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A NOVEL TYPE OF PROTECTED THIRD-RAIL

Through the courtesy of H. M. Hobart we are able to give our readers some interesting details of the novel third-rail installation described in the issue of this paper for July 24, 1915, page 154. This electrification is about ready for operation. Drawings of the rail and contact shoe are printed elsewhere in this issue. In examining these drawings and the pictures given in the earlier article one is inclined to believe that under climatic conditions existing in this country there would be difficulty at times with this scheme due to the collection of ice in the slot. It would also appear to be troublesome to maintain a good contact area between the shoe and the rail with the side-contact scheme owing to sidewise motion of the trucks. On the other hand, it must be remembered that the designer of this novel rail is an experienced steam railroad operating man, and its novel features have been adopted in the light of his expert knowledge of existing electrifications. In this country the tendency has been to use rail sections of a girder shape and often standard sections for the contact rail. A form as unusual as that adopted for the Manchester-Bury section of the Lancashire & Yorkshire Railway would be considered quite radical here from the rolling mill standpoint. All of which goes to prove, as we have contended before, that heavy electrification is in process of flux and experimentation, and each new project involves elements of novelty.

THE ATLANTIC CITY RECEIVERSHIP

The expected has happened in Atlantic City, and the Atlantic City & Shore Railroad Company, which operates the local electric railway system in that city as well as the interurban line to Ocean City, has passed into the hands of a receiver as a result of unregulated jitney competition in that city. Atlantic City is under the commission form of government, but if the purpose of this form of government is to bring greater intelligence to bear upon the problems of city government or administration, it has lamentably failed in this case. We cannot imagine any more specious form of reasoning than that put forth by the commissioners to excuse their failure to adopt a proposed regulatory ordinance covering jitneys, indorsed by a committee representing the Chamber of Commerce, the Hotel Men's Association and the Rotary Club of Atlantic City. The explanation is so unique that we cannot refrain from quoting from it. It says, in part: "That the trolley company has been losing money heavily since the advent of the jitney there can be no doubt, but the company is

simply facing a condition that has confronted every means of transportation since history began. * * * The commissioners cannot be expected nor called upon to protect the dividends of the trolley company any more than the profits of the individual jitneys. Both are lawful enterprises, and it is for them to work out the problem of competition." The commission then goes on to compare the competition between the newer jitney and the older electric car with that of modern means of transportation and the oxcart, that between the transcontinental steam lines and the Rocky Mountain stage coach, and that between the sail boat and the steam boat. "And so," the commission continues, "this present problem of competition between the jitneys and the trolleys will work out in time, although it may seem a hard one just now."

THE JITNEY NO IMPROVEMENT

If the jitney represented a real improvement in methods of transportation there would be an excuse for the action of the commissioners. But the jitneys are not doing the work of the electric cars in Atlantic City, and they never can. At present they are giving in the heart of the territory a service which is practically subsidized at the expense of the electric railway company. Until the jitneys have demonstrated that they can supplant the electric car in all of its service, or in the greater part of it, on the same basis of operation as regards schedules, continuity of service, responsibility, the comfort and safety of passengers and taxation, they cannot be considered a substitute for it. That the city could do without the trolley line entirely, the commissioners admit, is inconceivable. Incidentally it develops that last year the Atlantic City & Shore Railroad paid \$38,000 taxes to the city, made up of a license fee of \$50 per car and about \$34,000 as a real estate and personal tax. In addition, when Atlantic Avenue, the principal street of the city, was paved, the railway company, besides paving between its rails and for 2 ft. outside at a cost of about \$300,000, paid to the city \$150,000 toward paving the balance of the street, and since then it has paid \$5,000 annually for the use of the street. The proposed license fee of \$50 per jitney would certainly not equalize the taxation burden, and the request of the citizens' committee, rejected by the commissioners, that every jitney owner should file a bond of \$2,500 for the proper performance of the obligations and to indemnify the public in case of injury, is certainly a very moderate requirement when compared with the responsibility to which the trolley company is held.

THE AUTOMATIC RAILWAY SUBSTATION

While the automatic substation was fully described in a paper presented before the A. I. E. E. at the San Francisco meeting held in September, the crowded condition of the program of that meeting and the relatively small attendance of electric railway men precluded adequate discussion. In order that the interesting proposition, which had had a commercial trial on a small scale, might be brought to the attention of the electric railways, the *ELECTRIC RAILWAY JOURNAL* abstracted the paper fully in the issue for Sept. 18 and interested itself in bringing out some discussion. This undoubtedly contributed in a measure to the reception that the presentation of a somewhat similar paper enjoyed at the recent C. E. R. A. meeting, at which real interest on the part of railway operating men was manifested. The general attitude toward the plan was naturally and properly critical while at the same time hospitable. Objections were of two kinds, technical and economic. As far as the former are concerned we have no doubt that they can be overcome as they materialize. The vital question is economic: Under what conditions, if any, will automatic substations yield a substantial profit? The claims made for them along this line are such as to command attention, but railway men have done so much pioneering that they are necessarily more wary of innovations than they were when money was more plentiful. We believe that most companies will wait until there are more data from actual installations of this kind before changing over their own distribution systems.

THE CHICAGO REPORT ON ELECTRIFICATION

If the recommendations of the committee on smoke abatement and terminal electrification of the Chicago Association of Commerce are followed there will be no general electrification of the steam railway terminals there in the near future. The complete report was not available at the time of going to press with this issue, and the official abstracts given out were presumably prepared primarily for the daily press and so rather fragmentary and quite incomplete so far as many of the matters of engineering interest are concerned. But sufficient data are contained in them to indicate that, while the engineering difficulties of electrification are considered surmountable the conclusion is otherwise with regard to the financial ones. No comment on the technical features of the report is possible until fuller data come to hand, but the following points are clear: First, justification for a general enforced terminal electrification cannot be found on the basis of the smoke nuisance, because there are worse offenders than steam locomotives in this regard. Second, the individual requirements and possibilities of the different roads are so great that the enforcement of a general scheme would work many hardships. Third, there is no reason why individual roads should not electrify as congestion and economy dictate, and the selection of a general electrification system which would be acceptable to all roads which might at some time voluntarily electrify is highly desirable. We admit that

the amount estimated by the committee as the cost of the entire work, namely, \$274,440,620, is a large sum for the roads to raise at this time, but until the complete report is available to explain the basis for the figure comment is idle. It will also be interesting to learn from the report itself the reasons which induced the committee to decide that the single-phase system is best.

SINGLE-PHASE MAINTENANCE COSTS

The seven years' experience of the Chicago, Lake Shore & South Bend Railway with single-phase equipment in eliminating the inherent weaknesses in a new system illustrates the benefit of co-operation between user and manufacturer. In an article published in the issue of the *ELECTRIC RAILWAY JOURNAL* for Nov. 6, 1915, page 940, data were given to show that maintenance costs have now been brought down to about 2½ cents per car-mile, a very creditable figure, especially when the weight of the cars is considered. How this was done is described in the present issue.

When it was built this road was said to be the heaviest and highest-speed interurban electric railway in the country, if not in the world. A very substantial type of construction was employed with a view to giving reliable service under severe operating conditions, including a liberal use of trailers. A quality of performance was therefore expected of the novel a.c. equipment under conditions that would have been severe for the standard d.c. equipment of 1908. In justice to the a.c. motor it is well to remember that the a.c. motor designed years ago now finds itself in competition with a type of d.c. motor which did not then exist, the high-voltage, commutating-pole motor. The single-phase motor was one solution of the problem of reducing power transmission cost while maintaining high transmission efficiency. It was a radical solution involving the speedy commercialization of a theoretically simple but practically complicated design. The difficulties were transferred from the transmission system to the motor. These difficulties have been gradually brought under control, as is reflected in the maintenance costs, until, as in the C., L. S. & S. B. Railway, the costs are comparable with similar ones for d.c. equipment. In motors of later design, such as are used on the New York, Westchester & Boston Railway, the maintenance cost is still lower.

In the meantime, however, another solution of the same problem has been found in the beaten path of d.c. progress, and at present this one seems to be considered the more general solution for interurban lines, offering, as it does, a much simpler control when the interurban car passes upon the lower voltage d.c. circuit in the terminal cities. However the single-phase system must receive credit for a share in the commercializing of the commutating-pole principle which has made d.c. high voltage practicable. Because it was necessary to have compensating windings to neutralize the armature ampere-turns in the a.c. motor such windings were taken as a matter of course. The d.c. commutating pole, different in construction and for a somewhat different

purpose but similar in principle, became popular soon after.

To sum up the single-phase situation the following appear to be the salient features: In ten years the structural weaknesses have been eliminated from the compensated series motor; there is now substantial confidence in its reliability; the maintenance costs are reasonable; it finds itself under competitive conditions more difficult than those of a few years ago. The next step, as indicated in the Philadelphia-Paoli electrification, will be in the direction of weight and cost reduction.

ELECTRIC LOCOMOTIVE CAPACITY

The two most recent electric locomotives to be placed in service have been characterized by maximum tractive efforts, or drawbar pulls available for starting, that approximate 125,000 lb., exceeding by some 50 per cent all previously existing figures except for the largely experimental "triplex" type of steam locomotive. That this remarkable advance has been made in a single step makes pertinent the question as to whether electric locomotive hauling capacities are to continue to increase beyond this in accordance with the tendency displayed in the history of steam railroads, and if so, where the limit in locomotive size will be reached in case any such limit exists.

Apparently there is nothing that could hamper the electric locomotive designer in the production of larger and more powerful units should the demand for them exist. With the establishment of the principle of extending the locomotive along the track in a series of short, articulated units, all that is required for greater tractive effort is the addition of a few more pairs of driving wheels, the clearance limitations of height and width being no longer important since the way has been found to get motors of the requisite power for each articulated unit, or truck, within the vertical and transverse space that is allotted to it. The added weight of greater locomotive length would have, of course, an influence upon the bridges, but as regards the track there seems to be no need for special consideration, because past experience tends to show that it is only the long, rigid wheelbase, such as does not appear in the modern locomotive, that is productive of damage. The existing wheel loads are, perhaps, somewhat higher than desirable, but at that they are generally less than those of steam locomotives, and in any event they do not directly affect the possibility of lengthening the locomotive to get more power.

Beyond the question of physical dimensions, however, are limitations in connection with operation that can hardly fail to be felt in case the growth of electric locomotive capacity should continue. Foremost of these, perhaps, is the matter of drawbar strength. With a drawbar pull of 125,000 lb. the elastic limit (or point at which permanent set takes place) of even the new standard M. C. B. coupler is rather closely approached. This design, which was brought out in experimental form by the Master Car Builders' Association only three years ago, was intended to serve as a real universal

standard, presumably for many years to come. Its yield point was set by the designers at 175,000 lb. owing to the fact that a limit had to be placed somewhere upon the great size and weight of the parts, and it was considered that this figure should be ample for all normal conditions. It should be said, perhaps, that the coupler does not actually fail under the drawbar pull above mentioned, as the ultimate strength is some three times greater, but permanent set may always be expected to take place under pulls of more than 175,000 lb., and, of course, this is only the preliminary of a failure to operate or to hold properly.

A locomotive drawbar pull of 125,000 lb. matched against a physical strength of drawbar of 175,000 lb. is by no means unreasonable under static load, and under ordinary circumstances the "suddenly applied" load of theoretical mechanics due to uncushioned shocks is hardly a probability in a freight train, although it is a possibility that might occasionally produce the effect of an increase of, say, 50 per cent in the static drawbar pull. Therefore, in a train equipped throughout with couplers of the new standard type there should be no difficulty with locomotives even larger than the latest machines. This, however, is dependent upon a condition that can hardly obtain for years to come. The vast majority of couplers in use to-day are neither so heavy nor so scientifically designed as the new standard, and their strengths range downward at various figures materially less than the maximum herein mentioned. The cars thus equipped obviously cannot be changed over *en bloc*, and until the lighter couplers disappear (a matter practically dependent upon the life of the cars) there are bound to be some couplers in every train which will be hardly able to withstand even the static pull from the largest electric locomotives that are now operating. The possibility of trouble with still larger locomotives than these would be obvious.

It would seem, therefore, that there is at least one serious obstacle in the way of materially larger electric locomotives except, perhaps, under conditions such as on a coal or ore road where special equipment was used and where the number of interchange cars was at a minimum. In addition, there is the matter of train lengths on level divisions, where ordinary modern steam locomotives are able to haul loads of 5000 tons at high speed, and where the advantages of an electric locomotive of greatly increased power would be offset by difficulties in making up and handling the tonnage suitable for its full capacity.

To say that these obstacles are insurmountable would be somewhat daring in the present age of rapid change. Nevertheless they are sufficiently serious in the light of existing conditions to make a further material increase in electric locomotive capacity exceedingly doubtful. In fact, it is safe to say that, according to present experience, the limit of size for the individual unit may be set at a point but little, if any, beyond the figures that have already been established by the remarkable locomotives that have been designed for the electric installations on the Norfolk & Western and on the Chicago, Milwaukee & St. Paul Railway.

Reducing Maintenance Costs on a Single-Phase Railway

The Chicago, Lake Shore & South Bend Railway Has, by Close Study of Operating Conditions, Greatly Reduced Maintenance Costs—Details of Economies Developed Are Given in This Article

The Chicago, Lake Shore & South Bend Railway has had more than seven years of experience with the single-phase system. During this period the defects of the equipment, which were minor in character, have been eliminated. A general description of the road, with maintenance and operating data, was given in the issue of the *ELECTRIC RAILWAY JOURNAL* for Nov. 6, 1915, page 940. The present article takes up in detail the methods by which economies were achieved, with special reference to the collecting devices and to the results of a change in gear ratio.

PANTOGRAPH DEFECTS AND REMEDIES

Pantograph troubles have been more or less insignificant in their effect upon maintaining schedules. After five years of service, however, the No. 0000 copper contact wire became so badly worn that breaks occurred quite frequently, and these largely accounted for the damaged pantographs. During the year ended Dec. 31, 1913, seventy-four cases of pantograph trouble were recorded, but in the year following this the number was reduced to thirty-five. The reduction was largely due to the installation of the steel contact wire. About twenty-three breaks occurred in 1913, whereas in 1914 the substitution of the No. 0000 auxiliary steel contact wire entirely removed the cause of troubles arising from this source.

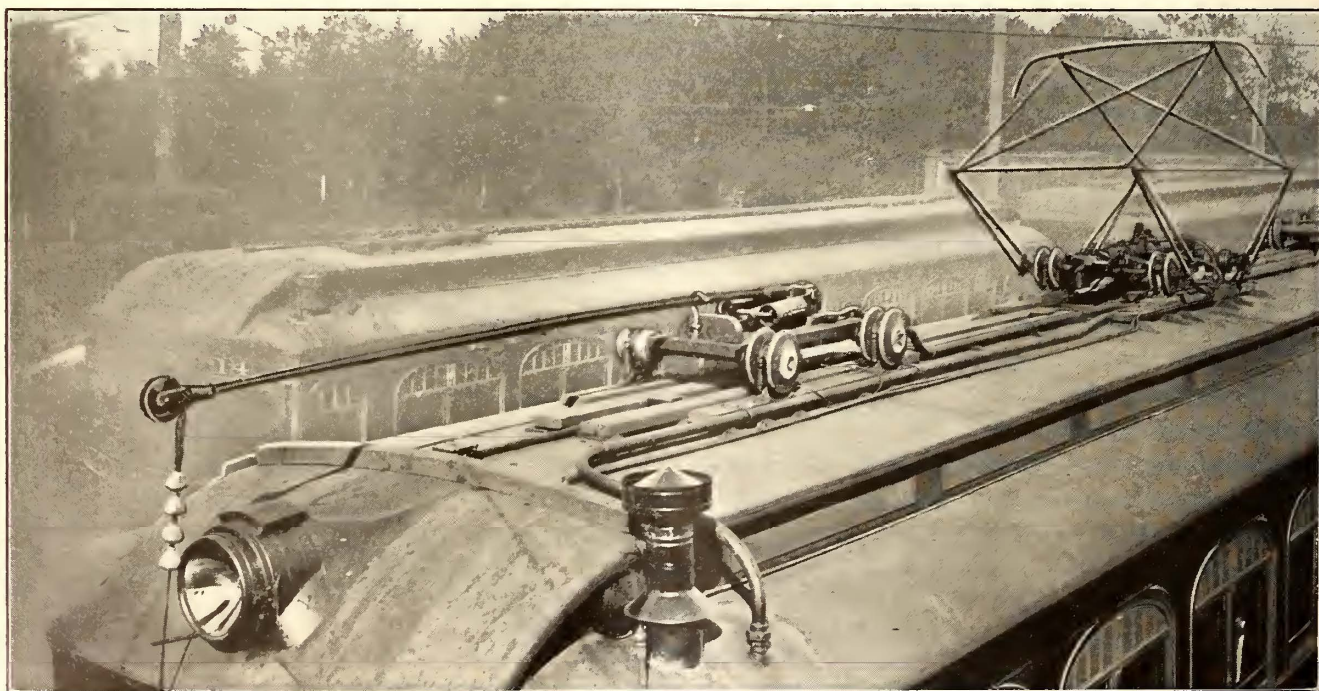
Following the change from a copper to a steel contact wire, excessive wear developed on the No. 12 gage galvanized-iron pantograph shoes, so that a life of only 2500 miles was obtained from them. To increase the mileage two sections of half-oval mild steel, $\frac{3}{8}$ in. x $\frac{1}{2}$ in., were substituted for the galvanized-iron pan. The cost of this type of shoe, including material and labor, was 45 cents. As the mileage was increased to 9000,

the cost with the new shoes was 5 cents per 1000 miles. One of these shoes, riveted and clinched to the 1-in. angle horns, is shown in an accompanying illustration.

Prior to adopting the $\frac{3}{8}$ -in. half-oval shoe $\frac{1}{4}$ -in. x $1\frac{1}{4}$ -in. half-oval mild steel was used for the horns. These horns were too light, for, as wear occurred, the edges tended to turn up and in some cases caught the trolley wire and damaged the pantographs. The trouble occurred particularly at section insulators, where the turned-up knife edges cut the composition runners. With the $\frac{3}{8}$ -in. shoe this difficulty was relieved, but excessive wear on the composition runners in the section insulators resulted and they became the weakest points in the line. A recent change to a composition known as "Micarta" has materially reduced the rate of wear and entirely eliminated the tendency to deteriorate and split. Deflectors of $\frac{1}{2}$ -in. round iron placed at the points where the contact wire branches to sidings, also prevented the pantographs from catching at these points.

Lubricated shoes have been tested to increase the life of pantograph shoes and reduce wear on the trolley wire, but were found to be of little value because grease would not remain on the contact strips sufficiently long to produce results. Tests were made with the galvanized-iron pan, and a groove was made in the pan to serve as a grease reservoir. At high temperatures during the summer months the grease melted and ran down on the car roof, marring its appearance and shortening the period during which the lubricant was of value.

Except at railroad crossings, the standard clearance between the top rail and trolley wire is 21 ft. This allows 9 ft. 5 in. between the car roof and the trolley wire, or the normal height of the pantograph in the raised position. The average pantograph pressure against the trolley wire is 10 lb., sufficient to provide good contact



SINGLE-PHASE MAINTENANCE—CAR ROOF WITH TROLLEY POLE AND PANTOGRAPH

at railroad crossings where the maximum contact-wire height obtains. At each inspection the contact shoe pressure at the standard height is tested with a spring balance.

All things considered pantograph mechanism defects have been relatively few and largely confined to the supporting porcelain insulators at the roof. Breakage of these insulators was attributed to various causes, the principal one being that insufficient creepage surface caused undue heating of the insulator and its ultimate deterioration. Hair-line cracks in these insulators were the first indication that deterioration had begun, and as a general rule the insulators failed under the surge created when the pantograph was raised to make contact with the trolley wire.

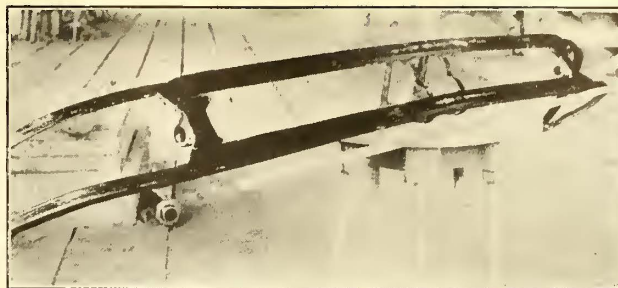
In the illustration on the preceding page the old and new types of insulators are shown. The small spool type was the original one used and the larger insulator with greater creepage surface was substituted for it. Changes in these insulators are being made as defects develop. In connection with the mounting of the pantograph, it is interesting to note that the car roof is covered with 16-oz. sheet copper grounded to the car-body bolster by copper cables. Under this an 8-oz. duck covering thoroughly painted was applied.

RESULTS OF REDUCING THE GEAR RATIO

Undoubtedly the discovery of a gear and a pinion of sufficient strength to withstand the enormous torques of 6600-volt, single-phase motors, as well as the adoption of the correct gear ratio has been of great importance in making this equipment a success. Unusually high speeds were required to meet competition and to furnish the character of service which would obtain the passenger business as well as develop the territory traversed. For a number of years it was deemed inadvisable to attempt to lower the gear ratio below 25:66, because it would entail a reduction in the scheduled speed. The inauguration of the Gary-Chicago service, however, necessitated a reduction in the gear ratio to 21:70 to permit the 500-hp. standard motor cars to pull two trailers. This change also required a reduction in the maximum scheduled speed from 58½ to 48 m.p.h. By a careful balancing of the schedules on the different sections of the line, the reduction in gear ratio has made changes in the time of only two trains.

This reduction in the gear ratio and the change from a standard tooth to a stub-tooth, bull-nose gear with a 16:53 ratio, the equivalent of 21:70, eliminated broken gears. This change largely accounted for the improved results obtained from the electrical equipment, which is quite clearly shown in the reduction in equipment failures from 282 in 1911 to 187 in 1915. During the year 1911 ten gear breaks were recorded, whereas during the year ended June 30, 1915, no breaks occurred. While the breaking of gears and pinions has never been such a serious factor as to diminish the reliability of the service, the result of the changes mentioned has been a profitable one.

The changes made in the types of gears used since the beginning of operation on this road were as follows: At first, standard cast-steel gears with spokes were employed, but the heavy duty required of them and the limited clearances with these large motors and trucks, made the use of heavier-gears of this material impossible. A solid-web, cast-steel gear was then substituted, but it failed principally from broken teeth. To eliminate the breaking of teeth a special gear having a cast-steel center and a tool-steel tire with stub-teeth was employed. However, the unusual temperature rise incident to single-phase motor operation and the difference in the coefficients of expansion of the two metals resulted in numerous tire breaks. Flexible gears with



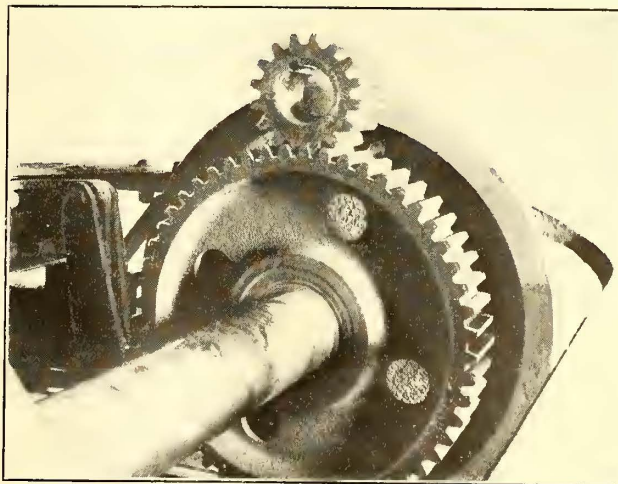
SINGLE-PHASE MAINTENANCE—PANTOGRAPH SHOE WITH HALF-OVAL CONTACT STRIPS

spring cushions were then tried, but the composite design with the limited clearances would not permit them to be made sufficiently strong. The next to the last step in solving the gear problem was the adoption of a gear and a pinion manufactured by the Tool Steel Gear & Pinion Company with standard teeth and a 25:66 ratio at 2½ pitch. While these gears and pinions stood the service without excessive breakage, the temperature rises in the single-phase motor due to rapid acceleration continued to cause some failures in the electrical equipment. To eliminate these and to obviate any chance of failure in the gear teeth, the gear ratio was reduced and a stub-tooth, bull-nose gear was adopted with the excellent results stated.

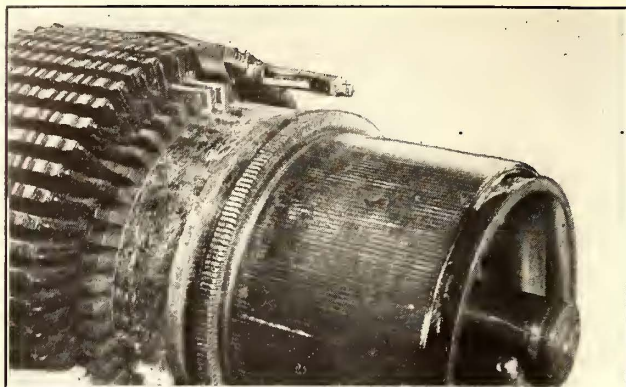
ELECTRICAL EQUIPMENT EXPERIENCE

One of the benefits derived from the reduction in gear ratio which lowered maximum temperatures was a constant diminution in number of motor failures, and of preventative coil and switch-group defects. Relatively few failures in the high-tension wiring on the cars were recorded before the change in gear ratio was made, and none have occurred since. The failures that did occur in the wiring were due to insufficient insulation of the lead-covered cables. This was overcome during 1913 and 1914 when the cars were entirely rewired with cable having a heavier insulation and no lead covering.

Commutator flashovers are exceptionally rare, only one commutator having been lost due to a ground in the eight years of operation. This result was largely attributed to the fact that all commutators were turned and slotted 3/32 in. deep whenever the armatures were brought into the shop. Some mechanical weaknesses developed in the original resistance coils which, when subjected to the severe vibration incident to service on this road, broke in the bend on the coil rest where the leads are brazed. Trouble at this point has been obviated by



SINGLE-PHASE MAINTENANCE—STUB-TOOTH GEAR AND PINION



SINGLE-PHASE MAINTENANCE—TIN CHANNELS AND END OF ARMATURE COIL WITH ASBESTOS TAPE

applying Monel metal tips as a substitute for the original German silver tips.

High temperatures in the resistance coils, combined with the sand-blast action caused insulation failures particularly at the points where the coils cross the air vents. This difficulty has been overcome by the use of a reinforcement between the coil rest and the spider, consisting of a tin trough and molded-mica insulation as a substitute for the fish paper originally used. The use of a tin trough across the air vent has not created any difficulties from eddy currents. Another improvement has been the substitution of $\frac{3}{4}$ -in. asbestos tape in place of linen tape. Whenever an armature is brought into the shop for new coils, the coils are reinsulated from the connection at the commutator to the bend on the coil rest.

In the original construction of the armatures the coils on the pinion end were covered with a brass flanged end bell, and those on the commutator end were covered with an asbestos hood. Under this hood the ends of the coils were covered with Bakelite cement. This cement also filled the openings between the coils and was intended to keep the coils from vibrating. A great deal of trouble was experienced with the loosening of the cement and the forcing out of the asbestos hood, which in turn caught on the brush-holders and was torn loose. On the pinion end, trouble with grounding of the coils on the end bells was also experienced. During the period of reconstruction of these armatures by the Westinghouse Electric & Manufacturing Company, the flanges were machined off of the end bells, the asbestos hoods were discarded and the ends of the coils were covered with $\frac{1}{8}$ in. of Bakelite cement, which was finally baked. This practice did not prove satisfactory because it resulted in the retention of the heat in the armature. Also when the armature was in service and extremely warm, the cement cracked and left openings between the coils, back of the neck of the commutator and at the end bell. Carbon dust from the brushes collected in this crevice where it could not be blown out. In course of time so much carbon dust would accumulate that it would cause short-circuits between the windings and result in an armature failure.

To overcome trouble from this source all of the cement was removed from both ends of the windings and from the crevice between the German silver and the copper windings. This lowered the temperatures of the armatures, at the same time permitting the ready detection of poor connections in the windings. However, the mechanical department was not entirely satisfied with the result, as the Bakelite cement between the German-silver leads would chip off and be thrown out by vibration and by the force due to the high armature speed. Small asbestos hoods were then placed between the leads

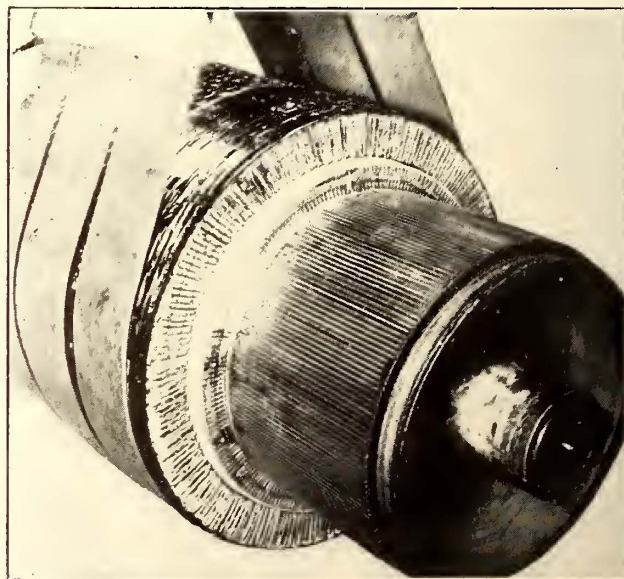
of the German-silver windings on the commutator end, and between the copper winding and the bell on the pinion end of the armature. All openings or crevices were again filled with Bakelite cement and baked thoroughly. Some of the armatures treated in this manner have been in service for the past year and are still in a perfect condition. Judging from the condition of these armatures it is the opinion of the master mechanic of the road that the hoods will last until the armatures need to be rewound. An armature fitted with these hoods is shown in the illustration below.

Other purely mechanical defects that developed under the service conditions included occasional breaks in the rigid connections on the brush-holder yokes. In the original motors this yoke was made of strap copper which frequently became annealed and broke under vibration. The substitution, two years ago, of standard motor cables with soldered terminals which clamped to the brush-holder supports eliminated this difficulty. Vibration also accounted for a number of broken brush-holder castings in the original motors. As shown in one of the accompanying illustrations, the break in holder usually occurred in the body casting which was improperly designed. Originally these brush-holders were of brass and made in one piece. In the new design the brush-holder proper was made with a cast-steel body and a detachable brass box which was bolted to the body casting with four stud bolts. When one of these holders becomes worn it is only necessary to renew the box, thereby saving practically one-third of the cost of replacement. Moreover, the detachable box, in many instances, is removed and restored to the correct dimensions in a press. The old and new brush-holders and the detachable box are shown in the illustration on page 1111.

Transformer difficulties have been exceedingly rare; in fact, only three transformers have failed in the last six years. These became defective when the support bolts loosened under vibration, allowing the case to open and permitting snow and water to enter. Since the roadbed has become seasoned and more thorough and regular inspections have been made, failures of this nature have entirely ceased.

BEARINGS

Thorough inspection followed by careful lubrication has made hot journal bearings a rare occurrence. The



SINGLE PHASE MAINTENANCE—COMMUTATOR END OF ARMATURE FITTED WITH ASBESTOS HOOD

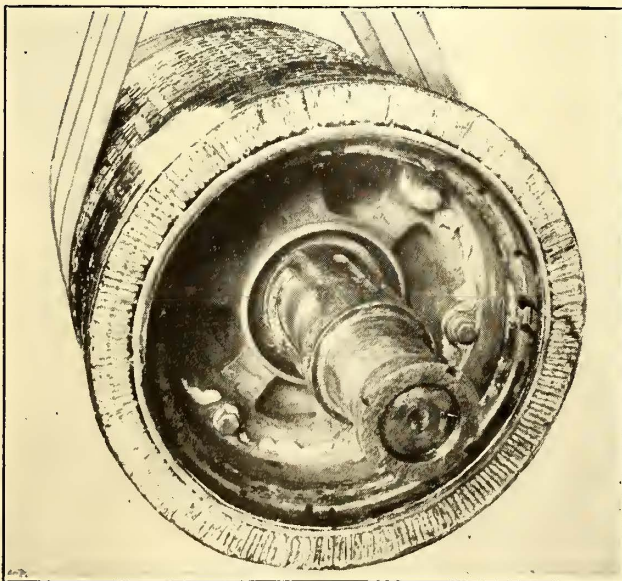
M. C. B. brass is standard, and a tendency to tilt due to braking and rapid acceleration has not been experienced. About four years ago the bronze motor-axle bearings were replaced by cast-steel babbitted shells and considerable saving was thus effected. The bronze bearings, which were not babbit-lined, cost at that time \$6.85 a pair. The steel bearings cost \$3.60 new, and during the four years have been rebabbitted twelve times. The cost of rebabbitting was 75 cents per pair, which reduced the cost per shell to \$1.05.

Other recent minor improvements to increase the life of equipment parts include the introduction of case-hardened, $\frac{1}{8}$ -in. chafing plates in the journal-box yokes. As these are renewable, wear on the truck frame proper at these points is eliminated. Similarly, $\frac{1}{8}$ -in. renewable plates in the brake-lever guides on the circle bars take all the wear and the life of the truck frame at these points is thus prolonged.

