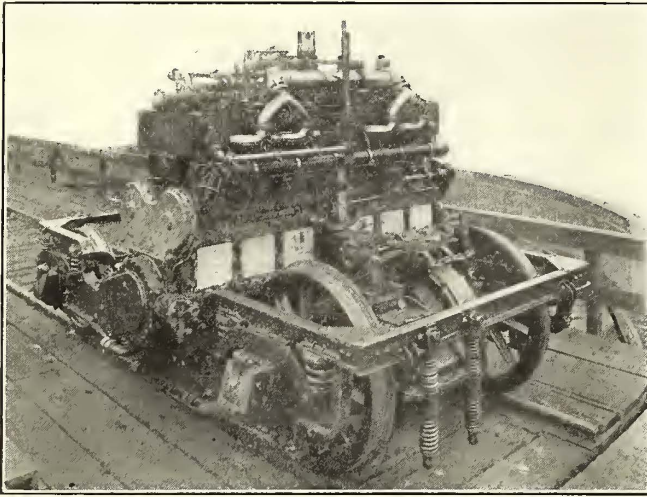
Construction Details of Baltimore Route Sign Box

mately normal. Fig. 3 is an example of a wheel on which the groove has been turned and a part of the tread removed. After this wheel is ground, the flange will be of the proper shape and thickness and the tread normal. The diameter of this wheel will be reduced very little, and the cost of grooving and grinding will

The government of the Province of San Luis in Argentina proposes a tramway in Villa Mercedes.

GASOLINE CARS FOR SUNSET-CENTRAL SYSTEM

New model McKee gasoline motor cars of type "C" as shown have lately been built for the Sunset-Central system, which includes the Morgan's Louisiana & Texas, Galveston, Harrisburg & San Antonio and Houston & Texas Central Railroads of Louisiana and



Improved Motor Truck of Gasoline Car

Texas. While the latest motor truck maintains the builder's standard motor car principles, the new design is the result of nine years' experience of some fifty railroads using this equipment. The efficiency of drive, 96 per cent, is the same as the earlier cars, but upkeep and maintenance are materially reduced. The value of even the first designs is shown by the fact that a seven-year old car recently covered more than 5000 miles in one month and earned \$117 per day at a total operating charge of 14 cents per mile.

Among the features of the new power truck are: integral steel casting side frames; M. C. B. wheels and axles; driving box which can be removed without dropping the wheels; inclosure of machinery and all moving

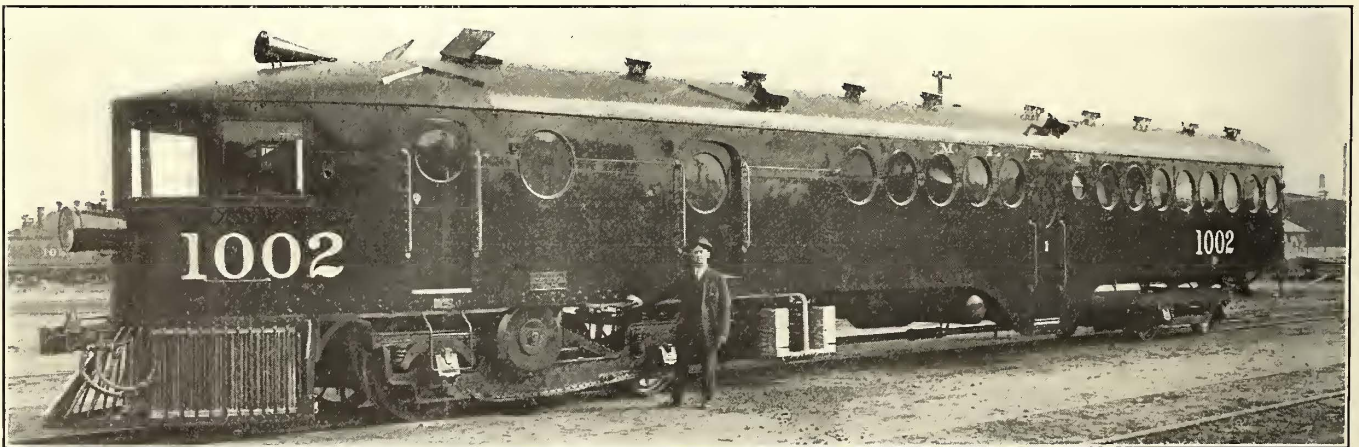
red hot; increased number of friction elements in multiple-disk clutch to give more positive action and greater efficiency, and use of the stronger herringbone gear instead of the ordinary involute spur gear.

One of the most interesting novelties is the auxiliary hand oiler between the cylinder units whereby the motorman can oil the crank and rod bearings in five seconds, thus facilitating journal oiling in starting on a cold morning. Furthermore, in case of hot journals, the emergency oil can be applied through this lubricator without obliging the motorman to leave his seat.

Altogether the life of the new power truck has been greatly increased, and 50 per cent reduction in repairs is confidently expected. The time between shoppings will hereafter be controlled almost entirely by the wear of the driving tires. The general specifications of the Sunset-Central cars are as follows: engine, 200 hp, six cylinder, air-starting and reversible; weight of car in working order, 78,000 lb.; length between pulling faces of couplers, 72 ft. 3 $\frac{3}{4}$ in.; length over end sills, 70 ft.; length of engine compartment, 13 ft. 8 in.; length of baggage compartment, 8 ft. 6 in.; length of smoking compartment, 16 ft. 4 $\frac{1}{8}$ in.; length of passenger compartment, 28 ft. $\frac{7}{8}$ in.; width inside, 9 ft. 4 $\frac{3}{4}$ in.; width over side sills, 9 ft. 8 in.; width over sheathing, 9 ft. 8 $\frac{1}{4}$ in.; width over all, 10 ft. 2 $\frac{3}{4}$ in.; height, top of rail to top of car (light), 11 ft. 9 3-16 in.; height, floor to ceiling at center of car, 7 ft. 5 $\frac{5}{8}$ in.; seating capacity, passenger compartment, fifty-four, smoking compartment, twenty-nine, total, eighty-three.

FARE BOXES FOR INTERURBAN SERVICE

The Stark Electric Railway, Alliance, Ohio, has introduced a novel method of fare collection on several of its interurban cars. One Cleveland fare box is installed on the rear platform and another on the front platform. When a passenger enters the car at the rear he drops his ticket or fare into the box. The conductor hands him a cash slip punched from that station to the destination station. When he leaves the car he deposits this slip in the box at the front end of the car, which is watched by the motorman. If the



Latest Type of Gasoline Motor Car for Service on Louisiana and Texas Lines

parts in oil-tight, dustproof and foolproof housings; automatic continuous lubrication of crank shaft, cam shafts, bearing rods, air pump, water pump, etc.; water-jacketing of manifold pipes so that the gases are heated and equally distributed to the different cylinders; more accessible location of throttle and spark levers; increased water space around the valves and cylinder heads to permit overloading the engine; tungsten-steel valves to avoid distortion and to operate, even if

passenger rides beyond the point for which his slip is punched, the motorman makes him pay for the extra length of ride. The company has this system in operation between four stations out of Alliance. These stations are designated respectively as 1, 2, 3 and 4 in large figures on the cash slip, so that the motorman can tell at a glance whether the passenger leaving the car at, say, Station 4, has really paid his fare to that station.

PRISON CAR BUILT BY THE MONTREAL TRAMWAYS

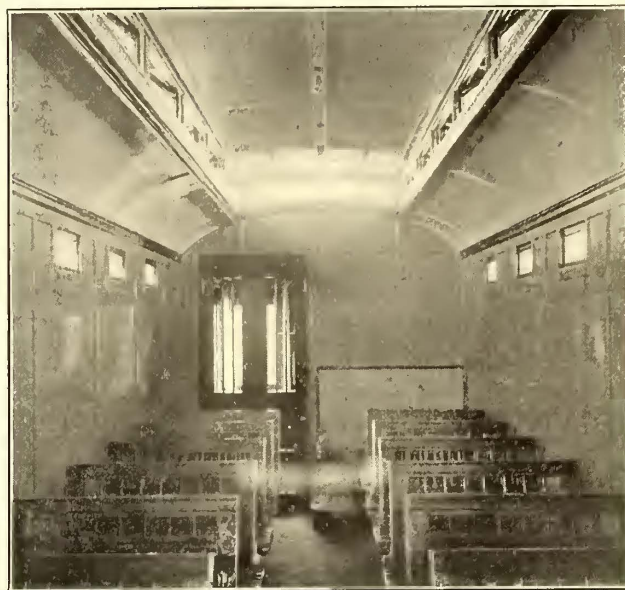
The Montreal Tramways Company has recently completed for the Province of Quebec a fifty-four passenger car for transportation of prisoners twice a day between Montreal and the new prison at Bordeaux, 7 miles distant. The car is 48 ft. 4 in. long over all and 34 ft. 8

floor line from a Peter Smith heater. The electrical equipment comprises four Westinghouse 533-T-4 motors and one K-35-G controller. The car is run directly into the prison yard over a Y which will also be available for the delivery of fuel and other supplies.

The Montreal Tramways Company is probably the first in America to build a car of this kind. A ref-



Montreal Prison Car—Interior of Car, Showing Part of Both Compartments

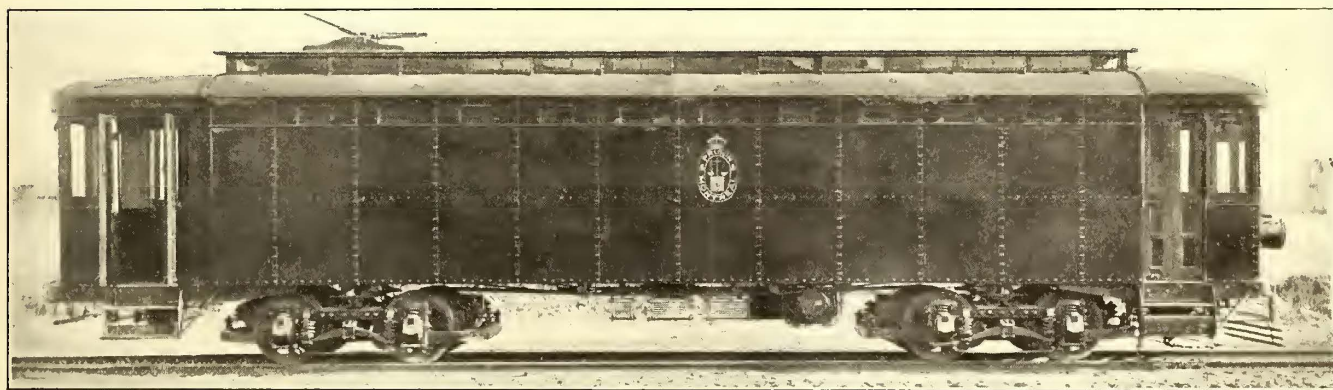


Montreal Prison Car—View Showing Elevated Seat for the Guard

in. over the seating compartments. The body is divided into two compartments for the purpose of separating convicted from accused persons. The front platform is provided with a cab for the motorman, while the rear platform is arranged as a compartment for the prison officials who may be required to accompany the prisoners. The guard's place is in front of this compartment on a seat which is elevated 6 in. to afford a better view of the prisoners.

The floor framing of this car has 7-in. side sills, but owing to the character of service each side is composed

erence to the prison cars built by the Grosse Berliner Strassenbahn (Great Berlin Street Railway) was published in the *ELECTRIC RAILWAY JOURNAL* for Oct. 7, 1907, page 753. This method of conveying prisoners is cheaper than the use of the ordinary patrol wagons, and furthermore the inmates are saved a great deal of needless humiliation. The adoption of the trolley-car service by the Montreal penal authorities is in harmony with the many humane features of the Bordeaux institution. This structure is a splendid example of a modern light, sanitary prison with such features as



Montreal Prison Car—View Showing Sheathed Sides, with Ventilating Louvers and the Usual Form of Monitor Roof

of No. 16 sheet steel which is carried from the lower line of the side sill to a height of 6 ft. 1 in. These sheathings are attached to 2-in. x 3-in. wooden posts, and as each side is riveted in one piece, the side girders thus formed carry a large part of the car stresses. The windows, of course, are placed above the line of vision. They number ten per side and are of solid sash construction, 13 in. x 4½ in. in size. Ventilation is obtained from the monitor roof and forced draft at the

electrically controlled locks and electric lights and push-buttons in every cell.

The Washington Water Power Company, Spokane, Wash., operates a suburban high-speed line between Spokane and Medicine Lake and Cheney, the latter places lying respectively 16 and 19 miles out of Spokane, and upon this line it did not have an accident during 1913.

News of Electric Railways

New Haven Segregation Agreement

An agreement was reached on Jan. 10, 1914, between the Department of Justice at Washington and the officers of the New York, New Haven & Hartford Railroad in regard to the readjustment of the company so that the company will meet the requirements of the Sherman law as interpreted by Attorney-General McReynolds. The New York, New Haven & Hartford Railroad, in addition to the cancellation of the Boston & Albany agreement, which becomes effective on Feb. 1, will dispose of its holdings in the Boston & Maine Railroad, various electric railways, the Merchants & Miners' Transportation Company, the Eastern Steamship Corporation and the Maine Steamship Company, under a plan the details of which will be worked out as promptly as possible with representatives of the Department of Justice by Chairman Howard Elliott and Messrs. Moorfield Storey, of Boston, and Walker D. Hines, of New York, special counsel of the board of directors. Concerning other steamer lines, application has been made, under the Panama Canal act, to the Interstate Commerce Commission, and their disposition will be determined by that body. Until the plans are worked out and put into effect the management and operation of the properties will be continued as at present. The conference at which the agreement was reached was between the Attorney-General, Assistant Attorney-General Jesse C. Adkins, Frank M. Swacker and T. W. Gregory, special assistants to the Attorney-General, representing the Department of Justice, and Howard Elliott, Arthur T. Hadley and L. S. Storrs, representing the New York, New Haven & Hartford Railroad.

In a supplemental statement made public from Mr. Elliott's headquarters it was said:

"The new New Haven management, while it could not agree fully with all of the views of the Department of Justice, nevertheless felt that in the interest of a peaceful solution of the New England railroad situation it was wise to yield and to work in full harmony with the department in bringing about an adjustment. While that is going on the New Haven management hopes that all interested, whether owners, employees or patrons of the road, will cooperate in every reasonable manner to maintain the integrity and welfare of all the properties.

"There is, of course, a very large amount of detail to be considered in reaching a final conclusion as to the method of segregating the properties. This work will be undertaken in a fair spirit by the Department of Justice and the New Haven company. As the Interstate Commerce Commission well said in its opinion about the New England's situation, 'what is needed, first of all, to improve the railroad situation in New England is rest and an opportunity for constructive work.'

"Pending the adjustment of the details with the government and while new financial plans are being completed, improvements of all kinds will necessarily be postponed and no money will be spent except such as is absolutely necessary for safety."

Akron Company on Proposed Franchise Settlement

The Northern Ohio Traction & Light Company, Akron, Ohio, has issued a statement giving the reasons why the company cannot accept the proposed new franchise in Akron, the amendments to which were noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 10, 1914, page 93. The company contends that the amendments to the franchise ordinance as proposed by the Council are too burdensome to warrant their approval and that a short-term franchise, with seven tickets for a quarter, would make it impossible for the company to sell bonds for the construction of extensions. In the statement which it issued dealing with the matter the company said:

"The company had endeavored to be fair and yield every point which could be yielded without wholly unreasonable sacrifice of the interests of its bondholders. Following the original basis of settlement agreed to by all parties in October, when Solicitor Taylor and Mr. du Pont were in-

structed to prepare an ordinance based on this agreement, the company made still further concessions as in the progress of the matter additional demands were made.

"The point to which new demands were carried on the part of some of the city officials appeared, however, to know no stopping place. With each council meeting and each conference more and more burdensome amendments were presented. The City Solicitor and the City Council have added so many new and burdensome amendments that the company could not accept the ordinance as it was finally proposed to pass it. None of these recent amendments was submitted to the company. A conference to see what could be done concerning them was proposed and directors of the company came to Akron with a view to having such a meeting with the City Solicitor and the Council, but received information that the ordinance must be passed as it then stood or not at all. When this word was received by the company the definite statement was made that the ordinance as then pending could not be accepted by the company and that the Cuyahoga River water rights agreement would, therefore, not stand as it had been made a part of the terms of settlement.

"The company has acted in good faith throughout. When property owners' consents for extensions were declared necessary it immediately obtained them. When a referendum on the whole matter was suggested the company favored that also. In short, the company tried to meet the city officials more than half way, and it is sorry that its efforts to adjust the situation on a basis of more complete satisfaction to the public have been unsuccessful."

