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#### CONTENTS.

Atlantic City Selected for the Convention.....	775
The Location of the Heater Switch.....	775
The Continuity of Committee Work.....	776
Accidents on Open Cars.....	776
Mileage and Capital Investment of Electric and Steam Roads.....	776
Testing Interpole Shop Motors.....	777
Car Illumination.....	778
Legal Status of Free Transportation of Employees.....	779
Comparative Results of Twin City Rapid Transit Company.....	779
The Jersey City Yards and Shops of the Hudson & Manhattan Railroad.....	780
Committee on Electricity of the Maintenance of Way Association..	783
Single-phase Electrification of the London, Brighton & South Coast Railway.....	784
Electrification of the Kiruna-Riksgränsen Line of the Swedish Railways.....	788
Iron-Bar Overhead Construction on Brooklyn Bridge Loops.....	789
Light-Weight Cars, Their Construction and Operation.....	790
The Cause and Prevention of Accidents.....	790
Investigation and Care of Return Railway Circuits.....	793
Boiler Economy and the Application of Flue Gas Analysis.....	794
Sub-Committee Meeting of the Joint Committee on Engineering Accounting.....	795
Amount of Maximum Tender.....	796
Aluminum Wire for Field Coils.....	796
Chicago Subway Plans.....	797
Meeting of Southwestern Electrical & Gas Association.....	797
Metropolitan Street Railway Reorganization Plan.....	798
Instruction Room for Berlin Motormen.....	799
Pittsburgh Meeting of Committee on Equipment.....	800
Atlantic City for the 1911 Convention.....	803
Motor-Driven Machine for Cleaning Screens.....	804
Rapid Finishing of Trolley Wheels.....	805
Paper on Low-Pressure Turbines.....	805
10,000-kva Water-Cooled Transformers.....	805
Automatic Switch for Emergency Car Lighting.....	806
Car Watt-Hour Meters with Mercury Flotation.....	806
Gas-Electric Car for Buffalo, Rochester & Pittsburgh Railway.....	807
Electric Railway Legal Decisions.....	808
News of Electric Railways.....	810
Financial and Corporate.....	815
Traffic and Transportation.....	819
Personal Mention.....	820
Construction News.....	822
Manufactures and Supplies.....	825

#### Atlantic City Selected for the Convention

The question of the place of meeting for the 1911 convention of the American Electric Railway Association was settled this week by the choice of Atlantic City. This decision was not reached, however, until a very great effort had been made to find a Western city which was able to provide the facilities required by the association. A careful examination of the hotel situation in the principal cities in the West disclosed the fact that Chicago was the only city which was able in this respect to care for the convention, but that Chicago was not available because the Coliseum, the only building capable of housing the exhibits, had been rented for other purposes from Sept. 12, 1911, to Dec. 1, 1911. As readers of this paper know, we have advocated the choice of a city in the Central West this year if any city could be found which would be able to furnish reasonable accommodations in the way of hotel and exhibit facilities, but the choice of Chicago would have meant either the abandonment of an exhibit or the selection of a date for the convention prior to Sept. 12 or after Dec. 1. The committee was not willing to adopt either of these alternatives, and, as Atlantic City was the most desirable convention location in the East, reluctantly decided in its favor. We believe that this conclusion was adopted wisely. Atlantic City is able to provide all the requisites of a successful convention and will be able to accommodate the association this year even better than before, because another hotel, the enlarged Dennis, will be open this year. Moreover, the Atlantic City hotel management has agreed to provide 100 more rooms with baths than last year and better meeting halls than last year for the Engineering and Accountants' associations. The time selected for the convention is from Oct. 9 to Oct. 13. This date is the usual one, being the second week in October. It is announced, however, that the committee will secure an option for the use of the Coliseum in Chicago during October, 1912. We believe that the majority of the members of the association will be sorry that the meeting will not be in Chicago this year, but will recognize that the choice of Atlantic City was the only course for the committee to take. There is nothing to prevent the association from holding a very successful convention there, and undoubtedly in the future there will be many years when the association will wish to meet there again. It seemed to many that this year was a good time to visit the Central West, but next year will probably be just as good.

#### The Location of the Heater Switch

One of the details which is sometimes lost sight of in car equipment is the convenient location of the heater switch. Frequently this switch is placed under one of the seats or on the

seat riser. Where this is the case the switch is not adjusted as frequently as it should be, because the conductor does not like to disturb the passenger who is sitting over or near the switch. On interurban cars, of course, the heater switch can be located in the motorman's cabinet and changes in its position can be signaled to the motorman by the conductor if it is inconvenient for him to go through the car. On city cars the heater switch should be located on some part of the bulkhead within easy reach of the conductor. To avoid meddling by passengers the switch should be operated by a conductor's key only. There is little doubt that by making the switch accessible for frequent adjustment an appreciable saving in heating current will be made possible.

#### The Continuity of Committee Work

A very good feature of the work of the joint committee on engineering accounting of the Engineering and Accounting Associations has been the appointment of a sub-committee "on review of the 1910 report." This should result in a better utilization of the work done by committees than has always been the case in the past. Too often an association's committee has rendered a good report at a convention at which comments of a valuable character have been elicited during the discussion of the report, but the conclusions thus reached have been lost to sight in the rush of work of the following year. What has been needed has been some action by which the report itself and the points brought out in the discussion should be rounded out and associated logically with the work of the committee of the following year on the same subject. The duties of the sub-committee just appointed on engineering accounting, however, are broader than that simply of reviewing the 1910 report, because the sub-committee will also make a study of the reports of all previous committees on the same subject and of discussions at the convention and after the convention. In this particular case, for instance, such work will include also the papers and discussion at the quarterly meeting on Dec. 7, 1910, of the Street Railway Association of the State of New York, as well as letters from men who have been considering the subject independently. A digest made in this spirit of thoroughness is most encouraging evidence that the final report of this committee will embody the best thoughts obtainable on engineering accounting, no matter where they originated.

#### Accidents on Open Cars

As the season for open cars is here it is well to be forewarned as to the greater liability of accidents with this type of equipment. Just how much greater is the danger on open cars than on other types of cars is strikingly shown in the paper by C. W. Kellogg, Jr., on "The Cause and Prevention of Accidents" which is printed elsewhere in this issue. The records of five Texas roads which he quotes showed that 59 per cent more accidents per 10,000 car miles operated occurred with open cars than with closed and semi-convertible prepayment type cars. It is true, of course, that open cars have large carrying capacity and may be loaded and unloaded quickly, which makes them particularly useful in handling large crowds at baseball games and amusement parks, but the much greater liability to accidents is the price paid for these advantages. No conductor can guard the entire length of the running board, especially when it is crowded two and three deep, nor can he prevent passengers on the inside seats from sticking out their heads and arms and being struck by poles or passing cars and teams. The open

car is not so popular as it once was. Our records of cars built during 1909 and 1910 show that only 454 open cars were built for city service during these two years, as compared with 5554 closed and semi-convertible cars. The cross-seat semi-convertible car is almost as comfortable as the open car for summer riding, and when combined with the prepayment feature is far safer.

#### MILEAGE AND CAPITAL INVESTMENT OF ELECTRIC AND STEAM ROADS

The desirability of strengthening the borrowing capacity of steam railroads was advanced as an argument in the cases in which the Interstate Commerce Commission denied recently the desired advances in freight rates. As the position of the companies in general is one with which our readers are perfectly familiar, it is not necessary to say more than that, in brief, the railways urged that they be allowed to charge higher rates and thus be able to earn a reasonable return and, in addition, such surplus as would provide them with a physical and financial strength that would attract capital. As some aspects of the steam railway case are analogous to the prevailing conditions in the entire electric railway industry and, furthermore, as they are intimately associated with the interurban situation, some analysis thereof is fruitful.

Upon the question of money borrowed the commission states in one decision, written by Commissioner Lane, that the total bonded debt of the steam lines increased, during the ten years 1899-1909, from \$5,518,943,172 to \$9,801,590,390, or 77 per cent, and the miles of track from 244,820 to 332,955, or 36 per cent. To demonstrate the immensity of the increase in funded debt the commission compared this sum with historical amounts. It also showed that the rate of interest on the total decreased from 4.55 per cent in the earlier year to 3.9 per cent ten years afterward. It may be added that, according to the annual reports of the commission, the stock of these companies was increased in the same period from \$5,512,063,578 to \$7,576,335,321, or 37 per cent. Combining the stock and bond capitalization we find that the increase in securities of both classes during this period was 58 per cent, and these figures do not show as great a discrepancy with the increase in mileage as those which the commission places in juxtaposition. It appears, moreover, that a good part of the new investment went toward the improvement of existing roads and terminals, with equipment therefor. That is to say, the steam railroads built up their existing properties to a greater extent than they built new lines. The reasons for this are found in part in the definite policy of some companies to develop main lines and avoid the construction of branches of doubtful profitability and in part in the civic and corporate need for better terminals.

Whatever may have been the reasons in individual cases, the final result is somewhat at variance with the corresponding development in railways of the street and interurban types now generally operated by electricity. The record of American street railway investments shows outstanding stock of these companies in 1899 of \$991,012,762 and in 1909 of \$2,427,935,397, an increase of 145 per cent. Funded debt increased from \$782,963,471 in 1899 to \$2,224,800,236 in 1909, or 184 per cent. The increase in total capitalization was 162 per cent. In the same period miles of track increased from 18,942 miles to 40,490 miles, or 114 per cent. As these returns show

greater proportionate development than the records of the steam properties, it is well to mention the primary cause, namely, the application of electricity to many existing and new properties and the upbuilding of outlying urban and suburban territory which rapid transit made possible. A contributory cause is, of course, the rise of the interurban railway, which fills a gap that would otherwise be occupied in many instances by the branch line of a steam system. Much of the interurban construction was inexpensive in the first instance, and its development in the next decade will be more intensive in character than in the past and will involve probably greater proportionate increase in capital liability than in mileage.