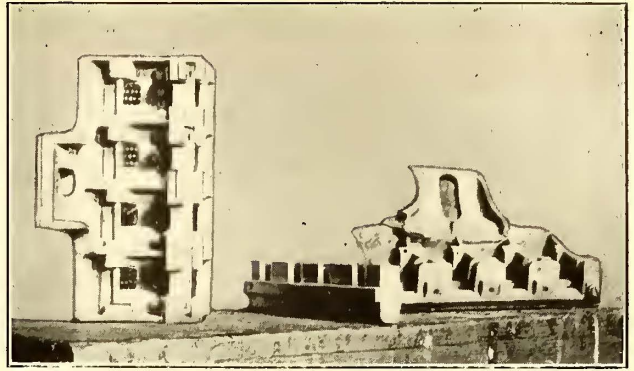
LIGHTING

Recent changes in the car-illumination scheme, which was described in the issue of the *ELECTRIC RAILWAY JOURNAL* for Dec. 12, 1914, page 1308, has materially reduced energy consumption. Seven 60-watt and five 25-watt Mazda lamps were substituted for fifty-two 23-watt lamps. Along this same line the mechanical department has just adopted the Esterline type TR-128 headlamps fitted with Mogul bases, and designed for 6-volt, 18-amp., 108-watt, concentrated-filament Mazda lamps. Until recently all cars were equipped with arc headlamps designed for 25-cycle alternating current. The cost of operation was 18 cents per night for power alone. Tests have demonstrated that the Esterline headlamp will cost but 0.56 cent per night, and it is also assumed that the cost of maintaining lamps will be practically eliminated. Whereas one man was required to keep the arc headlamps in good condition, none will be required exclusively to maintain the new headlamps.

In connection with these new incandescent headlamps small compensators, or transformers, designed particularly for this service have been adopted in the place of resistors to step down the voltage. These are provided with taps so that the motormen, by simply operating a switch, may dim the headlamps when operating in city streets. The dimming effect is obtained by reducing the pressure from 6 volts to 3 volts. A view



SINGLE-PHASE MAINTENANCE—PINION END OF ARMATURE
FITTED WITH ASBESTOS HOOD



SINGLE-PHASE MAINTENANCE—NEW AND OLD FORMS OF
BRUSH-HOLDERS

showing this headlamp installed, as well as the trolley and pantograph mounting on the car roof, is reproduced on page 1108.

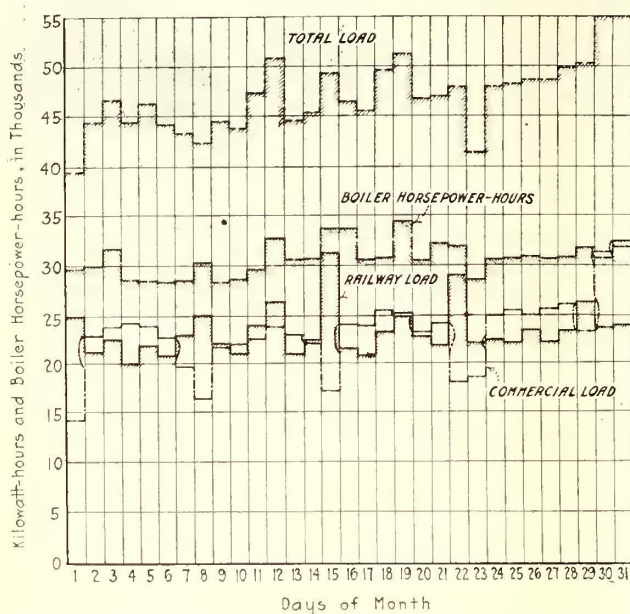
POWER GENERATION AND DISTRIBUTION

The power plant of the system is situated at Michigan City, Ind., at the upper end of the harbor about 1 mile from Lake Michigan proper. The plant is supplied with fuel by transfer tracks which connect two steam railroads. Eight 500-hp. Stirling boilers, normally rated at 200 lb. per square inch and equipped with superheaters supplying steam at 90-deg. superheat, are contained in the boiler plant. Draft for these is supplied by a 225-ft. stack with a 12-ft. flue. Six of the boilers are equipped with chain-grate stokers and flat ignition arches, while the remaining two boilers are equipped with Murphy stokers. As an economy measure in the boiler plant, all stokers are controlled by a McDonough automatic damper regulator which maintains a uniform steam pressure and at the same time regulates stoker speed to conform to any load demand. This has been found to be a very economical piece of apparatus, particularly where there is considerable fluctuation in the load, and in this plant it has effected a 10-per cent saving.

Three Westinghouse, single-flow, 2250-kw. turbines driving 25-cycle, three-phase, 6600-volt, a.c. generators at 1500 r.p.m., and one double-flow, Westinghouse, 3750-kva. turbine driving a 60-cycle, three-phase, 6600-volt a.c. generator at 3600 r.p.m., compose the generating equipment. Power is generated at 6600 volts and the voltage is stepped up by transformers to 33,000 for transmission. Power is supplied for the line between Michigan City and Pullman over the 33,000-volt transmission line to a substation situated at Calumet, 32 miles from the power house, and for the line between Michigan City and South Bend to Terre Coupee substation, located 21 miles from the power house. A 6600-volt feeder direct from the power-house busbars also connects to the line at Michigan City. In connection with these feeder lines two sets of reactance coils, built for a 10-per cent drop from the normal load, have been installed. These coils are a necessary protection against the severe surges coming in on the generators due to a grounded or short-circuited contact wire.

During a normal year 60 per cent of the station output is 60-cycle, three-phase current, which is wholesaled for commercial purposes, and 40 per cent is 25-cycle, single-phase which supplies the railway. An average power factor of 90 per cent is obtained for the 60-cycle commercial load, and one of 72 per cent for the 25-cycle railway load. Approximately a 55 per cent load factor obtains for the 60-cycle load and one of 45 per cent for the 25-cycle load. Due to the large size of the train units in operation between Gary and Pullman, the

maximum momentary peaks on the railway load approximate three times the average load, thus necessitating a large reserve generating capacity in order adequately to care for the maximum demands. In the accompanying illustration is shown the load chart for the kilowatt output and boiler horsepower in service for the month of August, 1915. These are representative of the average conditions prevailing at this plant. In this connection it is also interesting to note that the



SINGLE-PHASE MAINTENANCE—LOAD CHART FOR THE MONTH OF AUGUST, 1915

power load for 1915 for the railway totaled 7,546,000 kw.-hr., while the commercial load was 7,690,200 kw.-hr. Owing to the general business depression the commercial load has not been up to normal during the past year, but it will be seen that it is a large factor in the economy obtained at this plant. Unit results obtained in 1914 were as follows: Total cost per kilowatt-hour, 0.594 cent; kilowatt-hours per car-mile, 6.16.

MAINTENANCE OF OVERHEAD AND SIGNAL SYSTEM

The line between Gary and South Bend, 59 miles long, is equipped with Union Switch & Signal Company's type TDB., a.c. track-return semaphore block signals. Power for the signal system is supplied at 60 cycles and 2300 volts, the voltage being stepped down through transformers located in each block to the value necessary for operating the signals. Maintenance and inspection of the signal equipment is done by two men. They proceed over the road in a gasoline motor car of light weight and regularly inspect the signals, overhead, lighting arresters, telephone, switch lamps, bonds and the Egry registering machines used in connection with train dispatching. They make all repairs except those of breaks in the trolley wire or changes of high-tension insulators which is done by the line crew consisting of three men and a line car. These inspectors keep in constant touch with the dispatcher by reporting to him at each siding for emergency assignments.

Owing to the combining of these maintenance duties the average cost per car-mile for labor and material in maintaining the signal system is 0.196 cent. The average cost per car-mile for labor and material in maintaining the pole line is 0.084 cent. The average cost per car-mile for labor and material in maintaining the trolley line is 0.574 cent. These together make a total cost per car-mile for labor and material in maintaining the signal system and the overhead lines of 0.854 cent.

One-Man Cars in Australia

In an article written for the *Electric Railway and Tramway Journal* by P. J. Pringle, general manager Electric Supply Company of Victoria, Australia, it was stated that in the city of Ballarat there are seven tramway routes radiating from the business center and that all of the cars on four of the routes and on the extremities of the three other routes have been operated under the one-man system since October, 1913. In the city of Bendigo also, one-man cars have been in operation since September, 1913, on two of the four electric railway lines in the city.

The motormen on these one-man cars receive a somewhat higher rate than those on standard cars, but where the extremities of the line are operated on the one-man system the motorman is paid a higher rate only for the hours he is actually working on these sections. California type cars are used, the open section being inclosed with chain so that passengers must enter and leave by the front door, and each car is equipped with one fare box, which is temporarily fixed by the motorman at the side of the door in the front bulkhead.

When cars are traveling from the suburbs into the city passengers pay as they enter, when traveling from the city to the outskirts they pay as they leave. The average speed is approximately 8 m.p.h., and the company reports no difficulty in keeping the cars on time. In the beginning a few cases occurred where passengers climbed over the rear gates and left the cars without paying, but a few prosecutions in the courts rectified this difficulty, and since March, 1914, no trouble whatever has been experienced on this score. On the routes run entirely with one-man cars loads of from forty to fifty passengers are very frequently carried without any difficulty.

Variable fares are in force. On one route operated partly on this one-man principle there are several fare values reaching a maximum of 8 cents, and in this case all fares ranging from 3 cents up to 6 cents are paid into the fare box. In the case of 8-cent and 7-cent fares to the city, passengers are given special tickets by the motorman which are collected by the conductor, who joins the car at the boundary of the 6-cent fare zone. Those who are on the car at the time of his entering pay him according to the ticket that they produce and they are then given an ordinary passenger's receipt check. Paper tickets are stated to have been dispensed with and celluloid tokens are used in their stead, these making a very considerable saving in cost, as they are used over and over again.

Fare Increase Conference in Edinburgh, Scotland

The Edinburgh (Scotland) Tramways and the tramways committee of the Council recently held a conference on the proposed increase in fares of the tramway company. On behalf of the company it was pointed out that they had been forced to increase the tramway fares in consequence of the rise in the price of coal, cables and wages owing to the war; that this increased expenditure, which amounted to about \$121,750, did not include allowances which the company was making to dependents of employees engaged at the front. The company could not see its way to postpone the increase of fares or to consider any modifications thereof, except on the basis of a reduction in the rent, or of a guarantee by the corporation of profits similar to those of the past three years. The directors expressed their willingness at the end of three months to reconsider the matter if the increased fares were producing more money than was needed for additional expenditure.

Report of Chicago Committee on Smoke Abatement and Terminal Electrification

The Committee's Findings Oppose Electrification on the Score of Expense and Inadequacy as a Remedy for the the Smoke Nuisance, but Favor 11,000-Volt Alternating Current Among Available Systems—The Appointment of a Permanent Pure Air Commission is Recommended

After more than four years of work the committee of investigation on smoke abatement and electrification of railway terminals of the Chicago Association of Commerce has presented its report.* The following synopsis of this report has been prepared from a preliminary statement just made available by the committee. It is expected that a more detailed statement will be issued in a few days and extracts from this will be printed promptly in the *ELECTRIC RAILWAY JOURNAL*.

The Chicago committee consists of four men appointed by the Mayor, four appointed by the railroads and nine appointed by the association. The detail work has been done by a staff of which Dean W. F. M. Goss of the University of Illinois is chief engineer, succeeding H. G. Burt, who died in 1913. L. H. Evans is terminal engineer; Hugh Pattison, electrical engineer; T. H. Curtis, mechanical engineer, and W. M. Whiten-ton, operating engineer. The consulting engineers are Gibbs & Hill and George R. Henderson.

WHY GENERAL ELECTRIFICATION IS IMPRACTICABLE

After elaborate investigations the committee concluded that a general electrification of Chicago terminals is inadvisable, basing this conclusion upon the following facts, which were determined or verified during the investigations:

The minimum cost of electrification as a means in smoke abatement would be \$178,127,230.

The more probable cost, due to the necessity for improvements and rearrangements, which would be precipitated by electrification, would be \$274,440,630.

The least net annual operating deficit produced by electrification would be \$14,609,743.

Chicago, under the State constitution, cannot aid in meeting this expense.

An "arbitrary" or tax on terminal traffic to support the capital for electrification would constitute a burden upon the business interests of Chicago.

The cost would be so heavy that no court would uphold an electrification ordinance.

The Chicago electrification would equal the combined

electrifications of the whole world, would involve problems never heretofore met, and would be the first ever undertaken for air betterment where terminals were adequate from an operating viewpoint.

Before the steam locomotive is eliminated pollution must first be reduced to a minimum from the three more damaging services, high pressure steam plants, metallurgical and other manufacturing furnaces, and domestic fires.

The steam locomotive stands third among smoke producing services, using but 12 per cent of the fuel consumed, and its elimination would reduce the gaseous pollution of the air only 5 per cent and the solid pollution less than 4 per cent.

Electrification, hydro-electric and other long-distance transmission being inapplicable, would add power house smoke in quantities sufficient to offset much of the gain through elimination of locomotive smoke.

Suburban passenger services, such as those of the Illinois Central and other roads, produce but 1.54 per cent of the total visible smoke, and 1.97 per cent of all the dust and cinders.

Electrification will involve at least 3476.4 miles of track.

Electrification would subtract only 1,291,282 tons of coal from the total of 21,208,886 tons now consumed annually.

All smoke regulation in Chicago and elsewhere has erred in confining itself to the visible aspects of smoke, whereas the really harmful factors are the invisible gases and the solids of combustion, sulphurous gas and mineral dust in particular.

Chicago air is polluted annually by the introduction of 304,391 tons of soot, dust and cinders and of 5,008,111,106,758 cu. ft. of sulphurous and other gases.

Despite the fact that Chicago burns more coal annually than any other large city—8 tons per capita as against 4 tons for Manchester and 1½ tons for Berlin—its air is better than that of most large cities.

Chicago air has the benefit of better sun, wind and rain conditions than that of most other cities.

The loop is the smokiest district, with the stock yards and South Chicago a close second and third.

*An account of the official presentation of the report will be found in the news pages of this issue.

WHY CHICAGO RAILROADS CANNOT ELECTRIFY

Electrification would ultimately cost.....	\$274,440,630	11. Spare parts	485,343
The 600-volt direct-current (third-rail) system, minimum plan, would cost.....	197,908,000	12. Changes in overhead structures.....	834,261
The 2400-volt direct-current (trolley) system minimum plan, would cost.....	191,666,808	13. Changes in wire lines.....	2,028,007
The 11,000-volt alternating-current (trolley) system, minimum plan, chosen as the least expensive, would cost, in detail:		14. Changes in signal system.....	6,111,407
1. Power-station	\$10,302,104	15. Removal and re-establishment of locomotive terminals and new facilities	37,293,746
2. Transmission system	1,618,693		
3. Substations	2,024,736		
4. Switching stations	573,073		
5. Contact system	28,141,183		
6. Bridge warnings	1,071,989		
7. Return circuit	4,446,033		
8. Elimination of inductive effects and electrolysis	996,727		
9. Telephone system	272,052		
10. Electric locomotives, multiple-unit equipment, work and inspection equipment	91,703,557		
		Less salvage on equipment usable elsewhere....	\$187,902,916 9,775,686
		Net cost of committee's minimum plan.....	\$178,127,230
		Plus added costs due to betterments, improvements and changes precipitated by electrification	96,313,409
		Estimated total final cost.....	\$274,440,620
		Annual charges on investment of \$187,902,916..	16,946,436
		Annual saving through decreased costs of operation	2,336,693
		Annual deficit	14,609,743

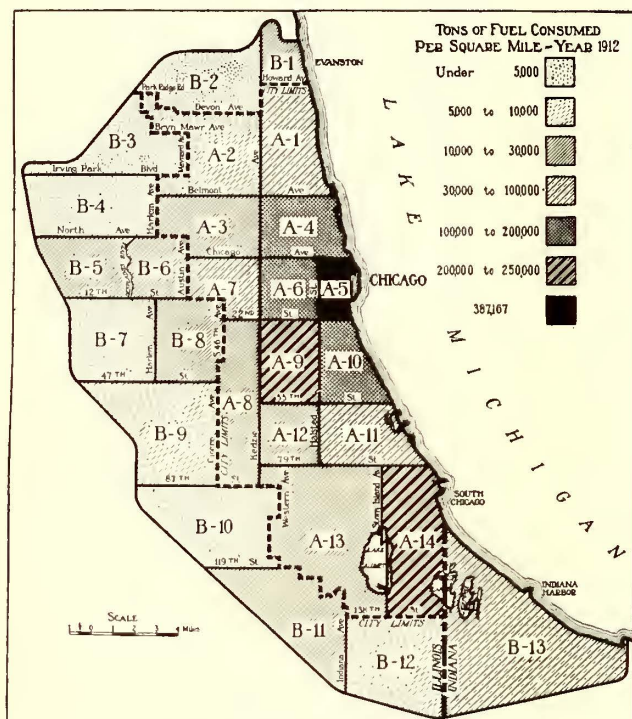
In Chicago air, the products of combustion constitute only two-thirds the total pollution, the other third being due to avoidable and unavoidable dirt from the general activities of the city and from poor municipal house-keeping.

The appointment of a permanent pure air commission with sweeping powers was recommended by the committee as the most feasible plan for reducing smoke, to the production of which the steam railroads are not the heaviest contributors.

GENERAL FINANCIAL PHASES OF THE PROBLEM

As regards the financial practicability of electrification the committee submits these findings:

1. The complete electrification of the railroad terminals as a betterment to be brought about by the railroads through the investment of free capital is, under present-day conditions, financially impracticable.



MAP OF CHICAGO DIVIDED INTO DISTRICTS ON THE BASIS OF COAL CONSUMPTION

2. Any procedure designed to bring about complete electrification which is based upon a financial program involving municipal co-operation is, under present-day conditions, impracticable.

3. Any procedure designed to bring about complete electrification which is based upon the application of an "arbitrary" to traffic of Chicago will constitute a tax which must be borne by the business interests of the city. The practicability of such a tax is a matter which has not been studied by the committee.

4. The preceding conclusions apply to the complete electrification of Chicago's railroad terminals. The financial practicability, under present-day conditions, of electrification as it might be applied to individual roads or to a single service of individual roads, is a matter which has not been investigated by the committee and concerning which no opinion is expressed.

5. The credit of the individual railroads, the properties of which make up the Chicago railroad terminals, differs greatly. This fact cannot be overlooked in estimating what portion of the potential credit of the railroads is available for the purpose of electrification.

6. Certain railroads making up the Chicago terminals operate entirely within the prescribed zone, while for others the great predominance of traffic lies outside the terminal limits. Complete electrification, from a financial point of view, would affect but a relatively small part of the fixed investments of some roads, while for others it would require practically the rebuilding of the property.

7. Electrification is a matter which may present greater advantages in connection with certain classes of service than with other classes of service; for example, the electrification of a railroad having a large suburban business would be more effective in developing opinion favorable to the railroad concerned than the electrification of a road the activities of which are wholly those of freight switching yards. A few only depend upon passenger traffic within the city limits for any considerable amount of their revenue. A larger number derive passenger revenue within the terminals from the movement of through passengers only, while other roads perform little passenger service or no passenger service at all.

8. The extent to which individual railroads have recently made large capital expenditures for terminal improvements, track elevation and enlargement of facilities in Chicago, and the extent to which they are committed to further expenditure for these purposes, must have a material bearing on their ability to make expenditures for new projects.

UNIQUE FEATURES OF THE CHICAGO ELECTRIFICATION PROBLEM

The committee, realizing that many public-spirited citizens will not understand its decision, in the light of reports of electrifications in New York and elsewhere, points out the essential differences between electrification here and those installations that have so far taken place. Nowhere in the world, it finds, as a result of its investigations, has a steam railroad been electrified to avoid the pollution of a city's atmosphere. Nowhere has a terminal been electrified when that terminal from an operating standpoint has been satisfactory. No electrification in existence, either in America or abroad, is comparable, in scope and diversity of service, with that involved in the electrification of the Chicago terminals. A wide gap exists, the committee reports, between that which has been accomplished and that which would have to be done before local electrification would become a success.

Some of the electrifications that have been most widely heralded as such were in fact only a subordinate, though necessary, part of a greater scheme for terminal enlargement. The New York Central, the New York, New Haven & Hartford, and the Pennsylvania electrifications are not alone projects of electrification; primarily they are an essential detail of a new tunnel entry into the heart of New York City. These projects must necessarily stand upon a different basis than the Chicago proposal, where physical conditions absolutely requiring electrification are lacking and where physical conditions and the nature of the traffic would make electrification extremely difficult.

The committee finds that elsewhere steam roads have been electrified for these reasons:

1. Electrification has most frequently been employed in operating suburban passenger service.

2. It has been used for all passenger service in connection with the intensive development of great passenger terminals where underground operation has been involved.

3. It has been used for both freight and passenger operation in tunnels.

4. It has been applied to sections of through lines of route to improve operation of both freight and passenger service on difficult grades.

5. It has been applied to sections of through route lines in anticipation of operating economies through the utilization of water or other relatively inexpensive centralized power.

6. It has been employed by a single railroad in this country in the operation of three switching yards, the work of which must still be regarded as being in an experimental stage.

After studying all electrifications now in existence or planned, both in this country and abroad, the committee finds that of the total of fifteen American installations nine were undertaken because of operation in subways or tunnels, one as an experiment to test out economy in long distance passenger service, two to hold suburban business, one was equipped for initial electric operation because of charter requirements, and two for the purpose of utilizing water power instead of coal.

Of the foreign electrifications all English lines are classed as suburban. None conducts heavy electric locomotive service and none freight service except in a very minor degree. Practically all electric service is confined to suburban and interurban traffic handled by motor cars. In France the Orleans Railway confines its electric locomotive operation to passenger trains through a subway entrance into an underground terminal. It also operates electrically a suburban motor car train service on a line connected with this terminal. The Midi electrification is, in its present stage, experimental only, and for heavy grade lines where hydro-electric power may be substituted for steam.

In Germany no considerable heavy electric main line traction is as yet in operation. The Dessau-Bitterfeld is a short line and has been operated only in experimental service to test out apparatus and methods. The Magdeburg-Leipzig-Halle line, an important extension of which the Dessau-Bitterfeld line will form a part, when completed will represent the first German trunk line electrification, and the Lauban-Königszell line will represent a second such electrification. Both are predicated upon the production of cheap centralized power either from very low grade coal or from hydro-electric plants. While both of these lines will conduct a heavy electric locomotive passenger and freight service, neither of them will conduct a freight switching service comparable with that which exists in the Chicago terminals. In Switzerland the Loetschberg line and the Simplon tunnel line were electrified primarily because of tunnel operation; other Swiss electrifications are for light multiple unit train service only. All Swiss electrifications utilize cheap water power instead of the more expensive coal fuel. In Italy the Giovi with its branches is the only road which operates heavy electric service. The secondary lines in foreign countries operate a service which is entirely different from American operation, and resembles our interurban.

Thirty-eight steam railroads would be involved in the Chicago project, as against thirty-seven for the rest of the world. Of the Chicago roads twenty-five maintain passenger and freight service and twenty-three are classed as trunk lines, while thirteen perform transfer or switching service only. Eight of the trunk lines have no main tracks within the city limits but operate trains into the Chicago terminals over the tracks of other companies. Twelve railroads operate wholly within the area of investigation.

It was found that the Chicago mileage would be nearly twice that of all other electrically-operated mileage in America, and, exclusive of foreign light service lines, would be about 15 per cent greater than all existing

electrifications in the world. The committee's plan involves several times as much yard track mileage as do all existing American electrifications. The number of electric locomotives required would be approximately four times that of all which are now in service in America and two and a half times the number in service in the whole world.

Of switching service, which constitutes 59 per cent of the total locomotive mileage and presents a grave problem in that it has never been attempted electrically on a large scale, it has been ascertained that yard freight switching services, on the basis of car-miles, is more than sixty-five times as great as that on all existing electrified steam roads in America.

No similar service elsewhere, says the report, is handled electrically in any considerable volume except that on the Giovi Railroad of the Italian State Railways and on the New York, New Haven & Hartford Railroad in America. The latter operates, in part electrically and in part by steam locomotives, three freight yards having in the aggregate 72.7 miles of track, requiring about 90,000 electric locomotive-hours per year and handling about 2,500,000 car-miles per year in switching and transfer service. The freight yard traffic of the Chicago terminals aggregates approximately 3,430,000 locomotive-hours per annum and approximately 164,400,000 car-miles per annum in switching and transfer service.

NO SELF-PROPELLED VEHICLE AVAILABLE

As a preliminary to its study of electrification for Chicago steam roads the committee made an investigation into other methods of conducting transportation. It had been hoped that some type of self-propelling motor might be found, and the danger, engineering difficulty and expense of electrification be avoided. But this hope was not justified. The following systems were studied:

Internal combustion motor with mechanical drive, electric drive, compressed air drive, hydraulic drive, direct-connected motor.

Compressed-air motor.

Hot-water motor.

Electric storage-battery motor.

While it was found that progress had been made in adapting the gasoline engine to the requirements of light or special railroad service, the power requirements of heavy and diversified traffic, it is stated, are still beyond the gasoline driven unit. The Diesel oil-burning marine engine has the power, but neither type is self-starting, an imperative requirement for switching work. A new Diesel experimental locomotive was examined in Switzerland. Much had been hoped from it, but the inventor was found doubtful of its success in such heavy yard switching work as would be required here, and limited its future to light express work with constant speeds and infrequent stops.

Much, also, had been hoped from the storage battery, but it was found to lack power, to be too expensive and to share, with electrification, the disadvantage of producing power house smoke. The internal combustion motors are also smoke producing and are regarded as adding a new hazard of operation through their fuel tanks.

Compressed air and hot water motors, also, were found to be impracticable but their use is suggested on those sections of Chicago track that cannot be electrified.

There is available at this time, says the report, no form of locomotive carrying its own power capable of handling the traffic of the Chicago railroad terminals which could be substituted for the steam locomotive,

and there is no prospect of the immediate development of any such locomotive.

DETAILS OF THE COMMITTEE'S ELECTRIFICATION PLAN

While the committee does not find electrification feasible, it has prepared a plan which is covered in detail in the report.

The committee believes that the highest degree of efficiency in electrification can only be secured by joint procedure by all the roads. It is inconceivable, says the report, that the different railroads will undertake such a work independently. It may be argued that a course necessary in the case of one railroad may prove quite unnecessary in the case of another, and yet the fullest measure of technical success in the electrification can only be secured when individual interests and preference are subordinated to the requirements of a general plan.

The committee's plan contemplates the electrification of all track within the city limits and the conclusion of electrified trackage on each railroad as close outside the city limits as is practical. The mileage involved by this conception may be summarized as follows:

	Miles
1. Main track	1,475.59
2. Yard track	1,456.64
3. Industrial track owned by railroads	277.19
4. Miles of industrial track owned by industries	229.72
5. Industrial track, railroad repair track and shop track so located in streets at grade, in buildings or under structures employed in industrial processes as to require some type of self-propelling motor	37.26
Total ..	3,476.40

While in general the committee decided to terminate electrification at the first convenient point outside the city limits, this could not be accomplished on certain roads which conduct a suburban passenger service. It would be impracticable, according to the findings of the committee, to operate these frequent suburban trains part way by electricity and part way by steam. It has hence been decided that certain lines must be partially electrified beyond the limit of complete electrification to the terminals of the suburban service. Through passenger and all freight trains are to be operated by steam on the partially electrified extensions, which will be for use only by multiple-unit suburban trains, resembling "L" trains, but of heavier construction.

As yet no system of electric traction has been developed, the committee finds, which can be accepted as standard for all conditions on all railroads. If it were decided to proceed at once with the electrification of the Chicago terminals, it would be difficult for any group of men, the committee believes, to choose a system which would not be criticised by other men as able as those upon whom the choice of the system developed.

The system selected for Chicago, it is pointed out, must be suitable not only for passenger terminals and through line work, but also for yard switching and transfer work. It must be applicable to the requirements of railroads having a heavy suburban traffic, and also to those roads conducting freight yard and switching service. It must not only be satisfactory in its application to the terminal portion of a trunk line railroad, but it must lend itself to an indefinite extension of the limits of electrification over other and adjoining portions of the road.

Obviously, the report adds, the project must be regarded as too important to permit of the introduction of methods in any way questionable, or of a type of construction of untried value. Furthermore, it is not permissible to consider any methods which might serve to tide over a temporary condition anticipating the later selection of a permanent and stable system.

The committee, after obtaining complete engineering

data on these three systems selected the third as cheapest and most desirable:

1. Third-rail contact, direct current at 600 volts.
2. Overhead contact, direct current at 2400 volts.
3. Overhead contact, single-phase current at 11,000 volts.

The third-rail system was given up as the least practical of the three because of the difficulties to be met. Not only would the presence of the third-rail be a danger to employees in the yards and make necessary a large amount of reconstruction, but there would be trouble in operating trains, owing to the large number of gaps in the third-rail due to switches, street intersection and other such obstructions. After ascertaining the extent of this difficulty on six railroads, the committee found that:

Under present methods the six railroads examined would have 3834 gaps more than 25 ft. in length in the third-rail conductor aggregating 56.42 miles. Of these gaps 2216, aggregating 24.06 miles, would be unimportant since they would be short or would occur in places where trains could coast over them. Another class, numbering 881 gaps and aggregating 16.13 miles, could be reduced so that proper operation could be maintained; some of them could be eliminated by rearranging track or, assuming that municipal grant could be obtained, by closing some streets and reducing the width of other streets and roads. The expense of making these changes has not been determined, but it would be large. The remaining 737 gaps, averaging more than 115 ft. in length and aggregating 16.23 miles, or about 1 per cent of the total mileage examined, would require the use of an overhead third-rail conductor, a device that is cumbersome, difficult to install, inefficient, expensive and an obstacle to operation.

It is estimated by the committee that a total of about 75 miles of track in Chicago could not be equipped by the third-rail system.

Another objection to the third-rail is the fact that except in very unusual sleet storms, service through the trolley wire would not be interrupted, whereas both sleet and drifting snow furnish a serious problem with the third-rail. The rail is also a danger to property and life in case of wreck.

The difficulties of trolley installation would also be great, but less, it is believed, than those attending the use of the third-rail. The great trouble found is with low bridges and other structures over the tracks.

Within the area of investigation there are 492 permanent structures which fail to have sufficient clearance over tracks to allow the installation of the overhead conductor at the desired height of 24 ft. 2 in. Of these obstructions, 221 cannot be changed without great inconvenience and expense both to the city and to the railroads. There are 385 structures which have clearances of less than 25 ft.; 163 of these interferences can be changed to provide the desired clearance, but not without material expense, and 222 cannot be changed without great inconvenience and expense. There are seventy of these structures which have less than the minimum clearance of 16 ft. 6 in. permissible where trainmen are excluded from tops of cars. The conclusion follows that a sufficient clearance to permit employees to ride on tops of cars cannot be obtained throughout the Chicago terminals.

The adoption of the overhead contact system would permit the use of either a high voltage direct current or an alternating current of much higher voltage. The use of the first would result in damage to property by electrolysis. The use of the second would "kill" telephone and telegraph wires adjacent to the tracks, through inductive interference. Both conditions could

be remedied, though with difficulty and at considerable expense.

The committee finds that it would make no practical difference whether the roads manufactured their own electric power or purchased it from public service corporations.

Electricity would, it is concluded, neither increase nor decrease the dangers of operation. Added dangers would be introduced but compensating safety in other directions would offset these.

INCIDENTAL ADVANTAGES OF ELECTRIFICATION

The committee has made an effort to arrive at the incidental advantages that would accrue to the railroads through electrification. The change would give some increased capacity in existing trackage and terminals. In locations where operation under present-day conditions is congested it would give relief, and in locations where there is at present no congestion, electrification would constitute in effect an enlargement of existing facilities and hence would postpone the day when additional facilities would be required.

Electrification, it is concluded, would contribute to increased celerity and reliability in train movement. It would open the way to more intensive use of railroad property, both in this manner and by making double-decked freight and passenger terminal stations possible. It would also make possible the erection of buildings over tracks, but this value is regarded as speculative and, as a present-day asset, small.

Electrification, it is pointed out, would give the roads an asset in the use of electric service beyond that required for trains. It would benefit the roads through the increased convenience and comfort of passengers and it would also give the roads whatever advantage accrued, entirely indeterminate, through the lessening of smoke.

ELECTRIFICATION COSTS

In arriving at the cost of electrification the committee based its work on 1912 operation, extended to meet conditions if electrification were to begin in 1916 and be completed in 1922. The following accounting statement shows why the committee holds that electrification is financially impossible. The deficit on the minimum outlay of \$178,127,230 would be too great:

I—ANNUAL CHARGES	
1. Interest	\$8,906,362
2. Depreciation	7,808,278
3. Replacement of dissipated assets	231,796
4. Indeterminate charges	
Total charges	\$16,946,436
II—ANNUAL REVENUES	
1. Increase in net revenues	\$2,336,693
2. Indeterminate benefits	
Total credits	\$2,336,693
Balance, annual deficit on investment	\$14,609,743

The investigations show that electrified operation for all the railroads taken together and disregarding depreciation and interest would result in a decrease in operating expenses. Under steam operation, those accounts that would be affected one way or the other by electrification show a total of \$10,934,064. Under operation by the 600-volt direct-current third-rail system, the total would be \$8,442,298, with the 2400-volt direct-current system it would be \$7,355,771 and with the 11,000-volt alternating-current system it would be \$7,140,495. The installation of these three systems would result in a saving in operating expenses respectively of \$2,491,766, \$3,578,293 and \$3,793,569.