Indianapolis Arbitration Case Concluded

The Indianapolis Traction & Terminal Company having completed the presentation of its evidence in the arbitration hearings on the grievances of employees now before the Public Service Commission of Indiana, the commission allowed two days for the attorneys representing the company and those representing the employees to close their arguments. Frank S. Roby stated in opening for the employees on Jan. 7 that the twenty-three grievances submitted by the employees are divided into two groups, one having to do with the relations between the company and its employees and the other relating to wages and hours of labor. In his contention for recognition of the union he argued that as the officials of the company represent a large number of stockholders in making contracts for the benefit of the company and its stockholders the men should be recognized as an organized body to make contracts with the company for their benefit. He contended that when the company entered into the agreement with a committee of employees to submit grievances to the Public Service Commission for arbitration it recognized the organization of the men, in the same way that the men recognized the existence of the company when they signed the agreement. He argued against the sliding scale of wages. Mr. Roby claimed that employees are entitled to a living wage whether or not the employer is making any money.

S. C. Esarey, in continuing the case for the employees, made a brief argument from a sociological standpoint. He stated that sociologists contend that no family should be required to live on less than \$1,000 a year, but that 50 per cent of the men in this country earn less than \$500 a year. He considered it would be right to increase the fare in Indianapolis if necessary to grant the increase in wages.

W. H. Latta, for the company, read from an Illinois court decision that the right of a man to sell his labor at a price satisfactory to himself and the right of an employer to employ labor at a price satisfactory to himself are constitutional and legal rights which cannot be interfered with by any one. He contended that the law of supply and demand should control. He said:

"A given wage may enable a thrifty man to live well and accumulate money and property, as shown by some of the witnesses in this case, while another man less thrifty might be in poverty all his life on the same wage. This is a condition that cannot be controlled."

He showed that employees of the street railway receive the highest beginning wage that is paid for unskilled labor in the city. He stated that the evidence shows that the company has ten times as many applicants for employment as it has places and that 20 cents an hour must therefore be a living wage, otherwise men would not be applying for the positions in such large numbers. Referring to the demand that extra men receive not less than \$1.50 a day, Mr. Latta showed from a list of earnings that every extra man that worked earned more than \$45 a month. He explained that the company has sixty-one tripper and short runs daily, which meant that the company must have not less than sixty-one extra crews on hand at all times. When the company granted the men an increase of 1 cent an hour last June it would have amounted to \$3 a month if the men had worked steadily, but when they received the increase they lay off and their actual increase averaged only \$1.30 a month. Mr. Latta read the wage scale of the company, commencing with 20 cents the first year and increasing to 25 cents the fifth year, and insisted that there should not be any increase in the beginning rate of wage in Indianapolis. He stated that the cost of living in Indianapolis had increased perhaps 6 or 7 per cent in the last five years, and that the "beginning" rate of wage of the employees had been increased 11 per cent and the maximum rate of wage approximately 20 per cent. Mr. Latta said that the attorneys for the employees had failed in their attempt to show that the company was overcapitalized.

Mr. Latta also read statutes bearing on the value of intangible property and quoted from an Indiana statute to show that "the value of property results from the use to which it is put." He argued that the value of the terminal building and stations at Indianapolis is not in the bricks and iron and mortar but in the fact that a number of operating contracts with many interurban lines have been entered into which bring in a great network of traffic. Mr. Latta showed charts to the commission which explained how the income of the company was derived, showing that the company has a large income from investments, outside of the operation of the street cars of the city system. Mr. Latta contended that the motormen and conductors are not entitled to participate in earnings from realty investments and revenues produced from additional sources than the operation of the cars in the street railway system.

Mr. Latta averred that the company does not in any way concede that any other men than the car service men are parties to the hearing, and that the contract of Nov. 7 related to car service men only. In discussing the conditions of work of the employees, Mr. Latta stated that the arrangement of the schedules and runs are the result of twenty years' growth of the company in Indianapolis. In taking up the matter of recognition of the union, Mr. Latta argued that the contract of Nov. 7 expressly stipulated that the existing arbitration should be effective for three years, and that this contract cannot be modified by any contract with the union which would allow of further arbitration of future difficulties with individual men, as called for in one of the grievances. He said that the commission may stipulate the method of settling individual grievances for the next three years, but that the commission has not the power to compel the company to enter into a contract with the union. Chairman Duncan here remarked that this had been his idea of the situation.

Mr. Latta then recounted the details of the attacks on the men during the strike, to prove that many of the employees were satisfied, and, referring to evidence presented in the case, stated that only eleven employees were shown to have been members of the Amalgamated Association at the time the strike was called. Mr. Latta argued that the company, under these conditions, should not be compelled to enter into a contract with the union. He said: "The evidence shows that when the city government was paralyzed, when the county government was paralyzed, when the streets were littered with debris from these cars, this company stood firm on the ground that it would not enter into a contract with those men. The company had no hesitation in meeting its own employees, but it would not meet these organizers who came here only to stir up friction, to dictate and to create riot and trouble. This strike would not have amounted to a picayune except for the riot and intimidation effected here."

In closing his argument Mr. Latta asked the Public Service Commission to append to its findings in the case the reasons, rules and premises on which it bases its decision.

Mr. Clawson closed the argument for the employees in the afternoon, confining his remarks to reading extracts from conservation speeches made by former Vice-president Fairbanks, former President Taft and President Wilson; to personal attacks on the principal stockholders of the company, and to a dramatic plea in behalf of the "working classes." Mr. Clawson failed to produce the figures requested by the commission to verify the claims of the labor attorneys that the company was overcapitalized.

The evidence taken during the hearings comprises about 5000 typewritten pages, not including tabulated statements and charts, and it will probably require about thirty days for the commission to make its findings in the case.

Rochester Company Answers Petition of City for Order Reducing Fares

The New York State Railways has filed with the Public Service Commission of the Second District of New York its answer to the petition of Mayor Edgerton of Rochester that the company be ordered to reduce its fare in Rochester to 3 cents between the hours of 5 a. m. and 8.45 a. m. and 4.30 p. m. and 6.30 p. m. on week days; that it restore University and Lyell cars to Main Street, except during rush hours, and that it discontinue the use of its State Street car-house except for housing cars to be used in emergency. The company contends that compliance with Mayor Edgerton's request for 3-cent fares during rush hours on its Rochester lines would be to discriminate against its patrons in Syracuse and Utica; that it is by reason of the larger income that it receives from its Syracuse and Utica properties that it is able to pay dividends of 6 per cent on its preferred stock and 5 per cent on its common stock, which it holds to be a fair return to its stockholders; that an obligatory 3-cent fare would amount to confiscation of private property without due process of law, and that the company cannot legally segregate Rochester earnings from its earnings in other cities, since the company must manage its lines as one property.

The company says that 3-cent fares in Rochester would react against the sale of the \$5,000,000 of bonds recently authorized by the Public Service Commission to make possible new and better equipment and which it has been unable to sell at the price fixed by the commission. It contends that the proper maintenance and upkeep of the property, its ability to make needed additions and improvements and purchase new equipment are of more importance and benefit to the city than reduction in fare.

The allegation that the New York State Railways expended about \$16,000,000 to purchase the Sodus Bay and the Rochester & Eastern roads, the company contends, is misleading, because the latter company has become the owner of properties in Syracuse, Utica and Schenectady, and all its stock issues have been made under the authority of the Public Service Commission.

It is stated that the allegation that \$1,200,000 was paid out in dividends by the New York State Railways from its Rochester revenues during the year is not in accordance with facts, and that its revenues are derived largely from its Syracuse and Utica properties; in fact, that these revenues are not only greater than those derived from the Rochester city lines, but from those and the revenues of the Sodus Bay, the Rochester & Eastern, the Sea Breeze and the Charlotte lines combined. Prior to the transfer of the Rochester Railway to the New York State Railways, a majority of the stock of the Rochester Railway Company was owned by the Rochester Railway & Light Company. The latter pledged such stock as part security for its bond issue falling due in 1954, and the mortgage for that bond issue contains an agreement that the Rochester Railway shall not incur any indebtedness of any kind except for current expenses. The only way the company can raise money under the agreement is by increasing its capital stock, and of this the Railway & Light Company must take its proportionate share under the mortgage and deposit it to secure the mortgage.

The enactment of the Public Service Commission's law forbade such additional stock issues. This, it is said, left the directors without any means of raising funds to meet

increased current expenses and other obligations. It is alleged that the Rochester Railway is the only property of the New York State Railways that is hampered by such restrictions. This was why the merger of the Rochester, Syracuse, Utica and other properties into the New York State Railways was made.

It is alleged that it is impossible to segregate and set aside Rochester earnings and revenues and consider them separate and apart from the company's earnings and obligations elsewhere. Such a thing would be illegal and could not be considered because the company must manage its lines as one property. The company returns answer that it has paid 6 per cent upon its preferred and 5 per cent upon its common stock, which it considers a fair return. To load it beyond its means "is unjust, illegal and unwarranted."

Subway Proposed to Relieve Congestion at Public Square, Cleveland

It is said that Mayor Newton D. Baker and the new board of control of Cleveland, Ohio, are preparing an ordinance providing for an issue of \$2,000,000 of bonds to secure funds to construct a subway between the Public Square and the new bridge across the Cuyahoga River and between the west end of the bridge and West Twenty-eighth Street and between Detroit Avenue and West Twenty-fifth Street. The last would provide a connection for the Detroit Avenue and Boulevard lines with the tracks that are to cross the bridge. Mr. Baker, Street Railway Commissioner Witt, City Engineer Hoffman and County Surveyor Stichcomb conferred on Jan. 9 in regard to the matter. Engineer Hoffman presented estimates showing that a four-track subway, with terminal loops under the Public Square, can be built within the estimate of \$1,600,000 made by Commissioner Witt. This provides only for the subway between the Public Square and the bridge. The remaining \$400,000 will take care of the portion of the line at the west end of the bridge. It is probable that the question of issuing the bonds will be submitted to a vote of the people on March 3. Mr. Witt stated that if the people authorize the issue and the subway and terminals are built the Cleveland Railway will rent the improvements for an amount equal to the interest on the bonds. He feels that the improvement will relieve congestion at Public Square and at the junction of the West Side lines on West Twenty-fifth Street.

Mr. Witt has announced that the seating capacity of the Superior Avenue line will be increased 65 per cent by the addition of trail cars, but that the headway will be reduced from three to five minutes. If the plan proves satisfactory he intends to introduce trailers on all lines with the exception of Euclid Avenue, which, he says, has too many branches to make it successful. The conductors and motor-men contend that the operation of the trail cars will cause some of them to lose their places.

Fare Readjustment Ordered on Milwaukee Suburban Lines

The Railroad Commission of Wisconsin has ordered a readjustment of the fares of the Milwaukee Light, Heat & Traction company, which handles the suburban and interurban business of The Milwaukee Electric Railway & Light Company. The order provides that the fare everywhere beyond the one-fare limits in cities shall be 2 cents a mile. The distance from Milwaukee to South Milwaukee is 7 miles, and this distance has been divided into seven 1-mile zones. The distance to Tippecanoe is 2 miles, and this has been divided into two 1-mile zones. The principal reduction is in the fare to Wauwatosa, which has been 9 or 10 cents—a ticket or a nickel to the one-fare limit and a nickel for the remainder of the distance. The distance between the one-fare limit and the Milwaukee road depot in Wauwatosa has been made a 1-mile zone and it will cost 2 cents to ride across it. Thus the reduction in the fare amounts to 3 cents. The fare to West Allis is cut also, it being possible to ride from the one-fare limits to Seventy-seventh Avenue and Summit for 2 cents. The commission recommends that the single-fare limits be extended to Sixty-second Avenue on the Burnham Street line, and also that a single fare be charged within the limits of the city of West Allis. From Milwaukee to Hampton Avenue in

North Milwaukee the fare will be 6 cents. The Whitefish Bay cash fare is reduced from 10 cents to 9 cents and the Wanderers' Rest cemetery cash fare is reduced in the same manner. The commission says in part:

"In selling any product it is customary to employ a standard unit of measurement. Similarly, in selling transportation to persons the adopted standard unit of measurement is the passenger mile—one passenger carried 1 mile. Although steam lines in general have adhered to this standard, the electric interurban systems in many cases have used the so-called 5-cent zone system of rates. This system is merely an extension of the flat 5-cent city fare and has no scientific basis for suburban or interurban operation. The resulting inequalities which exist under this system of rates may well be illustrated by measuring the different fares charged by the unit of measurement—the passenger mile. No better examples can be cited than exist upon the respondent companies' suburban and interurban systems.

"It is deemed that a basis rate of 2 cents per passenger mile upon a cash basis, with a flat fare for the terminal and subterminals, will best meet the interurban requirements. That such a rate is not a departure in electric railway operation is shown by conditions in Wisconsin and other states. A gradual change is taking place from the old 5-cent zone basis to some form of mileage basis. It has been the contention that the basic rate in this case should be placed upon a cost-of-service basis. Computations in the matter of the city of Milwaukee vs. The Milwaukee Electric Railway & Light Company show that the rate of return upon the total interurban physical property amounted to 3.10 per cent in 1908, 3.05 per cent in 1909, 1.81 per cent in 1910 and 2.35 per cent in 1911. Similar computations for 1912 show the per cent return to approximate 1.6 per cent.

"These facts indicate that when 7.5 per cent is considered a fair return, the rates of return as quoted for the past five years have fallen considerably below an adequate return. To bring the revenues to the point where they would yield such a return for 1912, for instance, it would be necessary—assuming no decrease in traffic, which is very unlikely—to establish the basic rate at about 2.75 cents per passenger mile. When the conditions prevailing on the interurban system are considered as indicated by the passenger density per car mile, increasing only from 2.09 in 1908 to 2.13 in 1913, it seems best to place the rate at a lower figure than the cost of service would demand so as to encourage the passenger density with this lower rate to increase sufficiently the revenues to the point where they will bring an adequate return above all expenses. It should also be stated that a rate of 2.75 cents per passenger mile would result in a large number of increases upon the entire system, while a rate of 2 cents, although increasing certain low rates, reduces a considerable number and thus equalizes the conditions on a more satisfactory basis."

James D. Mortimer, president of the company, is quoted as follows:

"The opinion of the commission contains no detailed analysis of the probable effects of the change in suburban and interurban fares. I am unable at this time to make any accurate estimate of the effect on the company's revenues, and the financial aspect of this new commission order can only be determined by trial. A superficial examination of the order indicates a provision for the sale of coupon mileage books and for the temporary use of special commutation tickets good to the center of South Milwaukee.

"The coupon mileage provided for in the order is to consist of books containing 300 miles and selling for \$5.40, or 1.8 cents per mile. Coupon mileage, it is expected, will be used by some of the riders who make frequent use of the interurban lines. It is not expected to be used by suburban riders, as only in the extreme case can any saving be effected thereby. While the normal fare between Milwaukee and South Milwaukee has been increased, the effect is in part offset by the temporary sale of coupon books containing twenty rides and selling for \$2.50.

"The rearrangement in the method of computing fares will not in any way affect the transfer privileges now accorded interurban passengers desiring to ride on local cars in Milwaukee and Racine. While all the elements underlying the scheme of fares ordered by the commission have been successfully utilized for years, the combination in the present form and the use of a 2-cent suburban fare zone

has, so far as I recall, not heretofore been undertaken. The working out in practice of this fare scheme will, no doubt, be watched with interest by the public and by the electric railway operators throughout the country, and upon demonstration as a desirable system of fares will probably be adopted as a solution of many of the vexatious problems now confronting electric railways throughout the country."

Report on Los Angeles Railway Corporation

The report on the Los Angeles (Cal.) Railway Corporation prepared jointly by Consulting Engineer George A. Damon, who is associated with Bion J. Arnold, Chicago, and C. K. Mohler, chief engineer of the railway department of the city, was submitted to the City Council by the Board of Public Works on Jan. 8 and has been referred by the Council to its public utilities committee. A recapitulation of the report contains the following:

"Compared with other American cities, the local mileage in Los Angeles is liberal for the area covered and the population served. Past earnings have not been sufficient to take care of a large allowance for depreciation and nothing for amortization. The rides per capita are very high, averaging nearly a ride per inhabitant per day, a record exceeded only by San Francisco, where the income per capita is \$18.35, as compared with \$16.20 in Los Angeles.