Coming to the point mentioned by the commission in reference to the decline in the average rate of interest on bonded debt of steam railroads, we think that the significance of this does not lie just where it is placed by the public. One strong reason for the improved credit of the steam railroads is the resort by the companies with the best standing to issues of stock and convertible bonds for their capital needs, with the result that the margin of security behind the mortgage bonds has been protected and immeasurably improved. The stocks which have been issued at par in accordance with this policy have borne materially better returns than the 3.9 per cent mentioned as the average rate on outstanding bonds. Similarly, the convertible bonds, many of which bear  $3\frac{1}{2}$  per cent or 4 per cent interest, derived their marketability not from the rate of return which they carried, but from the speculative possibilities of enhancement in value and subsequent exchange for a stock giving a higher rate of return.

Again, the outstanding securities of 1890 contained a much greater proportion of the 6 per cent and 7 per cent bonds issued in the earlier days of the companies than were outstanding a decade later. Practically no long-time bonds bearing interest at these high rates have been issued by these companies for many years. In their refunding operations, not only during the last decade, but also for some years preceding, all companies participated in the advantages arising from the worldwide decrease in the earning power of money, which was then in the full flush of its progress and encouraged great capital expansion. Some roads issued  $3\frac{1}{2}$  per cent long-time bonds at better than par. Such securities rose for a time to about 110. In fact, one of the larger life insurance companies made a canvass about 1899 of banking sentiment throughout the country, and the consensus of the opinion which it found was that the interest rates in this country were descending permanently to the low level of those prevailing in Europe, and that therefore it could not figure with safety upon a return of over 3 per cent to  $3\frac{1}{2}$  per cent for the next twenty years. Of course, this tendency has been checked by the unanticipated increase in gold production and by the panic of 1907 and its effects, and at the present time it appears to be wholly reversed.

There are no statistics of electric railways to indicate the average rate of interest in the decade. The rate of interest on bonds has not varied greatly from 5 per cent, but companies in good financial standing have secured better prices for their securities, and in the case of new or comparatively new properties bankers do not receive the same concessions that they asked five or ten years ago. Electric railway securities, where no tangles on account of limited-term franchises exist, have increased generally in public favor. They have not the same character of a market as the standard steam railway securi-

ties, because they are limited to amounts much smaller than the general mortgages of the steam properties. Hence their purchase and sale are restricted more closely to the localities in which the properties are situated and do not reach the large amounts which characterize trading in the active securities of the trunk lines. The best basis for advancement of electric railway credit is the continuation of increases in gross revenues year in and year out in most properties. If all limited-term franchise complications and other adverse conditions, such as agitation for reduced fares, could be eliminated further improvement in the credit of the companies would follow.

It is a curious fact that both classes of railways appear to have fostered internal development of their existing plants rather more seriously than they have spread into new territory with extensions. In the great cities intensive development, through the construction of rapid transit facilities, is the order of the day, and the everlasting costly extension of the fare limit is less popular than it was, while interurban lines are paying more attention than they did to the vital questions of terminal facilities and increased investment to increase safety of operation. It will be interesting to see what increases of capital investment these changes will involve in the future and how they will compare with the additions to the older class of transportation properties.

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#### TESTING INTERPOLE SHOP MOTORS

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The increasing use of motors of the interpole type in the driving of machine tools is certain to exert a considerable influence upon electric railway shop practice in the near future. The advantages of interpole construction are well known to be the close speed regulation permitted; sparkless commutation over a wide range of loads, including a large overload capacity; low commutator temperatures resulting from the absence of sparking, leading to long life in the commutator structure; a considerable range of speed, and low weight and space occupied for a given output. These points are of direct interest in securing the maximum production from a given tool plant, combined with thoroughly reliable service and low maintenance requirements. In the movement for the use of direct-connected motors in electric railway shops, which is certain to result in the elimination of many expensive and inefficient existing tool drives, the interpole motor will inevitably become popular where variable speed is a vital issue—and how vital variable speed is to-day in shop economy remains to be much more generally appreciated.

Relying upon the reputation of certain manufacturers of wide experience in the production of interpole motors, the usual practice is still to install these equipments without special tests other than the placing of the apparatus in service as soon as it can be unboxed and the casual notation of its performance with respect to sparking. Sooner or later, however, companies which are interested in the finer points of operation will insist on making acceptance tests of motors for shop service through the economic necessity of saving time on repair and new construction jobs as well as cutting down the energy consumption to the minimum.

The important points in connection with the operation of interpole shop motors are the brush spacing, brush fit, brush position and the correctness of the winding. Sparkless commutation is absolutely dependent upon accurate brush spacing.

It is not common to find interpole motors giving bad commutation, but a small error in the machine work in the factory or a bad spot in the yoke casting may easily produce a lack of symmetry which will give no little trouble in service. In practice it has sometimes been necessary to correct poor commutation by placing one brush stud out of its normal mechanical spacing in order to locate the brush on the neutral point. Similarly, the brushes must be set and if necessary sand-papered to bear upon the whole commutator area beneath them, as in ordinary shunt or series-wound machines. Where adjustment of the neutral points is necessary fine regulation can be secured by the use of a shunt around the interpole coil directly concerned, and in cases where the interpole winding is slightly weak a minute shortening of the air gap by a shim or other polar adjustment has been found to work out well. The methods of testing polarity and correctness of windings of interpoles need not be repeated here, as they are those which have been utilized in ordinary motor testing for many years. Bad commutation quickly follows a partial short-circuit in an interpole winding, with excessive temperature rise in the defective coil if the machine is kept in service. The questions of heating, speed variation, efficiency and mechanical performance are all of interest in analyzing the operation of interpole motors, but the checking of the brush setting with relation to the determined neutral point is probably the most important question for consideration. This is a fundamental responsibility to the manufacturer, and it needs handling with great care by the purchaser, combined with close scrutiny of the commutation under changes in the loads placed upon a given motor.

### CAR ILLUMINATION

We wish that in the study which is being made by car builders and operating companies of increasing the comfort of passengers on electric railway cars greater attention would be given to the subject of better illumination. By this we do not mean more illumination, because on most cars the lamps at normal voltage are bright enough—in fact, are so bright that they offer a glare which at times is uncomfortable to the eye. What we have in mind is a more extended application to electric car illumination of the principles of shaded or reflected light which have proved so successful in recent house lighting. At present car lighting is not carried out according to any generally accepted plan. But if a logical system should be followed we believe not only that the cars will be more comfortable for the passengers but that there will be a reduction in cost of lamps and energy.

In the first place, there seems to be no very good reason why electric railway companies should not make more extended use than they do at present of the metal filament lamp. A few companies are now employing these lamps to a greater or less extent, and an account of the practice of the Chicago Railways Company in this respect was published in the issue of this paper for Dec. 17, 1910. Considered on a basis of 1800 hours illumination per year, and with four circuits of five 16-cp lamps and one circuit of five 32-cp lamps, the tantalum lamps showed an energy saving of 1726 kw-hours per car at the switchboard, compared with carbon lamps of like candle-power, or practically 1 kw-hour per car less demand during the lamp-burning period. The energy demand

from a car burning twenty-five 16-cp tantalum lamps compared with a like installation of carbon lamps showed a saving of 1301 kw-hours at the switchboard for an 1800-hour year. It was found, also, that during a test covering 600 car months the renewals were about twice as frequent with carbon lamps as with tantalum lamps, the exact figures being 4.269 renewals per car month for carbon lamps and 2.21 renewals per car month for tantalum lamps. These results were not obtained by any sacrifice of the comfort of the passengers. On the contrary, the illumination of the car interior was even better than before.

The second direction in which improvement may be sought is in that of maintaining the full voltage at the lamp terminals, irrespective of the fluctuations on the trolley wire. There is more need for this change on interurban roads than on city roads. So long ago as 1907, in a paper before the Central Electric Railway Association, R. C. Taylor, then with the Indiana Union Traction Company and now with the Illinois Traction Company, suggested the great value of some form of potential regulator for car lamp circuits. Some experiments have been conducted along this line, but so far as we know no regulator of this kind has met with general favor or has been a very conspicuous success. Here is a hint for the inventor of electrical appliances.

The third part of the general problem which we are considering is that of the proper position and arrangement of the lamps. The illumination of a car interior is of itself no easy task, partly because of the large expanse of opaque surfaces presented by the windows and partly because regard has to be given to both standing and seated passengers. Nevertheless, some things can be done. We think, for instance, that it would be worth while to consider the use in some installations of shades, in spite of their maintenance cost and of the inconvenience which they would present in car cleaning. General illuminating practice has conclusively shown that a shade when properly chosen will greatly increase the illuminating efficiency of a lamp. This improved efficiency is obtained largely by the elimination of the bright sources of light, because the pupil of the eye contracts and does not permit so much light to enter as when the bare filaments are not within the range of vision. Shades also would greatly improve the light distribution, and this would be particularly noticeable when the voltage is low. Again, most railway lamps have a low end candle-power as compared with the horizontal candle-power. Usually lamps are installed at an angle rather than in a vertical or horizontal position, but the life of a lamp is greatest when its axis is vertical, and this position also makes the application of a shade easiest. With a lamp depending from a short horizontal bracket and inclosed in a properly chosen shade the diffusion will be such that a plane at the level of the tops of the seats can be uniformly illuminated from lamps supported from the deck rails. A light-colored ceiling also increases the general illumination greatly.