This saving, however, is in part nullified by new expenses, due to the operation of stations that would have to be established at the end of electrified tracks to

provide for a transfer of trains from electric to steam locomotives, and also by the waste and consequent loss due to operating over shortened steam railroad divisions, which have surrendered part of their mileage to make the new terminal electric divisions. The engineers' estimates place the added expense under the first item at \$1,546,113 and the added expense under the second at \$450,000. This would leave the net saving in operating expenses, to follow electrification, at \$495,653 for the third-rail system, \$1,582,180 for the direct-current trolley system, and \$1,797,456 for the alternating-current trolley system.

Following the work of the committee, a number of the Chicago railroads have made a study of the cost which would be imposed upon them in excess of those set forth by the committee. Eight of these railroads have filed with the committee the results of their investigations. The reports thus submitted have been analyzed with results which are set forth as follows:

ESTIMATES OF INTERMEDIATE COSTS OF EIGHT RAILROADS	
1. Costs due to an extension of the mileage of electrification over that provided by the committee's estimates	\$20,872,500
2. Precipitated costs principally for track elevated	\$29,198,400
3. Total cost to the eight railroad corporations in excess of that necessary to electrification under the plan of the committee	\$50,070,900
4. The committee's estimate of the cost of electrification for the eight railroads	\$92,599,908
5. The excess costs, including costs due to extension of the plan and precipitated costs, in per cent of those which are covered by the committee's estimates	54.07

The committee's estimates of the net cost of electrification for all the roads of Chicago totals \$178,127,230. Therefore, carrying forward the same ratio, the committee finds that the total added and precipitated costs for all the railroads would amount to \$96,313,400.

Upon this basis, the total capital requirement imposed by electrification would be:

That incident to the development of a minimum plan as estimated by the committee	\$178,127,230
That required to cover precipitated costs and costs due to extension of plan	96,313,400
Total	\$274,440,630

Individual electrification by various roads, which refuse to join in the committee's plan of common installation and common operation, is also expected to raise the cost above the committee's minimum. One illustration makes this plain:

The committee assigns to the Chicago & Northwestern Railway a proportionate share in the cost of the common power station. The railroad itself, however, assumes at once that it would prefer an individual power station, and its estimates of the cost of the individual facility is \$3,894,767. This is \$1,683,936 in excess of the committee's estimates.

By far the most important factor in this list of indeterminate costs is that of terminal rearrangement and improvement. The city's terminals have grown up without preconceived plan, additional facilities being added now and then at points further out as the expansion of business and of the city dictated. Many of these changes might not become imperative for a decade, but under electrification would have to be made at once. Track elevations would be extensive in order to avoid grade crossings with trolley lines. Signal systems that are now somewhat out of date but might be continued in operation for a number of years, will have to be altered and it is probable many roads will decide to put in entirely new systems.

SYNOPSIS OF AMERICAN ELECTRIFICATIONS

In its work the committee had occasion to study all existing electrifications, and included in the report the following summary:

The Long Island represents the first complete electrification of a steam railroad on a large scale and is the most extensive example of multiple-unit passenger service in operation. This line is essentially a passenger line serving suburbs of New York City, and at certain seasons operating a heavy excursion business to the seashore. Practically the entire network of lines within a radius of 25 miles of the city, 88 miles of route, has been electrified. The purpose of this electrification was to fulfill the requirements of smokeless operation made necessary by the new tunnel entry into Brooklyn and New York City to the new Pennsylvania terminals. Freight service is conducted by steam locomotives exclusively and on some portions of the electrified system steam locomotives are also used to operate through passenger service.

The New York Central & Hudson River Railroad electrified to eliminate smoke and gases in the long tunnel entrance into the Grand Central Station in New York City. Operation was hampered and accidents made liable by this smoke. The electrification embraces the station yards and 53 miles of route serving a suburban territory. This was necessitated in order to secure continuous electric operation for the suburban trains. The route totals 244.60 miles of track.

The New York, New Haven & Hartford began electrifying because it used the New York Central station and had to follow the change of that road. It has extended this method of operation so as to conform to the Pennsylvania electrification on Long Island. Freight trains are handled by electric locomotives from New Haven to terminal yards located at four points on the Harlem River division. There are, counting switches and other secondary track, 531.68 miles of track involved in this electrification.

The Pennsylvania was forced to electrify in order to go under the rivers and Manhattan Island to its new New York City terminal. The electrification involves 9 miles of main line incidental to the terminal electrification, and 97.49 miles of track.

The West Jersey & Seashore operates 64.6 miles of main line for suburban traffic, the installation having been experimental, the object being to ascertain what main line operating economies would result.

The Spokane & Inland Empire was built for electrical operation because of the high cost of coal and the availability of water power. Total trackage involved is 131 miles. The road is partly an interurban, but also does freight work.

The Butte, Anaconda & Pacific is a copper line with 90.5 miles of track operated by hydro-electric power.

The Erie has 38 miles of experimental hydro-electric main line for suburban passenger use, but through passenger and freight trains operate over this section by steam.

The Southern Pacific has 114.81 miles of suburban track in California under electrical operation. Much of this is in city streets. A large suburban business is handled.

The New York, Westchester & Boston does an exclusively suburban passenger business over 53.56 miles of electrically-equipped track.

The Baltimore & Ohio has 8.4 miles of track under electric operation in Baltimore, made necessary by heavy grades and a long tunnel. This was the first electrification in America for heavy freight and passenger trains.

The Grand Trunk operates electrically through the tunnel under the St. Clair River to Port Huron, Mich. Twelve miles of single track are involved.

The Great Northern has electrically equipped the tracks in its 2.6 miles of tunnel at the Cascade summit. Power is generated by a hydro-electric plant.

The Michigan Central has 20 miles of electrically-operated track through the tunnel approach to Detroit under the Detroit River.

The Boston & Maine uses electricity in the Hoosac tunnel, which is nearly 5 miles in length. Twenty-one miles of track have been electrified.

The Norfolk & Western has electrified 25 miles of its main line which has heavy grades and a tunnel. Electric operation will be confined to coal trains, fast freight and passenger trains continuing under steam power.

The Pennsylvania has equipped for electric operation 20 miles of main line from Broad Street Station, Philadelphia. This change was forced to relieve congestion at the terminal, which cannot be enlarged. Through trains will continue to operate by steam.

The Canadian Northern has electrified 10 miles of double track through the tunnel into its new Montreal terminal.

The Chicago, Milwaukee & St. Paul is electrifying a portion of its main line over the Rocky Mountains, embracing a stretch of about 440 miles. The object is increased speed and track capacity over heavy grades reducing operating costs by the use of water power.

Boston Elevated Library

The Methods of Developing and Indexing the Library and the Duties of the Librarian Are Described

To facilitate the work of officials and their assistants, the Boston Elevated Railway established a company library on Sept. 1 of this year at its main offices, 101 Milk Street, Boston, Mass. The library is designed to be a general clearing house of information for all departments, and is managed not with the idea of amassing a great collection of books and other printed matter, but with the intention of maintaining the most important material, from the company's standpoint, within comparatively small quarters for the present and to keep in close touch with every other available source of information of interest to a transportation organization. The carrying out of this policy is reflected in the sectionalizing of the library and in the development of its general card index.

The library adjoins the executive offices on the fifth floor of the building and is under the general direction of M. C. Brush, second vice-president. There are now about 100 sections classified under such heads as "Investigations and Reports on Transportation Problems in Boston"; "Reports of Boston City Departments," including fire, police, public works, port directors, parks, finance commission, wire department and others; "Massachusetts commissions," including reports of the Public Service Commission, Gas & Electric Light Commission (which has jurisdiction over smoke abatement in Boston); Metropolitan Water & Sewerage Board, opinions of the attorney-general, acts and resolutions of the legislature, reports of the bank commissioner, industrial accident board, Massachusetts Highway Commission, Metropolitan Park Commission, etc. Other sections cover transportation problems in other cities, with special reports of consulting engineers and boards of investigation; the annual reports of electric railways in large cities; reports of public service commissions in New England; reports, pamphlets, etc., on municipal ownership; welfare work; maps of various cities, mounted on pulpboard; labor matters; atlases of metropolitan Boston; current periodicals in bound volumes; proceedings of the American Electric Railway Association, etc.

The card index capacity is 60,000 cards, all within reach of the librarian when seated at his desk. The

index is of the so-called "dictionary" type, with alphabetical subject entries and cross-references. The compactness of this arrangement enables inquiries by telephone or otherwise to be answered in the minimum time. Close relations are maintained with about twenty special libraries in Boston, including, besides the great libraries of Harvard University (in particular the business administration library), the Massachusetts Institute of Technology and the Boston Public Library, the libraries of Stone & Webster; Kidder, Peabody & Company; Arthur D. Little, Inc.; Insurance Library Association; C. H. Tenney & Company, and others. By telephone and messenger service material available is made quickly accessible through interchange facilities of the greatest value. In the broader sense, the Boston Elevated library is an intensive index of information, or a clearing house of data and references in which mere duplication is avoided in the interests of efficient service in connecting the seeker and the information desired in the shortest possible time.

The librarian is charged with the duty of caring for and indexing all scientific books, catalogs, pamphlets, essays, trade magazines, commission reports and findings and papers of the company, and of acquainting officials of the company with articles in these which may be of interest to them. So far as he can, he is required to know about new publications of a nature likely to be of interest to officials and to acquaint them with these. The office libraries of company officials are indexed in the library card catalog—a plan which avoids breaking up specialized collections of great local value within departments and bureaus and still preserves first-class accessibility. Thus, the typewritten stenographic records of various street railway arbitration cases are filed in the library of the second vice-president, indexed in the company library, and so made immediately available without encumbering the shelves of the latter, or withdrawal for more than a temporary period from their most useful location.

By use of cards issued by the Library of Congress pertaining to copyrighted books on railway and electrical matters, references to these volumes are deposited in the index automatically within two or three weeks after publication. The library subscribes to a number of journals, including the *New York Times Book Review* and the *Annals of the American Academy of Political and Social Science*, to the Bureau of Railway Economics, to engineering periodicals, to the United States Catalog of Books in Print, etc. The librarian is in a position to state the name and title of every municipal officer within the Boston Elevated territory, with the dates of municipal meetings. This information is of special value to department heads interested in construction and traffic matters. In every branch of its service the library seeks to act as a most efficient intermediary between the person seeking information and the repository of the desired data. The usual arrangements for circulation of books and periodicals are in vogue.

The questions referred to the library are most varied and include such points as the compilation of references to organization charts on railways, the comparison of different types of third-rail shoes, investigation of the cost of printing transfers, and numerous other topics. Following a recent fire in the company garage, information was sought on the behavior of gasoline when being strained through a chamois cloth into an automobile tank. Co-operative inquiry through the Insurance Library brought forth helpful information upon the possibilities of gasoline ignition through the creating of static charges in straining this liquid in the above way.

Lewis A. Armistead, a member of the company's staff with a varied experience in routine work and special research in different departments on behalf of executive interests, has been appointed librarian of the Boston Elevated Railway. Mr. Armistead is a member of the Special Libraries Association and has a broad acquaintance within the electric railway field. Comprehensive plans for widening the usefulness of the library are being steadily developed, and since its inception early in the fall it has become a valuable adjunct to the company's organization.

The Lesson of the Jitney*

Successful Experience with One-Man Cars Described—
Other Suggestions on Economical Operation

BY RAYMOND H. SMITH, GENERAL MANAGER JACKSON
LIGHT & TRACTION COMPANY

During the last eighteen months most street railway companies have suffered losses of revenue, the extent of these losses depending largely upon the industrial diversification of the localities served. This condition emphasizes the importance of activity in securing diversification of industries. In times of stress and extraordinary conditions the locality which is dependent upon a single line of industries is just as much affected as is the farmer who is staking his year's work on the success of a single crop.

The falling off of street railway earnings is in general due to one or more of the three following factors: The unusual conditions which have had a depressing effect upon business in general; the ever-increasing number of automobiles used by individuals for pleasure purposes, and the presence of jitney competition. After the war the electric railways will undoubtedly participate in the new era of prosperity which is to follow, but the street railways must look upon future losses of revenue from the privately-owned automobile as a certainty. While the losses sustained through the ordinary use of these machines by the owners and their families is a considerable item, this loss is greatly increased by the very natural desire to give friends a lift. This natural inclination has been greatly stimulated by the advent of the jitney. The effect is destined to grow very much in proportion to the number of cars sold, and the constantly decreasing cost of the automobile is also a factor.

The jitney has cut deeply into the earnings of the street railway, and this in many cases where it has ultimately withdrawn from the field. When operating under laws which have placed upon the jitney even approximately the same responsibilities as are upon the street railway, the tendency of this competition seems to be in the direction of failure, but when the last jitney has been withdrawn from service the community which has passed through the period of jitney craze emerges the loser. It has been such merely because the jitney has been of no lasting benefit to the place, and the street railway, which plays such an important part in the prosperity of a community, has suffered a loss which is bound to hamper it in its efforts properly to perform its duties as a common carrier.

That the jitney has its advantages cannot be well denied. Many who were at first strong in their protest against the unfairness of the competition have succumbed to the allurements that the rapid transit afforded, still, however, maintaining their former position on the equity of the situation. This cannot but bring forcibly home to the street railway operator the fact that patron-

*Abstract of a paper delivered before the Mississippi Electric Association on Nov. 12, 1915, at the Hattiesburg meeting.

age is naturally inclined toward the service which offers the greatest advantages, regardless of where the sympathies lie. It therefore behooves street railway operators to adopt any practical means of securing for their systems the good points of their competitor's service.

Transportation facilities which before the advent of the jitney seemed satisfactory will, with its passing, be deemed inadequate. It is coming to pass that street railway service is regarded as good or bad, depending upon whether or not there is a car in sight. Apparently the jitney is not now a success, but the question arises whether or not it can "come back." This must be settled between the automobile manufacturer and the street railway, as it seems to be a question of future first cost and operating cost of automobiles versus service and cost of street railway operation. The question of how much cheaper automobiles will become in the next five years is problematical, but this question does not rank in importance with that as to whether automobile operating expenses will increase or decrease. It is difficult to predict the future trend of these operating costs. The tire expense is now approximately 18 per cent of the total cost of machine operation, and it is not venturesome to predict that some genius will devise a tire which will do away with much of the expense and trouble now experienced from this source. Just what the gasoline or other fuel situation will be in a few years it is also difficult to foretell.

The jitney of the future cannot expect to be relieved of many of the obligations and burdens which many have escaped in the past. New legal restrictions and regulations have been applied to it with caution, and in some cases with reluctance, owing to its infancy, its popularity, and the possible political effect. If the indications point toward the successful and continuous operation of jitneys, many of the burdens of the street railway will be also assessed against it.

There is too much talent and engineering ability in the electric railway industry to permit serious interference with the electric road. But jitney competition has emphasized that quick acceleration, high speed and frequency of service are the demands of the public. It is not enough that large cars, sufficient in capacity to properly handle the traffic, be run. The demand is for more frequent cars and faster operation, and this immediately suggests more and lighter cars, so inexpensive to operate that the railways can afford to reduce the headway.

The Jackson Light & Traction Company has recently purchased and put into operation five single-truck, all-steel cars having a seating capacity of twenty-four passengers each. These are 25 ft. long over all and have special trucks equipped with 24-in. wheels. The cars weigh about 12,500 lb., and they are equipped with 30 to 35-hp. motors, the new 17½-hp. motors not being available for service at the time the cars were purchased. These cars are arranged for one-man operation. They have been very satisfactory, and the writer is convinced that cars of this design will gradually replace the larger and heavier rolling stock of to-day.

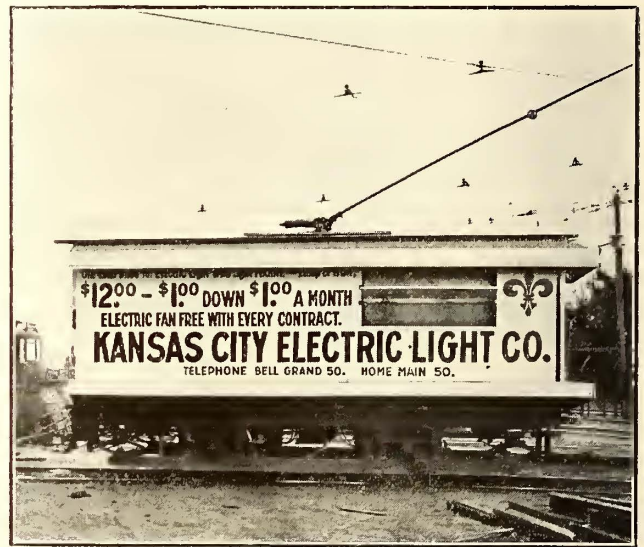
The writer cannot agree with those who are of the opinion that one-man operation is not adapted to cities of from 50,000 to 100,000 population. Local conditions, of course, determine what is best in any particular case, but the feasibility of one-man operation with the future light-weight car, controlled with the ease of an automobile, will not depend upon population. The ability of one man to look after the business of his car is dependent upon having frequent enough service to reduce the riding per car to a point where one man can conveniently handle it.

In the line of reducing expenses there seems to be no reason why cars should be operated through the streets

with a finish like that of a piano. Why should a street car require a highly-polished surface any more than a house? Again, many of us, especially those living in the southern section of the country, may find it possible to do without the extensive carhouses which we now think necessary. Similar cases may be cited in other lines where, if the railway industry is driven to it, economies can be effected. The writer has no fear that the jitney will replace the street railway, and anticipates that a few years hence small electric cars, quite different in design from the present street cars, will be operated over the street railway tracks with the speed, acceleration, control and comfort to passengers of the best automobile of to-day.

Kansas City Advertising Car

The Metropolitan Street Railway, Kansas City, Mo., operated on its tracks this past summer, for the Kansas City Electric Light Company, an illuminated advertising car exploiting the special installation offer of the light company, especially its electric fan feature. The car bore on each side and on the rear end painted signs presenting the offers, the words being lighted by globes concealed at top and bottom and operated by a flasher that caused illumination for about a minute, then darkness for a shorter time. During the period of darkness the flasher caused a small sign, inserted in each side, to revolve exposing alternately



KANSAS CITY ADVERTISING CAR

opposite sides. On the one side was a picture of a man drenched in perspiration. On the reverse, the same man was enjoying the draft from an electric fan. A small motor operated the flasher and also a hurdy-gurdy.

The car was manned by a motorman, a conductor, and an extra man, usually, for the hurdy-gurdy. It traveled 30 miles each clear night, successively on eight routes, which eventually covered the city tracks. It was on the streets two hours, not interfering with the early or late evening traffic. Among the children of Kansas City it was known as "the music car." The wording of the larger signs was changed with the offers of the different months, while the fan cartoons remained.

According to a paper issued by the United States Geological Survey, the value of the production of mica in the United States totalled \$328,746 in 1914. The chief mines are in North Carolina.

Bay State Street Railway Valuation

Methods and Results of Eighteen Months' Investigation of Massachusetts Property in Connection with Fare Case Now Being Heard by Public Service Commission

In support of its proposed fare increase, the Bay State Street Railway, Boston, Mass., recently filed with the Massachusetts Public Service Commission a valuation report prepared by Sloan, Huddle, Feustel & Freeman, Madison, Wis. The general preparation of the report involved the determination of the value of the physical property of the company within the State, and the ascertainment of the revenues necessary to meet present operating expenses, provide for depreciation and furnish a fair return. The principal problems concerned the valuation and the depreciation allowance. The actual operating expenses as shown by the books were used, and the fair rate of return, or cost of obtaining money, was put at 7 per cent. No attention was paid to development costs or other intangible values.

INVESTMENT COST BASIS OF VALUATION

As nearly as possible the investment cost of the property as it existed on Nov. 1, 1914, was obtained, this cost being defined as the money actually spent to build up the physical property then in existence. The cost of reproduction of the entire physical property was also ascertained. Before either value had been found, however, it was decided that the one to be used to show the total revenue needed was the investment cost. The only exception was in the case of land, for which item the present market value was used.

The determination of the investment cost of the property was difficult. Present construction cost regulations have been in effect for only a small part of the life of the system, which is composed of properties originally held by more than sixty separate companies, some organized as far back as 1862. Much of the property dates from 1899, when the main portion of the properties was gathered into two large systems, but not until 1907, when the company began doing its own construction work, were detailed construction records obtainable. In general, material purchase records have been reasonably complete since 1904. For ties, rails, poles and copper wire supplementary data for the earlier years were obtained from manufacturers, supply companies and other sources. Actual costs were found for practically all the track special work, and the greater portion of the rolling stock, car equipment and power station equipment. The records for labor were less extensive, being complete only since 1909. Analyses were made to ascertain the average costs of track laying and of installing the overhead distribution system, and these costs were adjusted to comply with the different conditions of earlier years. Grading prices were obtained from a study of the reports of the Massachusetts Highway Commission and a comparison with available contract prices. Actual grading costs were at hand for some large recent jobs.

The unit prices for investment cost included only the cost of labor, materials and immediate supervision. The overhead charges, which were based on the I. C. C. classification, were kept separate. These charges, including engineering and supervision, interest, taxes, fire and liability insurance, organization and legal expenses, and contingencies of inventory and construction, were considered only when incurred during or incident to the construction period. They were not applied to each individual item but were computed as an average cost to be applied to the total material and labor cost.

In spite of the careful taking of the physical inven-

tory, it was certain from past experience that some items were omitted, and that much work was done during the construction period which an examination of the present property would not disclose. Moreover, in examining the construction work orders to arrive at unit prices, there were a number of cases where the analysis showed costs beyond the normal, owing to unusual conditions. To allow for these a small and varying allowance for contingencies was added to the different accounts.

In following the investment theory for overhead charges, the fact that the company is a going concern reduced the allowance necessary for certain of the items. Engineering and organization expenses were less than would be required for a company just beginning construction. The company's credit also made it possible for money to be obtained on favorable terms for construction purposes. The engineers considered only the interest on the money actually needed for construction and did not include commissions or discounts usually paid for the obtaining of construction funds. All the above conditions resulted in the allowance of a weighted average of 12.74 per cent on the cost of labor and materials. The monetary allowance for overhead charges was \$4,769,717, and the investment cost including overhead charges amounted to \$42,211,810.

COST OF REPRODUCTION OF PHYSICAL PROPERTY

In establishing the cost of reproduction the same inventory of physical property was used as in the case of the investment cost. It was considered that any company starting out to build the system anew would be obliged to do in a few years substantially the same work which was done over a period of many years by the component companies of the system. Four years was deemed the time required. For unit prices the actual costs as of Nov. 1, 1914, were not taken. In their stead an average of prices obtaining for a short term of years preceding this date was used. The units employed did not contain any late prices, which might be abnormal owing to the European war.

The principal changes in overhead charges under the reproduction theory were in the items of engineering, organization and interest during construction. All three of these items are less for an operating company, building its property slowly in the form of extensions, than they would be for a company constructing the property as a whole. The weighted average for overhead charges in this case was 15.80 per cent.

After the values for the entire accounts were determined, it was necessary for later use in rate calculations to apportion the total value to the various operating routes. As previously stated, the value chosen was the investment cost with the one modification in that land was included at the present market price. The actual use of the property by the different routes formed the basis of apportionment. All lines in any one city used exclusively for local service were taken together as one route, but all other lines were considered separately and values found for each route.

DETERMINATION OF ANNUAL DEPRECIATION

In the investigation of depreciation, the engineers computed for each account the annual amount necessary to be set aside so that at the end of the normal life of the

depreciable property in that account a fund would be on hand equal to the original investment. The computation was made by dividing the cost new of the property minus its scrap value by the estimated life in years, it being understood that at no time would the fund actually equal the investment cost of the property in any account, as some portion of the items must be renewed constantly. Every effort was made to have the lives used reflect the company's actual experience. No use was made of life data from outside sources, for other than comparative purposes, except for those items whose normal lives could not be determined from the history of the company. Notes on the present condition of the property were made at the time of the field inventory. The number of years that a piece of property had been in use, taken in conjunction with its condition per cent, was the basis for a close approximation as to its probable remaining years of usefulness and thus of its total normal life.

For much of the property the history of renewals for items subjected to varying operating conditions formed the basis for the lives adopted. In the matter of ties, *e.g.*, it was found that for those laid under pavement the life depended largely on the life of the rail being carried. For ties in unpaved track the practice of covering them by back-filling has considerable effect in lengthening the actual years of service. Hence, to account for local conditions, a range of lives was sometimes assigned to items in the same group. For rail, the lives varied from ten to thirty-five years depending on traffic and other conditions. Certain of the property accounts were classified as non-depreciable. Table I shows the lives used in calculating depreciation on the various items.

In the computation of each account the various items were grouped to obtain the total amounts wearing out in the different life periods of ten, twelve or fifteen years, etc., and to these several totals were added the overhead allowances to determine the gross investment. The scrap value, if any, and the non-depreciable overhead were subtracted from the gross investment to determine the depreciable investment. This latter value for a group, divided by the life for that group, gave the annual depreciation, and the sum of all such group totals gave the total annual depreciation for the account. The composite life was finally determined by dividing the net depreciable investment by the annual depreciation

TABLE II—STATEMENT OF ANNUAL DEPRECIATION NECESSARY FOR EACH PROPERTY ACCOUNT

	Investment	Depreciable Investment	Annual Depreciation, Per Cent†
504—Grading	\$165,374*	\$161,078	2.0
506—Ties	1,421,665	1,384,739	5.6
507—Rails, rail fastenings and joints	4,592,294	3,585,926	3.5
508—Special work	2,077,406	1,873,677	5.7
510—Track and roadway labor	2,070,551	2,016,771	4.4
511—Paving	3,415,807†	3,122,719	3.1
512—Roadway machinery and tools	70,010	42,354	4.0
515—Bridges, trestles and culverts	686,699	665,137	3.0
516—Crossings, fences and signs	204,423	199,036	2.0
517—Signals and interlocking apparatus	85,304	82,625	7.2
518—Telephone and telegraph lines	71,478	68,672	6.9
519—Poles and fixtures	836,473	792,228	5.9
520—Underground conduits	176,677	172,047	2.0
521—Distribution system	3,040,700	1,848,971	3.7
522—Track bonding	397,685	230,788	2.6
523—Shops and car houses	1,715,824	1,662,842	2.3
524—Stations, miscellaneous buildings	68,888	66,783	2.3
525—Wharves and docks	22,072	21,398	1.3
526—Park and resort property	210,959	202,953	3.8
530—Passenger and combination cars	4,642,070	4,438,253	4.6
531—Freight, express and mail cars	120,755	115,248	5.1
532—Service equipment	469,577	446,924	5.2
533—Electric equipment of cars	3,607,136	3,312,547	4.4
536—Shop equipment	227,525	148,830	2.8
537—Furniture	125,680	121,607	2.4
538—Miscellaneous equipment	81,952	74,867	11.0
539—Power plant buildings	996,734	964,220	1.8
540—Substation buildings	84,814	82,221	1.6
542—Power plant equipment	3,678,621	3,421,588	3.4
543—Substation equipment	298,954	270,408	3.2
544—Transmission system	513,705	409,824	3.1
Total	\$36,177,812	\$32,007,281	3.90
Composite life in years			22.7

*Total investment under account No. 504, including non-depreciable investment, \$1,877,854.

†Total investment under account No. 511, including non-depreciable investment, \$3,689,683.

‡Annual depreciation divided by investment.

No depreciation was allowed on Accounts Nos. 502, 503 and 505.

allowance. The composite life of the entire Bay State property was found to be 29.26 years, and the annual depreciation required was \$1,410,615. Expressed as a percentage of the total investment, it was 3.9 per cent. The composite life of the depreciable property only was 22.69 years and the annual depreciation thereof was 4.41 per cent. The annual depreciation necessary for each property account is shown in Table II.

The Bay State Street Railway had included all charges for maintenance and depreciation in the one account for maintenance. In order to determine the additional amount required for depreciation, it was necessary to

TABLE I—STATEMENT OF LIVES OF PROPERTY USED IN COMPUTING ANNUAL DEPRECIATION

Years	Years	Years
Bridges, Culverts and Drains	Cross-arms	Switchboards and wiring, Average of generator served
Steel bridges over railroads.....25	Guys and anchors.....16	Roadway Machinery and Tools
Steel bridges over streams.....30	Miscellaneous work on poles.....15	Larger pieces of equipment only.....15-25
Timber bridges over railroads.....15	Trolley	Shop Equipment
Timber bridges over streams.....20	Overhead feeder	Machine units
Timber culverts	Underground cable	Signals and Interlocking Apparatus
Dry rubble culverts.....25	Submarine cable	Hand-thrown signals
Masonry and concrete structures.....75	Furniture	Automatic signals
Vitrified pipe culverts and drains.....30	Miscellaneous Equipment	Signal wire
Cast-iron pipe culverts and drains.....60	Horses, automobiles, wagons, etc.....5-10	Submarine signal cable.....10
Catch basins	Paving	Underground signal cable.....30
Buildings	Asphalt and asphaltina.....15-20	Telephone and Telegraph Lines
Dependent upon material and type.....15-75	Bituminous macadam.....12-15	Telephone sets
Cars and Car Equipment	Water bound macadam.....8-15	Iron box telephone sets.....14
Bodies	Concrete and hassam.....12-25	Telephone wire
D. T. semis.....20	Grouted brick on concrete base.....15-25	Submarine telephone cable.....10
S. T. semis.....22	Wood block on concrete base.....20-30	Underground telephone cable.....30
D. T. box.....25	Wood block on bridges.....10-20	Track and Roadway
S. T. box.....28	Plank on bridges.....5	Rails, including all fastenings.....10-35
D. T. open.....25	Granite	Ties
S. T. open.....30	Cobble and cobble mixed.....Same as rail	Paved track—same as rail.....10-35
Express	Power Plant Equipment	Unpaved track—under good backfill.....16
Snow plows	Boilers—water tube	Unpaved track—open to weather.....12
Trucks	Boilers—fire tube	Bonds—same as rail to which they are attached.....6-20
Motors	Engines	Special work
Controllers	Turbo-generators	Track and roadway labor—same as rail or special work where labor was incurred.....50
Control cable	Condensers	Grading and ballast—not depreciated.
Air-brake compressors	Pumps	Underground conduits.....
Registers	Stokers	
Arc headlights	Heaters	
Jacks and saws.....25	Coal-handling machinery	
Distribution System	Piping	
Poles	Generators—d.c.	
Iron	Alternators	
Cedar		
Chestnut		
Hard pine		

†Very little near twenty-five years.

*Twice life of rail.

separate from the 1914 maintenance charges the amount, which under the engineers' theory, would have been so charged. The maintenance accounts, which involved both labor and materials, were examined for the last three years available. The material sheets from all storehouses were scrutinized to determine whether or not the material would have been paid for out of the depreciation fund. If the labor charges for the materials so assigned could not be found directly, they were estimated on the same unit basis as in the investment valuation. In this way a comparison of these charges was made for three years and a reasonable deduction made for the year in question. As the actual operating expenses were to be apportioned for the fiscal year 1914, the deduction was made from the depreciation requirements as computed.

WORKING CAPITAL AND REVENUE REQUIRED

Working capital was considered in addition to the investment cost, the amount used being \$1,423,555. This was somewhat less than the net average actually required for the last five years. The routes were assigned working capital in proportion to their respective investments in physical property. The total value of all property in Massachusetts having been determined, the revenue requirements were figured, as shown in Table III. To the variable expenses for the fiscal year 1914,

TABLE III.—STATEMENT OF GROSS EARNINGS NECESSARY TO MEET THE PRESENT OPERATING EXPENSES AND PROVIDE FOR DEPRECIATION AND A 7 PER CENT RETURN ON THE INVESTMENT COST

Investment cost, total Massachusetts property.....	\$42,211,810
Working capital assignable to Massachusetts property.....	1,423,555
Total	\$43,635,365
Revenue Requirements for Massachusetts Property	
Variable expenses year ended June 30, 1914:	
Maintenance of way and structure.....	\$783,906
Maintenance of equipment.....	768,887
Traffic	58,353
Conducting transportation	3,381,835
General and miscellaneous.....	1,000,524
	\$5,993,505
Taxes	604,875
Amount needed for depreciation in addition to present maintenance charges.....	1,054,386
Interest on \$43,635,365 at 7 per cent.....	3,054,476
Total revenue needed.....	\$10,707,242
Total revenue year ended June 30, 1914.....	9,092,077
Additional revenue needed.....	\$1,615,165
Amount needed as per cent of passenger revenue....	18.73

including taxes, there were added the amount needed for depreciation and an amount equal to 7 per cent return on the investment cost. The results showed revenue requirements of \$10,707,242, or \$1,615,165 more revenue than was actually received.

DETERMINING THE COST OF SERVICE

A study of the routes operated indicated that the average cost of the service as a whole, per car-mile, or on any other basis, could not be applied to any city, town or section and fairly be considered as representing the cost of service in that city, town or section. The necessity of ascertaining as accurately as possible the cost of service on each route was therefore apparent. This requires localizing the variable expenses to the several routes, or, if this is impossible, apportioning them upon an equitable basis.