"The present interest charges of 5 per cent on the original bonded debt of \$20,000,000 and 5 per cent on the actual cost of extensions financed through the City Railway's account is a 'reasonable return upon the actual present physical value' of the system, but is not sufficient to compensate for hazard and enterprise in creating the property. An annual dividend of 2 per cent on \$20,000,000, or \$400,000 yearly, is a reasonable reward for hazard and enterprise, and should be allowed as long as present uncertain conditions continue. An additional dividend of a larger amount than \$400,000 annually is not justified by present net earnings. The payment of a dividend of \$800,000 out of the current year's earnings was made possible only by anticipating net earnings—by using the depreciation reserve fund, or by borrowing money.

"The present 5-cent fare, if continued during the coming year under present operating conditions and with a normal increase in earnings, will produce a surplus over and above the amount sufficient for interest charges and reasonable dividends. The control of this surplus should be in the hands of a public regulating body, which should decide upon the disposition of this part of the surplus net earnings for any or all of the following purposes: better service, extensions, renewals, amortization or fare reduction.

"In anticipating future developments it is safe to conclude that earnings will increase at a remarkable rate; that the percentage of earnings required for operating expenses should gradually decrease and that the ratio of investment to earnings should also be reduced—thus making the burden of fixed charges relatively lighter.

"The present management of the Los Angeles Railway Corporation is working under the following disadvantages: The franchise fabric is a patchwork; many franchises expire before the bonds covering the investment are due in 1940. This \$20,000,000 first mortgage bond issue, covering a greater portion of the property, is a closed mortgage and does not allow for the issue of any additional bonds to take care of improvements and betterments on the property covered by the mortgage. Extensions are made by a subsidiary company and the securities of this company are protected only by the piecemeal extensions and additional equipment, resulting in a limited market for these betterment bonds. Under present circumstances it is necessary for H. E. Huntington to buy these bonds personally.

"On the other hand, the city is working under disadvantages. There is no comprehensive franchise policy; there are numerous legal tangles in present franchise grants which may involve the city in expensive litigation before it can secure back again full control of its own streets. If the city attempts to reduce fares at the present time a controversy is inevitable, as the company claims it has eminent legal advice that present franchises intrench them securely upon a 5-cent fare basis."

The general contract ordinance proposed in the report

to be substituted for the present franchises is outlined as follows:

"A contract ordinance between the city and the local surface railway company should attain the following objects: The very best possible service at the lowest cost of operation, maintenance and depreciation; the protection of the actual present value of the property, plus the actual money invested in future extensions and betterments; the complete maintenance, periodic renewals and constantly increasing efficiency of the system; extensions and additions slightly in advance of actual need; one city, one fare, universal transfers, through routes and publicity of records; public supervision, which will include the regulation of the surplus earnings so as to better the service and reduce the fares; public control over plans for additional construction and equipment, regulation of contracts, rates and transfers and control of capitalization, accounts and transfer of power; right of the city to purchase the property at reasonable intervals and at a fair price, which is not to include any franchise value."

Municipal Ownership Approved in Nelson.—A by-law has been passed at Nelson, B. C., authorizing the city to purchase 40,000 of the 75,000 shares of stock of the Nelson (B. C.) Street Railway, Ltd.

Trial Train Over the Portland, Eugene & Eastern Railway.—The first trial train was operated over the electrified Portland, Eugene & Eastern Railway on Jan. 5, 1914, between Beaverton and Gaston.

Consolidation of Pennsylvania Associations.—The Keystone Railway Club and the Pennsylvania Street Railway Association have been consolidated under the authority of the joint executive and consolidation committees.

Order Prescribing Air Brakes for Hamilton Cars.—The Ontario Municipal & Railway Board has decided that the cars of the Hamilton (Ont.) Street Railway of the heavier type must be equipped with air brakes inside of six months.

Boston Arbitration Award.—On Jan. 16, 1914, the Boston (Mass.) Elevated Railway Arbitration Board granted a substantial wage increase to the employees. The particulars will be published in the ELECTRIC RAILWAY JOURNAL of Jan. 24.

Members of Chicago Harbor & Subway Commission Resign.—E. T. Shankland, J. J. Reynolds and John Ericson, members of the Harbor & Subway Commission of Chicago, and their secretary, W. J. Shanks, have sent their resignation from this commission to the Mayor.

Bond Issue for Car Line Rejected in Tacoma.—The citizens of Tacoma, Wash., by a vote of 4352 to 3233, have rejected the plan to authorize an issue of \$87,000 of bonds by the city to provide funds to construct an electric railway across the tideflats manufacturing district.

Toronto Purchase Agreement Drafted.—The agreement under which it is proposed that the city of Toronto will purchase the property of the Toronto (Ont.) Railway has been completed by the corporation counsel of the city and it is to be sent to Sir William MacKenzie for ratification.

Power from City Plant for "Owl" Cars.—Hardy Croom, general manager of the Jacksonville (Fla.) Traction Company, has taken up with the authorities of the city the question of purchasing power from the municipal lighting plant between 11 p. m. and 5 a. m. daily for operating the company's "owl" service.

Municipal Ownership Vote in Superior.—The City Commission of Superior, Wis., has decided to submit to the voters of that city at the election to be held in April the question of the advisability of the city condemning the property of the Duluth-Superior Traction Company in Superior. The idea is to have the city take over and operate the property under a law passed by the last Legislature.

New York Franchise Forfeiture Cases.—The forfeiture of a large number of unused street railway franchises in New York City and the removal of the rails are involved in judgments which have just been entered by Attorney-General Carmody. This announcement was made at the office of the Attorney-General on Jan. 10, 1914, as the culmination of a series of litigations extending over two years. All the franchises in question are controlled by the New York Railways, formerly the Metropolitan Street Railway.

Rules Regarding Interlocking Plants in Missouri.—The Missouri State Public Utilities Commission recently adopted rules governing the construction, maintenance and operation of interlocking plants by electric railways and steam railroads. The code was effective Jan. 1 and is similar to those in force in Illinois, Indiana, Wisconsin and other States. Companies using such plants are required to report four times a year. Prior to the construction or reconstruction of any interlocking plant a station map and profile showing all grades and tracks must be filed with the commission.

Portland's Public Utilities.—Franklin T. Griffith, president of the Portland Railway, Light & Power Company, Portland, Ore., contributed an article on the activities of the company to the *Morning Oregonian* of Jan. 1, 1914. He said that the present management has been in control of the company for seven years and that during that time \$24,000,000 has been expended for improvements and betterments. For the year 1913 about \$1,500,000 was expended by the company for improvements. The article was accompanied by several half-tone illustrations showing important phases of the new work.

Suspension of Franchise Negotiations in Kansas City.—Following the suspension of activities by the committee of the Council appointed to consider the new franchise for the Metropolitan Street Railway, Kansas City, Mo., considerable speculation has taken place as to the next move. Newspapers which opposed the proposed franchise are nonplused over the sudden change of tactics by the receivers and most of the papers are maintaining a discreet silence. Labor organizers have arrived in Kansas City with the avowed intention of unionizing the employees of the company. These men, according to their announcement, are prepared to remain in Kansas City until May.

Mr. Huff in Charge of Public Relations.—Among the duties which S. W. Huff will assume as vice-president of the Brooklyn (N. Y.) Rapid Transit System will be the direction of the bureau of complaints, which was conducted by John F. Calderwood, formerly vice-president and general manager. All complaints and suggestions from the public addressed to the Brooklyn Rapid Transit Company will receive Mr. Huff's personal attention. Mr. Huff has established his office on the first floor of the main office of the company at Montague and Clinton Streets, Brooklyn, and will receive personally, so far as possible, those who desire to call at the offices of the company in regard to complaints and kindred matters.

Circular Regarding M. C. B. Convention Exhibits.—The Railway Supply Manufacturers' Association, through J. D. Conway, its secretary-treasurer, issued under date of Jan. 10, 1914, official circular No. 1 inviting manufacturers of and dealers in railroad supplies to exhibit at the annual convention of the association to be held in conjunction with the convention of the Master Car Builders' Association on June 10, 11 and 12, 1914, and the American Railway Master Mechanics' Association at Young's Million Dollar Pier, Atlantic City. Details of the arrangements for the exhibits, applications for space, hotel rates, etc., are included with the circular. Mr. Conway may be addressed at 630 Oliver Building, Pittsburgh, Pa.

Berkshire Mountain Line Denied.—The Massachusetts Public Service Commission has disapproved the petition of the Berkshire Street Railway for authority to extend its line to a point near the summit of Mount Greylock at an estimated cost of \$1,100,000. The board states in its finding that the proposed line would be patronized only a short time yearly and largely by pleasure seekers; that depreciation would be excessive; that interest charges would amount to \$55,000 per year, and that to secure an adequate return such high fares would be necessitated as would prohibit the general use of the line by the public. The commission advises the construction of other not less profitable lines of larger usefulness in case the company is in the position to make such investment.

Engineering Departments of Harvard and M. I. T. to Combine.—The engineering departments of Harvard University and the Massachusetts Institute of Technology are to be combined as the result of an agreement reached on Jan. 9. The combined departments of mechanical engineer-

ing, electrical engineering, civil and sanitary engineering and mining engineering and metallurgy are to be conducted in the new Technology buildings now being built in Cambridge. Harvard is to discontinue its schools of applied science in these departments. The president of the Institute of Technology is to be the executive head of the co-operative work, and the faculty will consist of the faculty of the Institute, enlarged by the addition of Harvard professors of the departments involved.

Capital Expenditures of Detroit System.—The Detroit (Mich.) United Railway reports the following expenditures charged to capital account for the eleven months ended Nov. 30: Detroit United Railway, \$1,310,746; Rapid Railway, \$67,433; Detroit, Monroe & Toledo Short Line Railway, \$257,392; Detroit, Jackson & Chicago Railway, \$115,784; Sandwich, Windsor & Amherstburg Railway, \$143,393; total, \$1,894,750. It was expected that the expenditures for December would bring the grand total for the year up to \$2,225,000. In the matter of new cars and car equipment approximately \$700,000 was spent. In the matter of real estate and private right-of-way approximately \$200,000 was spent. These are all of course in addition to the regular expenditures for maintenance.

New York Commission Refuses to Order Extension.—The Public Service Commission for the First District of New York, by a vote of three to two, has refused to order the New York & Queens County Railway, Long Island City, to extend its tracks on Astoria or Flushing Avenue from Ehret Avenue to Jackson Avenue in Queens. Commissioner J. Sergeant Cram, who held the hearings to inquire into the situation, submitted an opinion recommending that an order for the extension should be made, in accordance with the requirements of the company's franchise. Commissioner Cram held that the population on either side of the route was sufficient to warrant construction and operation. Commissioner Eustis said that no company should be required to construct a route until the street is in proper condition for it.

Report Against Removal of Elevated Line in Boston.—The Boston Transit Commission has filed with the Senate the result of its investigation of the resolve by the Legislature of 1913 requesting an investigation as to the removal of the elevated structure on Washington Street and Main Street and an extension of the Washington Street tunnel to Dudley Street and the construction of a subway from City Square to Sullivan Square. The commission finds that to substitute subways for elevated within the points specified would involve very large expense, estimated as approximately \$13,232,500. This would not increase transit facilities and would have to be assumed by the city. The report continues: "While the commission fully appreciates the disadvantages of elevated structures on public streets, the fact must be recognized that they are in many cases the only practicable means of securing rapid transit facilities. It cannot be too clearly borne in mind that the project contemplated involves no additional transit facilities but simply contemplates a large expenditure to do away with the overhead structure."

Mayor Seymour of Tacoma on Municipal Ownership.—On his return to Tacoma, Wash., from the East Mayor Seymour, of that city, was quoted in part as follows in regard to the possibility of municipal ownership of the lines of the Tacoma Railway & Power Company, which are under the management of Stone & Webster: "Mr. Stone said they would sell the entire property. He did not state the terms under which the sale would be made, but he said all the company asked was a fair adjustment. I asked the advice of Mayor Baker of Cleveland in regard to the city taking over the property, and he thought it would be a splendid idea. I believe Mr. du Pont, Cleveland, would make a fair appraisal of the whole property. We could certainly control the situation if we owned the entire system, but there is the danger of political influence. I do not know of any man in public life in Tacoma capable of handling the management of the Tacoma system. I am not in favor of the city taking over the entire system because I do not believe we are ready for it at this time. It would probably take two years after we had decided to buy the system before the complete appraisal had been made and the system was ready to turn over to the city."

Further Appropriation for Subway in Chicago.—The finance committee of the Chicago City Council, in preparing the annual appropriation bill for 1914, made an allowance of \$2,000,000 from the city's traction fund, which is accumulated out of the payments made to the city by the surface railways, for the construction of subways to be used by the surface railways or elevated railways, or both. At the meeting of the finance committee the Mayor referred again to the advisability of doing away with the loop structure, over which the elevated roads operate in the downtown district, and announced his intention to bring suit to compel the companies to remove the structure. A suit of this kind was begun some time ago by Corporation Counsel Sexton but was abandoned at the time Attorney Hoyno for the State filed quo warranto proceedings against the Chicago Elevated Railways. The finance committee made no allowance from the traction fund for the maintenance of the Harbor & Subway Commission, the members of which have all resigned. William R. Willcox, formerly chairman of the Public Service Commission of the First District of New York, has been mentioned as a possible adviser in connection with subway matters in Chicago.

Special Report on Boston Transit Matters.—The Boston Transit Commission sent a special report to the Legislature on Jan. 9 upon several transit matters referred to it by the last General Court. The commission was ordered to estimate the cost of a tunnel under Boston Harbor between the city proper and Chelsea, and it suggests two routes, each of which is about 2.5 miles in length. The estimated cost of either tunnel is approximately \$6,700,000, including \$700,000 in land damages. The board volunteers the suggestion that with the completion of the extension of the East Boston tunnel from Court Street to Bowdoin Square and beyond opportunity will be afforded for a large increase in the traffic facilities between Boston, East Boston and Chelsea. The extension will probably be placed in service in 1915 and a valuable feature will be a loop at Bowdoin Square which will supersede the present inconvenient stub-end terminal at Court Street. By the East Boston tunnel the same points in Chelsea will be reached as would be covered by the proposed tunnels. The commission disapproves the building of a station in the Washington Street tunnel at Bennett Street, Boston. The proposed station would be built on a 4 per cent grade. It would cost upward of \$500,000. The location is near the present Boylston Street station, and an additional stop at this point would injure the rapid transit program for which the tunnel was created. The board states that a physical connection between the Dorchester tunnel and the South Station is being planned in the station designs made by the engineers of the commission.

Committees of the National Association of Railway Commissioners.—The names of the members of the valuation committees of the National Association of Railway Commissioners follow: Committee No. 1—Fred J. MacLeod, Massachusetts; E. C. Niles, New Hampshire; Milo R. Maltbie, New York. Committee No. 2—R. Hudson Burr, Florida; Charles M. Candler, Georgia; E. W. Doty, Ohio. Committee No. 3—O. F. Berry, Illinois; L. T. Hemens, Michigan; Halford Erickson, Wisconsin. Committee No. 4—W. D. Williams, Texas; J. M. Atkinson, Missouri; George A. Henshaw, Oklahoma. Committee No. 5—John M. Eshleman, California; H. F. Bartine, Nevada; Clyde B. Aitchison, Oregon. The resolution provided for an executive committee which was elected by the three members of the district committees. Its members include Mr. Atkinson of Missouri, Mr. Berry of Illinois, Mr. Candler of Georgia, Mr. Eshleman of California and Mr. Maltbie of New York. The entire committee elected as its chairman Mr. Erickson of Wisconsin and as its secretary Mr. Doty of Ohio. The work of the committee was perfected in Chicago on Dec. 10, 1913. On Dec. 17, 1913, at a meeting of the executive committee of the valuation committee Mr. Maltbie was selected as chairman of the executive committee. The executive committee of the National association appointed by Laurence B. Finn, Frankfort, Ky., president of the National association, is as follows: Robert R. Prentis, Richmond, Va.; Charles F. Staples, St. Paul, Minn.; Martin S. Decker, Albany, N. Y.; O. H. Hughes, Columbus, Ohio, and W. M. Daniels, Trenton, N. J.

Financial and Corporate

Stock and Money Markets

Jan. 14, 1914.

All through the trading in the early forenoon on the New York Stock Exchange to-day the price movements were irregular and business was almost entirely of a professional character. During the last half of the forenoon the trading was very quiet. A better tone was shown in the afternoon trading, but there was little increase in the volume of business. Railroad and other bonds were strong. Rates in the money market to-day were: Call, 2@2½ per cent; sixty days, 3½@4 per cent; ninety days, 3¾@4 per cent; five and six months, 4@4¼ per cent.

The local market in Philadelphia ended strong and active. In the early trading Union Traction sold at 46¼, while Philadelphia Rapid Transit was offered at 19¾.

A strong tone characterized the stock market in Chicago to-day. Bonds generally were unchanged.