The economies which have been mentioned would make possible the use of lower wattage lamps and so would reduce the power cost by a not inconsiderable amount. In addition, they would be of convenience to passengers because they would give better light to those who desired to read and they would not force the other passengers to look directly at bright sources of light.

### LEGAL STATUS OF FREE TRANSPORTATION OF EMPLOYEES

In a few States the passage of employers' liability acts has changed radically the legal relations between employer and employee so far as accidents to the latter while engaged in their work are concerned, but in most parts of the country the liability of the employer for an accident to an employee is still that of the common law. Under such circumstances, it is sometimes difficult to determine when one employee begins to be the "fellow servant" of another employee and when he ceases to occupy that relation. An interesting case involving this point was decided March 14 in the Court of Appeals of West Virginia, where suit was brought against one of the Wheeling railway companies because of a collision which caused the death of one of the employees at the power station, an ash hauler, who was riding on a car to his work. There was no question that if the man had been an ordinary passenger the company would have been liable because the collision occurred through the negligence of the motorman of one of the cars. But as he was riding "on his badge" and had not paid fare the question arose whether he was not, under the law, a fellow servant of the negligent employee who caused the accident.

The court admitted that the line drawn was close. Cases where brakemen, conductors or other trainmen are injured while engaged in train operation by the negligence of a fellow servant clearly fall under the fellow-servant doctrine, because these employees have to be on the trains to carry out the business for which they are employed. In other words, the danger of accident to them is one of the risks which they assume when they engage in railroad service.

A different state of affairs is presented when an employee other than a trainman is injured, and here there are also grades of responsibility. Perhaps the next step in the chain, after the liability to trainmen, is that to workmen engaged out on the line, like surveyors or carpenters who repair the fences along the right-of-way and travel on passes to the place of employment. Injuries to workmen of this kind have been considered differently in different States. In New York and Massachusetts in certain cases they have been held to come under the fellow-servant doctrine, but that is not the view which has been held by the courts in the majority of the States. There the position has been taken that the liability of the railroad company depends upon whether or not the injured person occupied the position of employee at the exact time of the injury and whether his contract of employment required him to ride upon the actual trains or cars on which he was when the accident occurred.

As this view of the subject was taken by the West Virginia court, it decided that an ash hauler or even a motorman is in no sense engaged in his employer's business when he uses the cars of the company in going to or returning from his day's work, and that his presence on a car is not in the direct line of his employment. Hence he must be regarded under the law as having all the rights of a passenger for hire. Whether the court would have decided differently if the employee had accepted his pass, or badge, with the understanding that the company would not be liable for personal injuries sustained by him when he was using the badge to secure free transportation on the cars of the company does not appear from the record. No evidence of any such agreement was presented, however, and the court said that it made no difference whether his badge or pass had been obtained by him gratuitously or not.

### COMPARATIVE RESULTS OF TWIN CITY RAPID TRANSIT COMPANY

Comparison of the operations of the Twin City Rapid Transit Company for two years under the Interstate Commerce Commission classification of accounts is possible with the publication of the last annual report, an abstract of which was published in our last issue. The calendar years 1909 and 1910 are the first two full years of operation under the Interstate classification, and their results therefore permit an analysis which derives value from the use of the same accounting principles throughout the period. The company still continues the publication of the amounts charged to the general operating expense accounts, and its consistent example in this respect is one that all companies should follow.

The total operating revenue of \$7,531,649 in 1910 is divided between \$7,481,696, or 99.3 per cent, revenue from transportation and \$49,953, or 0.7 per cent, revenue from operation other than transportation. As compared with the preceding year the increase in total operating revenue was \$561,873, or 8.1 per cent.

There was a small change in the operating ratio, which, including taxes and renewal appropriations in the calculation, was 64.77 per cent in 1910 and 64.20 per cent in 1909, or, exclusive of those two items, was 48.7 per cent last year and 47.3 per cent in the preceding year. Of course the amounts appropriated for renewals were proper operating expense items so far as they represented depreciation of physical property which it was not necessary to make good in the current year. Though their actual expenditure was deferred, they amounted to 9.8 per cent and 10.1 per cent of total operating revenue in 1910 and 1909 respectively and, when considered in connection with the maintenance accounts, change materially the aspect of the upkeep expenditures of the year. The maintenance of way expenditures were \$316,766 in 1910, and the maintenance of equipment expenditures \$373,065. These are, respectively, 4.2 per cent and 5 per cent of the total operating revenue. They total 9.2 per cent of the revenue or, with the renewal appropriation from surplus, 19.3 per cent. In 1909 the maintenance of way costs were \$256,990 and those for maintenance of equipment were \$345,753, equal to 3.7 per cent and 5 per cent respectively of the total operating revenue for that year. The total 1909 maintenance expenses were thus equal to 8.7 per cent of the revenue, or with the renewal appropriations for that year to 18.8 per cent.

Taking the same expenditures in another way, we find that of the operating expenses of \$3,667,702 in 1910 the actual maintenance expenses were 18.8 per cent, or with the renewal appropriations 38.8 per cent. In 1909 the corresponding figures were 18.3 per cent and 39.6 per cent. It thus appears that neither in percentage of gross revenues nor in percentage of operating expenses was there much change in the proportionate maintenance expenditures of the two years.

Conducting transportation costs were \$2,323,577, or 30.9 per cent of total operating revenue, last year, as compared with 29.2 per cent in 1909. Traffic expenses were 0.7 per cent and 0.6 per cent respectively of the operating revenue in 1910 and 1909, and the corresponding ratios for general and miscellaneous expense were 8 per cent and 8.8 per cent.

The net revenue during the year increased \$118,797, or an increase of 5.13 per cent.

## THE JERSEY CITY YARDS AND SHOPS OF THE HUDSON & MANHATTAN RAILROAD

BY HUGH HAZELTON, ELECTRICAL ENGINEER OF THE COMPANY

The storage yards and maintenance shops of the Hudson & Manhattan Railroad Company are located on the surface in Jersey City, near one of the tunnel lines. A plan of the yard and shops appears on the accompanying inset. The cars are brought up from the tunnel through an approach track at grades varying from 2 per cent on curves to  $4\frac{1}{2}$  per cent on straight track. This approach track is covered by a reinforced concrete shed, extending from the portal to a point where the track passes through the shop building. The approach track ends in a half circle having a radius of 90 ft., and when the train has reached the surface it has made a complete revolution. The yard is laid out in such a manner as to provide the maximum storage capacity, and, although the property meas-

7 ft. 1 in. above the floor on a level with the floor of the cars. They serve instead of scaffolding for window cleaners and obviate the necessity of men climbing up and down from the floor of the inspection shed to the car floor. The third rail has been omitted from the inspection tracks, but a Coburn trolley, which is suspended near each side wall, serves to supply current for moving the cars through the shop. The inspection shed is built with a structural steel frame and reinforced concrete walls, floors and roof. At the center of the inspection shed a signal tower has been built from which all of the yard switches and signals are operated. From this elevation the towerman has a view of all the yard tracks.

### PAINT SHOP

The paint shop accommodates six cars. At the entrance of one of the paint shop tracks a corrugated steel building is to be built to serve as a sand-blasting and washing house. The cars are thoroughly sand-blasted before they are painted and are then passed directly into the paint shop.



Hudson & Manhattan Railroad—View of Inspection Shed, Showing Suspended Walkways

ures only 200 ft. x 500 ft., this yard, with the shops, will accommodate 119 cars. The compact arrangement of the yard and shops tends to increase the efficiency of operation and to facilitate their management.