The books and records of the company showed that it was possible, by reference to the detailed records of labor, material and other expenses from which the general accounts were compiled, to localize practically all of the expenses except general, miscellaneous and other overhead items to the sixteen operating divisions. The revenues and variable expenses in the fiscal year 1914 were selected as representing present conditions, although these conditions have been modified by the recent

wage arbitration, which has materially increased the cost of operation.

The rule generally followed in selecting the unit of apportionment was to choose for expenses varying with the volume of traffic, a traffic unit such as the car-mile or car-hour; for expenses not affected by the volume of traffic, a stationary unit such as the track-mile. It was therefore necessary to consider each account separately and select the unit having the closest relation to the expense included. The track-mile and the car-mile were selected for the apportionment of maintenance of way and structures expenses. In apportioning the expenses for rails, rail fastenings, ballast, ties, special work and track labor, the influence of traffic volume, weather conditions, length of line and other factors were taken into account according to the best available judgment. The line-mile was selected as the unit for the apportionment of electric line expense for all accounts except track bonding, overhead trolley and those included in power cost. The expense of track bonding and overhead trolley varying more closely with the volume of traffic, the car-mile was used.

The expenses in connection with buildings and structures not included in power cost or pro-rated to other accounts were apportioned as follows: Carhouses, stations, waiting rooms and platforms on the basis of revenue passengers carried. Maintenance of equipment was in general figured on the car-mile basis, with the exception of expense of miscellaneous equipment, which was considered as an overhead charge. Traffic accounts were apportioned on the revenue passenger basis. For apportionment of power expenses two units, designated weighted feeder car-mile and weighted car-mile, were made up, considering the cost of power in districts and principal factors bearing upon it. Transportation expenses were apportioned in part on a car-hour and in part on a car-mile basis, the latter mainly covering supplies. Injuries and damages were apportioned on the revenue passenger basis. All overhead costs, such as superintendence and miscellaneous expense, were duly apportioned and pro-rated. The revenue was also apportioned by routes.

It is believed that these methods enabled the fair cost of service on each route to be determined, including depreciation, maintenance and operating expenses as variable costs, taxes and interest and working capital. The total of these items less the revenue gave the surplus or deficit shown by routes among the exhibits filed with the report. The total charges for the territory north and south of Boston were \$10,250,571, and the revenues \$8,623,783, leaving a total deficit of \$1,626,788. By the scheme of localization worked out, however, each division bore the cost of its own service and was not affected by conditions that might tend to increase or diminish the cost in other divisions or localities.

Parcel Carrying on Street Railways in Lancashire, England

The receipts recorded by the parcel-handling department of the street railways of Lancaster, England, during the past year were \$67,500, yielding a net profit of \$18,000. The average number of parcels handled each week approximated 24,000. The expense of delivery by horse and wagon approximated \$4,500 with a maintenance and depreciation charge of \$900, and in consequence, an experiment is under consideration whereby electric battery trucks are to be used in place of the horse-drawn vehicles. Street railway fares of messengers connected with the service amounted to about \$200, while general salaries and wages of the department amounted to \$35,000 for the year.

1200-Volt Steam Railway Electrification in Lancashire, England

Five-Car Units are Expected to Be in Operation Between Manchester and Bury by the End of December

It is expected that by the end of December the 1200-volt electrification between Manchester and Bury on the Lancashire & Yorkshire Railway will be in operation. Some of the general features of this important project were described in the issue of the *ELECTRIC RAILWAY JOURNAL* for July 24, 1915, page 154. Additional details have since become available and some of these are given herewith. The accompanying drawings, which are self-explanatory, show the construction of the contact shoe and the method of mounting and electrically connecting it with the wiring system. The method of mounting and inclosing the contact rail was fully described in the article referred to.

The rolling stock for use on this section is under construction in the company's shops. Each unit will be a five-car train consisting of three motor cars and two trailers. The cars are of all-steel construction, and the motor cars are being equipped with four 200-hp. motors each.

While the line now being equipped comprises only about 20 miles of single track it is the first stage in a general electrification scheme for the Manchester district, and the power house is being built with capacity for the future. Two 5000-kw. turbo-alternator sets have been installed to generate three-phase current at 6600 volts. There is also an auxiliary 500-kw. three-phase set.

An interesting feature of the station is the provision for coal supply by gravity, the difference of 35 ft. in level between the neighboring railroad track and the boiler-room floor being utilized to the best possible advantage. The boiler house has been laid out on the unit system, two boilers, two economizers placed directly over the boilers, one induced draft fan, and one chimney forming a unit. Two substations will be used at present, each of these containing three 1000-kw. rotary converters.

As previously stated this electrification has been carried out under the direction of J. A. F. Aspinall, general manager of the Lancashire & Yorkshire Railway. George Hughes is chief mechanical engineer of the road and A. Lund has acted as resident engineer.

Concrete Waiting Platforms in Los Angeles

The Los Angeles Railway has recently installed about fifty waiting platforms similar to that shown in the accompanying illustration. These are located on Santa Barbara Avenue, Los Angeles, on the "near" side of street intersections, and they are about 25 ft. long, 4 ft. wide and 8 in. thick. The concrete platforms, which are virtually short stretches of sidewalk, are inexpensive, and they serve to keep the pedestrians off the roadway

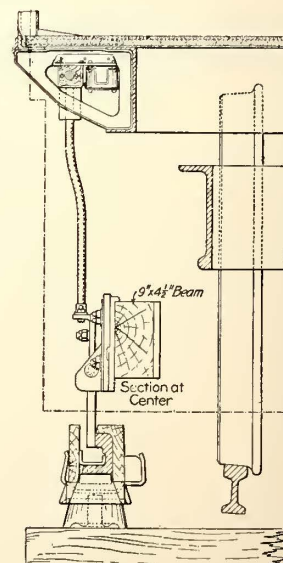
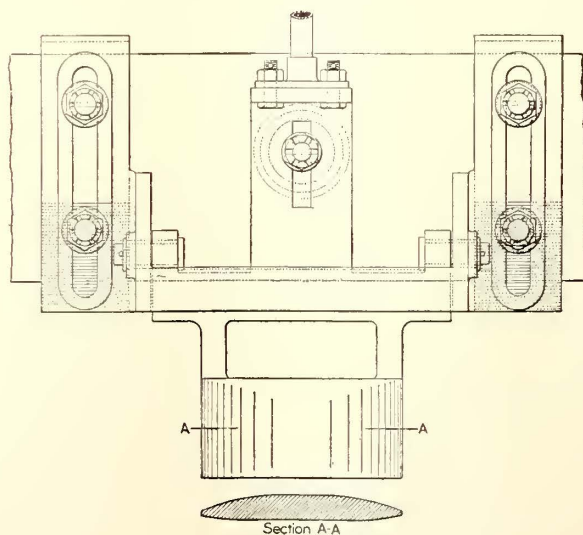
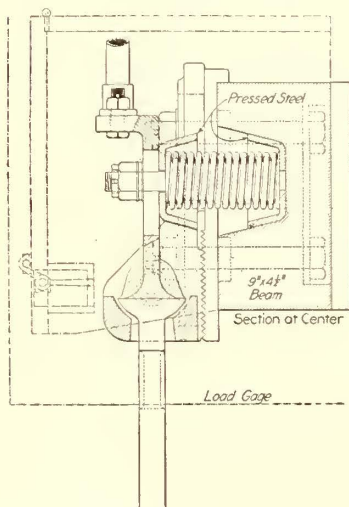


CONCRETE WAITING PLATFORM IN LOS ANGELES

on either side of the track. The platforms are located about 3 ft. from the tracks, so that it is impossible for those waiting upon them to be struck by the car steps.

The residents in this section desired waiting stations of some kind, but it was not found practicable to build waiting rooms on account of lack of space, aside from the expense.

The *Journal-Gazette* of Fort Wayne, Ind., conducts a traction column, in which the news items of the Fort Wayne & Northern Indiana Traction Company, the Ohio Electric Railway and other interurban lines entering the city are summarized in an attractive manner. Special attention is paid to the personalities in charge of the work of the companies.



LANCASHIRE & YORKSHIRE RAILWAY ELECTRIFICATION—DETAILS OF CONTACT DEVICE; CABLE MOUNTING, SHOE AND PROTECTED CONTACT RAIL

COMMUNICATIONS

Major-General Bancroft Thinks Electric Lines Along Shore Useful in Moving Troops and Supplies

BOSTON ELEVATED RAILWAY

BOSTON, MASS., Nov. 24, 1915.

To the Editors:

I have read the article on "Preparedness in Transportation," in the JOURNAL of Nov. 22, and I agree with you that all methods of transportation should be ascertained by the Government and plans laid to utilize them. This would include, of course, electric railways.

I suppose that on our eastern coast from Maine to Virginia there are lines which could be utilized to move troops and supplies for comparatively short distances, yet far enough for the purpose, up and down the coast. For comparatively short distances also, there are, of course, lines running a few miles distant from the coast, which might be utilized to some extent. I suppose, too, that in some parts of the country there are interurban lines which could move troops for a considerable distance.

I am not informed that if it were desired to move troops from the Middle West to the coast, east, south or west, it would be feasible so to do by trolley. That is, the lines are comparatively short, and the accommodations, if for anything more than a few hours' ride, with exceptional cases, are unsuitable. In other words, while advantage should be taken of all the country's resources, it seems to me, without making a thorough study, that the resources of the trolley for any considerable movement of troops would either be unimportant or inadequate. This, of course, is only first blush opinion and I should be glad if wrong.

I should suppose that one of the things the Government would do would be to make a careful study of the street railways of the country, and assign to them such tasks as were feasible of performance. The Government ought to recognize your public spirited suggestion, and I have no doubt will. I should think that in some way, perhaps through the American Electric Railway Association, your suggestion ought to be brought to the attention of the War Department.

WILLIAM A. BANCROFT, President.

Irresponsible Railway Training Schools

SIOUX FALLS TRACTION SYSTEM

SIOUX FALLS, S. D., Nov. 27, 1915.

To the Editors:

Within the last few months we have repeatedly had our attention called to a form of imposition which is being practised on prospective railway employees, and although operating companies are not directly concerned an effort should be made to remedy the evil. We refer to correspondence schools of railway training, which for sums varying from \$18 to \$25 send a course of instruction. Upon the completion of the courses, which require from two to six weeks, these schools issue attractive diplomas embossed with a gold seal and then refer the graduates to the nearest electric road with the assurance of employment.

During the past six months we have had a number of applicants from different portions of the State who were equipped with diplomas, some coming here in person and others forwarding written applications accompanied by photograph. Within the past two days we have had two personal applications, one from a training school at Kansas City and the other from St. Louis. One

man paid \$25 and completed the course in two weeks, the other paid \$18 and finished in six weeks. Neither of these men had personalities to recommend them as street car operators. Neither had ever had any street car experience, and they were not the class of men we want. I doubt if there is a road in the country that would have considered them for a minute. Both men had been guaranteed employment by the school upon completing its course.

It is apparent that these so-called schools are very keen for business. They buy advertising space in certain magazines regularly and evidently they find plenty of suckers. The legitimate correspondence school may be all right, but the schools that take every Tom, Dick and Harry, get their money, send a diploma and guarantee a job are certainly working a fraud on the public, and their methods should be exposed.

R. C. MILLS, Superintendent.

The Automobile and Hard Times

DENVER, COL., Nov. 22, 1915.

To the Editors:

I have read with interest the editorial entitled "Competition from Private Automobiles" in your issue of Nov. 6. In some communities the competition is felt more severely than in others. Good roads and mild climate are great factors. The smaller cities and towns have felt the competition more keenly than the larger cities.

At present the country districts of the United States afford the greatest field for the increased use of the auto, and here will be the scene of greatest development during the next few years.

Street and interurban railways have not been the only sufferers from the increased sale and use of the automobile. Steam railways have felt it, but in a broader sense. Nearly every industry or enterprise not directly or indirectly connected with the automobile industry has suffered, and I believe that the tremendously rapid growth of this great business has had more to do in bringing hard times to the United States than the European war.

According to estimates made by the *Scientific American* in June, 1915, there were in use in the United States 2,000,000 automobiles. Their annual cost of operation was placed at \$730,000,000. Add to this the selling price of the year's output of new cars, viz: \$450,000,000, and the sum of \$1,180,000,000 results. This tremendous sum is not a permanent investment. On the contrary, it represents wealth put into one of the most rapidly depreciating devices that transportation has ever developed. Rubber tires, gasoline, machine and all are gone or worn out within a comparatively short time. If the cost of building and maintaining garages, the cost of damages resulting from accidents and the expense due to the wear and tear of roads and pavement were added to the above expenditure, the grand total would look like a war debt.

According to the last census there were in the United States proper 92,000,000 people. This, divided into \$1,180,000,000, shows a present annual expense of approximately \$13 per capita, and this amount is increasing rapidly.

A very large percentage of the families owning and using automobiles have certain fixed incomes within which they must live. The auto has proved a new and additional source of expense, and to offset this economies and curtailments have been necessary in other directions. Men buy caps or cheaper hats and inferior clothes, as a good suit gets ruined more quickly apparently in an auto than a cheaper one. Likewise the

women wear auto veils and cloaks and get along without so many good hats or dresses. The members of the family cut out the porterhouse steak and eat deviled-ham sandwiches out under a tree or bean soup at home. They spend their vacations on near-by country roads instead of taking a trip on the train. Evenings are spent riding around instead of going to the theater. We might go all along the line, and practically every business man will tell you that he has felt the pinch of hard times, and almost invariably this pinch can be traced to the use of the automobile.

The automobile has come to stay. It will be cheapened and continually perfected. Its life and service will be lengthened and its use will become well-nigh universal. To fail to recognize this is most shortsighted, as it takes no prophet to foretell these conditions, which are virtually upon us now.

The burning question is, what is it going to do to the railway? My firm belief is that in most communities the railway will be as necessary as ever. The volume of business and conditions of traffic may change. These conditions must be met, how, no one at present can say; probably in different ways under various circumstances in different places.

Taxation must be equalized. One form of transportation must not be required to build and maintain its own substantial roadbed and also an additional roadway for its competitor to use practically free. I mean that the street railway that lays its rails for its own use and then paves the street around them for the use of the auto, must be relieved, and that the auto must bear its just share of such taxation.

JOHN A. BEELER.

Pavement Sand Cushion Becoming Obsolete

MINNEAPOLIS STREET RAILWAY COMPANY

MINNEAPOLIS, MINN., Nov. 24, 1915.

To the Editors:

Replying to your editorial on the use of a mortar cushion instead of sand for paving, the writer has not experienced any difficulty with a sand foundation under granite blocks or brick laid in or between street railway tracks. It has been our custom to grout both these types of paving, but we do not think a mortar cushion is necessary with these pavements. In the case of wooden blocks, however, it is desirable. We have used a mortar cushion to some extent with this type of construction and we have obtained better results than with a sand cushion.

There is a small additional expense in using the mortar cushion but, if it preserves the surface of the pavement, the money will be well spent. Pavements, to hold up under heavy traffic, must be built as permanently as practical, and the use of mortar for a cushion will be a help in this direction.

GEORGE L. WILSON,

Engineer Maintenance of Way.

PHILADELPHIA, PA., Nov. 10, 1915.

To the Editors:

Referring to your editorial in the *ELECTRIC RAILWAY JOURNAL* of Oct. 30 entitled "Pavement Sand Cushion Becoming Obsolete," there has been laid in Philadelphia during the past ten years a considerable amount of both granite block and brick pavement on a dry mixture of sand and cement. This mixture was usually in the proportion of four parts sand to one part cement, spread to a depth of from 2 in. to 4 in. The former depth in case of granite block supported by a sub-base of concrete. After the blocks or bricks had been rammed or rolled the pavement was thoroughly flushed

with a hose and protected from travel for a period of from three to four days. The joints between the bricks were then filled with fine dry sand.

Before trying this experiment it was thought that while this construction would permit of the removal of the bricks or blocks without breaking them, the sand-cement base would hold them firmly enough to prevent displacement by traffic. It was also believed that the sand joint would, to a great extent, prevent upheaval of brick pavement by expansion. Results during the last ten years seem to have abundantly demonstrated the efficiency of this type of foundation. The sand-cement concrete, particularly in the case of brick pavement, prevents access of water to the earth sub-base and when bricks have been removed for any purpose they can easily be replaced to the level of adjoining pavement. Brick pavement laid in this manner—that is, on an earth or gravel sub-base, was tried only on streets where travel was comparatively light. On heavily-traveled streets in the business section a concrete sub-base was provided. The cost for maintenance of this type of paving has been very small, and it is perhaps unnecessary to say that it can be laid quite cheaply and very rapidly.

H. B. NICHOLS.

Standardization of Railway Substations

SAN FRANCISCO, CAL., Nov. 26, 1915.

To the Editors:

Recent communications in your columns under the subject of "Cars at Less Than Cost" will serve to introduce another subject, that of railway substations. Having been concerned in the design and construction of this class of structure, I wish to draw attention to a profitable field for discussion in connection therewith.

The letters referred to bring out the idea that there is insufficient standardization in electric railway car manufacture because of the great variety in the demands made on the car builders by the railway companies, comparing unfavorably with the automobile industry, in which one design of automobile will serve for several thousand different customers. If this line of analysis be applied to the subject of railway substations, we will find the conditions still worse. In spite of my general approval of the policy of standardization, I must admit that the difficulties in getting a standard design of substation adopted appear greater than in the case of a standard passenger car. The latter must always run on two rails nearly the same distance apart, but the building may be located in an endless variety of conditions.

Why do we want a standard substation? Is it to save the railway companies the cost of preparing designs and specifications every time they want a new station or a number of them? Such a saving is well and good, but I believe a much greater one can be effected if a standard, or a series of standards, can be agreed upon, as I will explain directly.

Why a series? For this reason: A standard, inflexible design for a substation is something like a standard design for a residence. To build up a town of a lot of residences all exactly alike is, in general, not at all desirable, and absolute uniformity in substations is not practicable. We must compromise.

At the recent convention of the A. E. R. E. A. there was presented for the consideration of the convention a "Study for Standard Fireproof Substation Buildings of About 1000-kw. Capacity," the sub-committee stating "it is their earnest desire that a full discussion be given same on the floor of the convention in order that suggestions may be made for the guidance of future committees, as your committee recommends that this sub-

ject be considered again next year." Unfortunately there was not time for the full discussion which the subject deserved, and it appears to me that the columns of the *ELECTRIC RAILWAY JOURNAL* offer a suitable medium for bringing out further suggestions. I will, therefore, offer some remarks to start the matter.

A large saving to the railway companies could be made if the association should carefully draw up, say, two or three alternative standards, each of which should be carefully designed in connection with the standard sizes of metal forms for concrete now on the market. Then by having sets of these forms placed at convenient centers of distribution, a company desiring to build substations need only go to the nearest distribution point, procure a set of forms for itself or its contractor, and return them after using. By doing so it would at once eliminate all the cost of form lumber and days and days of sawing and nailing in producing an elaborate wooden structure which will be ruthlessly destroyed the minute the concrete has set and seasoned sufficiently. The design submitted shows brick walls, but I believe concrete, under the conditions just described, will be found preferable in a great many cases. I express this opinion as an independent engineer having no connection with cement interests.

Now to the difficulties of fixing upon a uniform design:

1. The degree of spaciousness which is economically permissible is a function of real estate values. The maximum desirable is a matter of judgment. The minimum possible can be found in portable substations, having a few inches around the machine, and walls and roof which are lifted off by a crane when extensive repairs to the machine are necessary. But neither generating stations on cars nor generating stations on ships should be taken as a guide in designing stations on terra firma. Because it is possible to exist under extremely irksome conditions is no reason for imposing them when they are avoidable.

The design submitted to the convention is quite a way above the minimum possible, but in my opinion not quite far enough.

Again, the design shows a residence and station in the same building. Now such a combination would commonly be constructed in a country town or village where real estate is relatively cheap, but where the operators would scarcely be in position to own their homes, for various reasons. In such a case we could afford to put some of the saving in real estate cost into a little more cubical capacity, affording space for disassembled parts on the floor and for working around in making repairs without knocking against apparatus on the switchboard, etc.; also providing a bathroom in the residence part, which should always be done if possible. It is possible for people to live in cramped, inconvenient quarters, but they do it at the expense of greater loss of energy and irritation of temper, reducing their general efficiency.

A cramped design may be necessitated by high real estate values in a city, but I think in this case the residence combination will usually not be required. Therefore in each case, city and village, the design submitted is not suitable.

2. The design assumes certain conditions. But there are other conditions which may be held to just as tenaciously. In some places, with some companies, motor-generator sets will be used instead of the rotary converters shown and will take up greater length on the floor. In some places provision for extension on the unit system must be made, not to speak of having floor space for installing a third machine without having to extend the building. In some places concrete walls will be preferable, in others brick. In slum districts the

plainest possible structure will suffice; in wealthy residential quarters the cultivation of a favorable public opinion demands a building harmonizing with the surrounding mansions in architectural merit. In some places no residence will be wanted in the building.

To meet these various conditions, why should not the association get up two or three alternative designs (which should themselves be susceptible of ready modification when necessary), making them to suit standard metal forms and standard form lumber, making the window and door frames to suit accepted mill standards, or metal frame standards; work up complete working drawings, with bills of material, tabulation of concrete reinforcement required, list of standard forms and drawings showing how the forms should be put together, and place all this matter at the disposal of the railway companies at a cost sufficient to cover the expense? Before again presenting the matter, let them make a thorough canvass of existing substations, learning the local conditions and obtaining opinions regarding the suitability of the adopted designs as regards convenience and degree of spaciousness, etc.

This is the kind of work which helps to make the association appreciated.

H. J. KENNEDY,

Electrical, Mechanical and Construction Engineer.

What Is the Rail Head?

ROBERT W. HUNT & COMPANY, ENGINEERS

CHICAGO, ILL., Nov. 23, 1915.

To the Editors:

Mr. Haas is to be commended for his excellent analysis of the practice of making rail renewals, published in your issue of July 31, 1915. The subject is a broad one, but the problem is constantly arising and requires careful study, for the reasons so admirably pointed out. There are, however, some phases of the subject which should be firmly fixed at the outset and even prior to a too general adoption of any precise practice. A very important matter in this connection is the determination of what actually constitutes the head of a rail, and this was commented upon in the *ELECTRIC RAILWAY JOURNAL* of Nov. 13, 1915.

There seems to be no good reason why the same definition for the rail head should not apply to rails of all sections and be that which has been used for years by the users of all types of standard section rails. As already pointed out, practice has always defined the rail head as being that area lying above the intersection of extensions drawn from the top angle-bar lines. While objections to this may be offered from the standpoint of grooved girder rails, it seems best to the writer to let this time-honored definition stand but to subdivide, by further definition, the head into, say, the lip and the bearing. This is, no doubt, work for the way committee of the American Electric Railway Engineering Association.

The best time to make renewals in general is, after all, perhaps largely a matter of individual opinion. While certain conclusions may be reached by calculation, the old question of the engineer's prerogative will probably still enter and be the deciding vote in any case. With so simple a thing as a steam railroad standard section rail, the limits of wear have never been fixed with anything resembling certainty, or even consensus of opinion. One has but to look at the profile of rails on curves and in yards to realize this fact. But, of course, with electric railway track in paved streets an entirely different problem is presented, and one for which, no doubt, some formula may be devised to indicate closely the desired facts.

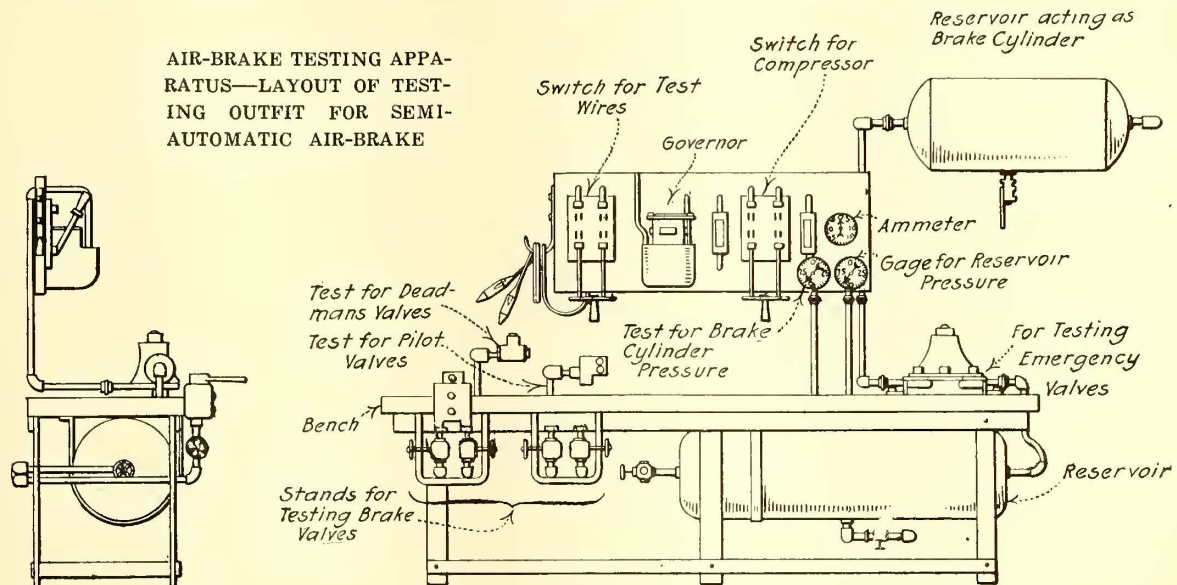
C. W. GENNET, JR., Engineer.

order to facilitate connections. For this purpose a $\frac{1}{8}$ -in. pet-cock is coupled to the dead-man's valve at the point where the pilot valve is regularly connected. This can be easily opened and closed and the same results as would occur in practice can be obtained.

Above the bench, within easy reach of the operator, is placed a connection board on which the following pieces of apparatus are located: An electrical switch for controlling the test circuit; a governor; an electrical switch for the compressor circuit; a small ammeter, and two gages. The first switch mentioned is an ordinary 600-volt, quick-break switch. To it is connected a set

until the governor cuts it out of circuit, and the governor action is repeatedly tested by reducing the reservoir pressure by means of the bleeding cock beneath the reservoir or by reducing the air pressure by using air for testing purposes elsewhere in the outfit.

In the same manner the functioning of all other parts of equipment may be tested under normal conditions. The brake-valve test is particularly effective as the use of a reservoir in place of the brake cylinder provides a perfectly tight receptacle and the gage connected to the brake line quickly shows leakiness of a valve. The emergency valve test is also effective, as its operation



of test wires in series with which are a number of heaters furnishing resistance sufficient to hold the current to a few amperes. This circuit is used to test the compressor fields and armatures for grounds, and the leads are long enough to reach any reasonable distance to the compressor. The air-compressor switch, governor and ammeter are used for testing the compressor after repairs by putting upon it a load approximating operating conditions as nearly as possible. The governor is connected in series with this circuit, which also contains a low-range ammeter. The reading of the ammeter shows the operator whether or not the compressor is running freely or is handicapped by tight bearings or improper connections in the armature or field circuits. The operator is informed as to the proper current for each type of compressor and therefore knows at a glance when it is operating properly.

The gages on the instrument board are connected respectively in the brake line and the reservoir line.

At some convenient point is placed a small reservoir which is used as a substitute for a brake cylinder. The use of this prevents the banging and pounding which would otherwise follow the throwing of a valve into emergency position. At the same time a result equivalent to the making of a brake application is obtained.

At one end of the main reservoir there is a T-connection, one leg of which is attached to a hose running to the compressor under test. The other leg is connected to the shop air line so that pressure can be maintained for testing if no individual compressor is available.

The piping layout is shown in an accompanying illustration.

In testing a compressor the air and electrical connections are made to the testing outfit and the compressor is timed for speed and examined for commutation under load, the reading of the ammeter being noted at the same time. The compressor is allowed to pump air

can be shown as well under test conditions as if it were actually on the car.

The testing outfit can be further used for testing repaired reservoirs or brake cylinders by connecting the compressor hose to the reservoir or brake cylinder and letting in air from the shop line. A slight modification would provide for the testing of safety valves.

The need for some such testing equipment as has been described above is almost self-evident. The ordinary, original straight air-brake equipment required a certain amount of attention and its share of overhauling. After repairs were made a few simple but necessary tests were in order. Repairs for such equipment were oftener made on the car than at the bench. After the work was completed the car was tested to determine the effectiveness of the repairs. This method of procedure, while passable, was not entirely satisfactory.

As the air-brake equipment was improved the number of parts increased and the number of functions performed by the equipment grew. It thus became impracticable to make satisfactory repairs without removing the equipment from the car. While straight-air equipment is nearly standard for surface cars, the semi-automatic is supplanting it to a great extent on account of its flexibility and simplicity, even where single cars only are used. The maintenance of this equipment demands more care and attention than the straight-air equipment, and repairs and overhauling should be attended to at a bench where the parts can be placed and held in easily accessible positions, and repaired, cleaned, lubricated and tested.

The Orleans, Toulouse, Lyons Railway, formerly a high tension a.c. suburban electric line at Lyons, France, has decided to abandon this system and return to the d.c. system. One of the lines from Miribel to Lyons has already been converted.

Rail Bond Testing—I—Methods Used in Testing

BY H. H. FEBREY, ENGINEER AMERICAN STEEL & WIRE COMPANY, FORMERLY ASSISTANT ENGINEER PENNSYLVANIA TUNNEL & TERMINAL RAILWAY

Bond testing falls short of its proper function when it is conducted only for the purpose of locating high-resistance joints so that repairs can be made. It is frequently argued that the expense of testing is unwarranted, but when conducted in a thoroughly analytical way testing can be made to lead to economies quite commensurate with its cost. Without systematic bond testing there is sure to be lack of knowledge of true conditions and this results in a continuation of wrong practices in matters of selection and installation of the bonds. More real attention to testing would reduce the number of poor installations. This may be seen on lines where extensions are made from time to time. Certain practices become more or less standardized and are used for years, and each year it may be found that a large quantity of bonds are required for general maintenance. Instead of regarding this as a matter of course, the rate of depreciation should be established by testing, and the percentage of failures noted. When it is considered that there are installations where the failures amount to a very small fraction of 1 per cent per year it is obvious that there is room for investigation where the annual replacements amount to much more than that, as is frequently the case. The reasons for bond failures are easily determined, and it can be ascertained by testing whether the installation or the design is faulty.

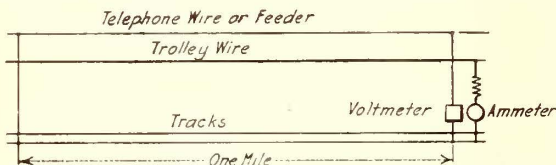
Suppose that a line is bonded so that a majority of the bonds, a few months after installation, are of low efficiency, i.e., the resistance of a perfect bond to the actual resistance is low. It may be so although it is not necessarily of prohibitive resistance. For the sake of argument, assume that it is not known that the

It cannot be claimed that more attention to tests would make the poorly-installed bonds good, but if it were known that they were deteriorating before the voltage was seriously affected the same errors on subsequent work could be corrected. Or it would be quite practical with certain types of bonds to improve their contacts without removing them, if this was done before corrosion had set in.

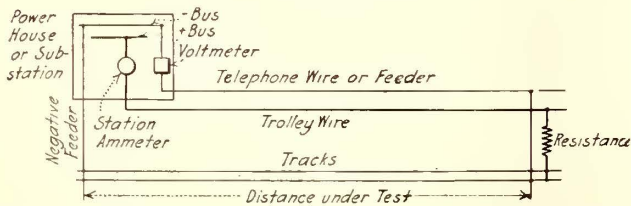
It is not necessary to wait for high resistance to develop. Observation by periodical and systematic testing will enable one to determine the quality of workmanship at the time of installation and the rate of depreciation thereafter. Knowing that the resistance of the bonds is increasing from year to year, the causes will be sought and determined and the incorrect practices discontinued.

A rail joint may be tested by reading the drop across the joint and calculating the resistance from the drop. This is practicable only when the current producing the drop is known. The other, and usual method, is to compare the drop across the joint with that in a certain length of solid rail adjacent to it. This comparison is made by means of portable testing sets, which operate on the principal of the Wheatstone bridge. Where the bond testing car is used the method is also comparative, as will be explained.

The total resistance of the bonds in a section of track can be ascertained by making the drop test of the entire section between selected points. The total resistance is calculated from this drop and the total bond resistance can be found by deducting the resistance of the total length of uncut rail. It can be determined then whether or not the resistance of the bonds is higher than it should be. The method of procedure in making a test of this kind is to use a telephone wire or spare feeder as one voltmeter lead, and to connect one end of it to the track at the distant point. It is connected to all bonded rails that are cross-bonded, and the other end is connected to either voltmeter terminal. The other voltmeter terminal is connected to the negative bus in the station or to the tracks. By reading the drop and the current flowing in the section under test, at the same time, the total resistance of the negative circuit can be ascertained. To the calculated resistance of the solid rail should be added the resistance of the negative feeders which lead to the station, and parallel negative

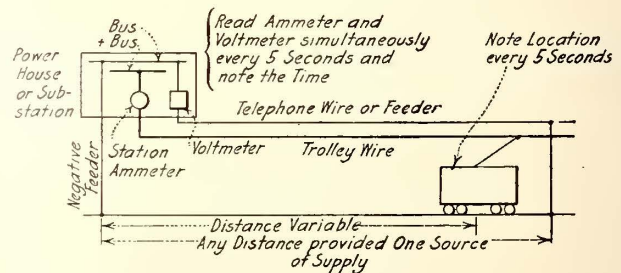


BOND TESTING—MEASURING RESISTANCE OF A SECTION OF TRACK



BOND TESTING—MEASURING RESISTANCE OF TRACK FROM POWER HOUSE OR SUBSTATION

efficiency is low. The bonds, being improperly installed or of incorrect design, will deteriorate and will later reach a point where their resistance becomes detrimental to the service. It may be three or four years before they reach a point where they are noticeably bad without testing and in that time additions to the line may have been made. Through ignorance of conditions the same bonding practice is adhered to and trouble develops on many parts of the system. This may happen, although a test of the system has been conducted shortly after installation, because the joints may have tested to within a certain limit arbitrarily chosen.