At Boston to-day the trading was quiet and prices steady. At the close the market was firm and considerably more active.

Business was fairly active on the Stock Exchange in Baltimore to-day.

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

	Jan. 7	Jan. 14
American Brake Shoe & Foundry (com.)	90	89
American Brake Shoe & Foundry (pref.)	127	128½
American Cities Company (com.)	36	36
American Cities Company (pref.)	60¼	61¾
American Light & Traction Company (com.)	337	336
American Light & Traction Company (pref.)	106	107
American Railways Company	38	38
Aurora, Elgin & Chicago Railroad (com.)	38½	37½
Aurora, Elgin & Chicago Railroad (pref.)	83	80
Boston Elevated Railway	87½	90
Boston Suburban Electric Companies (com.)	7	7
Boston Suburban Electric Companies (pref.)	*58	*58
Boston & Worcester Electric Companies (com.)	*6½	*6½
Boston & Worcester Electric Companies (pref.)	36½	37
Brooklyn Rapid Transit Company	88	89½
Capital Traction Company, Washington	112¾	112
Chicago City Railway	160	160
Chicago Elevated Railways (com.)	25	25
Chicago Elevated Railways (pref.)	75	75
Chicago Railways, ptrptg. ctf. 1	91	*91
Chicago Railways, ptrptg. ctf. 2	27¾	30
Chicago Railways, ptrptg. ctf. 3	6	6
Chicago Railways, ptrptg. ctf. 4	2	2
Cincinnati Street Railway	102	102½
Cleveland Railway	104¾	105¾
Cleveland, Southwestern & Columbus Ry. (com.)	5	5
Cleveland, Southwestern & Columbus Ry. (pref.)	26	26
Columbus Railway & Light Company	18	18
Columbus Railway (com.)	47	50
Columbus Railway (pref.)	76	77½
Denver & Northern Railway	70	70
Detroit United Railways	a80	80
General Electric Company	140¾	144½
Georgia Railway & Electric Company (com.)	120	120
Georgia Railway & Electric Company (pref.)	84	83
Interborough Metropolitan Company (com.)	15	15½
Interborough Metropolitan Company (pref.)	61	62
International Traction Company (com.)	30	30
International Traction Company (pref.)	90	90
Kansas City Railway & Light Company (com.)	15	15
Kansas City Railway & Light Company (pref.)	30	30
Lake Shore Electric Railway (com.)	*6	*6
Lake Shore Electric Railway (1st pref.)	*92	*92
Lake Shore Electric Railway (2d pref.)	*24	*24
Manhattan Railway	125	125
Massachusetts Electric Companies (com.)	11	12½
Massachusetts Electric Companies (pref.)	64	64
Milwaukee Electric Ry. & Light Co. (pref.)	95	95
Norfolk Railway & Light Company	24¾	24¾
North American Company	67	70
Northern Ohio Light & Traction Co. (com.)	60	57
Northern Ohio Light & Traction Co. (pref.)	101	101
Philadelphia Company, Pittsburgh (com.)	39	41
Philadelphia Company, Pittsburgh (pref.)	40	41
Philadelphia Rapid Transit Company	18¾	19¾
Portland Railway, Light & Power Company	48	48
Public Service Corporation	109	107
Third Avenue Railway, New York	43½	45½
Toledo Traction, Light & Power Co. (com.)	20	20
Toledo Traction, Light & Power Co. (pref.)	80	80
Twin City Rapid Transit Co., Minneapolis (com.)	104¾	105½
Union Traction Company of Indiana (com.)	11½	11½
Union Traction Company of Indiana (1st pref.)	80	80
Union Traction Company of Indiana (2d pref.)	14	14
United Rys. & Electric Company (Baltimore)	25	25
United Rys. Inv. Company (com.)	20	20
United Rys. Inv. Company (pref.)	39	39
Virginia Railway & Power Company (com.)	50	50
Virginia Railway & Power Company (pref.)	95	95
Washington Ry. & Electric Company (com.)	85¾	88½
Washington Ry. & Electric Company (pref.)	87	88½
West End Street Railway, Boston (com.)	69	71
West End Street Railway, Boston (pref.)	87	89
Westinghouse Elec. & Mfg. Company	66	67½
Westinghouse Elec. & Mfg. Co. (1st pref.)	116¼	116

* Last sale. a Asked.

ANNUAL REPORTS

Southern Pacific Company

The gross receipts of the Southern Pacific Company, San Francisco, Cal., in respect to its leased lines, and of the proprietary companies in respect to lines not leased, after excluding all offsetting transactions, were \$142,774,705 for the year ended June 30, 1913, which figure compares with \$131,525,071 for the year preceding. The operating expenses for 1913 were \$98,566,696, an increase over 1912 of \$6,454,413, giving a net operating income for 1913 of \$44,208,009, an increase of \$4,795,121 over 1912. The total other income in 1913 was \$11,742,172, giving a total income of \$55,950,191. After deducting from this amount \$29,082,374 for fixed and other charges, there was left a surplus for the period of \$26,867,807, representing 9.85 per cent on the outstanding capital stock of the Southern Pacific Company. The dividends paid during the year amounted to \$16,369,932, leaving a surplus of \$10,506,875, an increase over the preceding year of \$5,264,909.

During the past ten years there has been an increase of only 16.61 per cent in the mileage of track operated, but taxes have increased \$3,586,745, or 169.9 per cent. On June 30, 1913, the Southern Pacific Company had made the following advances against which no securities had been issued: for the construction and acquisition of new lines, including electric lines, \$82,866,981; for rolling stock and floating equipment \$41,037,205, and for lands and other properties, \$7,318,802, or a total of \$131,222,989. During the year the electric passenger equipment owned by the Southern Pacific Company was increased through the addition of ten electric motors.

dustrial hygiene affecting the public and its own personnel" during the year ended June 30, 1913.

Julius Kruttschnitt, chairman of the executive committee, makes the following remarks regarding the subjects of public relations and unified action on the part of the shareholders of the company:

"The management has labored energetically to conciliate the people of the communities traversed by the company's lines. As far as possible the officers of the company have attended commercial and other public gatherings, with a view to learning their needs and opinions, in order to improve the service and promote harmonious relations between the company and its patrons. The management is pleased to report the evidence of better feeling toward the company in these communities than has ever before existed.

"The officers of the company are too few in number to exert much influence on public opinion, and a large part of their time and energy which should be devoted to that end and to promoting safer and more efficient management is consumed in appearing before commissions, to protect the company's revenues, and before legislative bodies, to argue against ill-advised and damaging laws. The present is an age of regulatory legislation, and the stockholders should endeavor to defend their own interests by opposing unwise legislation adversely affecting their company and by correcting erroneous impressions current with the public. The ownership of the property is vested at the present time in over 23,000 stockholders, who could and should prove a potent protective force. A pathetic acquiescence on their part in the assaults of the demagogue and of the well-intentioned though unenlightened and irrational reformer tends toward but one result, while concerted effort will do much to repel the attacks and mold public opinion."

RECEIPTS AND DISBURSEMENTS OF ELECTRIC TRANSPORTATION PROPRIETARY COMPANIES OF SOUTHERN PACIFIC COMPANY FOR YEAR ENDED JUNE 30, 1913

	Total	Pacific Electric Railway	Fresno Traction and Fresno City Railway Combined	Stockton Electric Railroad	Visalia Electric Railroad	San José Railroads	Peninsular Railways	Portland, Eugene & Eastern Railway
Receipts:								
Gross operating income	\$10,753,486	\$9,399,079	\$212,454	\$191,489	\$75,506	\$366,952	\$280,319	\$227,686
Other income	257,762	*203,614	1,766	551	150	11,029	37,445	3,206
Total receipts	\$11,011,248	\$9,602,693	\$214,220	\$192,040	\$75,656	\$377,981	\$317,764	\$230,892
Disbursements:								
Operating expenses	\$7,379,321	\$6,365,519	\$146,039	\$110,510	\$72,709	\$251,188	\$225,636	\$207,719
Taxes	447,647	377,908	9,068	8,555	3,179	14,908	14,014	20,014
Hire of equipment	6,701	.....	.....	.....	.....	.....	.....	6,701
Interest on funded debt	2,740,500	2,528,353	45,180	.....	.....	141,967	25,000	.....
Interest on open accounts	398,953	.....	11,584	28,379	78,675	.....	181,655	98,660
Sinking fund contributions	152,417	128,667	11,250	.....	.....	12,500	.....	.....
Other charges	150,734	131,041	4,850	.....	89	2,512	10,241	2,019
Total disbursements	\$11,276,273	\$9,531,488	\$227,951	\$147,444	\$154,652	\$423,075	\$456,546	\$335,113
Surplus	.....	*71,204	.....	44,596	.....	.....	.....	.....
Deficit	265,025	.....	13,731	.....	78,996	45,094	138,782	104,221
Total road miles	776.78	560.54	16.88	7.29	34.23	27.55	64.44	\$65.85
Average miles of railway operated during year	751.35	550.22	17.14	6.39	33.41	27.55	54.14	\$62.50

*Does not include interest, amounting to \$155,232, accrued during the year on advances to the Pacific Electric Land Company.
†Includes 29.42 miles of steam lines.

The expenditures for additions and betterments during the year amounted to \$8,131,617. Of this amount \$8,060,398 was charged to the capital accounts of the various proprietary companies. The percentage of operating expenses to the gross operating income was 26.76 per cent in 1913, compared with 25.26 per cent in 1912, for maintenance, and 36.25 in 1913, compared with 37.26 per cent in 1912, for operation.

During 1913 much attention was paid by the Southern Pacific Company to the "safety first" movement and, according to statistics presented in the annual report, the number of employees killed decreased from forty-two in 1912 to nine in 1913, and the total killed per 1,000,000 locomotive miles decreased from 0.772 in 1912 to 0.156 in 1913. Since 1910 no passenger has lost his life in a Southern Pacific train accident, and during this time 162,514,509 passengers were carried. At the recent International Safety and Sanitation Exposition, held in New York, the Southern Pacific Company obtained the E. H. Harriman memorial gold medal for "making the best record in accident prevention and in-

The accompanying table shows the total mileage, average mileage operated and a condensed statement of receipts and disbursements for the various proprietary electric railways of the Southern Pacific Company.

Siemens & Halske Works

The Siemens & Halske Works, Berlin, Germany, have recently issued a report covering their business for the fiscal year ended July 31, 1913. The net profits of \$5,835,350 permitted a stock dividend of 10 per cent, or \$2,250,000. Of the remainder \$625,000 was assigned to reserve, \$375,000 for employees' bonuses and \$125,000 for employees' welfare work. The German shops alone built 138,000 pieces of apparatus having a total rating of 2,991,772 kw. Attention is called to the great field of development still open to nationwide transmission systems. The foreign business of the company is reported as prosperous, one of the most important orders being a 100,000-volt transmission system between Tocopilla and Chuquicamata, Chile, which will cost

about \$3,000,000. The largest turbine built during the year was of 21,500-kva capacity, the largest transformer of 23,500-kva capacity and the highest voltage transformer 110,000 volts at 10,000-kva capacity.

New Haven \$67,000,000 Convertible Bond Issue Annulled

The Massachusetts Supreme Court on Jan. 9 decided that when the Public Service Commission promulgated an order giving its consent to the issue by the New York, New Haven & Hartford Railroad Company of \$67,000,000 of convertible debenture bonds it went beyond its authority. The court therefore annulled the order.

The opinion of the court, which was unanimous, said in part:

"The approval by the commission of an issue of stock must relate to the present and not to a remote future. The price at which the public interest may require that stock may be issued during a period of ten years beginning five years hence is impossible of ascertainment now. But the approval of convertible debentures with the right to take stock at par in payment during that period involves fixing a price of the stock during the like period. An order entered now that stock be issued at par during that period of time can afford no security that the corporation will get an adequate return for its stock, or that rates and charges fixed upon such a capitalization will be fair, or that the rights of other stockholders will be guarded properly.

"No request has been made for the approval of an issue of bonds without the convertible-into-stock feature. Hence the only matter to be considered upon this aspect of the case is whether approval of an issue of convertible debentures such as is set out in the order of the commission is within its legal power."

Howard Elliott, chairman of the New Haven system, says of the decision:

"The company has not been unmindful of the fact that the decision of the Supreme Court might be adverse, and it has been making preparations for taking care of its finances in such event. As none of the short-term notes mature before the middle of May, there is abundant opportunity for the company to make the necessary arrangements."

On Jan. 10 the Public Service Commission issued the following statement defending its authorization of the bond issue:

"The commission recognized that it was a matter of doubt whether it could legally authorize an issue of bonds containing a provision for subsequent conversion into stock at par. There were so many reasons of sound public policy why the company at that particular time should have the opportunity of financing itself that it seemed to the commission that an issue of securities otherwise lawful and in the public interest should not be disapproved on account of the convertible feature of the bonds unless it was absolutely clear that this feature was illegal.

"The Public Service Commission is an administrative body, dealing principally with questions of policy, the statute having set the court over the commission to correct any excess of its lawful powers."

H. H. Porter on the Needs of the Springfield Properties

H. Hobart Porter of Sanderson & Porter, New York, N. Y., who took over the properties of the New England Investment & Security Company, Springfield, Mass., some time ago, in discussing the situation with respect to these properties with a representative of the ELECTRIC RAILWAY JOURNAL said that the members of the firm, particularly E. N. Sanderson and Francis Blossom, were making a careful study of the situation in order to determine what course it was desirable to pursue in matters of finance and operation. They found the properties to be in good condition and able to pay their way, but they are in a peculiar situation now that they have been divorced from the New Haven railroad.

As Sanderson & Porter analyze the situation, the electric railway system needs a yearly addition of capital to make the improvements and extensions required. This would amount to many hundreds of thousands of dollars a year and could not be supplied from surplus earnings even

if it were good public policy to permit the earnings to be used in that way. If the capital were increased annually the growth of the service should carry the increased charges. Mr. Porter has faith in the growth of the section. In specifying the needs for the capital outlay, he said that the Springfield system particularly needed additional carhouse space and adequate repair shops, both of which would cost considerable money. It is the fact now, he said, that cars cannot be cleaned as often as they should be because there is not enough carhouse space to accommodate them. The need of repair shops for the system has long been felt by the management, and plans had been made for carrying out these improvements before the properties were taken over. Mr. Porter said that the Springfield and Worcester companies were well equipped with rolling stock, but that there was need for the construction of certain extensions.

Reports of Electric Railways in Connecticut

The reports of electric railways in Connecticut to the Public Utilities Commission of that State show that on June 30, 1913, their total assets amounted to \$95,340,195, an increase in round numbers of \$3,000,000 over the preceding year. There has been an increase of operating revenues of \$664,970 and an increase of operating expenses of \$432,332. The total number of fare passengers reported by all roads during the year, with the exception of the Rhode Island Company, was 185,588,980. In addition to this number there were 34,430,849 transfer passengers, or a total of 220,019,829 fare passengers. These figures show an increase over the preceding year of 10,154,861 more fare passengers and 1,659,770 more transfer passengers, and a total increase of fare passengers carried of 11,814,631. The total average fare revenue from each passenger on lines charging a 5-cent fare, not including transfer passengers, was \$0.0485; including such transfer passengers it was \$0.0435. There were fourteen companies in Connecticut which made returns for the year to the commission.

American Railways, Philadelphia, Pa.—Stockholders of the American Railways, who hold \$1,485,000 of Johnstown Passenger Railway collateral trust 5 per cent bonds, due 1930, have received the privilege until Jan. 15, 1914, of exchanging the bonds for the new first and refunding mortgage 5 per cent bonds of the Johnstown Traction Company, at 102½ and interest for the present bonds and payment at 95 and interest for the new issue.

Binghamton (N. Y.) Railway.—At a meeting of the Binghamton Railway on Jan. 12, officers and directors were elected as follows: G. Tracy Rogers, president; George E. Green and George Dunn, vice-presidents; Elmer M. White, treasurer; R. W. Day, W. L. Connell, G. Tracy Rogers, A. J. Parsons, George H. Barlow, William H. Hecox and Thomas J. Keenan, directors. H. Tracy Rogers will continue as superintendent and W. D. Decker as assistant superintendent. Elmer M. White succeeds H. Carl Hardie as treasurer, while R. W. Day, general manager, and W. L. Connell, treasurer of the Scranton & Binghamton Railway, were elected directors of the Binghamton Railway to succeed T. B. Crary and Frank B. Newell.

Boston (Mass.) Elevated Railway.—The West End Street Railway has petitioned the Public Service Commission of Massachusetts for the approval of an issue of \$2,000,000 of its negotiable bonds to provide for the payment of \$2,000,000 of its bonds coming due on March 1, 1914.