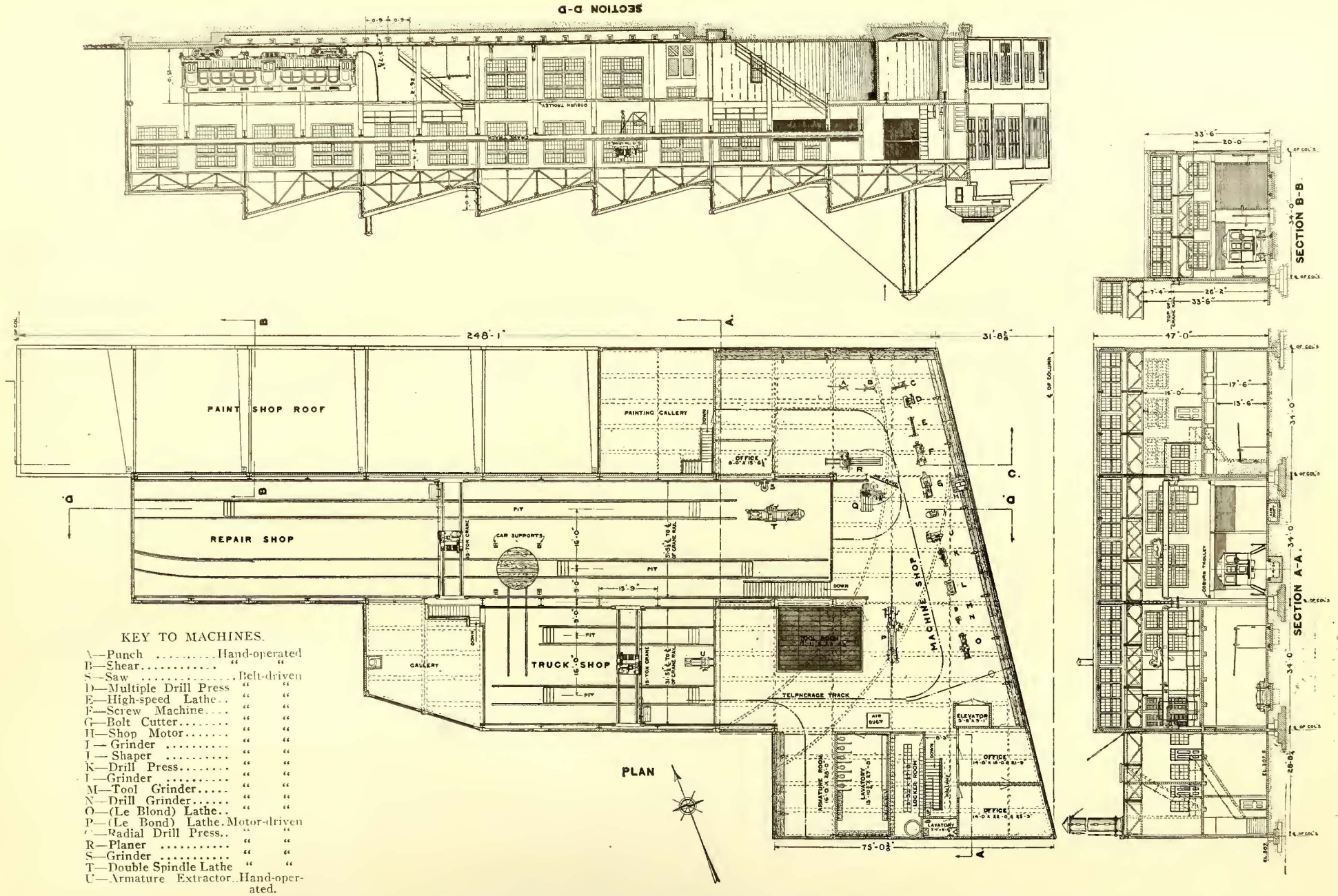
### INSPECTION SHED

The inspection shed, which is 397 ft. long, contains the two longest tracks running diagonally through the center of the yard and accommodates sixteen cars, or two trains of eight cars each. The longest trains now operated are made up of five motor cars. The inspection tracks are connected at each end to the main tracks of the yard, so that trains can run in either direction through the inspection shed.

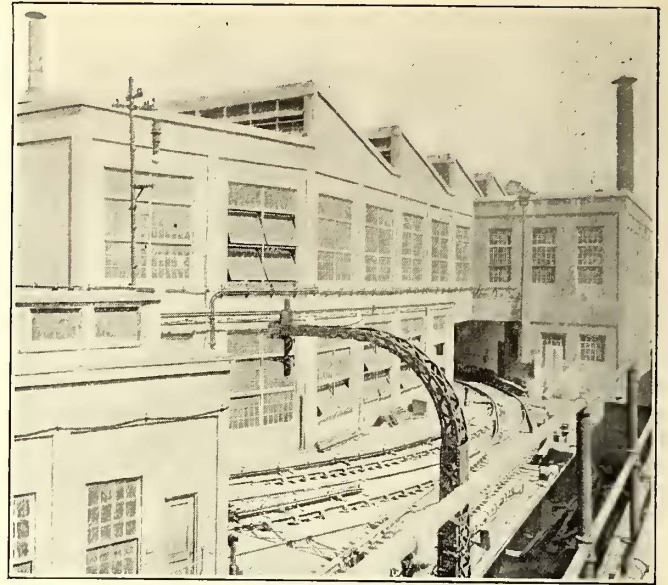
The inspection tracks are supported on concrete columns so that the top of the rails is 40 in. from the floor of the inspection shed. These columns are capped by wooden blocks to cushion the rails and to facilitate their attachment. Three suspended walkways are provided, one on each side wall and one in the center between the tracks. These walkways are

### REPAIR AND MACHINE SHOPS

The repair shop is adjacent to the paint shop and has space for six cars. The 15-ton Whiting electric crane which is provided in this shop is of sufficient capacity to lift one end of the car body from the truck by means of a steel yoke, as illustrated. A turntable is provided for turning the trucks so that they can be transferred to the truck room adjacent to the repair shop. Car supports are provided at each side of the truck turntables to support the car body while the truck is being cleaned, thus allowing the crane to be used for other purposes. Both the truck shop and the repair shop are provided with pits having a depth of about 43 in. All of the heavy repair work is done on the ground floor of these shops. The lighter machine work is done on the second floor of the front portion of the building. The truck shop also has a 15-ton Whiting crane, so that material in each shop may be lifted from the floor to the machine shop level. A 5-ton electric trolley running throughout the machine shop serves to dis-

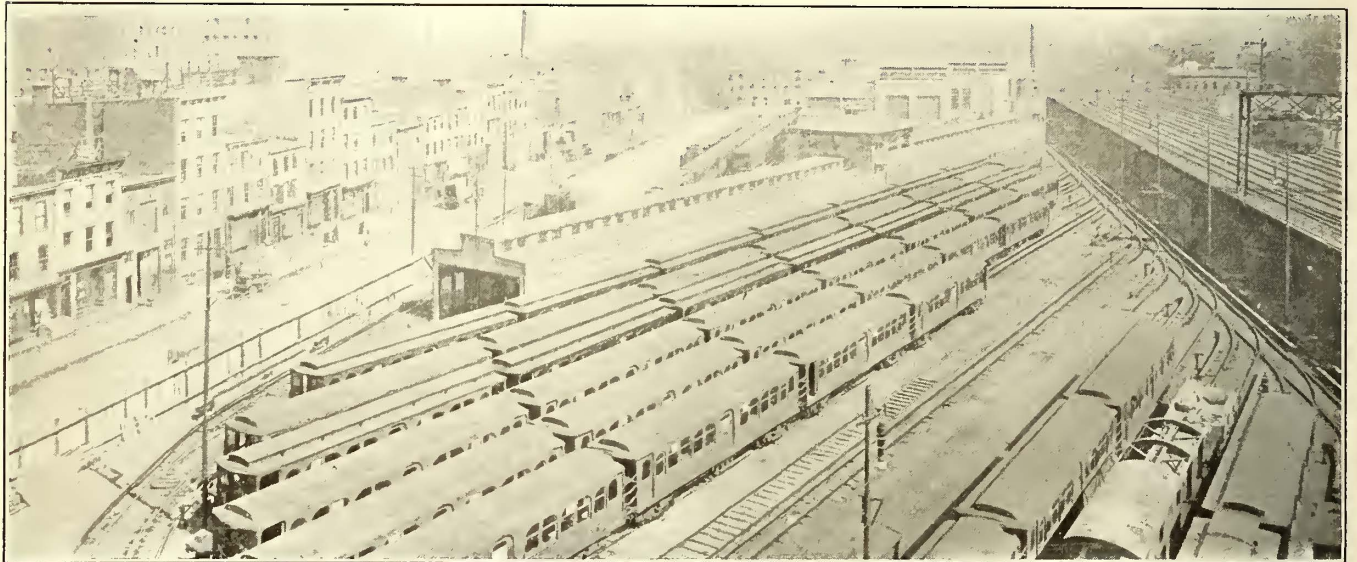


Hudson & Manhattan Railroad—General Plan, Transverse Sections and Longitudinal Section of the Jersey City Shops

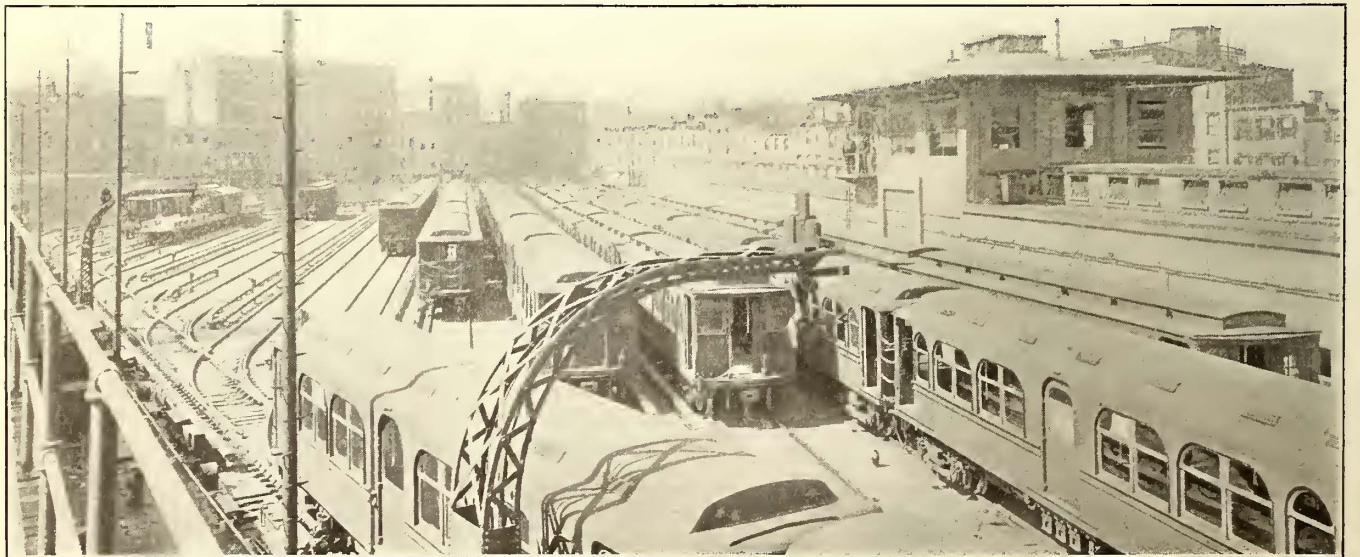


Hudson & Manhattan Railroad—Interior of the Tunnel Under the Shop Near the Portal

Hudson & Manhattan Railroad—Tunnel Portal Tracks Leading to Inspection Shed and Yard



Hudson & Manhattan Railroad—General View of the Jersey City Yard and Shop



Hudson & Manhattan Railroad—General View of Yard with Inspection Shed and Switch Tower on the Right



tribute to individual machines the material placed on the floor by the crane.