BOND TESTING—CONNECTIONS FOR USE OF BOND TESTING CAR

feeders should be taken into account. To determine the resistance of the solid rail the number of rail joints should be ascertained and the total length of rail which is cut out by the bonds should be deducted from the total length of rail in the track. If the rails are 30 ft. long and the distance between the bond terminals is 3 ft., there will remain 27 ft. of solid rail in each rail length.

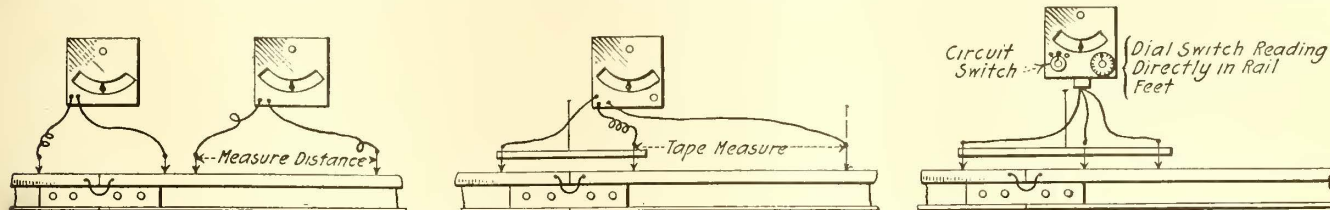
This is a quick means of determining the approximate total resistance of the bonds, but it will not locate the defective bonds, which must be done by testing each joint. The method here described does not give an ac-

curate measurement of the track resistance, on account of the leakage of current to the earth. This results in a smaller drop than would be read during test if there was no current leakage to earth, and therefore indicates that the track resistance is lower than it actually is. On the other hand, such a test is of value if it shows a relatively high resistance. It is best to conduct a test of this kind on short sections, such as a mile or less.

The bond-testing car is equipped with a low-voltage generator with brush contacts on the rails through

This is a very flexible method and by the use of properly calibrated resistances the measurements on the solid rail can be multiplied as desired, thus eliminating the necessity of awkwardly long measurements.

There are other testers which have three contact points at fixed distances apart. By varying resistances in the instrument the drop across the joint is made to equal the drop in the solid rail. The resistances are calibrated to read directly in rail feet. These do not read as close as the movable-point testers but are suffi-



BOND TESTING—CONNECTIONS FOR TWO-MILLIVOLTMETER METHOD; CONNECTIONS FOR A. S. & W. CO. TESTER; CONNECTIONS FOR WESTON TESTER

which current can be sent through the rails at all times for the test. There are two additional brush contacts for each rail, generally spaced 4 ft. apart, which are connected to the terminals of two millivoltmeters. The millivoltmeters record the drop in the 4 ft. of rail on a special paper roll which moves with the car. The drop in the 4 ft. of solid rail is practically constant and makes a straight line on the paper. When the contacts span the rail joint the drop at the joint is recorded and compared with the drop in the solid rail. The paper is graduated with horizontal lines which represent the number of millivolts deflection of the meter needle. The drop around the joint being generally higher than in the same length of solid rail, is shown, in general, on the chart above the line indicating the drop in the solid rail.

The portable bond testers are mostly arranged so as to read the number of feet of solid rail to which the joint is equivalent. They give very accurate results. Their principle can be explained best by reference to the two-millivoltmeter method. Two points are selected which include the bond terminals between them, and these are connected to the terminals of a millivoltmeter, which shows the drop across the joint. A second millivoltmeter is connected to two points on the rail adjacent to the joint which will register the same drop as that across the joint. The two drops being equal with the same current flowing the resistances must be equal, and all that is necessary is to measure the distance between the points on the uncut rail. This designates the number of feet of rail equivalent to the joint resistance. The two-millivoltmeter method is not used to any great extent because it is cumbersome, and the chances of error in reading both meters at the same time, especially when the current is variable, are considerable.

Another method which is essentially like the two-millivoltmeter scheme involves the use of a differential millivoltmeter. By using two fixed points which span the rail joint and moving a third point until a balance is obtained the resistance of the joint is determined by measuring the length of uncut rail required to make the balance. The drop in the circuit including the rail joint is reduced by the drop in the circuit, including the solid rail adjacent to the joint. When all three points are in contact the indication of the meter needle is the difference between the two drops. It is obvious that when the drops are equal the deflection is zero. This is the most accurate method to use because the resistance can be measured in terms of a fraction of an inch of the rail. By raising and lowering the movable point the correctness of the balance is well established.

ciently accurate for average use. They have the advantage of being readily handled by a single operator and are consequently more popular.

It can be seen from the foregoing descriptions that all bond testers obtain the resistance of the joints in terms of rail feet. Testing is necessarily comparative under average conditions. After obtaining the reading in feet of rail it is an easy matter to determine the ohmic resistance from data pertaining to the resistances of various rails.

Detroit Center-Entrance Trailers

BY C. L. KELLER, ASSISTANT MASTER MECHANIC,
DETROIT (MICH.) UNITED RAILWAY

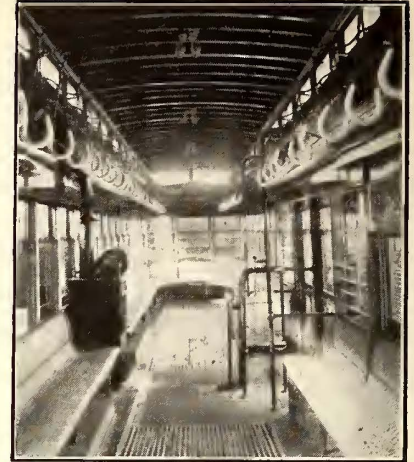
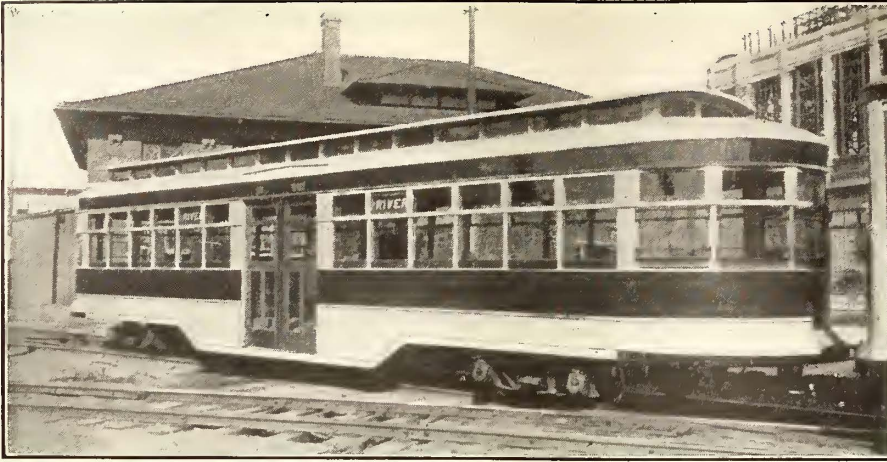
Detroit (Mich.) United Railway patrons are now being given an opportunity to judge the merits of center-entrance trail cars, as the first cars shipped on an order of fifty equipments of this type were delivered recently by the G. C. Kuhlman Car Company, Cleveland, Ohio, and were immediately placed in service.

While it is not possible, at this early date, to gage the general sentiment of the public concerning this innovation, it is anticipated that the increased efficiency of service will bring public approval and that this will repay the company for its thorough study of existing types of trail cars, and the conditions governing their operation, which was made prior to placing the order for the new cars.

The general dimensions of the trail cars are as follows:

Length over all.....	46 ft. 8 3/4 in.
Width.....	8 ft. 2 in.
Car floor above rail.....	27 1/2 in.
Side sill to top of monitor.....	8 ft. 11 1/2 in.
Truck centers.....	28 ft. 0 in.
Wheelbase of trucks.....	4 ft. 4 in.
Weight, without passengers.....	27,275 lb.

All-steel construction was adopted for the new cars. The outside sills are formed of 5-in. x 3 1/2-in. x 3/8-in. angles with the 3 1/2-in. leg in the vertical position. Entrance and exit facilities were provided in one center opening with two sliding doors, and the sill was bent downward to form a support for the step. All sills are continuous from end to end of the car and are riveted to angle buffers of the same size, bent to a radius equal to one-half the car width, the ends of the underframe being further protected by 5-in. anti-climbers. The cross-bearers are of several different sections, depend-



EXTERIOR AND INTERIOR VIEWS OF DETROIT ALL-STEEL TRAIL CAR

ing on load requirements, and a suitable drawbar anchorage is provided at the front end of the car by the two cross-bearers at that point which are made of 3-in. channels spaced 11 in. back to back and covered top and bottom with $\frac{1}{4}$ -in. plates.

The corner posts are composed of two $1\frac{1}{2}$ -in. x 2-in. tees spaced 6 in. apart and covered with a $\frac{3}{32}$ -in. plate from the sill to the roof. Door posts are of similar construction but with a spacing of $10\frac{3}{8}$ -in. between members. The window posts are placed at $29\frac{1}{4}$ in. centers, and are also formed of $1\frac{1}{2}$ -in. x 2-in. tees, slightly offset at the bottom to frame flush with sill angles. Below the belt rail these posts are sheathed with a $\frac{3}{32}$ -in. plate. The belt rail is formed of a Kuhlman standard pressed shape. The top plate is formed of a $3\frac{1}{2}$ -in. x 3-in. x $\frac{5}{16}$ -in. angle and a $1\frac{3}{4}$ -in. x $1\frac{3}{4}$ -in. x $\frac{3}{16}$ -in. angle which are reinforced over the center entrance by the addition of a 2-in. x 2-in. x $\frac{3}{16}$ -in. angle. The roof is of the monitor type, but the monitor extends toward the car ends to afford better ventilation at these points. The hoods are built as units and can be easily removed for repairs.

From the rail to the first step is 13 in. and the step is 5 ft. 8 in. long and 15 in. wide. A post in the center divides the step into an entrance and an exit, each 30 in. wide. The second step is $10\frac{3}{4}$ in. high and is on a level with the loading space, which is of the same width as the entrance. The loading space is $3\frac{3}{4}$ in. below the level of the car floor proper, and this difference in height is taken up by a ramp leading each way from the entrance well. The aisles are 3 ft. 5 in. wide, and the ramps are 6 ft. $9\frac{3}{4}$ in. long. The distance between the longitudinal seats is 4 ft. 5 in.

The entrance and exit doors slide into pockets on each side of the center opening and are operated by the National Pneumatic Company's door engines. Sheet-metal longitudinal seats with $\frac{1}{2}$ -in. felt padding covered with rattan provide for about fifty-six seated passengers, and fifty-six Rico sanitary hand straps have also been provided for the standing load. Natural, quarter-sawn white oak with no headlining was adopted for the interior finish, the absence of a headlining saving weight and reducing first cost as well as maintenance cost. An interior view of the car in one of the accompanying illustrations shows the effect of this kind of a finish. Tomlinson, spearhead, air and electric connecting, radial drawbars are mounted on the front ends of the cars, and other equipment of interest includes Westinghouse semi-automatic air brakes and Peter Smith forced-ventilation hot-air heaters. The car is mounted on Brill trailer trucks of the arch-bar type equipped with 22-in. wheels.

Sioux City Tracks Paved with Concrete

Comparatively few cities or few railway companies have used concrete pavements on so extended a scale as has been done in Sioux City, Iowa. Ten years of service under varying traffic conditions such as would obtain in a city of 50,000 inhabitants, have been so satisfactory as to warrant a more extended use of this type of pavement. In one of the accompanying illustrations is shown 6-in. 72-lb. T-rail track on wooden ties laid in a residential street with a concrete pavement which has been in service more than ten years. Experience with this particular piece of construction has led to some improvements which, it is believed, will increase the serviceability of the concrete pavement. To separate the track allowance from the street pavement, a longitudinal joint extending from the pavement surface to the bottom of the foundation was provided. This was filled with asphaltum and no transverse expansion joints were used.

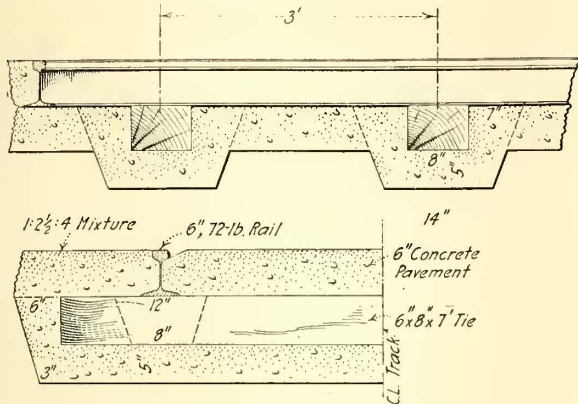
An examination of this pavement shows that steel wagon wheels following this wide longitudinal joint, have ground off the edges tending to make the joint wider. This damage has been repaired by refilling the joint occasionally with asphaltum. The occurrence of infrequent transverse cracks in the concrete, particularly over the wooden ties, has led to the adoption of transverse expansion joints. In some cases these transverse cracks show considerable wear under vehicular traffic. To retard this form of wear, these cracks and worn spots have been filled with asphaltum. Other defects developed where there was movement in the me-



CONCRETE-PAVED STREET IN SIOUX CITY, IOWA

chanical rail joints. Defects of this kind were not particularly serious and any of several measures could be adopted to overcome them. The welding of the joints offers a solution, as well as the provision of an asphaltum-filled pocket around each joint.

In the transverse and longitudinal track section the construction details are shown. The 6-in. x 7-in. wooden ties are laid at 3-ft. intervals on a 5-in. x 14-in. concrete bearing. These bearings are made integral with a longitudinal prismatic concrete beam, 12 in. wide



TRACK CONSTRUCTION IN CEMENT-PAVED STREET

under the rail and 8 in. wide at the base of the tie. The rails are fitted with $\frac{3}{4}$ -in. tie rods spaced at 5-ft. intervals. The pavement is 6 in. deep and formed of a mixture of 1:2½:4 of cement, sand and crushed Sioux Falls quartzite. Along the gage line of the T-rail the pavement surface is beveled about 30 deg. from the horizontal to meet the under side of the rail head and to form the flangeways. This class of construction requires approximately 315 cu. ft. of concrete per 100 ft. of track.

Rapid Crossing Installation in Cleveland

The accompanying halftone shows a crossing at the intersection of the tracks of the Cleveland Railway on Ninety-third Street with the tracks of the Wheeling & Lake Erie Railroad. The crossing rests upon an International Steel Tie Company's crossing foundation. The crossing was installed recently in one night, between midnight and morning. Neither the steam or the electric tracks were cut until 1 o'clock and both trains and street cars were going over the crossing before 4 o'clock. The whole foundation was well tamped with unscreened

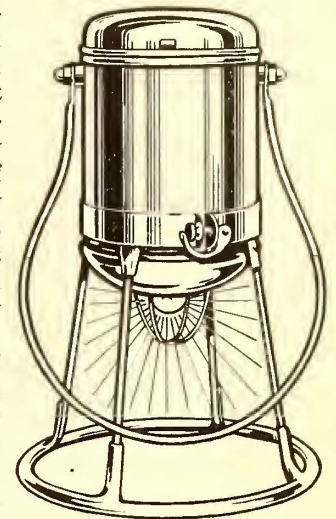


CROSSING INSTALLATION IN CLEVELAND, OHIO

broken stone and a concrete paving base was put in about flush with the rail base. The street surrounding the crossing was then paved with Medina stone block.

Lantern Which Casts No Downward Shadows

There have been many attempts to make a practical electrical lantern that would be useful in railway service, but an obstacle in the way of its development has been the securing of sufficient battery capacity to give reasonable life. The Federal Sign System (Electric), Chicago, Ill., claims to have overcome this difficulty in its latest type of electric lantern, illustrated herewith, which was invented by F. T. Baird of the Chicago, Rock Island & Pacific Railway. By the use of a high-efficiency, special dry battery and a high-efficiency tungsten lamp, it has been possible to make a lantern which weighs complete but about 2½ lb. and has a battery life of more than sixty hours. By the mounting of the lamp under the battery container, the light is thrown downward without producing any downward shadow, an impossibility with the oil lantern.



ELECTRIC LANTERN

The lantern consists of nickel-plated brass and steel parts; a container for the battery with the lamp base on the under side; a protecting guard and stand, and a bail which also acts as a switch. The battery contains four cells, producing 6 volts by connection in series, and it is supplied in one or two four-cell units. The two-unit, or duplex arrangement, permits the carrying of a reserve battery. The construction of the battery unit is such that it automatically connects itself in the circuit when placed in the container. The wire stand acts as a base for the lamp without interference with the radiation of light, and also protects the lamp. The latter is further protected by a small wire guard. The bail is so constructed that lowering it to one side connects the lamp in circuit while a reverse movement disconnects it. The lamp used is of 1¾ cp. capacity.

The intensity of the light from this lantern at a quarter-mile distance is said to be 30 per cent greater than that of the regular oil lantern, at a half mile 50 per cent greater, at three quarters of a mile 70 per cent greater, and at 1 mile 85 per cent greater. According to tests made by the Chicago & Alton Railroad, and affirmed by the general superintendent, this lantern will give an average service of two or three months on each battery. The lantern is said to be in satisfactory use by train crews in both passenger and freight service. The cost of operating the lantern appears to be about 1 cent per hour.

The State of Michigan has issued a 396-page compilation of the State laws relating to railroads, compiled under the supervision of Frederick C. Martindale, secretary of state. Laws relating to street railways are included in the list, and the various excerpts contain citations of court decisions and bits of legislative history that aid in the interpretation of the law.

Electric Railway Legal Decisions

CHARTERS, ORDINANCES, FRANCHISES

Federal Courts.—Compensation for Property Taken for Elevated Railway.

The property rights of an abutting owner are not taken without compensation, contrary to the due process of law clause of United States Constitution, Fourteenth Amendment, because, in a suit by him to recover for the loss in market value consequent upon the erection and operation of an elevated railway in the street, the trial judge directed a verdict in favor of the railway company, refusing to submit questions of damage to the jury under positive instruction to exclude from market value subsequent to the construction of the railway such enhancement, if any, as resulted from facilities furnished by the improvement itself, where the only testimony relating to market value either before or just after the road was built shows that no change in such value occurred, and there was no evidence as to what enhancement, if any, resulted from the improvement. (*E. L. Brand, Jr., and E. Belle Brand v. Union Elevated Railroad, Lake Street Elevated Railroad and South Side Elevated Railroad*, 35 Supreme Court Rep., 846.)

Federal Courts.—Gas Rates—Reasonableness—Valuation—Going Value—Reproduction Cost.

The "going value" of a long established and successful gas company was sufficiently taken into account in determining the value of the company's property for the purpose of testing the reasonableness of gas rates fixed by municipal ordinance, where the valuation was based upon a plant in actual and successful operation and overhead charges were allowed for promotion, organization and development expenses.

The expenses of taking up and replacing pavements on streets which were unpaved when the gas mains were laid need not be included when valuing the property of a gas company on the basis of reproduction new, less depreciation, for the purpose of testing the reasonableness of rates fixed by municipal ordinance.

The refusal of a court to enjoin the enforcement of gas rates fixed by municipal ordinance upon the conclusion reached that a return of 6 per cent per annum on the valuation of the gas company's property would not be confiscatory will not be disturbed on appeal, especially where the ordinance was attacked before an opportunity was afforded to test its results by actual experience. (*Des Moines Gas Co. v. City of Des Moines et al.*, 35 Supreme Court Rep., 811.)

Federal Courts.—Contract Exemption from Taxation.

The Federal Supreme Court will not disturb a decision of the highest New York court that the contract exemption from taxation conferred by New York Laws 1894, chap. 752, sec. 35, Laws 1896, chap. 729, sec. 4, Laws 1900, chap. 616, sec. 4, upon any person, firm, or corporation operating the New York city subway, in respect to his, their, or its interest therein under the construction contract, and in respect to the rolling stock and other equipment, does not exempt a corporation formed to operate the subway from a tax measured by capital stock and gross earnings, imposed under the New York tax law, secs. 182, 184 (Consol. Laws, chap. 60) upon the right to be a corporation and to operate as such. (*People of the State of New York ex rel. Interborough Rapid Transit Co. v. William Sohmer*, 35 Supreme Court Rep., 549.)

New York.—Fares Within City Limits—Connecting Carrier.

The prohibition against charging more than 5 cents for 5 miles or less, contained in one of the grants of the New York & Long Island Traction Company, which operated three different lines, is limited to the services of the defendant as a connecting carrier, and does not apply to the carriage of passengers over its several lines. (*Raynor v. New York & Long Island Traction Co.*, 151 New York Sup., 417.)

Maryland.—Public Service Commission Has No Power to Require Unprofitable Extension.

The public service commission may not compel an electric railway company to construct and operate an extension of its line, where the construction and equipment of the extension in the manner directed by the commission would in

the honest judgment of the directors of the company, result in annual loss to it, for the commission cannot so control the discretion of the directors. (*Towers et al., Public Service Commission v. United Railways & Electric Co.*, 95 Atlantic Rep., 170.)

New York.—Reasonableness of Regulations of Public Service Commissions to Order Transfers, Changes in Types of Cars and Installation of Underground Feeders.

An order of the Public Service Commission, Second District, requiring an Albany street railway company to arrange with the Schenectady Railway Company for the giving of transfers within the city to passengers entering the cars within the city, was reasonable.

While the Public Service Commission would not be justified in ordering a street railway to provide larger cars simply for the purpose of conforming to the style of an aristocratic city, if there was evidence before the commission that the smaller cars were not convenient or comfortable and not adapted to the large traffic of a large city, a question of fact was presented for the commission's determination.

Where, after the close of a hearing before the Public Service Commission resulting in an order requiring an Albany street railway company to make certain changes in its equipment and method of operation, and among other changes to purchase forty-two additional cars, the foreign war broke out and the company applied for a rehearing, claiming that it was impossible to raise the necessary money and that the expense of procuring such cars would be great, the portion of the order relative to purchase such cars should not be enforced until a rehearing was had.

Where a city had by ordinance the power to compel a street railway to put its wires underground, and pursuant to such power the company had at considerable expense put certain of its wires underground, the work requiring the tearing up of the streets, which could only be done by permission of the city, the Public Service Commission should not have ordered the company to make material yearly extensions of its underground conduit and feeder system but should have left it to the city to order the wires to be put underground and conduits to be built, as telephone and electric light wires could also be placed in the conduits, thus requiring but a single tearing up of the streets. (*People ex rel. United Traction Co. v. Public Service Commission of New York*, Second District, 153 New York Sup., 542.)

New York.—Rights of Abutting Owner Against Annoyance from Switchyard.

Abutting property owners are without remedy for annoyance caused by the operation of a street railway upon tracks lawfully laid within the street, but a company cannot operate a Y on its private property in such a way as to be a private nuisance to residents of adjoining property. (*Davis et al. v. International Railway*, 152 New York Sup., 88.)

LIABILITY FOR NEGLIGENCE

Alabama.—Injuries on Car Step—Burden of Proof.

A passenger suing for an injury received while alighting from a street car does not have the burden of proving that the step of the car was in an unsafe condition when she attempted to alight and that the unsafe condition was caused by the negligence of the street railway company or its employees. (*Birmingham, Ensley & Bessemer Railway v. Hoskins*, 69 Southern Rep., 339.)

Alabama.—Injuries to Persons on Track Between Crossings.

Car tracks in a locality far removed from the business section of a city are not presumptively imbedded in and a part of the street outside of a street crossing, and, in the absence of evidence to show that fact, motormen are not required to look out for persons on the track outside of street crossings, or give warning signals of approach to persons who may by chance intend to cross elsewhere than at a street crossing. (*Birmingham Railway, Light & Power Co. v. Strickland*, 68 Southern Rep., 912.)

Indiana.—Rights of Fire Department.

Where a municipal ordinance gave fire wagons the right-of-way and required street cars, upon signal of any fire apparatus, to stop immediately and remain standing until it had passed, those in charge of a street car may be found negligent where they did not stop upon the giving of the signal, though they did not have actual notice of the signal,

for while the violation of the ordinance shows them guilty of negligence, when by ordinary care they could have discovered the fire wagon, the rules applicable to a criminal prosecution do not apply. (*Indianapolis Traction & Terminal So. v. Beck*, 108 *Northeastern Rep.*, 153.)

Maryland.—Assistance to Passenger in Car.

It is not negligence for a conductor, after inviting and assisting a passenger from one car to another to enable her to get a seat, to fail to assist her down the aisle to a seat, she not being weak or sick, the speed of the train not being excessive or unusual, and the curve in the road, reached while she was walking, not being sharp. (*Plummer v. Washington, Baltimore & Annapolis Electric Railroad*, 92 *Atlantic Rep.*, 536.)

Massachusetts.—Defective Push-Button System.

The company is responsible where a passenger is injured after using a defective push-button system and believed that her signal had been recognized, the car starting suddenly while she was attempting to alight. (*Weil v. Boston Elevated Ry.* (two cases), 105 *Northeastern Rep.*, 984.)

Michigan.—Liability to Express Messengers.

To exempt a carrier from liability or to limit its liability for injury to an express messenger for injury caused by its own negligence, the contract or release must expressly and plainly so provide. (*Cottrell v. Michigan United Traction Co.*, 150 *Northwestern Rep.*, 857.)

New Jersey.—Injuries to Boy Boarding Car.

Where a boy nine years old attempted to board a moving trolley car on the invitation of the motorman, the act of the motorman in suddenly accelerating the speed of the car before the child reached a place of safety justified a finding of actionable negligence of the street railway company. (*Solomon et al. v. Public Service Railway*, 92 *Atlantic Rep.*, 942.)

New York.—Employers' Liability Act—Employee Hit by Train.

The guard on an elevated train went upon the tracks at the direction of the conductor to assist the motorman to raise the shoe of a disabled car from the third-rail. The train was between stations. No precautions were taken to flag on-coming trains, and one struck the guard. Held, that the company was liable under the employers' liability act (*Consol. Laws*, chap. 31, secs. 200-204) it not appearing that the guard was guilty of contributory negligence. (*Fay v. Interborough Rapid Transit Co.*, 154 *New York Sup.*, 154.)

New York.—Failure to Remove Center Poles in Street.

A city which grants to a street railway company authority to electrify a street railway operated under a franchise for horse cars but does not designate the location of the poles, may compel the removal of poles erected in the center of the street, when the poles have become dangerous by change in the conditions and use of the street, and the negligent failure so to do renders the company liable for damages sustained in consequence of the obstructions by persons lawfully using the street. (*Stern v. International Railway, et al.*, 153 *New York Sup.*, 520.)

New York.—Accident to Automobile Covered by Insurance.

Where defendant in an action for damages to plaintiff's automobile, sustained in a collision with defendant's street car, ascertains on cross-examination of plaintiff that the damages were covered by insurance which had been paid, it may, under *Laws 1914*, Chap. 368, Sec. 166, providing that amendments of pleadings may be allowed at any time to promote substantial justice, amend its answer and enter a plea in abatement. (*Allen & Arnink Auto Renting Co. v. United Traction Co.*, 154 *New York Sup.*, 934.)

New York.—Workmen's Compensation Law—Amount of Compensation.

The workmen's compensation act provides for a compensation amounting to two-thirds of the average weekly wages for all disabilities, total or partial, though for longer or shorter periods. An employee sustained injuries resulting in the amputation of one foot and other injuries not shown to be permanent, which in themselves would have disabled him from the time of his injury to the date of an award by the Compensation Commission. The commission awarded two-thirds of his weekly wages for 205 weeks for

the loss of the foot. Held, that the commission could not, in addition to such award, make a further award, running concurrently with the first award, for other injuries than the loss of the foot, though at the expiration of the 205 weeks, if disability still existed by reason of other injuries, the employee might be entitled to a further award, it being the plain purpose of the statute that awards shall take effect consecutively, rather than concurrently. (*Fredenburg v. Empire United Railways*, 154 *New York Sup.*, 351.)

Oregon.—When Person Boarding Car Becomes Passenger.

Where, in an action for injuries to a street car passenger, the evidence was conflicting on the issues whether the passenger attempted to board the car while standing and was thrown off by a sudden jerk of the car, or whether she attempted to board it while in motion, the court should charge that before the passenger could recover, she must show that she intended to board the car and gave notice thereof to the carmen, or that, in the exercise of reasonable care, they knew that she intended to board it, and that if the carmen did not know that she intended to board it, there could be no recovery. (*Tompkins v. Portland Railway, Light & Power Co.*, 150 *Pacific Rep.*, 758.)

Oregon.—Master and Servant—Employers' Liability Act—Trial by Jury.

The general manager and the superintendent of an electric company, both representing it in repair work, were bound to exercise reasonable care to prevent injury to a lineman, and, under the employers' liability act, it was the duty of each to use every care practicable for his safety, and they were liable for their failure to warn him of the fact that a current had been turned on near-by drop wires, as to which he was ignorant, and which, together with their failure to warn, was the proximate cause of his injury.

The Legislature cannot enact a law abolishing jury trials in law actions, nor can a law court arbitrarily refuse to allow a jury to be called in such cases. (*Hoag v. Washington-Oregon Corporation et al.*, 147 *Pacific Rep.*, 756.)

Pennsylvania.—Imputed Negligence—Automobile Passengers—Care Required.

The rule that an automobile passenger is not chargeable with the carrier's negligence does not relieve him from the duty of exercising reasonable care to avoid danger. (*Dunlap v. Philadelphia Rapid Transit Co.*, 93 *Atlantic Rep.*, 873.)

Pennsylvania.—Injury to Infant—Contributory Negligence of Parents.

Where a mother, though seeing a car standing not more than 100 ft. away and likely to start at any moment, sent an unattended child of tender years across a street traversed by a double line of fast-moving electric cars, she was guilty of contributory negligence and the parents cannot recover for injuries to the child from being struck by the car. (*Rapaport et al v. Pittsburgh Railways*, 93 *Atlantic Rep.*, 493.)

Washington.—Master and Servant—Industrial Insurance—"Extrahazardous Work."

A workman for a city contractor, engaged in constructing a manhole in the street near a railroad track, is not employed in an "extrahazardous work," so as to come within the scope of the state industrial insurance act. (*Puget Sound Traction, Light & Power Co. v. Schleif*, 220 *Federal Rep.*, 48.)

West Virginia.—Horse Receives "Shock" from Rails—Res Ipsa Loquitur.

Where, as in this case, the evidence tends to show that plaintiff's injuries resulted from the fall of his horse caused by a shock received from one of the rails of defendant's railway, overcharged with electricity and dangerous to persons and animals traveling on the street, and the character of the fall and the injuries to horse and rider and the electrical manifestation on the track at the instant of the fall are not inconsistent with other facts proved and the known and proved nature of electricity so employed when there are defects in the rails or in the bonds binding them, the jury may properly infer, in the absence of evidence showing that the bonds were not broken and that the track was in good repair and condition, that the injury resulted from a defective and dangerous track, and the rule *res ipsa loquitur* applies. (*Macy v. Charleston Interurban Railroad*, 84 *Southeastern Rep.*, 893.)

LONDON LETTER

City & South London Railway in Operation Twenty-five Years—Lancashire & Yorkshire Railway Nearing Completion

(From Our Regular Correspondent)

It is twenty-five years this month since the late King Edward, then Prince of Wales, formally opened the City & South London Railway, the first electric railway of note in England, and the immediate forerunner of the tubes that now pierce the subsoil of Greater London in all directions. Although electricity was employed as the motive power from the first, it was originally intended to operate the line by cable. Between the inception of the undertaking and its completion developments in electric traction enabled Greathead to apply it to his scheme with success. The original City & South London Railway between the Monument and the Swan, Stockwell, was a little more than 3 miles long and cost, approximately, £220,000 per mile. The South London line itself extended its southern limit to Clapham Common, while its northern end has pushed on through the heart of the city to Islington, where it has been linked up with the larger system at King's Cross and Euston. After the war it is proposed to enlarge the present tunnels to the size of the other tubes.