Chicago (Ill.) City Railway.—It is understood that the syndicate which in 1910 bought most of the \$18,000,000 of capital stock of the Chicago City Railway at \$200 a share will be dissolved on Jan. 31. This syndicate is distinct from the one dissolved on Feb. 1, 1912, which underwrote the \$22,000,000 of collateral bonds of the Chicago City & Connecting Railways.

Columbus Railway, Power & Light Company, Columbus, Ohio.—At a meeting held on Jan. 8 stockholders of the Columbus Railway Company voted to merge with the Columbus Railway, Power & Light Company, the stockholders agreeing to accept \$3,500,000 of preferred stock, series B, of the Columbus Railway, Power & Light Company, and \$3,500,000 of common stock. S. C. McMeen,

president of the Columbus Railway & Light Company, said that the new company will probably show net earnings of \$500,000 on stock the first year. D. M. Massie, F. R. Huntington, A. D. Heffner, William C. Willard, Herbert E. Bradley, E. R. Sharp, L. P. Mathews, E. W. Strong and Angus W. Dun were chosen directors.

Conestoga Traction Company, Lancaster, Pa.—A proposition to increase the capital stock of the Conestoga Traction Company from \$4,000,000 to \$5,000,000 was recently approved by the stockholders.

Danbury & Harlem Traction Company, Danbury, Conn.—Henry A. Hitner's Sons Company, Philadelphia, Pa., has purchased the entire railroad and power plant of the Danbury & Harlem Traction Company. The intention of the syndicate which started to build the road was to complete an electric railway from Danbury, Conn., to New York. The first portion under construction was about 16 miles, and of this 7 miles was completed when litigation stopped the work, and it was not again resumed. It is very likely that the purchaser will dismantle the entire road.

Dayton (Ohio) Street Railway.—The number of directors of the Dayton Street Railway has been reduced from ten to nine. Albert Emanuel is the retiring director, whose place will not be filled. He also retires as secretary of the company, in which capacity he is succeeded by P. A. Worman.

Interurban Railway & Terminal Company, Cincinnati, Ohio.—The management of the property of the Interurban Railway & Terminal Company has been taken over by the Warren Bicknell Company, Cleveland, Ohio, operating managers. F. H. Talbot has resigned as general superintendent and purchasing agent of the Interurban Railway & Terminal Company and M. Ackerman has been appointed general superintendent and local manager.

Evanston (Ill.) Railway.—An open mortgage has been filed with the Merchants' Loan & Trust Company of Chicago as trustee of the Evanston Railway to secure bonds issuable at the discretion of the board of not over 6 per cent interest to provide for a complete rehabilitation of the system during 1914. The bonds are dated Dec. 1, 1913, due Aug. 1, 1933, par \$100, \$500 and \$1,000. An amount of \$150,000 of these bonds has already been issued. The Evanston Railway is the company that has finally succeeded to the property of the former County Traction Company in Evanston. The Evanston Traction Company was first incorporated in August, 1913, to purchase the property of the County Traction Company in Evanston and it obtained a twenty-year franchise. For certain legal reasons the franchise was, with the consent of the City Council, transmitted to the Evanston Railway, which was incorporated with the same capital and the same directors and officers as the Evanston Traction Company. The officers of the Evanston Railway are: Clement C. Smith, president; R. E. Belknap, vice-president; C. F. Speed, vice-president and general manager; J. J. Lewis, treasurer; George Allison, secretary, and L. A. Gilbert, superintendent. A certificate was filed in Illinois on Dec. 30 increasing the stock of the Evanston Railway from \$100,000 to \$500,000. It is stated that the Evanston Traction Company has changed its name to the Allison Company.

Galveston (Tex.) Electric Company.—Lee, Higginson & Company, Boston, Mass., are offering for sale first mortgage 5 per cent bonds of 1905 of the Galveston Electric Company, due May 1, 1940, and callable at 110 and interest. There is an authorized issue of \$2,500,000 of these bonds, of which \$1,413,000 are outstanding, \$61,000 have been retired by a sinking fund and \$1,026,000 are reserved for future additions.

Harrisburg (Pa.) Railways.—A certificate was filed on Jan. 6 showing an increase in the funded debt of the Harrisburg Railways from \$3,000,000 to \$3,169,000.

Hudson Companies, New York, N. Y.—Russel S. Carter, G. E. Cabot, M. B. Metcalf, T. H. Newberry and A. S. Wing have been elected directors of the Hudson Companies to succeed A. A. Tingley, P. G. Bartlett, G. B. Schley, K. B. Conger and W. H. Barnum, resigned. It has been voted to increase the membership of the board from twelve to thirteen, and another director will be elected. The Hudson Companies controls the Hudson & Manhattan Railroad through ownership of the securities of that company.

International Traction Company, Buffalo, N. Y.—Ten second mortgage sinking fund gold bonds, dated July 1, 1896, of the Buffalo & Niagara Falls Electric Railway were paid on Jan. 1, at 105 and interest, at the office of the Bankers' Trust Company, New York, N. Y.

Johnstown (Pa.) Traction Company.—Bioren & Company, Philadelphia, and Newburger, Henderson & Loeb, New York and Philadelphia, are offering at 95 and interest, free of the State tax in Pennsylvania, the unsold portion of the new issue of \$2,000,000 of first refunding mortgage 5 per cent gold bonds of the Johnstown Traction Company. These bonds are dated Dec. 31, 1913, and due July 1, 1943, but redeemable on any interest date at 102 and interest—par values \$500 and \$1,000.

Joliet & Southern Traction Company, Joliet, Ill.—At the foreclosure sale of the Joliet & Southern Traction Company set for Feb. 11, as noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 10, the property will be sold in parcels in pursuance of decrees entered in the Circuit Courts of Kane County, Ill., on Sept. 12 and Dec. 20, 1913, in the consolidated foreclosure suits under the mortgage of the former Joliet, Plainfield & Aurora Railroad, dated 1903, covering the line from Aurora to Joliet, and the mortgage of the Joliet & Southern Traction Company, dated 1907, covering the line from and through Joliet to Chicago Heights, and also the terminal property in Joliet. This terminal property is required to bring not less than \$91,400, and is to be sold separately and also jointly with the property under each one of the mortgages.

Massachusetts Northeastern Street Railway, Haverhill, Mass.—The Public Service Commission of Massachusetts has approved the issue of 450 shares of common stock and 6650 shares of preferred stock at \$100 a share by the Massachusetts Northeastern Street Railway. The 4150 shares of preferred stock are to be issued in exchange for mortgage bonds of the Hudson, Pelham & Salem, Haverhill, Plaistow, & Newton, Lowell & Pelham and Seabrook & Hampton Beach Street railway companies. Other proceeds are to be used in paying floating indebtedness and in meeting the cost of additions and improvements.

New Orleans Railway & Light Company, New Orleans, La.—Seven first mortgage 6 per cent power house bonds, dated July 1, 1897, of the New Orleans Traction Company have been called for payment on July 1 at 105 and interest at the Fidelity Trust Company, Louisville, Ky.

New York & North Shore Traction Company, Roslyn, N. Y.—The Public Service Commission of the First District of New York has authorized the New York & North Shore Traction Company to issue additional capital stock to the amount of \$81,850, the proceeds to be used in paying for work already done in Queens County.

Oakland, Antioch & Eastern Railway, Oakland, Cal.—On March 3 the stockholders of the Oakland, Antioch & Eastern Railway will vote on increasing the funded debt of the company from \$5,000,000 to \$5,700,000 by the creation of \$700,000 of collateral notes or bonds secured by pledging some of the bonds heretofore issued.

Public Service Corporation of New Jersey, Newark, N. J.—The Public Service Corporation of New Jersey has filed a certificate with the Secretary of State showing that it has issued \$2,000,000 of 5 per cent general mortgage sinking fund gold bonds. The bonds were sold at 87½. The Public Service Railway has certified that it has issued \$620,000 bonds at 99½. Claiming that it has been subject to double taxation under the federal corporation tax act, the Public Service Corporation of New Jersey has started suits against H. C. H. Herald, collector of internal revenue, to compel the refunding of \$99,169. The recovery of the money is asked on the ground that it was improperly collected from both the Public Service Corporation and its subsidiary companies. Similar suits for the recovery of \$16,782 have been started against Isaac Moffit, collector of internal revenue at Camden.

Sheboygan Railway & Electric Company, Sheboygan, Wis.—On Jan. 5, 1914, the directors of the Sheboygan Railway & Electric Company held a meeting to fill the vacancies resulting through the sale of the property, the controlling interest in which was purchased by Peter Reiss, Jacob Reiss and John P. Reiss. The following officers were

elected: Peter Reiss, president; John P. Reiss, vice-president; Edward Hammett, general manager. Vacancies in the board of directors were filled by the election of Peter Reiss, John P. Reiss and William A. Reiss.

South Carolina Light, Power & Railways Company, Spartanburg, S. C.—A. B. Leach & Company, New York, N. Y., are offering for sale first mortgage 5 per cent sinking fund gold bonds dated 1912 and due May 1, 1937, of the South Carolina Light, Power & Railways Company. There is an authorized issue of \$5,000,000 of these bonds, of which \$3,000,000 are now outstanding.

Southern Illinois Railway & Power Company, Harrisburg, Ill.—The Southern Illinois Railway & Power Company has filed a trust deed to secure \$2,500,000 of 5 per cent bonds with the Fort Dearborn Trust & Savings Bank, Chicago, Ill., as trustee. The bonds are to be used in the construction of an interurban railway between Harrisburg, Ill., and Marion, Johnston City and Brenton.

Tampa (Fla.) Electric Company.—At the annual meeting of the stockholders of the Tampa Electric Company held on Jan. 5, 1914, the plan to increase the capital stock of the company from \$2,244,000 to \$2,618,000 was approved. The additional \$374,000 of stock will be offered to stockholders for subscription at par in the ratio of one share for every six present shares.

Topeka (Kan.) Railway.—E. H. Rollins & Sons, Boston, Mass., are offering \$24,000 of Topeka Railway first mortgage 5 per cent gold bonds dated Dec. 31, 1904, due Jan. 1, 1930, and callable on Jan. 1, 1915, or on any interest date thereafter at 105 and interest. These bonds are supported by a sinking fund which is required to redeem \$15,000 of the bonds annually on Jan. 1, at 105 and interest.

Twin State Gas & Electric Company, Dover, N. H.—A. H. Bickmore & Company, New York, N. Y., recently offered at 97.22 per cent three-year 6 per cent convertible gold notes dated Oct. 1, 1913, of the Twin State Gas & Electric Company. These bonds are secured by deposit with the Union Trust Company, New York, N. Y., as trustee, of \$600,000 first and refunding mortgage 5 per cent bonds. The total authorized issue is \$1,000,000, of which \$500,000 is reserved for future issue—par \$100, \$500 and \$1,000.

Underground Electric Railways, Ltd., London, Eng.—The London stock exchange has listed £76,000 of 4½ per cent bonds of 1933 of the Underground Electric Railways. This makes the total amount of this issue of bonds listed to date £1,806,000. There have also been listed 36,357 ordinary £10 shares fully paid of the London Electric Railway. Of this company there are already listed £3,173,670 of 4 per cent preferred shares and £4,191,106 of 4 per cent debenture stock.

United Gas & Electric Engineering Corporation, New York, N. Y.—The United Gas & Electric Engineering Corporation has been formed under the laws of New York, with an authorized capital stock of \$100,000, all of which has been purchased for cash, at par value, by the United Gas & Electric Corporation. The new corporation is organized to carry on a general consulting and contracting engineering business in all branches and will render such service as may be required by the subsidiary companies of the United Gas & Electric Corporation and the American Cities Company. The new corporation will also engage in the purchase of equipment, supplies and material of all kinds, and has taken over the entire business of the purchasing department of the United Gas & Electric Corporation and all of its contracts and obligations outstanding. The officers of the new corporation are: George Bullock, president; S. J. Dill, vice-president; J. S. Pevear, vice-president; B. F. Wood, chief engineer; Henry Morgan, secretary; H. J. Pritchard, treasurer; H. N. McConnell, commercial manager; F. G. Robinson, purchasing agent. The directors are George Bullock, S. R. Bertron, R. E. Griscom, J. S. Jenks, Jr., and John Gribbel.

United Railroads, San Francisco, Cal.—E. H. Rollins & Sons, Boston, Mass., are offering for sale \$193,000 of first mortgage 6 per cent gold bonds of the United Railroads. These bonds are dated Jan. 1, 1883, due Jan. 1, 1913, extended to Dec. 15, 1915, and callable at 101½ and accrued interest on any interest date. Being of an original closed

mortgage of \$3,000,000, of which \$1,800,000 were extended as above, they are secured by an absolute first mortgage on 36.3 miles of electric street railway in the heart of San Francisco.

York (Pa.) Railways.—The stockholders of the York Railways have authorized an issue of \$500,000 of one-year 5 per cent notes. The notes will be dated Feb. 2, 1914, and will be secured by the pledge of \$667,000 of first mortgage bonds of the company.

Dividends Declared

- Bay State Street Railway, Boston, Mass., 3 per cent, first preferred.
- Brooklyn (N. Y.) City Railroad, quarterly, 2 per cent.
- Montreal (Que.) Tramways, quarterly, 2½ per cent.
- New Hampshire Electric Railways, Haverhill, Mass., 2 per cent, preferred.
- New Orleans (La.) City Railroad, \$2.50, preferred; \$1 common.
- Ottawa (Ont.) Electric Railway, quarterly, 3 per cent; bonus, 3 per cent.
- Public Service Investment Company, Boston, Mass., quarterly, \$1.50, preferred; \$2, common.
- Puget Sound Traction, Light & Power Company, Seattle, Wash., quarterly, 1½ per cent, preferred; quarterly, 1 per cent, common.
- Rio de Janeiro Tramway Light & Power Company, Toronto, Ont., quarterly, 1¼ per cent.
- United Railways & Electric Company, Baltimore, Md., quarterly, 50 cents, common.
- United Traction Company, Pittsburgh, Pa., 2½ per cent, preferred.
- West Penn Traction Company, Pittsburgh, Pa., 1½ per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

ATLANTIC SHORE ELECTRIC RAILWAY, SANFORD, MAINE						
Period	Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus	
1m., Nov., '13	\$25,797	\$22,136	\$3,662	\$661	\$3,000	
1 " " '12	22,756	22,475	282	466	184	
CLEVELAND, PAINESVILLE & OHIO EASTERN, WILLOUGHBY, OHIO						
1m., Nov., '13	\$30,188	\$*18,016	\$12,171	\$10,483	\$1,688	
1 " " '12	30,862	*17,026	13,836	9,994	3,843	
11 " " '13	392,398	*212,250	180,148	114,683	65,465	
11 " " '12	370,526	*207,707	162,818	109,222	53,596	
CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY, CLEVELAND, OHIO						
1m., Nov., '13	\$98,490	\$*68,708	\$29,782	\$32,059	†\$2,277	
1 " " '12	100,446	*59,617	40,829	31,746	9,083	
11 " " '13	1,149,871	*696,580	453,292	348,843	104,449	
11 " " '12	1,086,456	*633,965	452,491	341,047	111,444	
DETROIT (MICH.), UNITED RAILWAY						
1m., Nov., '13	\$997,696	\$705,295	\$292,401	\$172,369	\$120,032	
1 " " '12	1,003,816	647,363	356,453	175,901	180,512	
11 " " '13	11,959,112	7,978,959	3,980,163	1,973,513	2,012,650	
11 " " '12	10,866,929	7,044,613	3,822,315	1,945,832	1,876,483	
JOPLIN & PITTSBURG RAILWAY, PITTSBURG, KAN.						
1m., Nov., '13	\$50,599	\$*30,024	\$20,575	\$12,542	\$8,033	
1 " " '12	47,488	*28,287	19,201	12,542	6,659	
12 " " '13	575,426	*346,055	229,371	150,500	78,871	
12 " " '12	528,126	*312,742	215,384	153,134	62,250	
LAKE SHORE ELECTRIC RAILWAY, CLEVELAND, OHIO.						
1m., Nov., '13	\$105,942	\$69,336	\$36,606	\$35,087	\$1,519	
1 " " '12	104,790	60,867	43,923	35,083	8,840	
11 " " '13	1,299,534	770,322	529,212	386,412	142,800	
11 " " '12	1,213,814	691,236	522,578	384,584	137,994	
NEW ORLEANS RAILWAY & LIGHT COMPANY, NEW ORLEANS, LA.						
1m., Nov., '13	\$607,588	\$293,839	\$313,749	\$207,827	\$105,922	
1 " " '12	587,776	281,379	306,397	188,610	117,787	
11 " " '13	6,284,881	3,289,886	2,994,995	2,238,177	756,819	
11 " " '12	6,036,279	3,123,218	2,913,061	2,044,060	869,001	
NEW YORK (N. Y.), RAILWAYS						
1m., Nov., '13	\$1,175,107	\$715,879	\$459,228	\$371,683	\$87,545	
1 " " '12	1,119,342	714,627	484,715	376,046	108,669	
11 " " '13	6,136,310	3,687,371	2,448,939	1,855,596	592,775	
11 " " '12	6,078,296	3,615,732	2,462,564	1,874,896	587,668	
NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO						
1m., Nov., '13	\$265,097	*\$184,001	\$81,095	\$49,373	\$31,723	
1 " " '12	239,141	*145,324	93,817	45,388	50,430	
11 " " '13	2,989,155	*1,829,359	1,159,797	511,533	648,264	
11 " " '12	2,736,157	*1,551,988	1,184,168	481,563	702,606	

*Includes taxes.
†Deficit.