The plan of the shops on page 781 gives a complete list of the tools in the machine shop with the exception of a new No. 4 Brown & Sharp miller and a Davis expansion borer. Practically all of the other important tools, including the lathe, hydraulic press and boring mill in the wheel-handling section, were furnished by the Niles-Bement-Pond Company. The larger shop tools are operated by direct-connected motors and the smaller tools in the machine shop are driven from line shafting, which in turn is belted to an electric motor. All of the motors are 600 volts d.c. There are also installed a Fox sand-drying stove and a home-made conduit pipe bender of the air-cylinder type. A recent alteration in machine shop practice has been the replacement of carbon drills by high-speed drills whereby the output has been increased six to eight times. The ground floor below the machine shop is used as a storeroom and heater room.

#### HEATING, LIGHTING AND VENTILATION

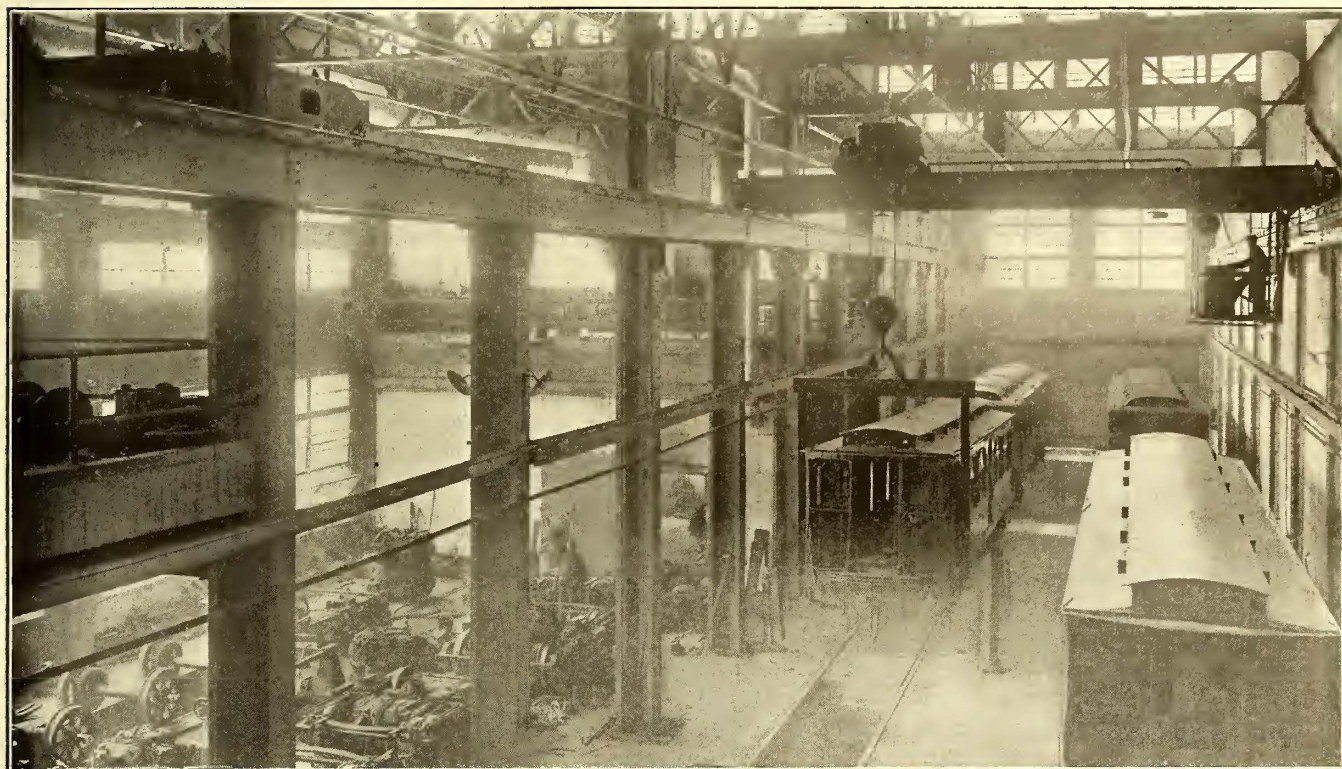
The shops are warmed by a hot-air heating system, in which

## COMMITTEE ON ELECTRICITY OF THE MAINTENANCE OF WAY ASSOCIATION

The American Railway Engineering & Maintenance of Way Association has appointed the following gentlemen as members of the committee on electricity: G. W. Kittredge, New York Central & Hudson River Railroad, chairman; J. B. Austin, Jr., Long Island Railroad, vice-chairman; N. E. Baker, Illinois Central Railroad; R. D. Coombs; A. O. Cunningham, Wabash Railroad; L. C. Fritch, Chicago Great Western Railroad; George Gibbs, Pennsylvania Tunnel & Terminal Railroad; G. A. Harwood, New York Central & Hudson River Railroad; E. B. Katte, New York Central & Hudson River Railroad; C. E. Lindsay, New York Central & Hudson River Railroad; W. S. Murray, New York, New Haven & Hartford Railroad; J. R. Savage, Long Island Railroad.

The subjects assigned to this committee for consideration during 1911-1912 are:

(1) Continue the consideration of the subject of third-rail clearance.



Hudson & Manhattan Railroad—General Overhauling and Truck Shops, Showing Car Hoist

air is passed by motor-driven fans through the heater tubes of three Harrison heaters directly over the furnaces. The hot air is then led by means of galvanized-iron ducts to the different portions of the building. The heater room also contains a 600-cu. ft. capacity Chicago pneumatic compressor for supplying air to the signal system. This is used for emergencies only, as ordinarily the 85-lb. tunnel pressure is employed. This compressor is tested regularly once a week.

All of the shops have been provided with very ample lighting and ventilation from the large and numerous windows. The shops are lighted at night by means of 100-watt tungsten lamps operating on 25-cycle current at 110 volts. This lighting has been found very satisfactory both in the shops and throughout the yard.

#### ENGINEERING

The design of yard and shops was made at the office of L. B. Stillwell, consulting electrical engineer. The track work was done by Jacobs & Davies, the civil engineers for the Hudson & Manhattan Railroad Company, who also built the concrete work of the structures. The detailed plans for steel and concrete for the buildings were made by J. B. French.

(2) Continue the preparation of a standard specification for overhead transmission line crossings.

(3) Report on the effect of electrolytic action on metallic structures and the best means of preventing it.

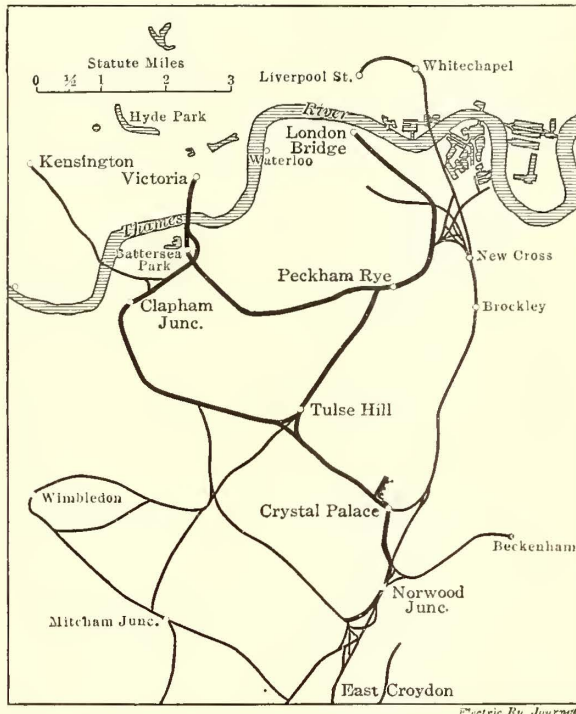
(4) Report on methods of insulation and protection.

## MILEAGE OF BLOCK SIGNALS IN THE UNITED STATES

The Interstate Commerce Commission has issued a bulletin giving statistics of block signals in use Jan. 1, 1911, on the steam and electric railways in the United States. Only those electric railways which are engaged in interstate commerce and are equipped with automatic absolute block signals are included in the tables. The total length of railways worked under the block system was 71,269 miles, an increase over 1910 of 5511 miles. Of this amount 17,711.5 miles were equipped with automatic block signals. The increase in automatic block signals was 3474 miles. Telephones were used for train dispatching on 41,717 miles of road, an increase of 15,373 miles during the year.