The new electrified line of the Lancashire & Yorkshire Railway from Manchester to Bury is now almost ready to be put into service. It is to be operated at 1200 volts, which is a novel pressure for England. On the success of this line will depend a very large conversion scheme of electric traction in the Manchester area, and the power plant at Clifton Junction has been designed to provide power when needed for a large mileage of electric railway. The power station is situated on a lower level than the railway, so that the delivery of coal is extremely easy. Babcock & Wilcox boilers have been installed to furnish steam to 5000-kw. turbo-alternator sets supplied by Dick, Kerr & Company. The turbines are designed to generate three-phase current at 6600 volts, which will be delivered to the various substations which are equipped with 1000-kw. Dick-Kerr rotary converters for transforming the 6600-volt current to direct current at 1200 volts. The switch gear in the power house, much of which includes special features, has been furnished by the British Thomson-Houston Company. The feeders to the substations are, wherever possible, in the form of overhead bare copper conductors carried alongside the railway, but where the conductors pass under bridges or through congested areas three-core Henley cables are employed. The collector rail is of a channel form with a head of such section as to provide a wide contact surface. The rail is fixed upon insulators provided with lugs to prevent lateral movement, and is inclosed with boards of Jarrah timber, the fire-resisting properties of which are well known. The only opening round the rail is a slot at one side of the cover for the accommodation of the current collector, but drainage holes are provided to prevent the accumulation of water in the groove formed between the guard and the collector rail.

The new electric service on the London & South-Western Railway between Wimbledon and Waterloo, via East Putney, has been established. The new trains make the journey between Waterloo and Wimbledon in twenty-four minutes, as compared with thirty minutes under the old conditions. The electric service will enable trains drawn by locomotives to be run express between Waterloo and the boundary of the electrified area. The electric trains run every twenty minutes. The company expects soon to open electric service on the Kingston circular route.

The London County Council is recommended by the highways committee to authorize the employment of women conductors on the tramcars during the period of the war and thereafter so long as conditions are abnormal. It is proposed that they be paid proportionately to the time worked, at 5s. a day, a rate equivalent to the present minimum daily rate of pay of male conductors, with the usual increments according to length of service and the war grant of 6d. a day. It is also proposed to employ women on unskilled work at the central car repair depot, and as porters in the Council's stores department.

The London United Tramways has decided to employ a number of women as conductors. Preference will be given to the relatives of men already in the company's service or who have joined the forces. Each woman will be paid 4s. 6d. a day, working six days a week, with an extra war wage of 2s., making a total wage of 29s. a week. She will wear a dark blue costume, with the skirt bound in leather, a specially designed pair of gaiters, and a waterproof cap. Many women are also qualifying at the company's school of instruction to become conductors. They must be at least 5 ft. 5 in. in height and between twenty-five and thirty-five years of age.

The omnibus and the tramway employees have agreed to accept women as conductors in the London area as an expedient during the war period. Recently the subject was discussed for several hours at the annual delegate conference of the Licensed Vehicle Workers' Union. Ultimately a resolution was agreed to on the terms stated previously. The resolution added that this was only subject to the licenses being issued from Scotland Yard under the same conditions as the licenses which are issued to male conductors, and also subject to the same wages being paid. An additional condition was that the women are to do the same kind of work as the men.

The Glasgow Corporation Tramway Department, it is understood, is considering the possibility of employing women to run the cars. The supply of motormen has run so short in consequence of the many enlistments that sufficient male labor cannot be obtained for the work. The fitness of women for the work has first to be demonstrated. The department has not yet made any experiments which would justify a reference of the question to the tramways committee. It is stated, however, that the women now employed as conductors are being asked if they are prepared to undertake the work of the motormen if such a development is found feasible. It may be recalled that Mr. Dalrymple, the tramway manager, stated in the address which he made in London about two months ago to the Municipal Tramways Association that the most difficult problem which the Glasgow department had to face was the shortage of motormen. He then presented statistics of the number of men who had enlisted, and said that throughout the greater part of the past twelve months the men who had remained in the service had had to work seven days a week, and that despite this the service had to be curtailed considerably last winter.

The Dundee tramways committee has decided to reconstruct the service on account of the depletion of the staff through enlistment. A scheme has been worked out to meet the men's demand for an increase of 3s. a week on the ground that the cost of living has increased. The working week is to be increased from fifty-four to sixty hours, and men now earning 27s. and over will get 5s. extra, and men earning under 27s. will get 3s. extra, with the war bonus of 1s. This proposal has been agreed to on the understanding that the former conditions shall be reverted to on the return of a sufficient number of employees from military duty. It has also been agreed to curtail the evening car service by having the last car leave the center of the city at 10.30 p. m.

Bradford is one of the cities that has not as yet employed any female labor on the tramways. In a report recently issued by Mr. Spencer, the general manager, it is evident, however, that there is a shortage of labor and that immediate action is necessary to avoid serious consequences. The present staff of 1281 employees is considered necessary, and as 818 are of military age, it is reasonable to suppose that under Lord Derby's recruiting scheme many of the men will have to leave the service of the corporation for the time being. Mr. Spencer considers that men more than forty years of age do not undertake with satisfactory results the duties of a conductor, and that the alternative appears to be female labor. In looking into the peculiar conditions of Bradford, however, Mr. Spencer considers the employment of women for driving the cars to be out of the question, and impossible under any circumstances in Bradford. The subject is to be considered by the tramways committee, which will also have to pass upon the question of increased wages for the men.

A. C. S.

News of Electric Railways

VOTERS APPROVE DES MOINES FRANCHISE

Negotiations Extending Over a Period of Ten Years Concluded by Vote Taken on Nov. 29

The people of Des Moines, Iowa, at the special election in that city on Nov. 29, approved the franchise by the Des Moines City Railway. With returns in from all of the forty-eight city precincts, and with all but six of these official, the vote stood 7787 for the franchise and 1883 against the grant. This represented more than 50 per cent of the normal vote. It is expected that acceptance of the franchise will be filed Jan. 1 by the company, and with its filing several of the clauses of the franchise, including the six fares for a quarter rule, will go into effect.

The vote on Nov. 29 terminates negotiations between the company and the city of Des Moines, extending over a period of ten years. A little more than two years ago the Supreme Court decided the company's franchise had expired and it received two years in which to secure a new grant or remove its tracks from the streets. During this time the company, because it had no franchise, could not properly finance itself, and the principal stockholders personally advanced upward of \$1,200,000 to protect the situation and give the city adequate service, pending such time as the company could re-establish its right to operate, either by a decision from the court upholding its claim to a perpetual franchise, or by securing a new franchise from the city.

In spite of all the company could do, however, it was impossible to prevent the company from going into the hands of a receiver. Now that a franchise has been granted, all that remains to be done is to dissolve the receivership, made necessary to protect the interests of the bondholders, and raise the money to rehabilitate the property. According to A. W. Harris, president of the Harris Trust & Savings Bank, Chicago, which has been protecting the interest of the bondholders, this should not be difficult to do, in view of the excellent showing the company will be able to make as to earnings and equity.

Since September, 1913, Emil G. Schmidt has been in direct charge of the affairs of the company as president, with offices in Des Moines. It is generally accepted that it was largely through his efforts that the passage of a workable franchise was secured and that sentiment favorable to the company was created which is regarded as a most valuable asset to the company in the future. That this is so is attested by an editorial in the *Des Moines Tribune* which was concluded as follows:

"The vote was more than an expression of weariness and more than an appreciation of changed conditions. It was a testimonial to the urbanity, perseverance and intelligent generalship of Mr. Schmidt, who ought to look upon it as a vote of personal confidence. The city believed that if given his head Mr. Schmidt would make a street railway system everybody would be proud of and glad to pay a nickel to ride on. Mr. Schmidt should look upon this vote as a very urgent invitation to him to give up all notions of Ohio or Michigan and make Iowa and Des Moines his permanent home. The city and the State need men of his energy, confidence, enterprise, and persistence. Des Moines really voted for Schmidt yesterday."

President Emil G. Schmidt of the company said:

"I want to prove to the people that they have not made a mistake in voting for the new franchise. Formal acceptance of the new ordinance will be made on Jan. 1 and the provisions of the new measure will then be in effect. Our fiscal year begins at that time. All old litigation will be disposed of before then. We will pay off the bonds and issue a new mortgage to borrow the money which we need for the rehabilitation of the system. The receivership will be disposed of by Jan. 1, and the new fare rate of six rides for a quarter will then go into effect. We shall contract this winter for work to begin next spring and we plan to spend \$750,000 in improvements during the spring and summer. Forty new cars, to be ordered at once, will be in service early in the spring."

Mr. Schmidt estimates that ten years of litigation over the franchise has cost the city and company more than \$250,000. He thanks the Chamber of Commerce, the Federation of Labor, and the employees of the company for their loyal efforts in bringing about the adoption of the new franchise.

A summary of the principal provisions of the ordinance was published in the *ELECTRIC RAILWAY JOURNAL* of Sept. 11, page 461. It is proposed to review the terms of the grant at greater length in a subsequent issue of this paper.

ST. PAUL TO BEGIN ELECTRIC OPERATION DEC. 8

A. J. Earling, president of the Chicago, Milwaukee & St. Paul Railway, Chicago, Ill., has announced that everything will be in readiness by Dec. 8 to make a trial run over the electrified division between Three Forks and Deer Lodge, Mont. Following the run over this 113-mile division, complete electric operation will be started. President Earling and C. A. Goodnow, assistant to the president in direct charge of electrification, accompanied by a staff of railroad officials and representatives of the General Electric Company, expect to be present at the beginning of electric operation.

DECISION FAVORABLE TO COVINGTON FRANCHISE

Federal Judge A. M. J. Cochran on Nov. 17 granted a perpetual injunction against the city of Covington, Ky., to prevent it from carrying out the terms of an ordinance passed on July 13, 1914, which provided for the sale of a street railway franchise through public bids. At the same time he decreed that the South Covington & Cincinnati Street Railway has a perpetual franchise from the city of Covington on certain streets.

The petition and evidence in the case included a history of the franchise from the time it was granted in 1869 down to the present time. The franchise contained no provision as to its duration and it was claimed that all actions of the Common Council and all approvals of the changes that have taken place by which the franchise and rights were acquired by the present company tacitly assumed that it is perpetual. In 1913 an ordinance similar to that of July 13, 1914, was enacted by Council, but the company secured an injunction to prevent the city from receiving bids.

In the trial of the case City Solicitor Blakely contended that the charter of the city gave it power to grant a perpetual franchise, but it did not grant any expressly and it could not be said by implication that a perpetual grant was made. He argued further that when a franchise is silent as to the term of years the length of the period is to be construed in favor of the public.

Judge Cochran held that the granting of a franchise under the ordinance of July 13, 1914, and the construction of a railway in accordance with its terms would be a material interference with the franchise and contract rights of the plaintiff on the streets mentioned and a violation of the terms of the franchise and an impairment of the rights. The passage of the franchise ordinance, the advertisements for bids and the threatened acceptance of bids constitute a cloud on the franchise and rights of the company. Further proceedings would result in a multiplicity of suits and an interruption of the public service of the plaintiff, as well as irreparable damage to the property. The court said:

"The defendant is perpetually enjoined from carrying out the terms of the ordinance of July 13, 1914; from advertising for any further bids thereunder; from accepting any bids for making a grant thereunder; from interfering or attempting to interfere with the plaintiff in the maintenance or operation of the street railway lines upon defendant's streets, and from acting in any such form or manner as would alter, impair, limit, infringe or destroy the title of the plaintiff in its grant, rights and franchises above described, and the plaintiff's title in or to same and all of them is forever settled and quieted hereby."

City Solicitor Fred W. Schmitz has announced that the case will be appealed to the Supreme Court.

CHICAGO ELECTRIFICATION REPORT PRESENTED

The formal report of the committee on smoke abatement and railway terminal electrification of the Chicago Association of Commerce, abstracted on pages 1113 to 1118 of this issue, was formally presented by the committee to the association on Dec. 1. The event was celebrated by a dinner in the Gold Room of the Congress Hotel, Chicago, last Wednesday evening. Charles L. Dering presided, and after explaining the purpose of the gathering, presented Harry A. Wheeler, vice-president of the Union Trust Company, and a member of the committee, who briefly told the history of the report and described the smoke abatement problem and sources of air pollution as found by the committee's engineers. Harrison B. Riley, president of the Chicago Title & Trust Company, the next speaker, then discussed the necessity for electrification as the means of smoke abatement and its engineering and financial practicability. Judge Jesse Holdom, of the Illinois Appellate Court, chairman of the smoke abatement committee, then formally presented the report to the association.

The points especially emphasized by the speakers were that the report was primarily a smoke abatement report, and that the question of the electrification of the steam railroad terminals in Chicago was considered as the only means of relieving air pollution from that source. For this reason complete electrification of all of the steam railroad trackage in Chicago only was considered, and the estimates were based upon thoroughly tested electrical equipment as it existed in the state of the art in 1912. Hence, the estimates should not be considered as applying to recently developed and more efficient, though untried, equipment. The speakers also brought out the point that where electrification afforded an operating economy it should be adopted. Nothing in the report was intended to indicate that the electrification of certain roads was not feasible and financially warranted.

OBJECTION TO TOLEDO PAVING CHARGES

At a meeting of a sub-committee of the committee on railways and telegraph of the Council of Toledo, Ohio, on Nov. 24 Councilman Hein's resolution, calling for a settlement of the city's claim against the Toledo Railways & Light Company for paving between its tracks on certain streets was discussed. Henry L. Doherty, chairman of the board of the company, asserted that the fare paid by the people now is just about sufficient for maintenance. The Heine resolution provided that the company should not be allowed to operate cars on the streets concerned until it had paid the paving bill. Mr. Doherty said that the people of Toledo seemed to think that a franchise was valuable only to the company.

A second meeting was held on Nov. 26 when the matter was again discussed. Mr. Doherty said the company objected to paying the full cost of the paving, which will last about twenty years, without assurance that it will be allowed to use the streets for a portion of that time, but had no objection to paying its pro-rata share of the cost of paving in accordance with the time it is allowed to use the streets in question. Mr. Doherty said he would endeavor to have his views embodied in a letter to be presented to the City Council at its next meeting.

WILKES-BARRE STRIKE UNCHANGED

With the exception of intermittent riots of small proportions, the strike situation at Wilkes-Barre, Pa., has undergone no material change.

In an attempt to end the strike Martin Freeman and Louis Frank, representing the Chamber of Commerce of Wilkes-Barre, discussed the strike situation with Governor Brumbaugh, Attorney General Francis Shunk Brown and Commissioner of Labor William Price Jackson at Harrisburg and mapped out a peace program in which the Governor and the Attorney General have offered themselves as conciliators to hear both sides.

In connection with these efforts, P. J. Shea, the strike leader, said: "We will confer with anybody on earth on this strike situation."

T. A. Wright, general manager of the Wilkes-Barre Railway, said: "Although it would of necessity be a matter that I would have to submit to the board of directors, I should

not think of refusing an invitation to a conference from the Governor."

The company also reiterated that it has always stood ready to submit to the courts the legality of the board of arbitration reversing its original decision.

CINCINNATI TRANSIT COMMISSION ORGANIZED

At an informal meeting at Cincinnati, Ohio, on Nov. 24 E. W. Edwards, Christian Schott, William A. Hopkins and E. H. Dornette were sworn in as members of the Rapid Transit Commission by City Solicitor Schoenle. William Cooper Proctor was unable to be present. It was decided to have City Engineer Frank Krug, who is also the commission's engineer, arrange conferences with each of the nine interurban roads which will use the rapid transit belt, discuss plans and the cost of making connections with the proposed line, and then report to the commission.

Some of the roads were built to broad gage to correspond with the tracks of the Cincinnati Traction Company. Since the rapid transit road will be constructed with standard gage tracks, it will probably be necessary to standardize all the roads.

The City Council will be asked to issue \$100,000 of bonds to provide funds for the initial expense of the commission.

ORDINANCE AUTHORIZING CHICAGO TRACTION COMMISSION SUBMITTED

The creation of a commission to report on the operating, engineering and financial problems involved in the proposal to consolidate the Chicago surface and elevated lines and construct a subway has advanced to the point where an ordinance authorizing the employment of the commission has been approved by the local transportation committee and submitted to the City Council. The terms of the ordinance authorizing the employment of three engineers to serve on this commission, were mentioned in the *ELECTRIC RAILWAY JOURNAL* of Nov. 20, page 1050. As stated at that time, one of the engineers selected must be from Chicago and be familiar with its local transportation problems, and the other two must be familiar with the efforts made to solve the transportation problems in New York, Philadelphia and Boston. The ordinance requires that the commission report by April 1, 1916, so that an ordinance authorizing the consolidation and a general scheme of improved transportation can be submitted at the June election. The ordinance also gives the committee authority to compensate these engineers with money taken from the traction fund.

TOLEDO PLANT FORCED TO SUSPEND

The Water Street power plant of the Toledo Railways & Light Company, Toledo, Ohio, was forced to suspend on the evening of Nov. 26 and for an hour almost every car in the city stood still. In explaining the accident, William Richards, superintendent of the electrical department of the company, said:

"The short-circuit at the manhole, caused by a defective feed cable, produced a surge in the power station which caused one of the largest generators to short-circuit. This resulted in a blow-out. There is no way of determining the cause, as all the evidence was destroyed in the accident. Almost the entire system was at a standstill for a time as the result of the accident. It was the most complete shutdown since the construction of the plant in 1896."

SPRINGFIELD ELECTROLYSIS REPORT

C. V. Wood, president Springfield (Mass.) Street Railway, has received a report on the electrolysis situation at Springfield from the Stone & Webster Engineering Corporation, Boston, Mass., following a study of local conditions requested by the company. Earlier in the year the United States Bureau of Standards investigated the electrolysis problem at Springfield, recommending the conversion of the Margaret Street generating plant into an alternating-current station, with the inauguration of direct-current distribution from substations. President Wood stated that the plans proposed by Stone & Webster for the improvement of conditions were substantially the same as those discussed in the government report. The various interests concerned and a bureau representative will confer on the matter.

WESTCHESTER BARRED IN NEW HAVEN SUIT

All the testimony relative to the purchase of the New York, Westchester & Boston Railroad by the New Haven system was stricken from the record on Dec. 1 by Judge Hunt in United States District Court in the trial of eleven former directors of the New York, New Haven & Hartford Railroad on the misdemeanor charge of conspiring to monopolize transportation in New England. Judge Hunt said:

"The Government has thus far failed to show that there was intent on the part of any of these defendants to conspire to monopolize the interstate traffic of New England in so far as the purchase of the Westchester road was concerned. Although the original projectors of the Westchester line may have had in mind a road to do an interstate business, the Government has failed to show that the Westchester was used by the New Haven in interstate traffic."

The New York, Westchester & Boston Railway is a high-speed single-phase line operated out of New York from a connection with the subway as far east as New Rochelle and as far north as White Plains.

CHAIRMAN MCCALL BEFORE GOVERNOR ON DEC. 3

Chairman Edward E. McCall of the Public Service Commission for the First District of New York obtained a postponement from Nov. 30 to Dec. 3 of the hearing before Governor Whitman on the charges filed against him with the Governor by the Thompson legislative committee. Mr. McCall in a letter to the commission refused to present before the committee his account with the Bankers Trust Company, but said that he would permit the Governor to examine all records, official or otherwise.

On Nov. 29 the committee questioned Commissioner Wood with respect to his connection with both the American Sanitary Towel Company and the Northwestern Construction Company and went over the transfer of title to \$5,000 of stock in the former company to John A. Maher for a consideration of \$1 and in the latter to his brother. On Dec. 1 the committee inquired of Mr. Wood about the contracts for signals for the Fourth Avenue subway. On the same day Commissioner Williams was questioned regarding his accounts in various banks and trust companies.

GIVING RAILWAY LINES AWAY

Press dispatches report that J. D. Sugg, president of the San Angelo Power & Street Railway Company, San Angelo, Tex., has offered the 3.5-mile railway system in that city to the City of San Angelo as a gift.

Gilbert F. Myer, president of the Realty Company, McKeesport, and general manager of the Port Vue Street Railway, McKeesport, has offered to the Borough of Port Vue the 1-mile line of the railway with all equipment if the borough will agree to operate the railway for five years.

Trackless Trolley Line Abandoned.—The Merrill Railway & Lighting Company of Merrill, Wis., has sold its trackless trolley bus. The company reports insufficient patronage to warrant its operation.

Chicago Can Build Subway by Assessment.—An opinion rendered by the city law department states that the Chicago board of local improvements has the power to obtain funds for subway construction by levying assessments against the property owners which would be benefited by the subway.

Valuation of Toledo Properties Proposed.—Councilman John Mulholland introduced an ordinance in the City Council of Toledo, Ohio, on Nov. 22 which provides that a valuation of the property of the Toledo Railways & Light Company be made by three experts to be chosen by a committee consisting of the president of the Council and the city solicitor, a third city official to be chosen by these two.

I. C. C. Grants Extension of Time.—An order has been entered by the Interstate Commerce Commission extending, for a period of twelve months from July 1, 1916, the order commanding the railroads to equip all cars in service in accordance with specific regulations laid down by the commission in an order issued March 13, 1911. These regulations provided for the equipment of freight cars as to their physical safety.

Penalty Action Begun in New York.—The Public Service Commission for the First District of New York has instructed its counsel to begin an action against the Third Avenue Railway and the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway to recover the statutory penalty for failure to obey the commission's order of May 21, 1915, requiring the companies to make certain repairs to their tracks.

Decision in Alien Labor Law Case.—The Supreme Court of the United States on Nov. 29 sustained an opinion of the New York Court of Appeals and a verdict of the Court of Special Sessions of New York City, both of which upheld the validity of the New York law against the employment of aliens on public works. The law led to far-reaching disturbances in connection with work on the New York subways. Afterward it was amended to permit employment of aliens when Americans were unavailable, but the cases settled on Nov. 29 already had been instituted.

American Employers' Profit-Sharing Plans.—The National Civic Federation, New York, N. Y., will have ready for distribution about Jan. 1 the results of its investigation of the subject of profit sharing between employer and employee, referred to in the *ELECTRIC RAILWAY JOURNAL* of Nov. 20, page 1052. It was originally expected that the report would be ready by Dec. 1. The report will contain an analysis of more than 100 plans now in operation in this country, as well as a description of many abandoned ones and the causes of their failure. The views of employees and the attitude of labor unions will be set forth.

Seeking to Make Seattle Municipal Line Profitable.—Councilman Oliver T. Erickson of Seattle, Wash., has introduced a resolution in the Council calling upon Corporation Counsel Bradford to prepare the necessary papers and outline a method of procedure to obtain common user trackage privileges for the Seattle Municipal Railway over the tracks of the Seattle, Renton & Southern Railway on Fourth Avenue and Fourth Avenue South, to a terminus at Second Avenue South and Washington Street, in the business districts. It is hoped that by this means the business of the line, which is now operated at a loss, may be increased.

Objection to Clay County Bond.—It is said that the Interstate Railway, which secured a verdict of \$1,500,000 against the Kansas City, Clay County & St. Joseph Railway for alleged usurpation of right-of-way, will file a motion in the Supreme Court for the increase of the appeal bond of the defendant. This bond for \$3,400,000 was approved by the court. It is understood the plaintiff considers the bond insufficient. If such a motion is filed, it is expected that opportunity will arise for presenting the interests of the public, as protected by the Public Service Commission, in any burdens placed upon the utility. If the case takes the ordinary course, it will not be heard for perhaps three or four years.

Vestibules and Changes in Fenders Recommended.—In a report submitted to the Public Service Commission of Maryland by Transportation Expert Duer and Chief Engineer Phelps recommendations are submitted advocating the vestibuling of all cars in Baltimore and such changes in the construction of the fenders and wheel guards as will, it is claimed, afford more protection to the general public. The point is made that while there is no serious criticism of the present fenders being used, they could be so constructed to make them more effective. It is recommended that the United Railways & Electric Company be ordered to close 560 cars at once, the work to be done in eighteen months by vestibuling thirty-one cars a month.

Final Argument on New York Bus Franchise.—Final pleas against granting a franchise to the New York Motor Bus Company, which seeks to operate buses on new routes, were heard on Nov. 29 by the franchise committee of the Board of Estimate of the City of New York. The chief plea against granting the franchise was by William H. Page, counsel for the Fifth Avenue Coach Company, which operates the present bus lines. Briefs were put in on behalf of the Interborough Rapid Transit Company and the New York Railways Company, in which the argument that the buses would cut down the profits of the new subways was put forward. The Third Avenue Railway Company also put in a brief opposing granting the franchise.

Basis of Renewal of Bridge Operating Contract.—In a report to the transit committee of the Board of Estimate of New York City, Bridge Commissioner F. J. H. Kracke suggests that in place of the old contract for operation on the Williamsburg Bridge, which expired on Aug. 31, a new contract be entered into with the Brooklyn Rapid Transit Company and the New York Railways with increased rental for operating cars over the bridge. Mr. Kracke says: "I would advise the making of new contracts with the companies now providing through service on the Williamsburg Bridge, as being in the best public interest in view of the large mileage they control in Brooklyn and Manhattan, provided that suitable terms of such nature as to leave no doubt of their adequate protection of the city's rights, be agreed to by the said companies." The companies have been operating since Aug. 31 under a permit which expired on Nov. 30.

Seattle Needs Appraisal Expert.—Ralph S. Pierce, assistant corporation counsel of Seattle, Wash., recently advised the finance committee of the Council that the legal department of the city must have expert help in the preparation of its case against the Puget Sound Traction, Light & Power Company in which the company is seeking to be relieved of certain franchise requirements. At the hearing before the Public Service Commission, at which the company's application will be considered, a valuation of the properties will be introduced. Mr. Pierce states that it is important that the city have an expert engineer to testify, as the valuation fixed at the hearing will be the basis of any action that the company may bring to discontinue transfer privileges or increase fares. The company is seeking to be relieved of provisions in its franchises compelling it to pave between tracks, pay 2 per cent of its gross revenues to the city, etc.

Seattle Heating Franchise Rejected.—The Puget Sound Traction, Light & Power Company, Seattle, Wash., has informed the franchise committee of the Council that the company cannot agree to carry passengers on its lines on transfers issued from the Seattle Municipal Railway upon payment by the city of Seattle of 1 cent for each passenger so transferred, in exchange for a steam heating franchise. The company is willing to accept the franchise requirements imposed by the city with this and one other exception. The company asks that the life of the franchise extend to 1934, instead of 1925. Last February the company applied to the city for a renewal of its steam heating franchise, and at this time Councilman Erickson suggested that the grant be made contingent upon the willingness of the company to transfer passengers between Division A and Division C on payment by the city to the company of 1 cent for each passenger transferred.

Toronto Engineers Not in Favor of Subway.—The commission of engineers which has been engaged in the preparation of a scheme for the solution of the traffic problem in Toronto, Ont., has completed its labors and, as stated previously in the *ELECTRIC RAILWAY JOURNAL*, will make its report to the city within the next week. It is known that the engineers are not in favor of the construction of a subway system. The proposals of the engineers will have a direct bearing on the hydro-radial system, of which Toronto must be the center. The question of submitting the scheme to a vote of the people at the forthcoming municipal elections is considered out of the question. The same applies to the suggestion that a by-law be submitted to the people for their sanction to the raising of \$2,000,000 or \$3,000,000 for the purpose of enabling the city to start preliminary work on the project. Sir Adam Beck has admitted that the Hydro-Electric Power Commission had for a year been negotiating for the purchase of all the radial railways now entering the city.

Changes in Engineering Personnel of District Commission.—As the work of valuing the properties of the public utilities in the District of Columbia nears completion it becomes evident that it will be necessary for the Public Utilities Commission of the District of Columbia to have on its permanent staff a man who has had considerable experience in this class of work and one who is thoroughly familiar with the details of these particular valuations. On account of the limited funds available for the employment of a force

under the commission it will be necessary to combine this position with that of engineer of the commission. J. Kappeyne of the valuation bureau has been selected to fill this position, and his promotion will take place this month. H. C. Eddy, who since the creation of the commission has occupied the position of engineer, will be employed by the electrical department of the District of Columbia, if his services can be procured, for the purpose of working in conjunction with the commission on an electrolysis survey of the District of Columbia.

Salary of Chicago Surface Lines' President Approved.—At a recent meeting of the Chicago City Council an order was introduced to the effect that the salary of L. A. Busby, president of the Chicago Surface Lines, should be reduced from \$60,000 a year to \$18,000 a year, the same as that received by the Mayor. Under the contract ordinance between the surface railways and the city, the latter has the right to regulate the salaries of the officers. This question was submitted to the Board of Supervising Engineers, Chicago Traction, which reported that under the terms of the ordinance the president's salary was not excessive. The ordinance provided that in arriving at the permissible salary which could be paid a railway officer, the compensation paid for like service in other industries must be taken into consideration. Upon this basis the Board of Supervising Engineers found that the salaries of the presidents of eleven railways, not named for publication, were larger in terms of per cent of the gross receipts than that paid the president of the Chicago Surface Lines. These salaries varied from 0.147 per cent of the gross income to 0.54 per cent, Mr. Busby's salary of \$60,000 represents 0.18 per cent of the gross income. The local transportation committee, acting upon the recommendation of the board, dismissed the order.

PROGRAMS OF ASSOCIATION MEETINGS

American Association of Engineers

Engineering welfare and the advancement of engineering opportunities will be discussed at the first convention of the American Association of Engineers to be held at the Hotel La Salle, Chicago, on Dec. 10 and 11. The program includes addresses by F. H. Newell, professor of civil engineering at the University of Illinois; T. B. Lambert, power engineer of the Chicago Telephone Company; Richard Yates, ex-governor of Illinois, and J. H. Prior, chief engineer of the Illinois State Public Utility Commission. The association has 260 members. Through the association's clearing house service 100 engineers have been put in touch with positions in the last two months.

American Society of Mechanical Engineers

Among the papers of direct interest to electric railway operatives to be presented at the annual meeting of the American Society of Mechanical Engineers in New York, Dec. 7-10, are the following:

"A Novel Method of Handling Boilers to Prevent Corrosion and Scale," by Allen H. Babcock.

"Turbines vs. Engines in Units of Small Capacities," by J. S. Barstow.

"Proportioning Chimneys on a Gas Basis," by A. L. Menzin.

"Operation of Parallel and Radial Axles of a Locomotive by a Single Set of Cylinders," by Anatole Mallet.

"Four-Wheel Trucks for Passenger Cars," by Roy V. Wright.

A report will also be presented on a code for abrasive wheels.

The entertainments will include a reception and tea to the ladies, members and guests on the afternoon of Dec. 8, a smoker on the evening of Dec. 8, and a dinner and dance on the evening of Dec. 9. The plan this year will be to have a few excursions of exceptional interest, rather than a multiplicity of less important trips. It is proposed to visit the power and elevator plants of the Municipal and Woolworth Buildings and the Seventy-fourth Street station of the Interborough Rapid Transit Company, in which turbines of 40,000 hp. capacity, the largest units running at the present time in a railway plant, have been installed.

Financial and Corporate

ANNUAL REPORTS

Chicago Elevated Railways

The combined statement of income, profit and loss of the Metropolitan West Side Elevated Railway, the South Side Elevated Railroad and the Northwestern Elevated Railroad, which are controlled by the Chicago (Ill.) Elevated Railways, is as follows for the year ended June 30, 1915:

Gross operating revenue.....	\$8,045,265
Way and structures	\$163,679
Equipment	334,928
Power	911,094
Conducting transportation	2,042,388
Traffic	6,479
General and miscellaneous	411,738
Total operating expenses	\$3,870,306
Net operating revenue	\$4,174,959
Taxes, city compensations and other items.....	700,243
Operating income	\$3,474,716
Non-operating income	*117,906
Gross income	\$3,592,620
Interest and rents	*2,188,409
Net income	\$1,404,211
Dividends	1,105,373
Surplus	\$298,838

*Inter-company rentals deducted.

On account of the new classification of accounts issued by the Illinois Public Utilities Commission for the first year to end on June 30, 1915, the figures for the year ended June 30, 1914, are not generally comparative with the foregoing figures. An exception, however, is the gross operating revenue, which for the preceding fiscal year amounted to \$8,182,861. Hence the gross operating revenue for the last fiscal year decreased \$137,596 or 1.7 per cent.

United Railways Investment Company

The statement of net income applicable to the common stock of the United Railways Investment Company, San Francisco, Cal., based on the assumption that this company and its controlled companies are one, is as follows for the year ended June 30, 1915:

Gross earnings	\$32,574,111
Operating expenses and taxes:	
Operating expenses	\$17,166,109
Taxes	1,482,416
Total operating expenses and taxes.....	\$18,648,525
Net earnings	\$13,925,586
Other income	474,821
Gross income	\$14,400,407
Deductions from income (rents, miscellaneous interest, etc.)	3,691,471
Net income before deducting fixed charges.....	\$10,708,936
Fixed charges—interest on bonds, notes, etc., held by the public.....	*6,240,101
Net income after deducting fixed charges.....	\$4,468,835
Dividends on preferred stock held by public.....	†1,536,977
Balance available for improvements, etc., and dividends on common stock.....	**\$2,931,858
Improvements, etc., charged against income by the several companies	860,434
Balance available for dividends on common stock....	†\$2,071,423

*Includes \$358,771 interest on series "B" second mortgage 5 per cent bonds of Sierra & San Francisco Power Company, payable in like bonds up to and including Jan. 1, 1916.

†Includes \$799,130 for dividend on United Railways Investment Company preferred stock, although none was declared during the year.

**Proportion applicable to common stock of United Railways Investment Company, \$1,369,789, or 6.715 per cent.

†Proportion applicable, as before, \$828,705, or 4.062 per cent.