Traffic and Transportation

A Word from the Brooklyn Rapid Transit Company to Its Patrons

The Brooklyn (N. Y.) Rapid Transit Company has reprinted and is distributing in its cars an advertisement which appeared in the Brooklyn daily papers of Dec. 31, headed "Brooklyn Rapid Transit Monopoly—Has the Process of Consolidation Hurt or Helped Brooklyn Transportation?" The company says that the first important movement toward the consolidation of railroads in Brooklyn began in 1893. It advanced materially in 1899 and was substantially completed early in 1913. The company has tabulated the fares between Park Row, Manhattan, and the principal outlying districts of the borough of Brooklyn and compared the fares in effect in 1893 with those in effect in 1913. The fares in 1893 to the points mentioned varied from 8 cents to 25 cents, whereas there is now a universal 5-cent fare to all of the places mentioned except to Coney Island, where the fare is 10 cents with a commutation fare of 5 cents during certain hours. The fare to Coney Island in 1893 was 25 cents. Perhaps the greatest flat reduction in fare has been from 21 cents between Manhattan and Jamaica in 1893 to 5 cents in 1913. The company emphasizes the fact that every one of the reductions in fare which it notes was made voluntarily by the company. Under the heading "Vast Growth of Free Transfers" comparisons are made between 1893, 1899, 1903 and 1913. The statement is made that in 1893 practically no transfers were issued. In 1899 the companies comprised in the Brooklyn Rapid Transit System issued 41,893,744 transfers, in 1903 69,411,386 transfers, and in 1913 151,316,687 transfers. The car mileage operated for each 100,000 of population in 1893 was 3,500,000, whereas in 1913 it was 4,100,000. In the meantime car capacity has increased more than 200 per cent on the surface lines and nearly 30 per cent on the elevated lines. In 1893 the longest distance passengers were carried by surface car for a 5-cent fare without change of cars was 6 miles, whereas in 1913 the distance was 10 miles. The average receipts per passenger declined from 4.87 cents in 1893 to 3.74 cents in 1913, a reduction of approximately 30 per cent. The fixed charges per passenger carried declined from 0.93 cent in 1893 to 0.86 cent in 1913. This is a reduction of a little more than 7 per cent in spite of the additional expenditure of more than \$55,000,000 for improvements and facilities. The taxes of the company to city, state and nation increased from \$406,603 in 1893 to \$1,750,083 in 1913, or approximately 330 per cent. The company concluded the advertisement as follows:

"Consolidation in Brooklyn's transportation history has undoubtedly been followed by reduced fares, better service, improved facilities and higher wages.

"It has been accomplished without increasing the burden of fixed charges. The principal acquisitions of new properties in 1899 were accomplished by an actual decrease of about \$20,000,000 in net capitalization and of more than \$600,000 a year in interest charges.

"Notwithstanding the expenditure of more than \$55,000,000, after consolidation, in additions and improvements, the portion of each fare which goes to fixed interest or rent for acquired lines is 7 per cent less than it was before consolidation.

"Railroad consolidation has saved the people of Brooklyn many millions.

"The successful working out of the problem of consolidation described in the above comparisons has supplied the credit and standing which have, in the year now ended, enabled the Brooklyn Rapid Transit Company to participate with the city in the largest development of municipal rapid transit known to history—have enabled this company not alone to pledge the contribution of \$60,000,000 of new capital, but to admit the city for forty-nine years to equal share in the growth of a great part of the system which conservative financing and careful administration have now, after many years, made profitable.

"When our part of the dual system is completed—with its still longer hauls for a nickel and its quicker and more comfortable service—then will come a crowning achievement to twenty years of effort for better transit, made pos-

sible only by unified control and management. Then combination will be harnessed to co-operation. This ought to be a strong and effective team.

"We are conscious of our shortcomings and of our failure fully to satisfy all our patrons—that, possibly, would be a goal unattainable. We may not be doing quite all we can. For such imperfect conditions as we are responsible we invite public and private criticism, and for such as we are not responsible for and are powerless to help without the co-operation of the city and our patrons we ask that co-operation.

"But we do say with pride that in no city has a unification of transportation facilities been accomplished more successfully than in Brooklyn—measured by the test of public service, by reduction in fares, by greater economy and efficiency in operation, by larger wages and more comfortable conditions for employees, and by conservative and honest financing.

"If this be monopoly, has it hurt or helped Brooklyn?"

Bay State Service Orders

The Public Service Commission of Massachusetts has issued a finding in which the petition of the Board of Aldermen of Fall River for improved waiting-room facilities is suspended prior to the installation of additional trackage in City Hall Square. The order states that the changes in track layout now under discussion between the city authorities and the Bay State Street Railway are likely to cause the removal of the present waiting room. Ample accommodations with sanitary conveniences are suggested by the board for installation by the company.

The commission has refused to require the company to grant all-day free transfer privileges at Merrimac Square, Lowell, to passengers to and from Collinsville. A 5-cent fare between Collinsville and the center of Lowell is now in force at all hours, and free transfers are granted workmen at night and morning in Merrimac Square. The board finds that on the Collinsville line the limits of the 5-cent fare during normal hours of the day extend from Merrimac Square to Lake View Park, Dracut, a distance of 5.21 miles, and that a longer ride for a 5-cent fare is given upon this line than upon any other line diverging from Merrimac Square. The board says:

"If the request of the petitioners should be granted, the commission could not, without discrimination, refuse a similar modification and extension of fare limits in a number of other communities adjacent to Lowell. Such a disturbance in the existing fare situation in and around Lowell would result in a substantial impairment of the company's revenue which the commission does not feel warranted in recommending at this time in view of the financial condition of the company and the necessity of further expenditures for the improvement of the roadbed and equipment upon various portions of the company's lines in order to enable them to furnish more satisfactory service and accommodations."

The board has denied the petition of the selectmen of Stoughton for the establishment of a 5-cent fare on the company's line between Stoughton and Center Street, Brockton. The regular fare is 10 cents, with free transfer privileges at the latter point. A commutation ticket covering the same transportation and good at all hours of the day is also issued at the rate of 71-7 cents per ride. The distance from Stoughton Center to Brockton Center is about 6 miles. Upon the commutation fare above mentioned free transfers are given which enable passengers to ride a maximum distance of about 12 miles upon a single ticket. In compliance with an order of the Board of Railroad Commissioners issued in 1901, a 5-cent fare for the benefit of workmen was established for morning and evening service between Stoughton and Center Street, Brockton, without transfer facilities. The board is of the opinion that the existing rates of fare, in view of the conditions in the case, and in comparison with other street railway fares in the State, are not unreasonable, and therefore makes no recommendation in favor of the petitioners. Regarding complaints of irregularity of service and inadequate accommodations on this line, the board points out that upon its recommendation an express service has been installed which tends to separate the local and the through traffic and affords better facilities for residents of Stoughton.

Increase in Traffic on Long Island.—Reports compiled by Long Island Railroad indicate that the number of commuters living on Long Island has increased more than 56 per cent during the last three years. Last year 215,419 sixty-trip monthly commutation tickets were sold as against 157,937 in 1910. The present population of Long Island is approximately 2,500,000, or about 25 per cent of the total population of New York State.

Massachusetts Trolley Freight Orders.—The Public Service Commission of Massachusetts has issued orders granting the Boston Elevated Railway and the Bay State Street Railway the right to transport express matter in Everett. These orders will enable a comprehensive service to be established throughout eastern Massachusetts as both companies now hold freight-carrying franchises for practically the entire territory occupied by their lines.

Finding Upon Medford Express Service.—The Massachusetts Public Service Commission has disapproved the establishment of an express passenger service between the Sullivan Square elevated terminal, Boston, and Medford Square as desired by petitioners residing in Winchester. The board points out that the existing express car facilities between Sullivan Square and Winter Hill, Somerville, as maintained in the rush hours by the Boston Elevated Railway, have improved transit conditions on the line in question and that the extension of express car operation to Medford Square would upset the balance which should be preserved between the interests of local and through passengers.

Concession to Suburban Residents at Kansas City.—The Metropolitan Street Railway, Kansas City, Mo., has filed with the Missouri Public Service Commission an agreement to establish the same service on the Fairmount park line in winter as in summer, and will begin the service Jan. 25. The fare will be 5 cents. Fairmount residents have in the past transferred at the park station, paying another fare. They contended that there should be through service at all times, and the company has acceded to the request, though probably at a loss during the winter months, when the park is closed. The company has also arranged to install service between Argentine, in Kansas City, Kan., and the stockyards, without transfers.

Stop Question Before Detroit Council.—The ordinance committee of the Council of Detroit has taken under advisement the proposal advanced by members of the Council to return to the far-side stop. At a hearing on Jan. 13 officials of the Detroit (Mich.) United Railway presented their reasons for favoring the near-side stop, which has been in effect since last June. They contend that the present stop makes for safer operation. Police Commissioner Gillespie, at whose instance the near-side stop was applied to Detroit, presented statistics which show a decrease in street accidents since the adoption of the near-side stop. None of the aldermen who have urged a return to the old stop was present. The present stop will probably be maintained.

"Safety First" Ideas Advanced in Timetable.—In the timetable of the New Midland Power & Traction Company, New Midland, Ohio, for December, 1913, is incorporated not only the time of the trains arriving at and leaving from the union depot at Cambridge, but lessons on "safety first" and the traffic rules of Cambridge. The company has experienced considerable trouble lately on account of careless driving and vehicles on the wrong side of the street, and one or two slight accidents have resulted. Owing to the large demand for the timetable it proved a very desirable advertising medium for the merchants and afforded the company an opportunity to attract the attention of drivers, children and other people to the "safety first" idea.

Transfer Hearing in Brooklyn.—On Jan. 9 a hearing was held before the Public Service Commission for the First District of New York in regard to the proposal of the Brooklyn Rapid Transit Company to install a universal system of transfers on its lines in Brooklyn. Mr. Chamberlain, attorney for the commission, reported that the inspectors of the commission would require two weeks' additional time to complete the work of mapping out the proposed system, and the hearing was therefore adjourned for two weeks until Jan. 23, when it will come up before the whole commission. According to the reports of inspectors

of the Public Service Commission, the Brooklyn Rapid Transit Company has consented to a complete interchange of transfers with the recently merged Coney Island & Brooklyn Railroad.

Lynn-Salem Fare Reduction Denied.—The Massachusetts Public Service Commission has denied the petition of the committee on transportation of the City Council of Salem for the establishment of a 5-cent fare between Salem and Lynn on the Bay State Street Railway. The petitioners claimed that the predecessors of the company promised reduced fares to Lynn and Boston as a result of the granting of a franchise for the construction of the present Highland Avenue line, and that the Bay State Street Railway is morally bound to observe such promises. The board points out that no reference to any such engagement on the part of the company appears in the grant of the location or in contemporaneous newspaper articles, and that no reason exists for reversing the adverse decision of the board upon this issue in 1909.

Operation of New York Road Ordered Suspended.—The Public Service Commission for the First District of New York has ordered the Manhattan & Queens Traction Corporation to suspend operations of its electric railway across the Queensboro Bridge and to Grand Street, Newtown, until the cars shall be placed in safe operating condition. The engineers of the commission reported the cars as unsafe to operate. The company operated eighteen cars, and the engineers' objections applied to seventeen of them. The order was to take effect at midnight on Jan. 9, but at the request of the company was extended until midnight on Jan. 11 on the condition that the commission would station an inspector on the line and that after midnight on Jan. 9 the company should not put in operation any car which was not approved by such inspector. The company has borrowed five cars and repaired three of its own and on Jan. 15 was operating with this equipment. It has new equipment under order.

Steam and Electric Traffic Interchange on the Coast.—The passenger department of the Southern Pacific Company announces that in order to take care of the traffic between Palo Alto, Los Altos and Los Gatos it has arranged with the Peninsular Railway, San José, Cal., for the interchange of traffic at Palo Alto and Los Gatos. The Peninsular Railway will make close connections at Palo Alto with as many steam-line trains to and from San Francisco, and in addition passengers will have the advantage of the other trains operating over the Peninsular Railway, their tickets being good on all the Peninsular Railway electric trains. The running time of the electric trains between Palo Alto and Los Gatos, utilizing the new line recently completed between Monte Vista and Congress Junction, will be approximately the same as that of the steam line. The Peninsular Railway serves the same communities as the steam line, the tracks of the two companies being parallel for a considerable distance.

Contribution to Convention Authorized by Court.—In the ELECTRIC RAILWAY JOURNAL of Jan. 10, 1914, page 103, mention was made of the Student Volunteer Convention held recently in Kansas City, Mo., and to the methods adopted by the Metropolitan Street Railway for handling the 5000 men in attendance at the convention, nearly all of whom were strangers in Kansas City. An interesting development in connection with the convention was the order made by Federal Judge William C. Hook authorizing the receivers of the Metropolitan Street Railway to contribute \$1,000 toward the expense budget fund collected by a committee of the convention. J. W. S. Peters, attorney, petitioned Judge Hook to make the order. In his opinion Judge Hook made it plain that the company is not a philanthropic institution. The judge said he would have refused the \$1,000 on the first request, but when the attorney had foresight enough to point out that the company would profit in fares paid by the delegates, he said he felt justified in authorizing the contribution.

Revision of Percentages for Suburban Traffic in Vancouver.—A report has been presented by the city auditors of Vancouver, B. C., to the Vancouver City Council on the system of fixing percentages paid by the British Columbia Electric Railway to the city for suburban traffic. The auditors found that the percentages due the city, as reported by the

company, on traffic within the old city limits and on traffic within the annexed districts, where nothing was paid for the use of streets, were correct, but objected to the system of calculating percentages for traffic on various lines beyond these areas. As a result of a conference with the city auditors, the officers of the company have agreed that the percentage in future shall be based on tests made every six months of the traffic on the several lines affected. Another question involved was in regard to settlers' tickets. During September, 1913, 243,240 of these tickets were used. The officers of the company declined to withdraw from their position that no percentage was due on this traffic, but expressed a willingness to pay \$1,200 a year on this account. The arrangement in both cases will extend from Jan. 1, 1914, to the expiration of the franchise in the city in 1919.

Interurban Development at Indianapolis.—In an article reviewing the effect that the construction of interurban railways has had on the development of Indianapolis, published in the Indianapolis *Star* of Dec. 31, 1913, these significant statements were made: "Interesting statistics were compiled last year showing just what the interurban railways have meant to Indianapolis. The statistics disclosed that the increase in trading population has been more than 6,000,000 persons, or 1700 per cent, from 1900, when the first interurban line entered the city, until the beginning of 1913. The population of Indianapolis in 1900 was 169,000 and in 1912 it had increased to 267,000. The trading population in Indianapolis was represented in 1900 by 377,761 visitors, or an average of 1035 a day. In 1912 this number had increased to 6,431,714, or an average of 17,573 a day. Out of the 17,573 passengers carried by the interurbans every day, one is theoretically counted twice, thus leaving one-half the total, or approximately 9000, to represent the average daily number of visitors. It is believed that final statistics will reveal that the record of 130,000 tons of freight handled in 1912 will be beaten by the 1913 records. Out of Indianapolis there are four long trunk lines, one running 130 miles to Goshen, with two limited trains in either direction each day; one 130 miles to Fort Wayne, with ten limited trains each way daily; one 117 miles to Louisville, with six limited trains each way daily, and one 110 miles to Dayton, with six limited trains each way daily. There are more than 2000 miles of interurban track in Indiana connecting with the Indianapolis Traction Terminal Station, Indianapolis."