## SINGLE-PHASE ELECTRIFICATION OF THE LONDON, BRIGHTON & SOUTH COAST RAILWAY

Shortly after the London County Council took over and electrified the tramways in that city, the London, Brighton & South Coast Railway began to feel the effects of their competition for the suburban business south of the Thames. Parliamentary powers to convert the entire system of the London, Brighton & South Coast to electric operation were obtained in 1903, and Philip Dawson was retained as consulting engineer to investi-



London, Brighton & South Coast—Map of Suburban Lines; Electrified Sections Shown by Heavy Lines

gate and report on the system to be adopted and the details of the installation. Mr. Dawson's report was so favorable that he was instructed to prepare specifications and ask for bids on an initial contract covering the electric equipment of what is known as the South London line, which connects the two terminals of the road at Victoria and London Bridge and passes through East Brixton, Denmark Hill and Peckham Rye. This line is 8.7 miles long and is double-tracked. Including the yard and station tracks the total length of single track to be equipped was 20.5 miles.

The decision as to what system to adopt was not made until after the most careful examination of existing installations and consideration of the many special problems involved in the possible electrification of the entire system of the London, Brighton & South Coast Railway. Very heavy traffic was being handled by steam locomotives between London and Brighton, and it seemed probable that if electric operation proved successful on the purely suburban lines it might soon afterward be extended at least as far as Brighton, a distance of 52 miles from London. For this reason the single-phase, alternating-current system was selected as being the most economical, and the results of more than a year's operation of the South London line have justified the installation of that system.

The contract for the equipment of the South London line was awarded early in 1906 to the Allgemeine Elektrizitäts Gesellschaft, whose bid was considered by the railway company to be the most favorable from all points of view. Experimental trains were run early in 1909 over parts of the South London line, and in December of that year full electric operation was begun from terminal to terminal. The results of operation of the South London line proved so successful from the start that in May, 1910, the directors of the railway company decided to extend the electric zone to include the suburban lines from

Battersea Park and Peckham Rye to Tulse Hill, Crystal Palace and Norwood Junction. These lines, comprising a total of 13½ route miles and 41½ miles of single track, are now being equipped. When they are completed the electric zone will include 62 miles of single track. On the accompanying map of the suburban territory served by the London, Brighton & South Coast Railway the electrified routes are shown in heavy black lines and the routes still worked by steam in lighter lines.

The South London line traverses a thickly populated district on the south side of the River Thames. It has many sharp curves and numerous grades up to 1 per cent. There are nine intermediate stations, making the average distance between stops 4590 ft. The shortest distance between stations is 1386 ft. In Victoria Station five tracks have been equipped with overhead trolley wires and in London Bridge Station six tracks have been equipped. One of the engravings on page 785 shows the electric train platforms in Victoria Station. The running time between London Bridge and Victoria, a distance of 8.7 miles, including stops of twenty-six seconds at each of the nine intermediate stations, is twenty-four minutes, or an average rate of 21.7 m.p.h. The steam trains formerly made the run in thirty-six minutes. The rolling stock of the South London line consists of sixteen motor cars and sixteen trailer cars. During the hours of light traffic the trains are made up of two third-class motor cars and a first-class trailer car, while during the morning and evening rush hours two such trains are coupled together and operated as one unit. Both the motor and trailer cars are of the side-door type with an aisle on one side. This arrangement permits the cars to be loaded and unloaded at terminals in less time than would be possible with end-door cars. It has proved very satisfactory. The cars are 60 ft. long and 9 ft. wide. The motor cars have a motorman's and baggage compartment at one end only and will seat sixty-six passengers. The trailer cars have nine passenger compartments and a total seating capacity of fifty-six. The motor cars are mounted on pressed steel, four-wheel trucks, each of which carries two Winter-Eichberg compensated-repulsion type motors. These motors have a capacity of 115 hp for one hour and 57 hp continuously, with a temperature rise not exceeding 75 deg. C.

On the extensions which are now being electrified a somewhat different type of cars and make-up of trains will be used. Thirty motor cars and sixty trailers have been ordered, and the trains will be made up of two trailers and one motor car dur-

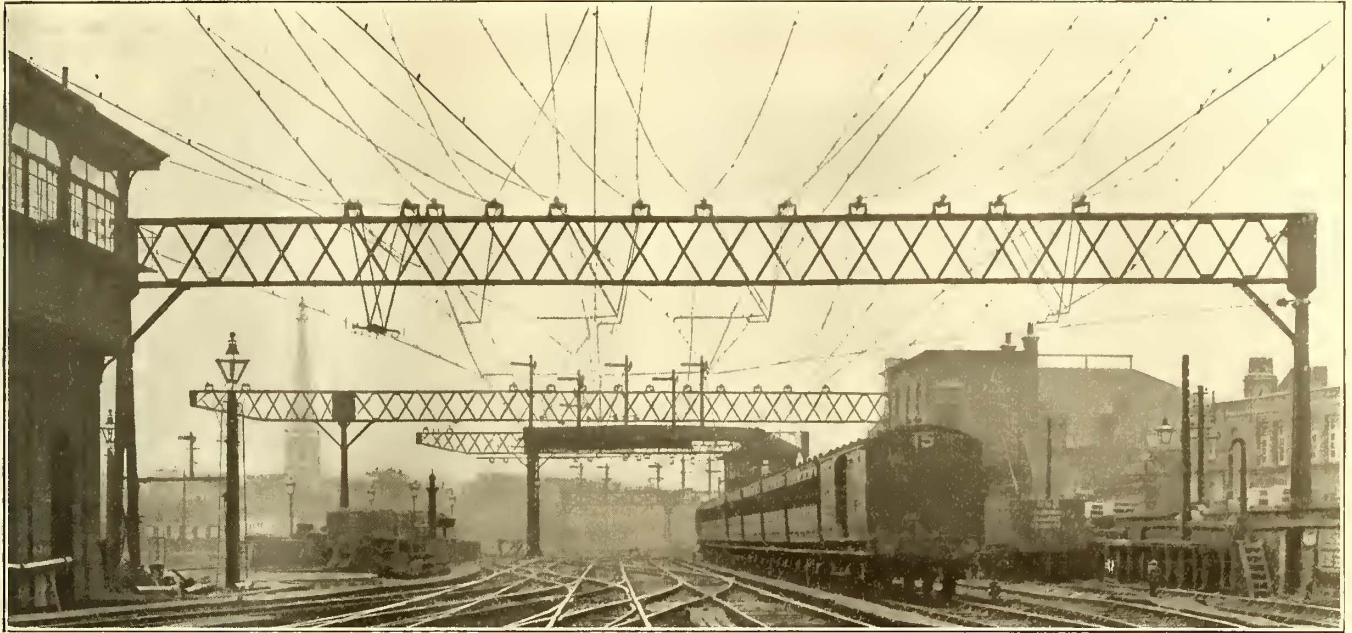


London, Brighton & South Coast—Three-Car Train at Wandsworth Road Station

ing hours of light traffic and four trailers and two motor cars during the rush hours. The new cars are only 56 ft. long and 8 ft. wide, and while they have side doors opening into each compartment no side corridor is provided. The motor cars are equipped with four Winter-Eichberg motors, each of 175-hp hourly capacity and 100-hp continuous capacity. The type of motor truck used is shown on page 786.

The underframes of the cars are of structural steel, but the bodies are of wood sheathed with aluminum to provide a metallic path to ground for any leakage of current from the bow collectors on the roof. The floor is built up independently of the underframe and all the conduit and wiring was installed

used for running in opposite directions. They are raised and lowered by pneumatic cylinders, to which air is admitted through a valve mounted near the master controller in the motorman's cab. Only one bow can be raised at a time, and the operating valve handle is interlocked with the master controller



London, Brighton & South Coast—Overhead Construction in Yard of London Bridge Station

before the bodies were erected. An engraving on page 787 shows a car floor turned upside down in the shop for the purpose of installing the conduit. The bottom of the car floor is covered with a layer of "uralite" fireproofing  $\frac{1}{4}$  in. thick, which in turn is protected by sheet aluminum.

in such a way that the direction of movement of the car controls the selection of the proper bow. Two aluminum collector strips are mounted on each bow. The leading strip is rigidly attached to the main bow, while the trailing strip is carried by a light auxiliary bow which is kept up against the wire by the



London, Brighton & South Coast—Train Shed of Victoria Station, Showing Tracks for Electric Trains

Current is collected on each motor car from the overhead trolley wire by a special form of sliding bow collector. Owing to the limited overhead clearance at a number of bridges, particularly at the entrance to Victoria Station, the collectors are mounted on the roof over the motorman's compartment, which is lowered somewhat to give sufficient clearance when the collectors are folded down. Two bows mounted on one base are

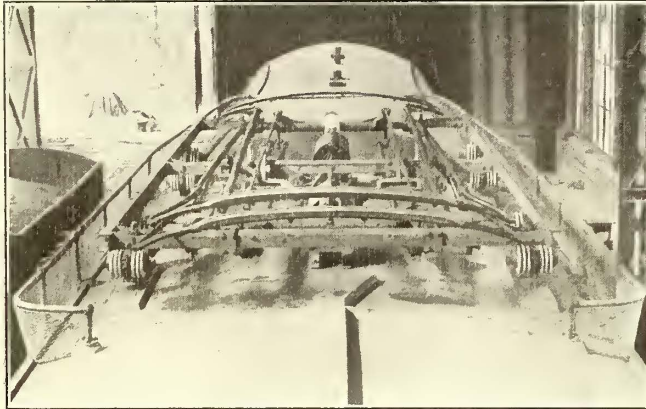
pressure of light springs. This arrangement of double collectors on one bow insures continuous contact with the trolley wire, since if the collector on the main bow leaves the wire for an instant the auxiliary collector of small inertia remains in contact. The aluminium collector strips are grooved on their contact surfaces and the grooves are filled with heavy grease. The wear on the copper contact wires is inappreciable after

eighteen months' operation while the life of the collector strips is from 5000 to 6000 miles. The collector bows work through a range of 6 ft. from the highest to the lowest position, and they are mounted so that the pressure against the trolley wire remains practically constant.