It should be noted that the foregoing statement includes no charges for depreciation as such, and no amounts charged against income for sinking fund requirements. Moreover, the results included for the Philadelphia Company and its affiliated companies are for the year ended March 31, 1915. The report states that the 6 per cent serial notes of 1908 have now been reduced from \$3,500,000 to \$700,000 and \$2,800,000 of the notes cancelled. During

the period covered by this report \$600,000 was paid on the principal of the notes and on Aug. 16, 1915, \$200,000 more was paid. The 6 per cent convertible gold bonds of 1910 have been reduced from an original issue of \$1,229,000 to \$790,000. A total of \$1,066,000 par value of the 5 per cent collateral trust sinking fund gold bonds has been purchased out of earnings and is now held by the trustee of the sinking fund. During the six months ended June 30, 1915, the floating debt was reduced \$79,000, and to date \$149,000. The United Railroads of San Francisco has paid \$50,000 on account of its notes held by the United Railways Investment Company, thus reducing the amount now in the treasury to \$740,000.

The statement of income, profit and loss of the subsidiary United Railroads of San Francisco, controlled through the California Railway & Power Company, for the year ended June 30, 1915, follows:

Gross earnings:	
Passenger	\$7,968,094
Advertising	56,000
Total	\$8,024,094
Operating expenses and taxes:	
Maintenance of way and structures.....	\$633,943
Maintenance of equipment.....	435,826
Transportation	3,129,801
General	558,255
Total	\$4,757,826
Taxes	516,000
Total operating expenses and taxes.....	\$5,273,826
Net earnings	\$2,750,268
Other income	208,058
Gross income	\$2,958,326
Income charges	522,147
Net income before deducting bond interest.....	\$2,436,179
Bond interest:	
United Railroads' bonds.....	\$954,160
Underlying bonds	674,492
Total	\$1,628,652
Net income	\$807,526
Surplus at beginning of year.....	1,018,632
Profit and loss credits.....	154,146
Profit and loss—gross surplus.....	\$1,980,305
Profit and loss charges.....	961,649
Profit and loss—surplus, June 30, 1915.....	\$1,018,656

The total earnings of the United Railroads of San Francisco decreased from \$8,506,725 for the year ended June 30, 1914, to \$8,024,094 for the last fiscal year, an amount of \$482,631. This decrease took place entirely in the passenger earnings, which fell off 5.7 per cent. The operating expenses, however, increased from \$4,722,737 to \$4,757,826, an amount of \$35,089 or 0.74 per cent, while the taxes showed an increase from \$503,800 to \$516,000, an amount of \$12,200 or 2.4 per cent. The net earnings of the company therefore suffered a loss of \$529,920 or 16.1 per cent. The other income of the company increased \$22,421, income charges increased \$99,323 and bond interest decreased \$16,058, so that the net income showed a decrease of \$590,765. After the profit and loss credits and debits, however, the surplus at the end of the last fiscal year was very slightly larger.

The decrease in the passenger earnings for the year is said to be essentially accounted for by the jitney competition and by the general depression. At the present time it is stated that, notwithstanding the jitneys, the earnings are running ahead of last year. During the fiscal year there was a decrease of \$135,631 in "railroads, properties and franchises," while the additions and betterments totaled \$202,174. The reserve for depreciation increased \$426,198 during the year. Since June 30, 1914, \$205,000 of underlying bonds have been retired.

The business of the Sierra & San Francisco Power Company, outside of the sale of power to the United Railroads of San Francisco, which business at June 30, 1914, amounted for the year to \$397,963 or approximately 35 per cent of the gross receipts, increased at June 30, 1915, to \$455,276 or approximately 39 per cent of the gross. The gross income of the Coast Valleys Gas & Electric Company showed a reduction of less than 1 per cent, notwithstanding the heavy and continuous rains lessening the demand for electric energy for irrigation purposes, and also notwithstanding the reduction in rates required by the commission.

JITNEYS CAUSE RECEIVERSHIP

Atlantic City & Shore Railroad Suffers Unbearable Losses Because of Unrestricted and Unfair Jitney Competition

Clarence L. Cole on Nov. 26 was appointed receiver of the Atlantic City & Shore Railroad, Atlantic City, N. J., by Judge Rellstab in the Federal Court at Trenton. The main cause of the receivership was the losses brought about by jitney competition, the growth of which has been described from week to week in the Traffic and Transportation department of the *ELECTRIC RAILWAY JOURNAL*.

During the five years preceding 1915 the company's net profits aggregated \$200,000, all of which was invested in extensions and road betterments. With the growth of the jitney traffic the company's gross receipts for the current year were reduced by \$100,000, so that instead of closing the year with a profit, as heretofore, it was confronted with a deficit of \$80,000. The jitneys were permitted to pick up the best part of the traffic without regulation or restrictions, thereby creating an unfair competition which the company could not meet. An appeal was made to the authorities of Atlantic City, requesting the enactment of regulations which would protect the company, but the request was denied.

Mr. Cole after his appointment issued the following statement:

"There will be neither suspension of service nor any material curtailment of cars for the immediate future at least. I will confer with officials of the line, counsel for bondholders and others, and proceed to map out a policy. How it will succeed experience alone will tell. Ultimately if rehabilitation should be impossible under the conditions the court may order the sale of the line."

The application for the receivership was made in behalf of H. F. Bachman & Company, Philadelphia, who have a claim of \$12,682. In addition, it was set forth that the company owed the West Jersey & Seashore Railroad \$35,000, and that it would be unable to pay \$23,875 due to the Girard Trust Company, Philadelphia, as December interest on a bond issue of \$950,000.

CO-RECEIVERS FOR EMPIRE UNITED

C. Loomis Allen is Appointed by Court to Act with H. S. Holden in Receivership of New York Line

C. Loomis Allen was on Nov. 27 appointed co-receiver of the Empire United Railways, Inc., to act with H. S. Holden. This action was taken at a hearing before Justice W. S. Andrews to show why Mr. Holden's temporary appointment, noted in the *ELECTRIC RAILWAY JOURNAL* of Nov. 13, should not be made permanent. Not a single dissenting voice was raised to the appointment of the two permanent receivers instead of one.

Alexander H. Cowie, who represented the bondholders' protective committee and was also empowered to represent the trustee, the Columbia Trust Company, New York, proposed Mr. Allen's name. Mr. Cowie stated that on Nov. 1, when the road went into the hands of the temporary receiver, there was a feeling of uneasiness among the bondholders of the subsidiary Rochester, Syracuse & Eastern Railroad, and a committee was appointed to protect their interests. Bonds of \$4,896,000 were outstanding, and about \$2,041,000 have already been deposited. Mr. Cowie went on to say that under the mortgage provision covering these bonds the trustee could apply within thirty days for a sole receiver to operate the property behind the mortgage. The committee felt that this was too drastic a measure and suggested that a co-receiver be named at this time, but if such were not done the trustee would probably ask for a separate receiver.

William Nottingham for the company stated that it only desired an amicable readjustment of affairs with as little expense to the company as possible. He said that the bondholders above mentioned would have the right under the mortgage to divorce the Rochester, Syracuse & Eastern Railroad from the Syracuse, Lake Shore & Northern Railroad and the Auburn & Northern Railroad, which, with the former, make up the Empire United Railways, Inc. He did not believe, however, that this would be to

the advantage of the consolidated property, as the Rochester, Syracuse & Eastern Railroad would then have to pay a large rental for trackage as before the consolidation. He therefore stated that the company acquiesced in the naming of a co-receiver, and Deputy E. H. Lewis, representing the attorney general's office, also agreed to the appointment.

OAKLAND-ANTIOCH REFINANCING APPROVED

California Railroad Commission Authorizes New Securities for Capital Debts—Deferred Interest Unpaid and New Stockholders' Loan to Be Funded in 1918

The California Railroad Commission has approved a plan to refinance the Oakland, Antioch & Eastern Railway, Oakland, Cal., through the issuance of \$1,195,000 of first mortgage bonds and \$262,200 of promissory notes. The proceeds of both bonds and notes sold are to be used solely for the company's debts for capital expenditures, represented by notes or accounts payable. The bonds are to be sold to bondholders or stockholders for cash, or issued in payment of bond interest earned, at not less than 80 per cent face value. The \$262,200 of 6 per cent notes maturing on Jan. 1, 1918, are to be issued to stockholders for cash at face value. Of the bonds, \$328,000 may be pledged as security for the \$262,200 of notes, stockholders being obligated in case of non-payment of principal or interest to accept the pledged bonds in full compensation at 80 per cent of face value. Bondholders who have not signed the present agreement may participate at any time just as the signers. The application to the commission was noted in the *ELECTRIC RAILWAY JOURNAL* of July 13.

The company stated before the commission that its stockholders had paid assessments amounting to \$1,215,000 and incurred a deficit of almost \$456,774, and after two years of operation they had found their indebtedness and their interest obligations beyond their ability to pay. Over one-eighth of the capital stock, or 12,600 shares, was forfeited for non-payment of assessments. The company told the commission that another assessment would bring still greater forfeiture with a possibility of a general refusal to support longer the growing burden of debt. On June 30, 1915, there was due \$1,027,657 of outstanding indebtedness, secured by \$1,493,000 of pledged bonds. There was due on July 31, 1915, accounts payable of \$219,643, or a total of \$1,247,300 of pressing obligations. In addition \$317,500 of gold notes will be due on Feb. 1, 1918. The company thus faced receivership or a temporary readjustment, pending demonstration of its earning capacity.

Under the plan now approved as a remedy for this condition the bondholders' agreement calls upon the bondholders of the Oakland, Antioch & Eastern Railway and the two controlled lines, the Oakland & Antioch Railway and the San Ramon Valley Railroad, to deposit their interest coupons maturing during 1915, 1916 and 1917 with the Union Trust Company of San Francisco. Before Jan. 1, 1918, the Oakland, Antioch & Eastern Railway agrees to deposit with that trustee as many first mortgage bonds, dated Oct. 1, 1911, as at 80 per cent shall equal the face value of all interest coupons deposited and unpaid by Jan. 1, 1918. Moreover, in the interim, the railway agrees to pay 6 per cent interest on the deposited coupons. On Jan. 1, 1918, the trustee is to distribute the deposited bonds, the bondholders surrendering for cancellation their receipts showing the face value of the deposited coupons. The stockholders' agreement calls upon the stockholders to lend the Oakland, Antioch & Eastern Railway \$3 a share payable at different periods before July 1, 1916. The railway agrees to deposit with the trustee promissory notes equal to the stockholders' payments and first mortgage bonds double the face value of the notes. On Jan. 1, 1918, the deposited bonds at 80 per cent are to be distributed to the stockholders in payment for their loans.

Commissioner Edgerton, who wrote the decision, stated that he could not authorize bonds to be issued for bond interest payments, but if the security holders of the railway desired to make a total sacrifice of \$510,000 they should be permitted to do so, in so far as the bonds and notes represent capital expenditures. Yet, if any holders declined such a sacrifice, it was their privilege and right.

American Railways, Philadelphia, Pa.—It is reported that a single holding company will take over the control of the American Railways and the National Properties Company. The plan for the amalgamation of these two companies was described in the *ELECTRIC RAILWAY JOURNAL* of Nov. 6. The main feature was the purchase by the National Properties Company of the American Railways common stock, payment being made in new collateral trust bonds of the former company. The formal call for deposits under such an arrangement, first noted in the issue of Nov. 27, has been extended until Dec. 15.

Baton Rouge (La.) Electric Company.—An initial dividend of 2 per cent has been declared on the common stock of the Baton Rouge Electric Company, payable on Dec. 1 to holders of record on Nov. 22.

Citizens' Traction Company, Oil City, Pa.—An initial dividend of 1 per cent, or 50 cents, has been declared on the common stock of the Citizens' Traction Company, payable on Dec. 1 to holders of record on Nov. 22.

Clarksville & Dunbar Cave Railway, Clarksville, Tenn.—A. C. Murray, formerly president of the Clarksville & Dunbar Cave Railway, is now operating this 5.5-mile line as receiver. This change in condition was caused by automobile competition.

Kansas City Railway & Light Company, Kansas City, Mo.—The depositaries for receiving claims and stock under the Kansas City Railway & Light Company reorganization plans, primary and supplemental, are as follows: In Kansas City, Mo.—New England National Bank, First National Bank, Fidelity Trust Company, Southwest National Bank of Commerce, City Center Bank, Commerce Trust Company, Gate City National Bank, Pioneer Trust Company, National Reserve Bank, Commercial National Bank and Western Exchange Bank. In Chicago, Ill.—Continental & Commercial Trust & Savings Bank. In Louisville, Ky.—National Bank of Kentucky.

Lima-Honeoye Light & Railroad Company, Avon, N. Y.—It is reported that the Lima-Honeoye Light & Railroad Company, operating a 6-mile line between Lima and Honeoye Falls, is now in the hands of a receiver. A previous note in regard to commission refusal to allow the separation of the light from the railway business was published in the *ELECTRIC RAILWAY JOURNAL* of July 3.

Minneapolis, Anoka & Cayuna Range Railroad, Minneapolis, Minn.—The Minneapolis, Anoka & Cayuna Range Railroad has completed the last step in the reorganization which has been under way since Jan. 26, 1914, when F. H. Hunter was appointed receiver for the old Minneapolis & Northern Railway, which built the line. Mr. Hunter managed the property until Jan. 27, 1915, when Charles P. Bratnober and his associates acquired the title by lien foreclosure. Mr. Bratnober then sold the line to the Minneapolis, Anoka & Cayuna Range Railroad, and the property was finally cleared of outstanding obligations on Nov. 13, 1915, when the receiver was discharged and deeds of conveyance were filed.

Monongahela Valley Traction Company, Fairmont, W. Va.—At special meetings of stockholders of the Monongahela Valley Traction Company and the Fairmont Gas Company on Nov. 24, the sale of the gas company to the traction company was ratified. The details of this proposed sale were published in the *ELECTRIC RAILWAY JOURNAL* of Nov. 6.

Republic Railway & Light Company, New York, N. Y.—Reilly, Brock & Company, Philadelphia, Pa., have sold at 97.75 and interest, to yield more than 5.75 per cent, the unsold portion of the \$3,000,000 of 5 per cent three-year secured gold notes of the Republic Railway & Light Company. The purchase of these notes was mentioned in the *ELECTRIC RAILWAY JOURNAL* of Nov. 20. The proceeds will be used to pay off the \$3,000,000 of 5 per cent notes maturing on Jan. 1, 1916. The new notes are dated Dec. 1, 1915.

San Francisco-Oakland Terminal Railways, Oakland, Cal.—The San Francisco-Oakland Terminal Railways has asked the California Railroad Commission for authority to issue promissory notes to banks as follows: \$36,569 to each of the following: Central National Bank of Oakland, Bank of

California, National Association, Savings Union Bank & Trust Company, Anglo & London Paris National Bank, and Oakland Bank of Savings; a note for \$29,520 to the Central National Bank of Oakland, and a note for \$6,089 to the First National Bank of Oakland. All these notes are payable one year from date and bear interest at 6 per cent. They are to redeem notes, now due, which have been partly paid.

Southern Public Utilities Company, Charlotte, N. C.—The Illinois Trust & Savings Bank, Chicago, and Wm. Morris Imbrie & Company, New York, are offering for sale \$3,250,000 of first and refunding mortgage 5 per cent gold bonds of the Southern Public Utilities Company. The bonds are dated July 1, 1913, and due on July 1, 1943. The authorized issue is \$30,000,000 and the above-stated amount represents all the outstanding securities. They are redeemable on any interest date beginning with Jan. 1, 1916, at 105 and interest. A large portion of the issue has already been placed with investors, but the unsold balance is being offered at 95.5 and accrued interest, to yield about 5.3 per cent.

Taunton & Pawtucket Street Railway, Taunton, Mass.—In accordance with the recent opinion handed down by the full bench of the Supreme Judicial Court, as noted in the *ELECTRIC RAILWAY JOURNAL* of Oct. 16, Judge Wait of the equity session of the Superior Court on Nov. 23 entered a decree directing the foreclosure of a trust mortgage held by the Federal Trust Company, securing a total of \$200,000 of bonds issued by the Bristol County Street Railway. The court also appointed as receivers of the property covered by the mortgage Thomas T. Robinson, Dedham, Mass., John Lovejoy, Rockland, Me., and John A. Arnold, Pawtucket, R. I. The receivers of the old Bristol street railway sold the property to the Taunton & Pawtucket Street Railway subject to the above-mentioned mortgage. The purchasing company has maintained in a long legal fight since 1909 that the mortgage and the bonds secured thereby were illegal and invalid and did not constitute a lien upon the property it had acquired. The foreclosure now ordered, however, forms the final decision against this contention, and the bondholders are now in a position to realize upon their holdings through the foreclosure of the street railway property.

Virginia Railway & Power Company, Richmond, Va.—W. J. Parrish has been elected a director of the Virginia Railway & Power Company, the board being increased to fifteen members.

Washington (D. C.) Interurban Railway.—The property of the Washington Interurban Railway, including the single-track electric railway from Fifteenth and H Streets, Washington, D. C., to Berwyn Heights, Md., a distance of 8.5 miles, is to be sold at foreclosure on Dec. 23 at the latter place. It is said that the foreclosure is made under the first mortgage of the Washington, Spa Springs & Greta Railroad, the predecessor company, under which mortgage \$232,000 of twenty-year 5 per cent bonds are outstanding. The court authorization of the sale was noted in the *ELECTRIC RAILWAY JOURNAL* of July 31.

Washington-Oregon Corporation, Vancouver, Wash.—The reorganization plan of the Washington-Oregon Corporation permits every creditor to participate in the North Coast Power Company, which recently purchased the corporation's properties, as noted in the *ELECTRIC RAILWAY JOURNAL* of Nov. 13. The holders of first mortgage bonds of the corporation will receive 40 per cent of first mortgage bonds of the power company and 60 per cent of preferred stock, while the holders of second mortgage bonds will receive 49 per cent of common stock and an option to buy the balance of preferred and common stock.

Washington Water Power Company, Spokane, Wash.—The maturity of \$3,336,000 of 6 per cent notes, due on Feb. 2, 1916, has been provided for by the Washington Water Power Company through the sale of \$1,700,000 of two-year 5 per cent notes, dated Feb. 2, 1916, and \$1,700,000 of first refunding mortgage 5 per cent bonds, due in 1939. The first issue was sold largely to holders of maturing notes. The bonds were purchased and resold at par and interest by White, Weld & Company and Lee, Higginson & Company, New York.

DIVIDENDS DECLARED

Baton Rouge (La.) Electric Company, 3 per cent, preferred; 2 per cent, common.

Brooklyn (N. Y.) Rapid Transit Company, quarterly, 1½ per cent.

Citizens' Traction Company, Oil City, Pa., 50 cents, common.

Frankford & Southwark Passenger Railway, Philadelphia, Pa., quarterly, \$4.50.

Indianapolis (Ind.) Street Railway, 3 per cent.

Louisville (Ky.) Traction Company, quarterly, 1 per cent, common.

ELECTRIC RAILWAY MONTHLY EARNINGS

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, ME.

Period	Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Sept., '15	\$71,401	\$35,961	\$35,440	\$17,450	\$17,990
1 " " '14	69,099	*29,159	39,940	17,323	22,617
12 " " '15	783,707	*387,671	396,036	211,970	184,066
12 " " '14	777,721	*372,008	405,713	208,868	196,845

BATON ROUGE (LA.) ELECTRIC COMPANY

1m., Sept., '15	\$16,446	*\$8,685	\$7,761	\$2,193	\$5,568
1 " " '14	14,332	*9,384	4,948	2,087	2,861
12 " " '15	185,470	*109,269	76,201	25,527	50,674
12 " " '14	177,278	*115,159	62,119	25,182	36,937

CAPE BRETON ELECTRIC COMPANY, LTD., SYDNEY, N. S.

1m., Sept., '15	\$33,639	*\$18,184	\$15,455	\$6,594	\$8,861
1 " " '14	27,773	*17,817	9,956	6,396	3,560
12 " " '15	344,372	*207,270	137,102	79,196	57,906
12 " " '14	367,115	*210,435	156,680	76,218	80,462

CITIES SERVICE COMPANY, NEW YORK, N. Y.

1m., Oct., '15	\$411,505	\$14,323	\$397,182	\$40,833	\$356,349
1 " " '14	300,212	10,391	289,821	40,833	248,988
12 " " '15	4,232,915	163,503	4,069,412	490,000	3,579,412
12 " " '14	3,940,940	103,057	3,837,883	396,666	3,441,217

EASTERN TEXAS ELECTRIC COMPANY, BEAUMONT, TEX.

1m., Sept., '15	\$68,914	*\$33,426	\$35,488	\$8,710	\$26,778
1 " " '14	59,970	*33,179	26,791	8,601	18,190
12 " " '15	679,441	*379,186	300,255	104,940	195,315
12 " " '14	650,066	*398,404	251,662	100,388	151,274

GRAND RAPIDS (MICH.) RAILWAY

1m., Sept., '15	\$100,771	*\$68,404	\$32,367	\$14,002	\$18,365
1 " " '14	108,327	*74,706	33,621	13,690	19,931
12 " " '15	1,195,379	*824,876	370,503	164,282	206,221
12 " " '14	1,288,300	*833,073	455,227	159,440	295,787

PENSACOLA (FLA.) ELECTRIC COMPANY

1m., Sept., '15	\$22,013	*\$12,187	\$9,826	\$7,061	\$2,765
1 " " '14	20,510	*13,666	6,844	7,272	7428
12 " " '15	246,989	*146,777	100,212	86,639	13,573
12 " " '14	280,441	*176,742	103,699	86,334	17,365

PHILADELPHIA (PA.) RAPID TRANSIT COMPANY

1m., Oct., '15	\$2,219,105	\$1,232,080	\$987,025	\$816,614	\$170,411
1 " " '14	2,097,100	1,195,274	901,826	807,938	93,888
4 " " '15	8,066,754	4,530,010	3,536,744	3,264,763	271,981
4 " " '14	7,910,776	4,557,958	3,352,818	3,234,036	118,782

PORTLAND (ME.) RAILROAD

1m., Sept., '15	\$102,069	*\$57,291	\$44,778	\$19,250	\$25,528
1 " " '14	95,122	*53,522	41,600	19,555	22,045
12 " " '15	1,050,120	*654,855	395,265	261,197	134,068
12 " " '14	1,038,223	*641,664	396,559	256,549	140,010

PORTLAND RAILWAY, LIGHT & POWER COMPANY, PORTLAND, ORE.

1m., Sept., '15	\$454,856	*\$258,679	\$196,177	\$184,165	\$12,012
1 " " '14	483,313	*262,257	221,056	184,666	36,390
12 " " '15	5,639,948	*3,081,249	2,558,699	2,210,355	348,344
12 " " '14	6,511,485	*3,319,816	3,191,669	2,148,892	1,042,777

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

1m., Sept., '15	\$609,782	*\$387,575	\$222,207	\$182,823	\$39,384
1 " " '14	683,557	*399,925	283,632	177,816	105,816
12 " " '15	7,690,014	*4,775,166	2,914,848	2,165,430	749,418
12 " " '14	8,623,412	*5,054,890	3,568,522	2,108,802	1,459,720

REPUBLIC RAILWAY & LIGHT COMPANY, NEW YORK, N. Y.

1m., Oct., '15	\$276,355	*\$166,411	\$109,944	\$58,915	\$51,029
1 " " '14	251,893	*164,016	87,877	57,143	30,734
10 " " '15	2,511,277	*1,538,926	972,351	577,046	395,305
10 " " '14	2,500,002	*1,550,746	949,256	564,505	384,751

SAVANNAH (GA.) ELECTRIC COMPANY

1m., Sept., '15	\$64,018	*\$42,693	\$21,325	\$23,127	†\$1,802
1 " " '14	65,201	*42,779	22,422	22,800	†378
12 " " '15	799,977	*520,751	279,226	278,358	868
12 " " '14	848,945	*565,072	283,873	274,218	9,655

TAMPA (FLA.) ELECTRIC COMPANY

1m., Sept., '15	\$78,756	*\$39,265	\$39,491	\$4,371	\$35,120
1 " " '14	80,755	*42,738	38,017	4,258	33,769
12 " " '15	976,210	*498,552	477,658	52,751	424,907
12 " " '14	964,417	*525,974	438,443	55,559	382,884

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

Traffic and Transportation

SKIP STOP DENIED IN MILWAUKEE

Popular Vote, After a Three Months' Trial of the Skip Stop, Is Against the Plan

The Wisconsin Railroad Commission has decided not to authorize the general introduction of the skip stop on the system of The Milwaukee Electric Railway & Light Company. A test of the system has been made, with the authority of the commission, on three of the lines of the company during the past three months. The trial was authorized at the request of the city of Milwaukee and on Nov. 20, at the direction of the commission, a vote was taken of the patrons of the line to determine how popular the plan was with them. To secure an indication of the relative convenience or inconvenience to patrons living at different distances from the business center of the city, each line was divided into six zones, and during the week in question ballots by which passengers could state their preference were distributed and collected by inspectors of the commission working in groups of two. The ballots were so arranged that by tearing off one corner the preference of the patron could be easily indicated without the inconvenience of writing while on a moving car. The ballots were issued when the passengers paid their fare and were collected when they left the car. The returns were separated by zones. Approximately 45,000 ballots were distributed, and of these 36,040 were returned to the inspectors.

Of the total votes cast, 41.6 per cent were in favor of the plan and 58.4 per cent opposed to it. The votes by zones showed that a larger percentage of the patrons in the zones farther from the business center favored the plan than in the zones nearer the center of the city. In the nearest zone the votes in favor of the plan, on the three lines, were respectively only 38.2 per cent, 39.5 per cent, and 31.8 per cent, whereas in the farthest zone they were 49.8 per cent, 48.1 per cent and 36.6 per cent.

As a result of this study the commission has decided that the plan "would cause material inconvenience to a majority of the patrons, and that this inconvenience would more than offset the advantages of speed and operation to be gained." In consequence, the plan was discontinued on Dec. 1.

In commenting on the defeat of the plan a representative of one of the political parties in Wisconsin is quoted as saying that in his opinion much of the opposition arose from the idea that the benefits from the skip stop accrued primarily to the company rather than to the public.

James D. Mortimer, president of The Milwaukee Electric Railway & Light Company, expressed the belief that if the trial had extended over six months instead of three months the patrons would have had a better chance to realize the advantages to them of the quicker service and the vote would have been different. He also said that the company had encountered practically as much antagonism when it had introduced the near-side stop in Milwaukee, but that as the merits of this improvement became more familiar to the people all opposition had disappeared.

SCOPE OF ILLINOIS TRACTION SERVICE

Company Issues Pamphlet Showing Interchange of Freight with More than Eighteen Steam and Electric Roads in Eight States

The Illinois Traction Company, Peoria, Ill., has issued a circular in which is set forth the broadened scope of services which it is performing for shippers in the St. Louis and East St. Louis district. In the pamphlet are listed names of stations in Illinois, Indiana, Minnesota and the Dakotas reached by the McKinley System and its connecting steam railroads. It also gives routeing instructions and tariff references, which commercial traffic managers and shipping clerks will find useful. There is an account of the equipment owned and operated by the company.

The McKinley System has its main freight station in St. Louis, at Twelfth Street and Lucas Avenue, and in addi-

tion substations for package freight, to which drayage is absorbed, at the receiving stations of the St. Louis Transfer Company, the Columbia Transfer Company, Fidelity Transfer Company and Beck Drayage Company.

H. H. Wylie, general agent of the Illinois Traction System at St. Louis, is quoted as follows:

"St. Louis shippers, and travelers generally, have not been fully initiated into the workings of a big interurban system. Every day there come up incidents of this. The idea prevails that we handle passengers and a little express business, but relatively few merchants and manufacturers realize what the system is doing in the way of freight distribution. With the municipal loop agitation, and effort being made by St. Louis to secure the entry of other interurbans, the proposition of educating the people in the benefits of interurban service is an important one. In a small way we are trying to do something along these lines with the pamphlet 'Specific Services.' The McKinley System interchanges freight with more than eighteen steam and electric railroads in Missouri, Illinois, Indiana, Iowa, Michigan, Minnesota and North and South Dakota, and it has combination rates and services with many boat lines on the Mississippi and Illinois Rivers, and Lake Michigan."

In addition to the location of the St. Louis team tracks and substations, the pamphlet enumerates those in East St. Louis, Granite City, Madison and Venice. According to the pamphlet, the Illinois Traction System offers special advantages for the movement of merchandise or package freight, which is transported on express time at freight rates. The time of transit to many places within 200 miles of St. Louis is reduced to the utmost minimum. Package cars are forwarded daily to points in Illinois, Iowa, Minnesota and the Dakotas.

FAVORABLE SKIP-STOP VOTE IN ST. LOUIS

The skip-stop schedule on trial on the Broadway and the Olive Street lines of the United Railways, St. Louis, Mo., was indorsed by the patrons of the lines by a majority of more than three to one in a referendum on Nov. 22. The total vote was, "yes" 67,588, "no" 21,395. Richard McCulloch, president and general manager of the company, discussing the result of the election, is reported to have said:

"The company is pleased with the outcome and feels that many of those who did not vote are for the 'eliminated stop' schedule, because those who were opposed to the new system were active in their objection. Although only half of the patrons of the lines voted, we feel that the public has shown considerable interest in the question."

Putting this question to passengers grew out of the application of the United Railways for a permit to eliminate several hundred stops, including all of its lines. The Public Service Commission, while declining to grant the permit, did authorize the company to eliminate 101 stops along its Broadway and Olive Street lines, during three months, to find, through such a test, whether the proposed plan was popular. The company, after making the experiment, asked passengers to pass upon the matter.

STATE SAFETY FIRST CONFERENCE

A safety first conference, called under the auspices of the State Department of Labor, was held in Oklahoma City, Okla., on Nov. 17 and 18. Nearly 200 representatives of different industries were present to listen to various speeches on safety work and to examine safety exhibits.

The chairman and speaker at the first session was George W. Knox, second vice-president and general manager of the Oklahoma Railway. Mr. Knox described the purposes of the meetings and discussed safety first work in general. The best definition of safety first that he had ever seen was "the exercising of ordinary care and the elimination of taking chances." He believed that the idea of indemnity insurance is wrong and that this method constitutes a premium-offering scheme for carelessness. To his mind the problem of how to prevent accidents is the easy part of the whole proposition, but the difficult part is to get people to think and act in a precautionary manner. Mr. Knox felt that a precautionary system of education should be devised and established in all schools and colleges, particularly for the elementary grades when the young mind is most susceptible to impressions. This method would result in incul-

cating thoroughly and absolutely all of the essentials for so shaping one's acts that all causes of danger will be eliminated to the fullest degree possible.

At the last session of the conference the Oklahoma Safety First Council was definitely organized. Oklahoma is said to be the first State to form such an organization. The body will be patterned to a certain extent after the National Safety Council, and the by-laws of the national organization will be used as far as possible. The purpose of the organization is to secure an energetic representative in every leading industry of the State to perfect smaller organizations in the industry. The latter, in turn, would perfect local organizations in the towns. A central committee, consisting of representatives from several different lines of industry, was named, with W. G. Ashton, State Commissioner of Labor, as chairman. More members are to be added as rapidly as possible. This winter it is planned to have a campaign for arousing meetings in every town. Motion picture films and stereopticon slides will be utilized.

RAISED SAFETY ZONES FOR DETROIT

Detroit will experiment with the raised safety zone in an endeavor to protect street car patrons from vicious and reckless automobile drivers who now drive heedlessly through the chalk-marked safety zones in the streets. The experiment will be made at Woodward and Adams Avenues, two blocks away from the most congested crossing in the heart of the city. The raised platform will be built of concrete. Police Commissioner Gillespie will be in charge of the experiment.

When safety zones for street car riders were first laid out on Detroit streets the ends of the zones were protected by standards. So many of these were knocked over at night, however, by automobile drivers, that the police department eliminated the standards and marked the ends of the zones with round disks. These do not furnish any obstruction to a driver wanting to drive through the safety zone, and as a result many street accidents have occurred within the zones. The determination to elevate the surface to an extent that will compel motorists to observe the zones is a kind of desperate last hope of the police department.

Officials of the Detroit United Railway have not looked with particular favor upon the kind of raised zone which is proposed, although they have expressed themselves as content to abide by any experiment which will decrease street accidents. It is the contention of the street railway operators that Detroit's climatic conditions in winter will make a concrete platform close to the car tracks dangerous for passengers. It is their idea that the cities cited as examples of the value of the raised zone are not confronted with the winter conditions which exist in Detroit. They fear that in the rush hour with crowds endeavoring to get upon a narrow concrete platform passengers may be shoved or slip in front of the car wheels.

Six-for-a-Quarter Tickets Discontinued.—The Lincoln Railway & Heating Company, Lincoln, Ill., has abolished the custom of selling six tickets for 25 cents.

Early Shopping Card.—The Buffalo, Lockport & Rochester Railway, Rochester, N. Y., is displaying in all its cars an early shopping sign. The card reads "Christmas Is Coming—Do Your Shopping Now." The card carries a picture of St. Nicholas.

Interurban Increases Fare.—The Indianapolis, Columbus & Southern Traction Company, Columbus, Ind., announced an increase from 1½ cents to 2 cents per mile, effective on Dec. 1. The 10 cents extra fare for limited cars will be continued.

Massachusetts Fare Increase Suspended.—The Public Service Commission of Massachusetts has suspended until May 1, 1916, the proposed increase in fares by the Massachusetts Northeastern Street Railway, Haverhill, Mass. The commission has fixed on Dec. 14 as the date for commencing the hearing in the case.