The Denver Storm.—Reference has been made previously in the *ELECTRIC RAILWAY JOURNAL* to the efforts made by the Denver (Col.) City Tramway to combat the severe snow-storm of last December. The *Tramway Bulletin*, published in the interest of the employees of the company, contains in the issue for December, 1913, some very interesting facts in regard to the severity of the storm and the efforts of the company to maintain service. Snow began falling between 3 a. m. and 4 a. m. on Dec. 1, and stopped on Dec. 5 between 11 a. m. and 12 noon. There was, however, a short interval on Dec. 2 when snow ceased to fall. The total snowfall was 47.6 in. The storm was the worst in the history of the city, and on Dec. 4 the company was routed in its efforts to keep the lines open and the first complete tie-up in the history of the company occurred. Denver suffered a heavier precipitation than any other place on the eastern slope of the mountains. The *Bulletin* says: "Friday morning, shortly after midnight, there was a lull in the storm. An army of laborers was rushed out and snow flew for four blocks, but the storm began again with renewed fury and the men were forced to stop. In short order drifts had effaced what had been done. At 7 o'clock Friday morning, although the snow was still falling, a huge army of laborers started out on Fifteenth Street, the main artery of the system, and that night a 'jigger' service was started from the Central loop to Eighth and Broadway. Saturday morning, Dec. 6, J. A. Beeler, vice-president and general manager, ordered out a number of horse-drawn plows for breaking up the solid ice that held fast the rails. The result was that, in addition to the work that each division superintendent and track foreman had accomplished, Sixteenth Street, the 'in' track on Broadway to Fifth and both tracks on Colfax Avenue had been broken up and opened and regular service restored, as well as on Stout Street and the Berkeley line. In other words, the main arteries of the system were in service."

Personal Mention

Mr. C. F. Foley, recently appointed to the Kansas Public Utilities Commission, has been elected chairman of that body.

Mr. J. H. Humpe, formerly general manager of the Lincoln (Neb.) Traction Company, has been elected secretary of the company.

Mr. P. A. Worman has been elected secretary of the Dayton (Ohio) Street Railway to succeed Mr. Albert Emanuel.

Mr. F. H. Talbot has resigned as general superintendent and purchasing agent of the Interurban Railway & Terminal Company, Cincinnati, Ohio.

Mr. C. E. Carson has been appointed superintendent of the Fort Dodge, Des Moines & Southern Railroad, Boone, Ia., vice Mr. F. K. Shuff, assigned to other duties.

Mr. W. H. Ferguson has been elected president of the Lincoln (Neb.) Traction Company to succeed Mr. W. E. Sharp, who has been elected chairman of the board of directors.

Mr. S. W. C. Jones has been elected secretary and treasurer of the Danbury & Bethel Street Railway, Danbury, Conn., to succeed Mr. M. H. Griffing, who has also retired as a director of the company.

Mr. W. E. Sharp, who has been president of the Lincoln (Neb.) Traction Company for four years, has been elected chairman of the board of directors and chairman of the executive committee of the company.

Mr. W. W. Stephens has been made superintendent of employment of the Metropolitan Street Railway, Kansas City, Mo., and has been succeeded as chief timekeeper in the accounting department by Mr. B. W. Boright.

Mr. J. H. Harvey, formerly superintendent of employment of the Metropolitan Street Railway, Kansas City, Mo., has been placed in charge of the Forty-eighth and Harrison division of the company, vice Mr. D. L. Fennell, who has been made secretary to the general manager.

Mr. L. T. Ebbson, for five years supervisor of rolling stock for the Metropolitan Street Railway, Kansas City, Mo., has tendered his resignation to become connected with the Lincoln (Neb.) Traction Company as master mechanic. Mr. Ebbson was formerly connected with the Chicago (Ill.) Railways.

Mr. Eugene Hight has been appointed electrical engineer of the Illinois Traction System, Peoria, Ill., his duties embracing all properties. Mr. Hight has been in the operating engineering department of the company nearly three years. He was graduated from the University of Illinois and took a post-graduate course at that institution.

Mr. M. Ackerman, who has been general manager and purchasing agent of the Springfield & Xenia Railway, Springfield, Ohio, has been appointed general superintendent and local manager of the Interurban Railway & Terminal Company, Cincinnati, Ohio, the management of which property has been taken over by the Warren Bicknell Company, Cleveland.

Mr. C. W. Clark has resigned as superintendent, electrical engineer and purchasing agent of the Marion, Bluffton & Eastern Traction Company and the Bluffton, Geneva & Celina Traction Company, Bluffton, Ind., with which he has been connected since July 15, 1906. Mr. Clark will take charge of the Bluffton Electric Light & Water Works as general manager. He has been connected with interurban railway and electric light work since February, 1901.

Mr. Daniel L. Fennell, formerly superintendent of the Forty-eighth and Harrison division of the Metropolitan Street Railway, Kansas City, Mo., one of the most important of the road, has been made secretary to Mr. James E. Gibson, general manager. The office is a new one with the company. Mr. Fennell, in his new position, will have charge of much detail work which has heretofore been cared for by Mr. Gibson. The secretary will take care of advertising, complaints, information for other electric roads, relations with the American Electric Railway Association and traffic for special occasions.

Mr. Elmer M. White has just accepted the office of treasurer of the Binghamton (N. Y.) Railway. Mr. White has had long experience in electric railway work and for many years was secretary of the Street Railway Accountants' Association of America, the predecessor of the American Electric Railway Accountants' Association. His last connection with an electric railway was as auditor of the Coney Island & Brooklyn Railroad, Brooklyn, N. Y. He resigned this office in June, 1912, to become auditor of the Americana Company, publisher of the Americana Encyclopedia, a position which he is now resigning to re-enter railway service.

Mr. A. D. Mackie has been elected vice-president and general manager of the Springfield (Ill.) Consolidated Railway and the Springfield Gas & Electric Company and a director of the companies to succeed Mr. A. D. Furlong, whose appointment as general manager of the Saginaw-Bay City Railway and election as vice-president of the Saginaw & Flint Railway, Saginaw, Mich., was announced in the *ELECTRIC RAILWAY JOURNAL* of Jan. 3, 1914. Mr. Mackie has been connected with Hodenpyl, Hardy & Company, New York, N. Y., for the last two years as general sales manager of their gas and electric properties in Michigan, Indiana, Ohio and Illinois. Previous to that he was for eight years superintendent of new business for the Springfield and Peoria (Ill.) gas properties, and for ten years previous to that he was connected with the gas light companies in Detroit and Grand Rapids, Mich. This is Mr. Mackie's first direct connection with the railway end of the properties.

Mr. L. G. Rudd has been appointed superintendent of the East Lyme and Saybrook divisions of the Shore Line Electric Railway, with headquarters at Saybrook Junction, Conn. Mr. Rudd began his railroad career when he was twenty-three years old as a conductor on the New London (Conn.) Street Railway. He was with the company in that capacity for a period of seven years and was then made assistant superintendent, in which position he served for two years. He left the New London Street Railway in 1905 to become connected with the New London & East Lyme Street Railway as a conductor and express messenger, in which work he became familiar with multiple-unit operation. He was appointed superintendent of the East Lyme division of the New London & East Lyme Street Railway on May 1, 1908. On Dec. 15, 1913, he was appointed superintendent of the East Lyme and Saybrook divisions of the Shore Line Electric Railway, Norwich, Conn., leases the New London & East Lyme Street Railway.

Mr. George H. Harris has resigned as superintendent of the railway department of the Birmingham Railway, Light & Power Company, Birmingham, Ala., effective on Feb. 1. Mr. Harris is a graduate in civil engineering and was connected with the engineering departments of the Chattanooga, Rome & Columbia Railway; Briarfield, Blockton & Birmingham Railway; Southern Railway; Alabama, Georgia & Florida Railroad, and the Georgia, Midland & Gulf Railroad. He left the employ of the last-named company in 1890 to superintend the conversion of the Birmingham system from mule power to electricity. At the completion of the reconstruction he became master mechanic, in which capacity he served until about 1902, when the office of superintendent of traffic was created. Mr. Harris was chosen to fill that position and continued as superintendent of traffic until 1904, when he was appointed manager of the railway department of the company. His title was subsequently changed to superintendent of the railway department. Mr. Harris is a director of the Merchants' Savings Bank & Trust Company, Birmingham.

OBITUARY

H. L. Metcalf, who had been connected with the Pacific Electric Railway, Los Angeles, Cal., died at his home in South Pasadena on Dec. 24, 1913.

George F. Reed, whose appointment as manager of the Springfield (Mass.) Street Railway to succeed Mr. E. J. Dickson was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 13, 1913, died suddenly at his home in Springfield on Jan. 10. Mr. Reed was born in Cummington, Mass., on May 10, 1867. He entered the employ of the Springfield Street Railway in February, 1882, as a clerk.

Construction News

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

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

RECENT INCORPORATIONS

Kansas City Southwestern Electric Railway, Kansas City, Kan.—Application for a charter has been made by this company in Kansas to build an electric line between Olathe and Ottawa. W. B. Strang, incorporator. [E. R. J., Jan. 3, '14.]

***Gulf & Bay Railway, Stackhouse, N. C.**—Chartered in North Carolina to build a 10-mile electric or steam railway between Belva and Carmen. Capital stock, \$10,000 to \$50,000. Incorporators: A. G. Betts, D. M. Harshburger and B. Starbuck, Stackhouse, N. C.; W. N. Garrett, Hot Springs; Robert C. Lieb, Walnut, and W. B. Barnhisel, Dufur, Ore.

***Erie & Northern Ontario Railway, Bridgeburg, Ont.**—Application for a charter will be made by this company to the Dominion Parliament to build an electric railway from Port Maitland, on Lake Erie, to Smithville. Another line from Port Maitland to Port Colborne is also contemplated.

***Sewickley & Edgeworth Railway, Pittsburgh, Pa.**—Chartered in Pennsylvania to build a 2-mile electric railway in Allegheny County. Capital stock, \$12,000. Incorporators: William Walker, Lee, president; Henry Oliver, W. F. Lloyd, W. B. Carson and S. L. Tone, Pittsburgh.

***Kentucky, Rockcastle & Cumberland Railway, Cressmont, W. Va.**—Incorporated in Kentucky to build an electric or steam railway. Capital stock, \$200,000. Incorporators: Paul W. Scott, H. T. Lovett, R. B. Williams, H. H. Hannon, H. K. Eutsler, C. M. Brown and M. P. Wiswell.

FRANCHISES

Tuscaloosa, Ala.—The Birmingham-Tuscaloosa Railroad & Utilities Corporation has received a six months' extension of time on its franchise in which to complete its line in Tuscaloosa. This is part of a plan to build a 55-mile railway between Birmingham, Tuscaloosa and Bessemer. [E. R. J., Sept. 27, '13.]

Little Rock, Ark.—The Little Rock Railway & Electric Company has received a franchise from the Council in Little Rock.

Little Rock, Ark.—The Little Rock, Pine Bluff & Eastern Traction Company has received a franchise from the Council in Little Rock.

Clovis, Cal.—The Fresno & Clovis Interurban Railway has received a franchise from the Council on Fifth Street from the east city limits to the west city limits in Clovis. This 24-mile line will connect Fresno, Clovis and Academy. F. S. Granger, Clovis, president. [E. R. J., Dec. 27, '13.]

East St. Louis, Ill.—The East St. Louis Railway has asked the Council for a franchise on Main Street from Broadway to Missouri Avenue in East St. Louis.

***Hagerstown, Md.**—Henry A. Bester, Jr., and Clarence Keedy, representing the Washington County Traction Company, have received a franchise from the County Commissioners over 2 miles of county roads from the eastern limits of Hagerstown to Security.

Preston, Ont.—The Galt, Preston & Hespeler Railway has received a twenty-five-year franchise from the Council in Preston.

St. Thomas, Ont.—The London & Lake Erie Railway & Transportation Company has received permission to build an extension on Wellington Street in St. Thomas. Permission was also given the company to run the city's line on Wellington Street from Forest Avenue to connect with this extension.

Centralia, Wash.—The Washington-Oregon Corporation has received two franchises from the Lewis County Commissioners for several extensions in Centralia.

TRACK AND ROADWAY

Birmingham (Ala.) Interurban Railway.—Surveys have been completed between Hale Springs and Birmingham, 9 miles. This 14-mile line will connect Birmingham, Hale

Springs and the coal mines. Daniel P. Hale, Birmingham, is interested. [E. R. J., Nov. 8, '13.]

Birmingham Railway, Light & Power Company, Birmingham, Ala.—This company plans to spend \$1,300,000 for reconstruction and improvements of its lines during the year. The two extensions already planned are from Vinesville to Corey and from the Boyles line to Balsito.

Alabama City, Gadsden & Attalla Railway, Gadsden, Ala.—About 2 miles of new track will be built between Gadsden, Ala., and Noccalula Falls during the year.

North Alabama Traction Company, New Decatur, Ala.—About 2 miles of concrete paving will be laid along this company's line in New Decatur during 1914.

Lacombe & Blindman Valley Electric Railway, Lacombe, Alta.—Grading on 8 miles of this line has been completed and contracts for ties and rails are being awarded. This is part of a plan to build a 10-mile line from Lacombe to Gull Lake and thence to Rimbey, a total distance of 30 miles. J. C. Gibson, Toronto, is interested. Gasoline-electric cars will be operated. [E. R. J., Feb. 15, '13.]

Nelson (B. C.) Street Railway.—Plans are being considered for the betterment of existing lines and for the construction of several extensions in Nelson during the year.

British Columbia Electric Railway, Vancouver, B. C.—The new extension of the Hastings Street east line to the foot of Capitol Hill in North Burnaby has been placed in operation. A contract has been awarded by this company to R. Shields, Vancouver, B. C., to build an interlocking control tower, electrically controlled, at the crossing of the Esquimalt & Nanaimo Railway, on the Esquimalt Road, Victoria, B. C.

***Bakersfield, Cal.**—W. P. Early, Petaluma, and A. D. Bowen, San Francisco, are considering plans to build an electric line from Bakersfield to San Luis Obispo. Surveys will soon be made.

Geary Street Municipal Railway, San Francisco, Cal.—Contracts for materials for the construction and equipment of the new lines to be built by the city this year in San Francisco were awarded recently by the Board of Public Works as follows: the United States Steel Products Company, the contract for steel rails, rail joints, fastenings and rail spikes; the Payne Bolt Works, the contract for steel tie rods and nuts; the Eccles & Smith Company, the contract for tie plates, brace plates and rail braces, and the Caspar Lumber Company, redwood cross ties.

Sacramento Valley West Side Electric Railway, Willows, Cal.—Permission has been received by this company from the State Railroad Commission to construct the first unit of its line from Dixon south to a connection with the Oakland, Antioch & Eastern Railroad, a distance of 12½ miles. H. W. Manor, vice-president. [E. R. J., Jan. 10, '14.]

Baltimore & Washington Transit Company, Washington, D. C.—An extension at Takoma Park is being planned by this company.

Washington Railway & Electric Company, Washington, D. C.—It is planned to build 2.94 miles of new track in Washington during the year.

Milton, Fla.—H. S. Laird and associates are considering plans to build an electric railway in Milton and from Milton to Bagdad. [E. R. J., Sept. 27, '13.]

Covington & Oxford Street Railway, Covington, Ga.—A 2-mile extension will be built and the company's present lines in Covington will be relaid with 56-lb. rails during the year.

Valdosta (Ga.) Street Railway.—This company has awarded a contract to the West Construction Company, Chattanooga, Tenn., to rebuild its line on Patterson Street in Valdosta with 7-ft., 70-lb. rails.

Danville, Crescent & Kankakee Traction Company, Danville, Ill.—Right-of-way is being secured and plans are being made to begin construction in the spring on this line to connect Danville, Crescent City and Kankakee. John P. Pallissard, Watseka, Ill., is interested. [E. R. J., June 14, '13.]

***Johnson City, Ill.**—C. E. McClintock, Johnson City, is interested in a plan to organize a company to build an electric railway from New Orient Mine west of West Frankfort to Old Frankfort.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.—Plans are being considered for an extension to Morton Lake.

Charles City & Western Railway, Charles City, Ia.—Work will be begun early in the spring on the electrification of this line from Charles City to Marble Rock, 13 miles. It is planned to connect this railway with the Chicago Great Western Railroad.

North Louisiana Electric Railway, Shreveport, La.—For several months negotiations have been under way for the issue of \$3,500,000 worth of bonds by this company, which plans to build a line between Shreveport and Monroe via Ruston and Minden. It was announced recently by A. B. Blevins, promoter of the project, that the preliminaries for the underwriting of the bonds are completed and that construction will be begun in the spring. The surveys have been completed and the right-of-way secured for the entire line. [E. R. J., Jan. 10, '13.]

United Railways & Electric Company, Baltimore, Md.—Work has been begun on the Callow Avenue extension in Baltimore.