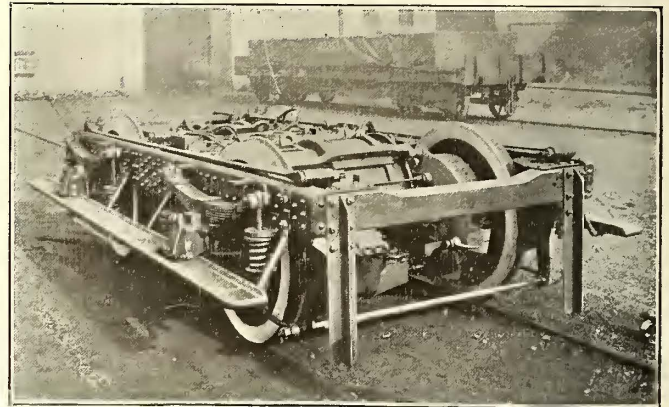
The control apparatus is arranged in two duplicate groups for the operation of the four motors in pairs. The high-tension power circuit passes from the bow collector through a

unlocked with the collector bows so that it cannot be opened unless both bows are down. Furthermore, when the door is open the air in the cylinders holding the bows up against the wire is exhausted and the high-tension circuit is automatically grounded.

Electrical energy at 6700 volts and 25 cycles for the operation of trains is purchased from the London Electric Supply Corporation. It is delivered from the generating station at



London, Brighton & South Coast—Bow Collector on Roof of Motor Car



London, Brighton & South Coast—Pressed Steel Motor Truck

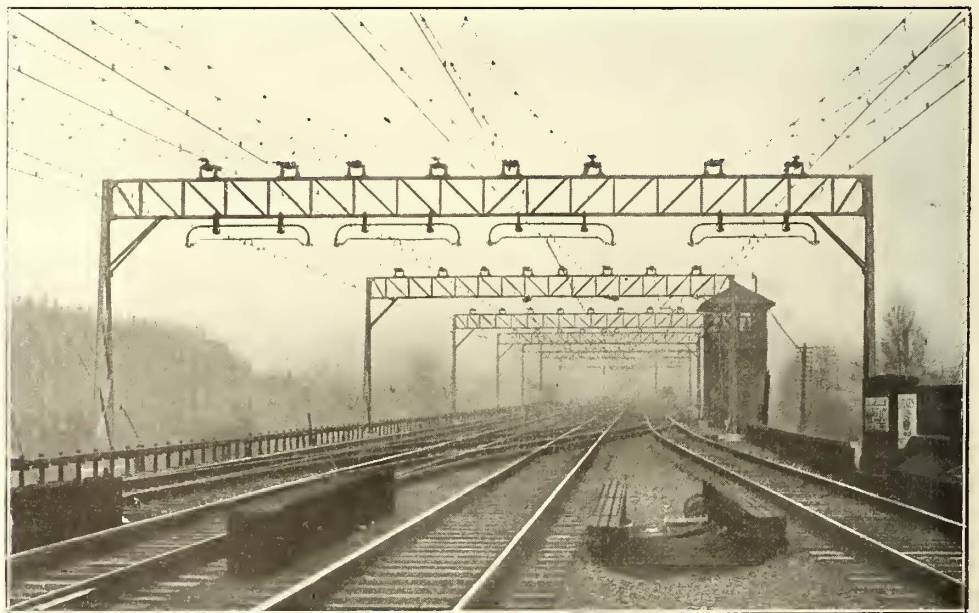
choke coil, fuse and primary of an overload relay transformer to the circuit breaker. From the circuit breaker it divides and passes through the primaries of the two main transformers to ground. Each branch of the circuit may be cut out by opening an isolating switch inserted between the transformer and the circuit breaker. Current for the lights, compressor motor and control is obtained from the secondary of an auxiliary transformer which is wound to give 300 volts.

Seven contactors are required for each pair of motors, and the control is divided into five steps. A schematic diagram of

Deptford to the signal cabins at Queens Road and Peckham Rye Junction, where it is metered and fed to the overhead distributing system. The Board of Trade fixed 20 volts as the maximum permissible drop in the return circuit, and this requirement made it necessary to install two-conductor booster and distributor cables throughout the electric zone. The overhead line is sectionalized at each signal cabin, and series booster transformers, with a ratio of 1:1, are located at every cabin. One side of these boosters is connected across the section break and the other is in series on the outer conductor of the



Bow Collector with Two Contacts



London, Brighton & South Coast—Four-Track Overhead Construction at Balham Junction

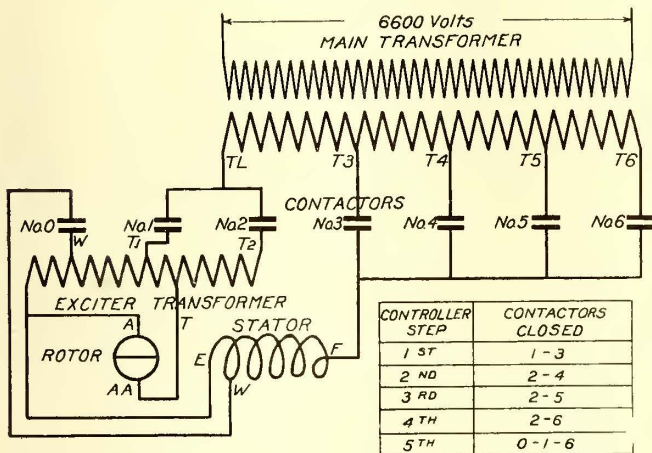
the control circuits is shown herewith. The taps from the secondary of the main transformer give four voltages varying from 450 volts to 750 volts, and the exciter transformer has two ratios. Combinations of these give five speeds, forward or reverse. Special precautions have been taken to prevent accidental contact with any of the high-tension apparatus on the cars. All of the high-tension apparatus, with the exception of the main transformers, is mounted in cabinet built in the motor-man's compartment. The door to this cabinet is mechanically in-

booster cable. The outer conductor of the distributor cable is bonded to the track rails and the inner conductors of both the booster and distributor cables are connected to the trolley feeder busbars in the signal cabins.

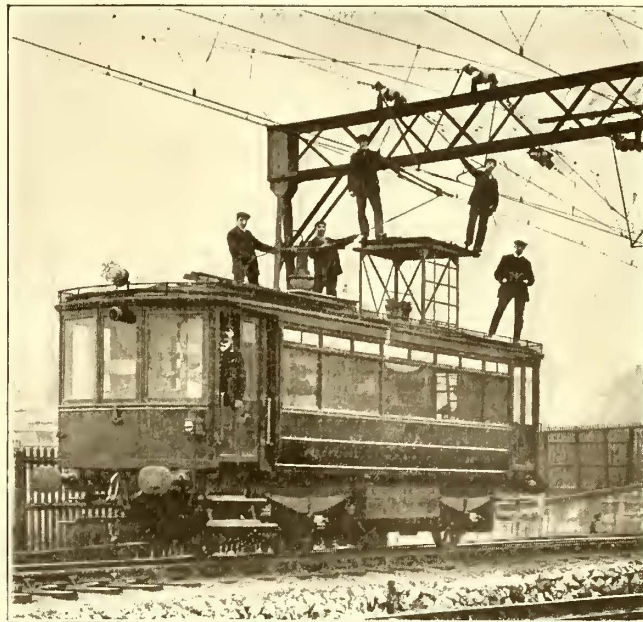
The overhead trolley construction is especially interesting. For the most part the wires are supported by structural steel girders or bridges carried on A-frame posts. In some places cantilever bridges and side bracket posts have been used. The single conductor wire is hung from two catenary cables each

consisting of twelve-stranded galvanized steel wires. These cables are not continuous over the supporting bridges but are attached with turnbuckles adjusted so that the sag is evenly balanced on the two sides of each bridge. The trolley wire is round copper, of grooved section, with an area of 0.197 sq. in. It is hung from the catenary cables by dropper wires spaced about 10 ft. apart. These dropper wires are looped over the catenary cables so as to permit about 2 in. of vertical play, and where they exceed 2 ft. 6 in. in length they are made in two pieces with a connecting link which gives an additional 2 in.