Gates on All Seattle Cars.—The work of installing safety gates on cable cars of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been completed, and every car the company now operates has gates. The electric cars were equipped first, the cable cars being the last to remain with open gates and running boards.

Installing Thermometers in St. Louis Cars.—In compliance with the orders of the Public Service Commission of Missouri the United Railways, St. Louis, is installing thermometers in its 1400 cars. Under the ruling of the commission the temperature inside the cars must be at least 45 deg. Fahr., and not more than 70 deg. Fahr., when the outside temperature is 35 deg. Fahr., or less.

Complainants Fail to Appear at Fare Hearing.—None of the plaintiffs appeared at the hearing before the Public Service Commission of the Second District of New York on the complaint of L. L. Amidon and others against the Warren & Jamestown Electric Railway, in which they seek a reduction of the fare between Frewsburg and Jamestown, N. Y., from 10 cents to 5 cents. The hearing has been adjourned indefinitely.

City and Company to Confer on Car Type.—The Ontario Railway & Municipal Board on Nov. 22 directed the city of Toronto and the Toronto Railway to confer immediately as to the best type of car to be substituted for the running board vehicle. They have thirty days to agree on a type of car. If at the end of that time they fail to come to a complete understanding the city will have fifteen extra days to suggest an alternative type of car, with final appeal to the railway board.

Increase in Wages in Manchester.—The Manchester (N. H.) Street Railway, Manchester & Derry Street Railway and the Manchester & Nashua Street Railway have increased the wages of their trainmen to the following scale: First year, 23 cents an hour; first half of second year, 24 cents an hour; second half of second year, 25 cents an hour; third year, 26 cents an hour; fourth year, 26½ cents an hour; fifth year, 27 cents an hour; sixth year, 28 cents an hour; seventh year, 29 cents an hour; after seven years, 30 cents an hour.

Illinois Commission Jurisdiction Suit on Dec. 14.—In the suit in the Circuit Court of Cook County in which the city of Chicago questions the authority of the Public Service Commission of Illinois, the court, acting upon the joint application of the Attorney General for the State and the Corporation Counsel for the city, has decided to hear arguments on Dec. 14. Counsel having agreed not to enforce the service order until the case has been argued, the court has not acted on the prayer of the complainant for a temporary order to restrain the commission from putting the service order into effect. The terms of the order of the commission fixing service standards were reviewed at length in the *ELECTRIC RAILWAY JOURNAL* of Oct. 20, page 931.

Rates Advanced in Missouri.—The Missouri Public Service Commission recently granted an increase from 2 cents to 2½ cents a mile for passenger fares, with somewhat lower rates on round trips and mileage books, and an increase of about 5 per cent in freight rates. The commission held that a former state reduction from 3 cents to 2 cents a mile in the passenger rates was not accompanied by a sufficient increase of business to offset the lower income. In granting a general increase to the petitioning carriers the commission said: "When it is considered that we are asked to fix one schedule of rates that will be reasonable for fourteen railroads serving territory dissimilar in cost of construction, in destination and character of traffic, some containing large commercial centers and forming valuable connections with other carriers, while others do not, it is apparent, however well informed the commission should be as to the value of the property upon which the carrier is entitled to earn a reasonable return, no adjustment of the rates could be expected in which equal results would follow as to the return received by each carrier."

Buffalonians See the Liberty Bell.—The presence of the Liberty Bell in Buffalo on its return to Philadelphia after its circuitous transcontinental trip from San Francisco presented one of the most difficult traffic problems handled by the International Railway, Buffalo, N. Y., in some time. During the hour that the bell was on exhibition in Buffalo, it is estimated that at least 60,000 persons tried to view it, and that 75 per cent of those who inspected the historic relic rode on the street cars. The ease with which the problem was handled by the railway without delay or extreme overcrowding delay was commented upon by the police and city

officials. Nelson H. Brown, general superintendent of transportation, and T. W. Connette superintendent of the Buffalo city lines, took personal supervision of the car movement. Cars of almost every route in the city were looped through Main, Exchange, East Seneca and Michigan Streets, within less than 500 ft. of the bell, so the need for transferring from one line to another in congested downtown centers was almost entirely eliminated. The superiority of the controlled entrance type of near-side pay-as-you-enter cars over the old type cars was again demonstrated.

Skip Stops Begun in Detroit.—Starting on Sunday, Nov. 28, the Detroit (Mich.) United Railway began the operation of skip stops on the Woodward Avenue line, the heaviest passenger traffic line in Detroit. The skip stops are not effective within the heart of the city. In so far as possible the stops have been made at alternate blocks, cars running in opposite directions not stopping at the same intersection except at transfer points. Stops have been marked by poles painted white. The company was moved to immediate action following the receipt of a letter from Commissioner of Police Gillespie, in which he urged the establishment of the skip stops. Briefly, his reasons for asking for the new plan of stops are: The addition of trailers on Woodward Avenue has practically blocked east and west traffic in many of the short blocks; the contemplated action of the Common Council in compelling motorists to stop with the street cars will be made more practical; the belief that the plan will make possible the putting on of more cars, thereby affording greater accommodations for the public, especially during the rush hours. If the experiment on Woodward Avenue proves satisfactory to the authorities and the public the skip-stop plan will be extended to other lines in the city.

Ohio Supreme Court Decides Fare Case.—The Ohio Supreme Court on Nov. 19 handed down a decision in which a 5-cent fare is established on the line of the Interurban Railway & Terminal Company between Pleasant Ridge and Fountain Square, Cincinnati. Pleasant Ridge, then an independent village, granted franchise rights on competitive bidding as to fares in 1901. The Rapid Transit Company was the successful bidder. It offered a 7-cent fare with transfers, with the proviso that the fare would be reduced to 5 cents should the village be annexed to the city of Cincinnati. The franchise was afterward assigned to the Interurban Railway & Terminal Company. Subsequently the village was annexed to the city. Suit was filed to enforce the terms of the franchise and the decisions of both Courts of Common Pleas and Appeals were in favor of the city. The company made the defense that it did not own the lines through Norwood and is compelled to pay the Cincinnati Traction Company 3 cents out of each fare for the use of its tracks. It contended further that the village ordinance was invalid, for the reason that it attempted to fix the rate of fare outside its own limits. The court held that the acceptance of the franchise constituted a binding contract between the two parties.

"Safety" Motion Picture Films Available.—The use of motion picture films in educational work is becoming more common every day, and perhaps in no other branch of education have they proved more effective than in teaching workmen and the public generally about the causes and remedies for accidents. Three electric railway companies which have had made for their own use series of films showing accidents common in electric railway operation and the means of avoiding them are the Chicago (Ill.) Surface Lines, Pittsburgh (Pa.) Railways and Pacific Electric Railway, Los Angeles. It is interesting to learn that arrangements have recently been made by the National Safety Council of Chicago by which these films are available to other railway companies. The National Safety Council held its last annual convention at Philadelphia on Oct. 19-21. This meeting was reported on page 905 of the issue of this paper for Oct. 30. The members are largely steam railroads and industrial corporations, although a number of electric railways were represented at the Philadelphia convention. H. A. Bullock, of the Brooklyn (N. Y.) Rapid Transit Company, was elected at that meeting a member of the board of directors and chairman of the membership committee of the electric railway section, and hopes to interest other electric railway companies in the important work being done by the Council.

Personal Mention

Mr. C. F. Bruce, auditor and purchasing agent of the Tulsa (Okla.) Street Railway, has resigned to become secretary and treasurer of the Southwest Mortgage & Investment Company, Tulsa.

Mr. A. Ludlow Kramer, president of the Electric Properties Corporation, New York, N. Y., has resigned in order to take a rest after an operation. Mr. Guy E. Tripp, chairman of the Westinghouse Electric & Manufacturing Company, has been elected to succeed him temporarily.

Mr. C. Loomis Allen, chairman of the board of the Maryland Electric Railways, vice-president of the Syracuse & Suburban Railroad, president of the Newport News & Hampton Railway, Gas & Electric Company, and formerly president of the American Electric Railway Association, has been appointed co-receiver of the Empire United Railways, Inc., Syracuse, N. Y. Mr. H. S. Holden, Syracuse, was appointed receiver of the company on Nov. 1.

Mr. J. S. Pevear, president of the Birmingham Railway, Light & Power Company, Birmingham, Ala., a subsidiary of American Cities Company, whose time has been largely engaged in connection with the administration of the United Gas & Electric Engineering Corporation in New York, took active charge of the Birmingham property on Dec. 1. Mr. J. P. H. De Windt will remain with the Birmingham property in the capacities of vice-president and general manager.

Mr. H. C. Kendall has resigned as traffic engineer with the Portland Railway, Light & Power Company, Portland, Ore., to accept a position with the Denver (Col.) Tramway, of which Mr. F. W. Hild, former general manager of the Portland Railway, Light & Power Company, is now vice-president and general manager. Mr. Kendall was engaged about three years ago to make a traffic survey and work out rerouting plans for the Portland Railway, Light & Power Company. Prior to coming to Portland he was connected with the Illinois Traction Company. Mr. Kendall is a graduate of Massachusetts Institute of Technology.

Dr. W. F. M. Goss, chief engineer of the Chicago Association of Commerce committee on smoke abatement and electrification of railway terminals, has been dean of the college of engineering of the University of Illinois since 1907. For two years past he has been absent on leave from the university to permit him to devote his entire attention to the work of the committee, an abstract of the report of which appears elsewhere in this issue. Dean Goss is well known in the fields of steam railroading, mechanical engineering and education, to each of which he has made notable contributions. Immediately after completing his studies at the Massachusetts Institute of Technology in 1879 he organized the department of practical mechanics at Purdue University. He was identified prominently with Purdue for a long period, occupying the positions of professor of experimental engineering, dean of the schools of engineering and director of the engineering laboratories. In this connection he co-operated with the steam railroads in making tests of locomotives and of parts of railroad equipment, which work has been continued at Illinois. He recently served as president of the A. S. M. E. and has held numerous other positions in technical societies. He is the author of several books, principally on locomotive topics. At Illinois he was instrumental in establishing the department of railway electrical engineering, which is co-ordinate with those of railway mechanical and railway civil engineering. These three departments form a special school which has exceptional facilities for their work.



DR. W. F. M. GOSS

Mr. Nathan A. Rumney, the newly appointed general freight and express agent of the Detroit (Mich.) United Lines, was born in England on June 16, 1878. When he was



NATHAN RUMNEY

eleven years old he moved to Detroit, Mich. After completing his education in the public schools of that city, he began work with the Michigan Central Railroad in 1894. In October, 1901, he joined the late George W. Parker, his predecessor, in organizing and developing the express and freight service on the Detroit United Lines. His first position with this company was in the general freight department, and he afterward filled various traffic positions until he was appointed traveling freight and express agent

in 1905. As general freight and express agent, Mr. Rumney will assume charge of a department handling the heaviest electric interurban express and freight traffic in this country with the possible exception of the Pacific Electric terminal at Los Angeles, Cal. The Detroit freight terminal alone receives and delivers more than 1,000,000 lb. of freight daily. The system of the Detroit United Lines comprises more than 850 miles of track.

Mr. G. H. T. Shaw recently succeeded Mr. C. A. King as general manager of the Lee County Central Electric Railway, Lee Center, Ill. From 1887 to 1889 Mr. Shaw was connected with the Lake Shore & Michigan Southern Railroad as a rodman and assistant engineer on the line between Cleveland and Buffalo. In 1890 he served as assistant engineer in charge of field work on building the section of double track for the Chicago & Northwestern Railroad from Rochelle to La Fox, Ill. In 1892 and 1893 he was engineer in charge of a party in the location of the Ferrocarril del Cauca from Buenaventura to Cali, Colombia, South America. From 1893 to 1905 Mr. Shaw established himself as a consulting engineer with offices at Dixon, Ill. During this period he had charge of large works in swamp drainage in Illinois, Wisconsin and Indiana and irrigation projects in California and Oregon. From 1905 to 1910 Mr. Shaw was located at Toluco, Mexico, in charge of extensive surveys for the location of 1100 km. of railway from Mexico City to Acapulco. From 1910 to 1913 Mr. Shaw was manager for the Balsas & Pacific Railway, with offices in London, England. This company had started to build a railway along the route of surveys made by Mr. Shaw, who called in the surveying parties in 1913. Since then Mr. Shaw has been located at Lee Center. The Lee County Central Electric Railway is now the owner of a part of a system of interurban electric railways started in 1903 by Mr. Shaw and his associates and projected to extend from DeKalb, Ill., to Rock Island, Ill. Mr. Shaw was president of the three companies. The old companies are all defunct, but it is the hope of the present company to build the system along the lines which were formerly in view.

OBITUARY

P. E. Huber, one of the founders of the Oerlikon Works in Switzerland, died at Zurich, on Oct. 4, at the age of seventy-nine. He was a native of Zurich and received his education in the local Polytechnic High School, of which Mr. Alfred Escher was at the time president. After practical experience with the Sulzer firm in Winterthur and with Escher, Wyss & Company in Zurich, Mr. Huber in 1863 founded the firm of P. E. Huber & Company at Oerlikon, which, after various changes, in 1876 took the form of the Maschinenfabrik Oerlikon. Mr. Huber continued to be the active director in charge until 1894, and from then until 1911 remained as president of the advisory council of the firm, of which he was a member at the time of his death. He also served as president of the Aluminum-Industrie A. G., Neuhausen.

Construction News

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

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

RECENT INCORPORATIONS

*Evanston (Ill.) West Side Railway.—Incorporated in Illinois to own and operate electric railways. Capital stock, \$10,000. Incorporators: Bertram W. Rosenstone, Henry J. Myerson and Oscar A. Ross.

*Lawrence, Topeka & Western Railway, Lawrence, Kan.—Incorporated in Kansas to construct an electric railway from Lawrence to Topeka. The line will be on the north side of the Kaw River. Capital stock, \$100,000. Incorporators: Former Governor W. R. Stubbs, J. D. Bowersock, J. E. Stubbs, A. Henley, C. E. Dutton and C. R. Hosford, all of Lawrence.

FRANCHISES

Long Beach, Cal.—The Pacific Electric Railway has received permission from the Council to abandon its line beginning at Seventh Street and Pine Avenue and extending westerly to Seventh Street and Riverside Drive.

Belvidere, Ill.—The Elgin & Belvidere Electric Company has accepted the ordinance adopted by the Council of Belvidere on Sept. 2 which provides for the abandonment of the city lines. The line on West Lincoln Avenue and the tracks on South State Street south of Logan Avenue are to be taken up and the poles removed within thirteen months and the tracks on the State Street line north of a point just south of the Chicago & Northwestern Railroad within two years.

Buffalo, N. Y.—The International Railway has asked the Council for a franchise to construct a double-track extension on Washington Street between Ohio and Perry Streets; also on Ohio Street from Washington to Main Street. This extension will connect with the new terminal station being built by the Lackawanna Railroad, the Cleveland & Buffalo Transit Company and the Detroit & Cleveland Navigation Company at the foot of Main Street at Ohio Street.

Salt Lake City, Utah.—The Utah Light & Traction Company has asked the Council for a franchise to extend its Capitol Hill line along Second North Street across the front of the capitol, thence north on West Canyon Avenue to a point east of the capitol building.

Seattle, Wash.—The franchise committee of the Council has recommended that the petition of the Puget Sound Traction, Light & Power Company to operate a shuttle service in the circuitous route of the Ballard Beach line be granted. The company proposes to operate the Ballard Beach cars direct to the city and to operate a one-man car over the shuttle line. The committee, however, recommended that the company issue transfers to and from the shuttle line on a 4-cent ticket, and the company has agreed to this provision.

TRACK AND ROADWAY

Pine Bluff (Ark.) Company.—Material has been received for the reconstruction of this company's line on Cherry Street from Sixth to Twenty-sixth Avenue. From Sixth to Sixteenth Avenue the line will be double tracked, and to the end of the line at Twenty-sixth Avenue a concrete foundation will be laid and the track rebuilt.

San Diego (Cal.) Electric Railway.—Plans are being made by this company to extend its line on University Avenue to Euclid Avenue.

Municipal Railways of San Francisco, San Francisco, Cal.—The Board of Works has approved the city engineer's plans for the construction of the Church Street municipal railway between Eighteenth and Twenty-second Streets. This section of the road will run through Mission Park from Eighteenth to Twentieth Street and over a right-of-way the city has bought between Twentieth and Twenty-second Streets. The specifications provide for the removal of buildings, grading and track construction. Bids will be received by the Board of Works on Dec. 8.

Belleville & Mascoutah Traction Company, Belleville, Ill.—During 1916 this company plans to build 10 single-track miles of line between Belleville and Mascoutah.

Chicago, Milwaukee & St. Paul Railroad, Chicago, Ill.—Operation will be begun by this company on its electrified division from Deer Lodge to Three Forks, Mont., on Dec. 8. The complete electrification will consist of four divisions extending across the Rocky Mountains, comprising 650 miles of single track. Construction crews are now working on the second division from Three Forks to Harlowton.

Illinois Traction System, Peoria, Ill.—Efforts are being made to have this company build a line from Edwardsville east to Marine and to Highland.

*Washington, Ind.—Plans are being considered to build an electric railway between Washington and Linton through Bicknell, Frelandville, Pleasantville and Dugger. Options on the right-of-way, it is understood, have been taken. A. L. Brocksmyth, Bicknell, is interested in the project.

Charles City (Iowa) Western Railway.—An extension from Charles City to Colwell, 8 miles, has been completed by this company.

Tri-City Railway Company, Davenport, Iowa.—This company is considering the extension of a line into territory to the southeast of Moline.

Fort Scott & Pittsburg Railway, Fort Scott, Kan.—A report from this company states that negotiations are now under way with a construction company to build its line from Fort Scott to Pittsburg, 36 miles. The line will connect Fort Scott, Garland, Arcadia, Mulberry, Frontenac and Pittsburg. H. A. Cooper, Redfield Building, acting secretary. [Sept. 4, '14.]

Arkansas Valley Interurban Railway, Wichita, Kan.—A report from this company states that operation will be begun this week on its new 29-mile line to connect Halstead and Hutchinson via Burrton.

Berkshire Street Railway, Pittsfield, Mass.—It is expected that this company's Lee-Huntington extension will be in operation from Lee to Otis within a month. The company recently filed with the Public Service Commission an application for a certificate of operation covering that portion of the new extension, built two years ago, but not yet placed in operation.

Electric Short Line, Minneapolis, Minn.—Tracklaying has been begun by this company on its 45-mile extension from Winsted to Hutchinson and it is expected to have the new line in operation by January, 1916. The company expects to build about 50 miles of new line during 1916.

Fallon (Nev.) Electric Railroad.—This company reports that it expects to begin operation early next spring.

Interborough Rapid Transit Company, New York, N. Y.—Bids for the installation of tracks on the White Plains Road extension of the Lenox Avenue branch of the existing subway were opened last week by the Public Service Commission for the First District of New York. This line extends northerly from the terminus of the existing road at Bronx Park through White Plains Road to 241st Street, near the northern city line. It is to be a three-track elevated railroad, and will be operated in conjunction with the present subway system by the Interborough Rapid Transit Company. The steel structure for the new line is rapidly approaching completion, and the contract for station finish work has already been awarded. The two lowest bids for the work were received from the Coast & Lake Contracting Corporation, at \$53,930.50, and the Southeastern Construction & Engineering Corporation at \$101,205.86. Bids were opened on Nov. 30 by the Public Service Commission for the First District of New York for the construction of Section No. 2, Routes Nos. 19 and 22, being a part of the Southern Boulevard and Westchester Avenue branch of the Lexington Avenue subway. The line, which will be elevated, extends on Whitlock Avenue and Westchester Avenue from Bancroft Street to Eastern Boulevard. Unofficial totals of the two lowest bids are: Lawrence C. Maxwell, 1665 Eighty-second Street, Brooklyn, \$2,063,877; A. L. Guidone Company, 131 East Twenty-third Street, New York, \$2,072,700.

Manhattan & Queens Traction Corporation, New York, N. Y.—This company reports that during 1916 it expects to build 4 miles of single track.

Westchester Street Railroad, White Plains, N. Y.—This company is improving its White Plains-Tarrytown line. Practically the entire roadbed is being changed or raised to conform with the grades of the Tarrytown-White Plains State Road improvement. The tracks on Benedict Avenue, Yonkers, are being removed from the side to the center of the street. Tracks will also be laid in Elmsford.

Grand Forks (N. D.) Street Railway.—This company reports that during 1916 it will construct about 1 mile of new track in Grand Forks.

Ohio Valley Traction Company, Portsmouth, Ohio.—This company reports that it expects to build 21 miles of single track during 1916 to connect Ironton and Portsmouth. All materials have been purchased and all contracts let. The line will be completed about May 1, 1916.

Oklahoma (Okla.) Railway.—This company reports that during 1916 it expects to construct a 16-mile single-track extension from Edmond to Guthrie.

Oklahoma Union Traction Company, Tulsa, Okla.—This company reports that during 1916 it expects to build 15 miles of new interurban line between Tulsa and Sapulpa.

Sombra, Ont.—Plans are being discussed for a hydro-electric radial line for the river front to touch all the points of population from Wallaceburg to Sarnia. W. A. Scott, Bickford, Ont., clerk.

Portland Railway, Light & Power Company, Portland, Ore.—This company is seeking the abandonment of two short pieces of its line, one of which is on Burnside Street from Fifth to Washington Street at Sixteenth Street, and the other on Maryland Avenue from Shaver to Prescott Street. The company contends that both of these lines are little used and are operated at heavy expense.

Panama (Panama) Electric Company.—A report from this company states that plans are being made to build an extension to Fort Amador. The power plant being constructed by the company is nearing completion.

Harrisburg (Pa.) Traction Company.—The Council of East Berlin has granted right-of-way to this company into East Berlin for the maintenance of a trackless trolley line between East Berlin and Dover. The Council of Dover has already granted this permission. The line will carry both passengers and freight. It is expected that work on the proposed route will be begun in the near future.

Highland Grove Traction Company, McKeesport, Pa.—This company reports that it proposes to construct an extension from McKeesport to East Pittsburgh.

Slate Belt Electric Street Railway, Penn Argyll, Pa.—During 1916 this company expects to construct 15 miles of new line between Wind Gap and Stroudsburg.

Rhode Island Company, Providence, R. I.—Track has been laid by this company on Broad Street, Central Falls, to connect with the new Blackstone River bridge.

Chattanooga (Tenn.) Traction Company.—Grading has been begun by this company on its extension to Hixon. It is stated that grading will be completed in ninety days and the laying of track will be begun, the order for the rails having been placed some weeks ago.

***Cleveland, Tenn.**—H. M. Linn, Cleveland, is agitating the project of an electric railway from Cleveland to Chattanooga, Knoxville and Ocoee. In this connection he is quoted as stating: "Officials of the Tennessee Power Company recently went to Benton, where they recorded a charter for operation of an electric railway from a point on the Louisville & Nashville Railroad, near Ocoee, to Parksville. The company now operates between 5 miles and 6 miles of steam railway between these points and proposes to convert this line into an electric road for both freight and passengers. Every move thus far points to the development of a pleasure resort at Parksville."

Nashville Railway & Light Company, Nashville, Tenn.—This company has filed an amendment to its charter, authorizing it to construct a branch line from the Nineteenth Street line between Lillian and Rothschild Streets into Shelby Park.

Beaumont (Tex.) Traction Company.—Plans are being considered by this company to extend its Sabine Street line on Doucette Street to Grove Street, Beaumont.

Temple & Marlin Interurban Railway, Temple, Tex.—Formal organization of this company was completed at a meeting held at Marlin on Nov. 24. The following officers were elected: G. W. Glass, Marlin, president; George Harter, Temple, first vice-president; J. J. Waits, Durango, second vice-president; W. W. Turner, Marlin, secretary; T. A. Cheeves, Marlin, treasurer, and S. D. Hanna, Temple, chief engineer. The company expects to have the line in operation within the next eighteen months. [Sept. 25, '15.]

Bingham Canyon, Utah.—As soon as franchises in Bingham and through the county can be secured work will be begun on the electric line between Bingham and West Jordan, where the line will connect with the Salt Lake & Utah Railroad. Surveys have been completed and the capital for construction, estimated at \$250,000, is available at once. Harry S. Joseph is interested. [Aug. 7, '15.]

Monongahela Valley Traction Company, Fairmont, W. Va.—H. L. Lambert, vice-president of the Undercurrent Company of America, has been in consultation with officials of the Monongahela Valley Traction Company in regard to the installation of a car line without poles or overhead trolley wire to operate from Clarksburg's business center, across the new concrete bridge to the Baltimore & Ohio Railroad station in Glen Elk, testing out the patents of the Undercurrent Company of America.

Weston & Glenville Electric Railroad, Weston, W. Va.—At a meeting of this company held on Oct. 30 it was decided to discontinue business as a corporation and surrender its charter and corporate franchises. Notice of the dissolution of this company has been sent to the Secretary of State of West Virginia. [July 10, '15.]

SHOPS AND BUILDINGS

Illinois Traction System, Peoria, Ill.—The Jacksonville Railway & Light Company, Jacksonville, Ill., a subsidiary of the Illinois Traction System, has purchased the building occupied by the Jacksonville National Bank. The first floor of the building will be equipped for a salesroom and waiting station for this company.

Boston (Mass.) Elevated Railway.—This company is completing extensive alterations and additions to its freight and trolley terminal property at Copps Hill Wharf. The company has recently purchased from the New Haven Railroad a tract of 1 acre of land adjoining that owned by the elevated. The enlarged terminal will include about 2 acres. It will have three freight sheds to one now used. Seven automobiles and property to the value of about \$12,000 were destroyed on Nov. 23 when an explosion of gasoline set fire to the garage in the Boston Elevated yards on Harrison Avenue.

Laurel Light & Railway Company, Laurel, Miss.—This company is demolishing the old building at the Laurel-Ellisville Park and is erecting a moving picture theater with other attractive structures.

***Dallas, Tex.**—It is reported that interurban electric railway interests centering in Dallas have reached an agreement for the construction of a large system of terminals and a Union station. Stone & Webster Engineering Corporation, Boston, is interested.

POWER HOUSES AND SUBSTATIONS

Connecticut Company, New Haven, Conn.—This company has applied to the Council for a permit to rebuild and enlarge its power station on Commerce Street, Hartford. Four 1000-hp. boilers and a coal conveyor will be installed. The station will be equipped with smoke consumers. The cost of the proposed improvements, it is estimated, will reach the sum of \$197,000.

Sapulpa & Oil Field Railway, Tulsa, Okla.—This proposed railway is contemplating the installation of a power plant at Shamrock to supply electricity for operating machinery in the oil fields and also for railway use. High-tension lines will be used. J. A. Frates, general superintendent of the St. Louis & San Francisco Railroad, St. Louis, is president of the company.

Manufactures and Supplies

ROLLING STOCK

Oakwood Street Railway, Dayton, Ohio, is reported as preparing plans for the purchase of new cars.

Dayton, Springfield & Xenia Southern Railway, Dayton, Ohio, it is reported, will rebuild three of its cars shortly.

Springfield (Mo.) Traction Company during the year rebuilt four double-truck and two single-truck cars in its own shops.

Salt Lake & Ogden Railway Company, Salt Lake City, Utah, is reported to be in the market for six large open trail cars.

Alton, Granite & St. Louis Traction Company, Alton, Ill., has rebuilt two cars in its own shops for limited service between Alton and St. Louis. The company is now rebuilding another car.

Pittsburgh (Pa.) Railways has ordered fifteen center-entrance interurban cars from The J. G. Brill Company, in addition to the order for 175 city cars reported in the *ELECTRIC RAILWAY JOURNAL* of Nov. 27.

New York (N. Y.) Municipal Railway, noted in the *ELECTRIC RAILWAY JOURNAL* of Nov. 27, as expecting shortly to buy 100 more cars for its subway system, has issued requests to carbuilders for bids on this equipment.

Lewiston, Augusta & Waterville Street Railway, Portland, Me., has ordered from the Laconia Car Company seven 35-ft. flat cars with diamond arch bar trucks. This order is in addition to that ordered by the same company in October for five flat cars with trucks.

Worcester (Mass.) Consolidated Street Railway has converted two double-truck closed cars and one double-truck open car into the prepayment type. The reconstruction of nine double-truck open cars into the prepayment type is also under construction and is expected to be completed before the end of the year.

Chattahoochee Valley Railway, West Point, Ga., has ordered one 32-ft. 9-in. Edison storage battery car from the Railway Storage Battery Car Company, New York, N. Y. The car, which will be built by The J. G. Brill Company, is somewhat similar in general type to the two storage battery cars now operating on the Long Island Railroad between Valley Stream and Mineola. It will have double folding doors at each platform opening and will have two compartments, with a partition door in between, for separating whites from negroes.

TRADE NOTES

Westinghouse Traction Brake Company, New York, N. Y., has received an order to equip with straight air brakes two passenger cars of the Bush Terminal Railroad, Brooklyn, N. Y.

Spray Engineering Company, Boston, Mass., has adopted a new trademark and also the trade name "Spraco" to apply to all its products, including air washers, nozzles and cooling systems, etc.

I. R. Nelson Electrical Manufacturing & Repair Works, Newark, N. J., have moved into larger quarters in Newark. The new factory is located on Bond Street, where two buildings are being equipped with modern machinery for the manufacture of field and armature coils and general electrical repair materials for traction and industrial motors and generators. A system of vacuum drying and impregnating apparatus is also being installed.

Western Electric Company, New York, N. Y., announces that on Nov. 18 all of the assets of the Western Electric Company of Illinois were acquired by transfer to a company chartered under the laws of the State of New York, to be known as Western Electric Company, Inc. The stockholders of the Western Electric Company came to the conclusion that it was desirable that the company should have two classes of stock, common and non-voting preferred. As the statutes of Illinois do not provide for such classifications it was decided that the company should change its legal domicile. No change in the policies, operations, or management of the company is involved. The same board of directors and officers still continue. The Western Elec-

tric Company, Inc., under the laws of New York will have \$15,000,000 of 6 per cent cumulative preferred stock and 150,000 shares of common stock at no par value, but with \$5 paid in, making a total of \$750,000. The Western Electric Company has changed its Detroit headquarters from 263 Franklin Street to Kirby and Dequindre Streets. The new building is two stories high and has a frontage of 150 ft. and a depth of 130 ft. adjoining the Grand Trunk Railway in the section that forms a part of the inner belt railway of Detroit. The total floor space is 50,000 sq. ft., and the yard with an area of 54,000 sq. ft. is large enough to accommodate stocks of cross-arms, clay conduit and poles.

ADVERTISING LITERATURE

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Bulletin No. 24 describing its complete line of small motors.

Chicago Patented Tools Company, Racine, Wis., has issued a card illustrating its "Potstada" drop forged steel shear for cutting steel plate up to $\frac{3}{8}$ in. in thickness.

Harrison Safety Boiler Works, Philadelphia, Pa., have issued a reprint of a paper entitled "Establishing and Maintaining Boiler Room Economy," which was presented before the Ohio Society of Mechanical, Electrical & Steam Engineers by George H. Gibson.

Pelton Water Wheel Company, San Francisco, Cal., has issued sheets in the Spanish, Portuguese and English languages, which are intended to direct the attention of machinery users to the possibility of using Pelton water wheels for every class of apparatus.

Dick, Kerr & Company, Ltd., London, England, have just published a well illustrated pamphlet showing the character and scope of the work recently undertaken by them. At present they have large engineering works at Kilmarnock and at Preston, England. The former are devoted to the production of narrow gage steam locomotives, electric locomotive bodies, dump carts for contractors and similar material, while at Preston heavy electrical machinery is made, including generators of all types from 1000 kw. up, with direct connected turbines, converters, transformers, railway motors, etc. At these works, also, metal filament lamps have been manufactured during the past three years, and the Britannia works at Preston can turn out 8000 a day. Among the turbo alternators built at Preston recently are three of 1875 kva. for Madras, one for 2500 kva. for St. Helen's and one for 5500 kva. for the London & Southwestern Railway. Among the machines of lower speed designed for use of the reciprocating steam engines or water turbines are four of 1500 kw. for the Japanese State Railways and three of 8900 kva. for the British Columbia Electric Railway. Dick, Kerr & Company were responsible for the equipment of the Bury & Holcombe Brook line of the Lancashire & Yorkshire Railway with a direct current overhead system at a voltage of 3500. The concern also takes contracts of a civil engineering character.

RECENT ENGLISH DEVELOPMENTS

For many years the matter of connecting the populous district to the east of Middlesbrough by means of a tramway has been considered, and despite numerous setbacks the project is at last nearing realization. Within the next few weeks trackless trams will be running from North Ormesby, through Cargo Fleet and South Bank to Grangestown, and from South Bank to Normanby. For the immediate future, the system will have terminals at the Middlesbrough end of Smeaton Street, North Ormesby, near the Market Place, Grangestown, and the junction with the Redcar Road at Normanby. The standards have been erected along practically the whole of the route, and the cable is now being put into position. A large shed has been erected on the Middlesbrough side of South Bank to accommodate the cars, which will be similar in type to those which are running so successfully in Bradford and Leeds.

To meet the depletion in the municipal service occasioned by men undertaking military duties, women tramcar conductors were recently introduced on a section of the Nottingham electric car routes, a limited number, mostly related to men who have gone to the front, being at first engaged. It is intended to increase the number if the experiment proves successful.