Washington County Traction Company, Hagerstown, Md.—Plans are being made to build a 2-mile electric railway from Hagerstown to Security. Power will be secured from the Hagerstown & Frederick Electric Railway Company's power house at Security. Henry A. Bester, Jr., and Clarence Keedy are interested. The promoters state that this new company will be entirely independent of the Hagerstown & Frederick Electric Railway.

Moncton Tramways, Electric & Gas Company, Moncton, N. B.—During the year between 6 and 8 miles of new track will be laid between Moncton, Sunny Brae and Louisville.

Public Service Railway, Newark, N. J.—This company is asked to extend its First Street line from the present terminus at North Avenue and Madison Avenue to the end of North Avenue in Elizabeth.

***Cloudercroft, N. M.**—J. M. Poss, Cloudercroft, and associates are considering plans to build an electric line between Cloudercroft and Artesia.

New York, Westchester & Boston Railway, New York, N. Y.—About 8.4 miles of new track will be built between Larchmont Junction, New Rochelle and Port Chester during the year.

Geneva, Seneca Falls & Auburn Railroad, Seneca Falls, N. Y.—Plans are being made to ask the Public Service Commission for authority to proceed with the extension between Seneca Falls, Cayuga and Auburn. The company will soon ask for franchises in the towns of Seneca Falls, Cayuga and Aurelius. Arrangements for a re-survey of the route from Seneca Falls to Bridgeport, across the lake, and from Cayuga to Auburn are under consideration.

Dan River Railway, King, N. C.—Plans are being considered to build a 30-mile line from King to Asbury. Gas-electric cars will be operated for passenger traffic and steam for freight. H. Miller, Clements, N. C., is interested. [E. R. J., Jan. 3, '13.]

Okmulgee (Okla.) Interurban Railway.—A 10-mile line will be built between Okmulgee and Henryetta during the year.

Sapulpa & Interurban Railway, Sapulpa, Okla.—About 1 mile of new track will be built during the year in Sapulpa.

Berlin & Northern Railway, Berlin, Ont.—An extension from the company's present line at Bridgeport into the country will be built during the year.

Berlin & Waterloo Street Railway, Berlin, Ont.—About 2600 ft. of double track, concrete foundation and new steel, on the line from Wellington Street to Union Street in Berlin has been laid. It is proposed to build about ½ mile of concrete foundation on the line from King Street to the Grand Trunk Railway station in the spring. The work will be done by the City Council.

Guelph (Ont.) Radial Railway.—The city of Guelph has voted money to provide for extensions to this municipally owned railway in Guelph.

Hamilton (Ont.) Street Railway.—It is planned to build 4.5 miles of new double track during the year.

***London, Ont.**—As a result of two resolutions passed at the last session of the Middlesex County Council, the Hydro-Electric Power Commission of Ontario will be petitioned to conduct surveys and supply estimates of cost of construction on two electric radial lines within the county. One proposed line is from London to Stratford via St. Marys, and the other is from London to Grand Bend.

Ottawa (Ont.) Electric Railway.—The ratepayers of Eastview, Ont., will vote on a by-law providing for the extension of this line into Eastview and for granting a bonus of \$25,000 therefor.

Ottawa & St. Lawrence Electric Railway, Ottawa, Ont.—Work will be begun in the spring on the Ottawa-Morrisburg section of this railway. It is stated that a private right-of-way will be secured in Ottawa. [E. R. J., Sept. 20, '13.]

Toronto & Eastern Railway, Toronto, Ont.—It is reported that grading has been completed and track-laying well advanced on the line from Bowmanville to Pickering via Whitby. It is expected to have this line ready for operation early in the spring.

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—Plans are under construction to rebuild about 1 mile of the Windsor-Amherstburg line, eliminating several of the curves.

Berwick & Nescopeck Street Railway, Berwick, Pa.—A 2-mile extension will be built from Berwick to West Berwick and North Berwick during the year.

Bloomsburg, Millville & Northern Railway, Bloomsburg, Pa.—An 8-mile extension between Millville and Bloomsburg will be built during the year.

Corry & Columbus Street Railway, Corry, Pa.—About 6 miles of new track will be laid between Columbus, Pa., and Clymer, N. Y., during the year.

Ephrata & Lebanon Street Railway, Lebanon, Pa.—Grading has been begun on the section of this line between Hopeland and Schaefferstown. Track has been laid 6 miles beyond Lebanon.

***Sewickley & Edgeworth Railway, Pittsburgh, Pa.**—This company, the incorporation of which is given elsewhere in this issue, plans to build an electric railway to connect the Coraopolis terminal of the Pittsburgh Railways with the electric line at Leetsdale, thus establishing a continuous electric line between Pittsburgh and all important points in Ohio and Indiana. Henry Oliver, Pittsburgh, is interested.

Hull (Que.) Electric Company.—The double-track extension from Rivermead to the Jockey Club, at Connaught Park, has been placed in operation.

Montreal & Southern Counties Railway, Montreal, Que.—The bonding and other work on the roadbed on the extension from Marieville to St. Césaire, 9 miles, has been completed. Construction will continue all winter on the bridge across the Yamaska River, east of St. Césaire, which it is expected to have completed in the spring.

Northwestern Electric Railway, Easley, S. C.—Plans are being made to build a 150-mile electric railway from Easley to Augusta via Anderson, Abbeville, McCormick and Edgefield. Capital stock authorized, \$100,000 to \$2,000,000. Incorporators: James E. Leach and W. C. Smith, Easley; A. S. Farmer and J. H. Anderson, Anderson; S. J. Wakefield and A. M. Erwin, Antreville; W. P. Calhoun and O. P. Bright, Edgefield, and W. N. Graydon, Abbeville, S. C. [E. R. J., Jan. 10, '13.]

Jackson Railway & Light Company, Jackson, Tenn.—About 2 miles of new track will be built in Jackson during the year.

Memphis (Tenn.) Street Railway.—Work has been begun on Third Street for a loop line via Poplar Avenue to Front Street in Memphis.

Tennessee & Kentucky Railroad, Nashville, Tenn.—This company has changed its name to the Tennessee & Kentucky Interurban Railroad. The capital stock has been increased from \$10,000 to \$15,000. It is planned to build a line from Nashville to Goodlettsville, thence to Cross Plains, Orinda and Lamont to Adairsville. The charter also granted permission to operate a branch line from the

most feasible point along the route to Springfield, Tenn., and Franklin, Ky. [E. R. J., Jan. 10, '14.]

Salt Lake & Ogden Railway, Salt Lake City, Utah.—During the next few weeks this company will award contracts to build 3 miles of additional double track, 1 mile of paved track and miscellaneous trackage to reach the new city terminal and new freight yards in Salt Lake City.

Blaine-Lynden Electric Railway, Blaine, Wash.—Right-of-way is being secured for this line between Blaine and Lynden. John J. Pinckney is interested. [E. R. J., Jan. 3, '14.]

Washington-Oregon Corporation, Vancouver, Wash.—Plans are being considered by this company for two extensions from a point on the present line of the company ½ mile south of Centralia. One will extend west to connect with a line down Washington Avenue and the other north from the same point on Grand Avenue to connect with a proposed line on Gold Street in Centralia. These two lines will connect with the lines of the Puget Sound & Willapa Harbor Railway now being built through Centralia.

Appalachian Power Company, Bluefield, W. Va.—During the next four months this company will award contracts to build about ½ mile of new track.

SHOPS AND BUILDINGS

Tampa (Fla.) Electric Company.—The new office building at Tampa Street and Cass Street in Tampa has been completed.

Bay State Street Railway, Boston, Mass.—A new carhouse is being built on Bridge Street in Salem. The structure will be 300 x 200 ft. and of brick and concrete construction, and will have eleven tracks extending the length of the building.

Dover, Somerset & Rochester Street Railway, Dover, N. H.—This company is asked to consider plans to build a new depot at Sawyer Bridge in Dover.

Windsor, Essex & Lake Shore Rapid Railway, Kingsville, Ont.—Preliminary arrangements are being made to build a new passenger station on Talbot Road, Maidstone, Ont.

Salt Lake & Utah Railway, Salt Lake City, Utah.—It has been decided to spend \$100,000 on the construction of joint carhouses for the use of this company and the Salt Lake & Ogden Railway in Salt Lake City.

POWER HOUSES AND SUBSTATIONS

New York, New Haven & Hartford Railroad, Stamford, Conn.—It is reported that this company plans to build a new transforming plant in Bridgeport and use power generated at its Cos Cob plant to supplement the power generated locally in Bridgeport for the operation of the Bridgeport lines of the Connecticut Company, which it controls.

Bay State Street Railway, Boston, Mass.—An addition is being built to the power plant on Mason Street in Salem to house a turbine which will double the capacity of the plant.

Water, Light & Transit Company, Carrollton, Mo.—An order has been placed by this company with the Allis-Chalmers Company for one 375-kw turbine unit with condenser, one 200-kw belted generator, one 200-hp synchronous motor and an eight-panel switchboard. It expects to purchase soon steam pipe, valves, separators and traps.

Halifax (N. S.) Electric Tramway.—It is reported that a 500-kw motor generator set and other equipment for the company's generating plant is being installed in the power house at Halifax, N. S., by the Canadian General Electric Company.

Hull (Que.) Electric Company.—This company has ordered two 800-kw transformers for its plant at Deschenes, Que., from the Canadian General Electric Company.

Moose Jaw (Sask.) Electric Railway.—This company has recently added a 500-hp Mirrless-Diesel engine and generating plant to its power house in Moose Jaw and has just placed another order for an exactly similar unit.

Austin (Tex.) Street Railway.—This company has purchased a geared turbine unit of 750-kw capacity to be installed in the power house in Austin.

Manufactures and Supplies

ROLLING STOCK

Columbus Street Railway & Light Company, Columbus, Ind., has installed five new cars.

Houston (Tex.) Electric Company expects to purchase ten new double-truck cars during 1914.

Toledo Railways & Light Company, Toledo, Ohio, is rebuilding a number of its interurban and city cars.

Charleston-Isle of Palms Traction Company, Charleston, S. C., expects to purchase additional passenger cars.

Conestoga Traction Company, Lancaster, Pa., has ordered two 28-ft. pay-within car bodies and one 33-ft. 4-in. car body from the Cincinnati Car Company.

Port Arthur (Ont.) Electric Railway has ordered one 21-ft., single-truck, semi-convertible, pay-as-you-enter car body from the Ottawa Car Manufacturing Company.

British Columbia Electric Railway, Vancouver, B. C., has received four single-end, double-truck city cars, with Westinghouse 101-B2 equipment and Westinghouse straight air brakes, from the Preston Car & Coach Company.

Geary Street Municipal Railway, San Francisco, Cal., has ordered 100 car bodies from the Jewett Car Company, to be equipped with Baldwin trucks, Westinghouse motor equipment and Westinghouse air-brake equipment.

Saskatoon (Sask.) Municipal Railway has received six double-end, double-truck, pay-as-you-enter city cars, mounted on standard trucks, with Westinghouse 101-B2 equipment and Westinghouse straight air brakes, from the Preston Car & Coach Company.

Binghamton (N. Y.) Railway has recently had constructed by the Jones Car Company, Troy, N. Y., a new sample car fashioned after the cars of the Third Avenue Railway, New York, N. Y. This is a semi-convertible car with cross-seats, and it is probable that a number of cars of this type will be ordered by the company in the near future.

Illinois Traction System, Peoria, Ill., has ordered thirty-five 50-ton hopper bottom coal cars from Haskell & Barker and one interurban car from the St. Louis Car Company to replace one recently burned which had just been placed in service. The Decatur shops of this road have just completed building six large all-steel locomotives, similar to those built by them about three years ago.

Guelph (Ont.) Radial Railway has ordered two 46-ft., double-end semi-convertible, pay-as-you-enter cars from the Preston Car & Coach Company, equipped as follows: Nichols-Lintern sanders, Providence fenders, Peter Smith electric forced-air heating, Hunter illuminated signs, Westinghouse 101-B2 quadruple motor equipment and straight-air brakes. These cars are to be delivered in March.

TRADE NOTES

Galena Signal Oil Company, Franklin, Pa., held its annual meeting recently, at which J. C. Sibley and H. M. Tilford resigned as directors, leaving two vacancies on the board.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has appointed John R. McCune a director succeeding James S. Kuhn, and Paul D. Cravath succeeding the late A. N. Brady. One vacancy exists, caused by the resignation of T. W. Lamont of J. P. Morgan & Company.

H. M. Byllesby & Company, Chicago, Ill., have appointed George F. Maddock as manager of their examinations and reports department. Mr. Maddock, who succeeds Mr. Harold Almert, resigned, effective Jan. 1, 1914, has been the engineering representative of this company on the Pacific coast for a number of years, residing at Berkeley, Cal.

Charles N. Wood Company, Boston, Mass., has installed twenty trolley contact signals on the Bangor Railway & Electric Company, Bangor, Me. This item corrects a typographical error in a statistical column of block signal installations, which appeared in the ELECTRIC RAILWAY JOURNAL of Jan. 3, 1914, and which erroneously stated the installation to include only twelve signals.

William B. Scaife & Sons Company, Pittsburgh, Pa., manufacturer of the We-fu-go and Scaife systems of water purification, reports that its patent No. 775,901 has just

been upheld, with the exception of one claim, by the Court of Appeals of the Sixth Circuit Court, sitting at Cincinnati. The principal feature of this patent is a continuous-flow water-purifying system having the overflow sand filters in multiple.

Universal Safety Tread Company, Boston, Mass., received an order to equip with safety treads the 100 cars which were recently ordered by the Chicago City Railway. The American Abrasive Metals Company received an order for Feralun treads for the platform only on the folding door side of these cars. The above item is a correction of a previous correcting trade note which appeared in the ELECTRIC RAILWAY JOURNAL of Jan. 3, 1914, and which, owing to a misunderstanding, did not include the Universal Safety Tread Company in the order.

Laconia Car Company, Boston, Mass., has appointed Peter M. Kling assistant to the president. Mr. Kling will make his headquarters at the works at Laconia, N. H. He was formerly vice-president and general manager of the St. Louis Car Company for a number of years, and then acted in the same capacity with the John Stephenson Company until that company was sold to The J. G. Brill Company. He then went with the Pressed Steel Car Company where he was for several years manager of its passenger car department, which he organized, and in this position he had charge of the building of all steel passenger cars. For the past year he has been connected with the Brooklyn Rapid Transit Company.

Buckeye Engine Company, Salem, Ohio, has inaugurated a novel bonding system in connection with the sale of its product. When a salesman has a customer for a complete power unit or a Buckeye-mobile of a given size for belted or direct-connected service, before he settles the contract, an analysis is made of the calorific value of the fuel to be used. As a result of over a year's continuous test under various conditions with various grades of fuel, the company has considered it safe to make a guarantee of a normal specified amount of fuel per brake-horse-power, per indicated horse-power or per kilowatt. A guarantee, therefore, is embodied in the contract with regard to the fuel consumption, and the contract is returned to the general office of the company for approval. If it is acceptable to the company, the Fidelity & Casualty Company of New York is then asked to issue to the customer a \$10,000 bond containing a forfeiture and bonus clause. The bond calls for a forfeiture of \$1,000 for every 1/10 lb. of coal required per indicated horse-power per hour in excess of the guarantee, provided that in no case the amount of the forfeiture shall exceed the purchase price. For the sake of legality, an opposing condition is made fixing a bonus so that the purchaser must pay to the company in addition to the purchase price \$100 for every 1/10 lb. of coal per indicated horse-power per hour required less than that called for by the guarantee. If there is a forfeiture or bonus allowance to be made, it is deducted from or added to the original purchase price, and the terms of payment specified in the contract then prevail. The question of satisfying the guarantee is decided by a witness test. The machine is tested under steam at the regular working pressure at the plant of the Buckeye Engine Company in Salem in the presence of the purchaser or his accredited representative within — days from the company's notice that the unit is ready for testing. No charge is made to the customer for the expense of the test. The contract provides that this demonstration shall constitute the purchaser's acceptance of the unit with respect to the economy statement if the results are within 5 per cent of the guarantee contained in the contract.

ADVERTISING LITERATURE

Edward J. Hunt, Newark, N. J., has issued a catalog describing his transformer oil driers and purifiers. A photograph is shown of a 20-gal.-per-minute press. One passage of oil through this press is sufficient to raise the dielectric strength of oil to a value of 50,000 volts or 60,000 volts. The catalog also describes 50,000-volt oil-testing transformer sets, rated sixty cycles, 2 kva, 100-200 volts low tension, 50,000 volts high tension, with variable resistance, circuit breaker, oil-testing gap, pilot lamps, main switch and voltmeter for reading the high-tension voltage direct.