The acceleration obtained with the single-phase motors used on the South London line has been quite satisfactory, and the energy consumption compares favorably with that of direct-current roads. The average acceleration, from 0 to 30 m.p.h.,



London, Brighton & South Coast—Diagram of Motor Circuits



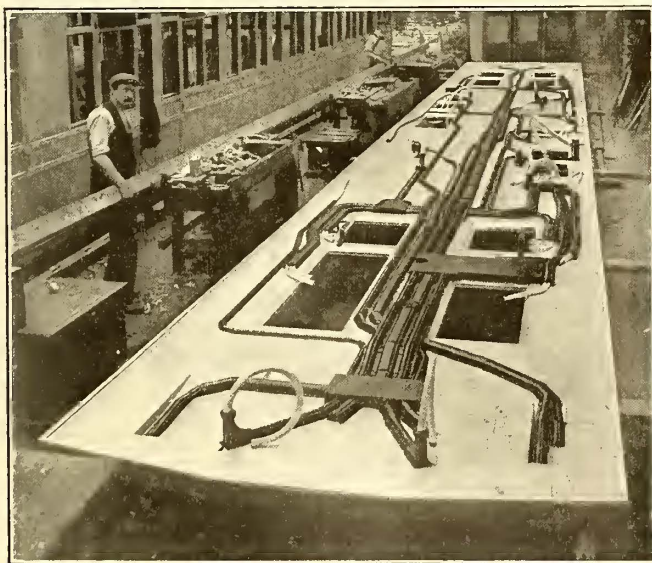
London, Brighton & South Coast—Gasoline-Electric Line Repair Car

of vertical play. The two catenary cables are tied together at 10-ft. intervals by wires of approximately the same length as the droppers.

Special care was given to the insulation of the overhead lines. Corrugated porcelain spool insulators were used in all cases, the choice of this type having been made after exhaustive tests extending over nearly twelve months.

The trolley wires are supported normally at a height of 16-ft. above the rails, but in the two terminal stations the wires are 19 ft. 9 in. above the rails. The minimum height of wire is 13 ft. 9 in. under a highway bridge. The wire is staggered

is at the rate of 1 m.p.h.p.s. The energy consumption per ton-mile, making no allowance for weight of passengers and for non-revenue mileage of cars but including all energy used in the repair shops and leakage from all sources, was 75.4 watt-hours. This figure was computed by dividing the total meter readings at the feeding-in point for eight months of 1910 by the total ton-miles run during that period. This is a very low consumption, notwithstanding the fact that all trains make all stops on the line. The total weight of an empty four-car train on the South London line is 150 tons, of which the weight of the electrical apparatus represents 18 tons. The weight of a three-car train of the type to be used on the Crystal Palace extension is 102 tons and the electrical equipment will weigh 19 tons. During trial runs on the South London line the average energy consumption was found to be 63.1 watt-hours per ton-mile as measured by instruments on the train. The transmission losses between the distributing room at Peckham Rye and the trains on the line are only about 3 per cent.



London, Brighton & South Coast—Wiring Bottom of Car

9 in. on each side of the center line of the track at alternate bridges. No tension device is inserted in the trolley wire, as experience has shown that the variations of temperature of the English climate are not sufficiently great to cause excessive slack or tension in the wires. For making line repairs a gasoline-electric motor car is used. This car is shown in one of the engravings.

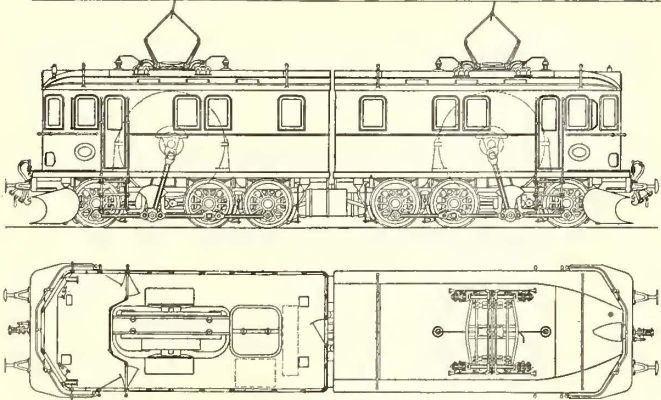
According to Mr. Dawson, the results of operation so far secured justify the claim that the single-phase system costs less to install and to operate than the direct-current system. It possesses the additional advantage that it is entirely suitable for extensions as far as may be thought necessary by the railway company. The experience of eighteen months shows that the cost of maintenance of single-phase car equipment is at least no greater than the cost of maintaining direct-current equipments of the same type. During the first twelve months of operation the motor cars averaged more than 58,000 miles.

The financial results of electric operation have been equally satisfactory. Within a few years after the competing tramways were electrified the South London line lost traffic amounting to more than 5,000,000 passengers a year. Although very little change was made in the rates of fare after electric operation was begun the whole of the traffic which had been lost was regained inside of twelve months and the number of passengers carried is steadily increasing.

All of the work of converting the South London line and the more recent extensions to Crystal Palace was carried out under the supervision of Philip Dawson, consulting electrical engineer. The names of the principal contractors for the equipment were published on page 582 of the issue of this paper for April 1, 1911.

## ELECTRIFICATION OF THE KIRUNA-RIKSGRÄNSEN LINE OF THE SWEDISH RAILWAYS

The railway administration of Sweden is now buying \$1,900,000 of coal a year while private railway companies are buying English coal to the same amount. Sweden itself has no coal deposits with the exception of the mines at Höganäs in the southern part. The output is so small compared to



Electric Freight Locomotive Proposed for Swedish Polar Zone Railway

the consumption that the mines supply but approximately 5 per cent of the total amount consumed. In view of the numerous waterfalls available for supplying electric energy the Swedish Parliament appointed a commission in 1902 to investigate the matter of railway electrification.

From 1905 to 1907 tests were made upon the stretches Tomtebodavärtan and Stockholm-Järfva. As the result of these trials the commission concluded to adopt a single-phase system of 15 cycles as the most feasible for the conditions. The next step was to choose the line first to be electrified. The committee concluded that it would be desirable to select one with a practically constant schedule, heavy haulage and adjacent to a waterfall so that the energy could be supplied with a minimum length of feeders. The Kiruna-Riksgränsen line satisfied these conditions. This section is within the polar circle and has the distinction of being the most northern railway in the world.

This railway has some tourist traffic in the summer, but it is used principally for transporting iron ore from the mines to the boundary at Riksgränsen and thence across Norway to the seaport of Narvik. The run between Kiruna and Riksgränsen is 129 km (80 miles). Under present conditions the freight handling is done by steam locomotives which haul 28 cars, the weight of each car being 11 metric tons empty and 35 tons loaded. The allowable drawbar stresses now limit the length of the train to 28 cars. It has been calculated that 35-car trains will be possible with electric locomotives because the decreased pulsating movement of the latter will diminish the maximum strains in the drawbars. The present steam locomotives use 2000 kg (15,868 lb.) of coal a day and require two firemen.

The polar latitude of this railway has made it necessary to have elaborate precautions against snow blockades. The conditions are most favorable along the southerly part from Kiruna to about 6 km (3.7 miles) beyond Abisko at the mouth of the Nuolja tunnel where the line can be kept clear with rotary plows. The northerly part from the Nuolja tunnel to Riksgränsen is subjected to such severe weather that it has been found necessary to construct concrete tunnels and snow galleries for 7 km (4 miles).

The line is single track of 4-ft. 8½-in. gage with a minimum radius of curvature of 500 m (1640 ft.). The grade for most of the way is a steady incline of 1 per cent from Riksgränsen to Kiruna. Two power-station sites were available, one 20 km (12.4 miles) distant from Kiruna; the other at Porjus Falls,

120 km (74.4 miles) from Kiruna. The latter location was selected owing to the favorable conditions for enlarging the plant at a later date. The falls, which are situated at the outlet of Porjus Lake, will give 65,000 hp obtained with a total fall of 50 m (164 ft.) within 3 km (1.9 miles). Both the intake canal and the tailrace will be blasted through solid rock. A dam 1000 m (3280 ft.) long will have to be built at the outlet of the lake for controlling the waters. It is planned to install five units of 12,500 hp each, three of which will be single-phase, 5000-volt, 15-cycle generators for the operation of the railway; the other two will be three-phase, 25-cycle generators of the same voltage for industrial purposes such as electric-reduction ovens.

There are to be four railway substations which are to be situated at Kiruna, Torneträsk, Abisko and Vassijaure. Each substation will have three transformers of 1000-kva capacity, stepping down the transmission potential of 80,000 volts to 15,000 volts for the overhead line. The transformers are constructed to stand a momentary load of 2700 kva each. The intention is to use only two transformers for regular operation and have the third as a spare.

The overhead line will be of the simplest kind. Wooden poles will be used, spaced approximately 30 m (98 ft.) apart. The overhead line will be carried on pipe brackets guyed by steel cables. Both the arms and cables will be insulated from the wooden masts. The ears will allow the wire to slip in its own direction so that displacements due to temperature changes and collector-bow pressures can be easily adjusted. Tension take-up devices will be installed at regular intervals.

Two classes of locomotives will be employed for hauling trains. The freight locomotives will be of the two-part interchangeable type to minimize the number of spare locomotives, so that if one-half becomes defective the other part can be coupled to a reserve half. Each locomotive will weigh 100 metric tons. Each half will be equipped with a 1000-hp motor operated directly at 15,000 volts and connected to two cranks set 90 deg. apart which will drive an intermediate shaft as shown in one of the drawings. The freight trains will be pulled by two locomotives. It is expected that a pair of these locomotives will be able to draw 40 flat cars and one freight car at a speed of 50 km (31 miles) per hour on the 1 per cent up grade. The total draw-bar pull will amount to 31,200 kg (68,764 lb.). The freight schedule will call for eight trains each way



Electric Passenger Locomotive Proposed for Swedish Polar Zone Railway

per day, transporting a total load of 11,000 metric tons. The electrical companies which are constructing these machines have guaranteed that each locomotive will cover a distance of 90,000 km (55,800 miles) a year at the speed mentioned.

The passenger locomotives will be similar in construction to those for the freight service but will be of the single-unit type. Each will have one 1000-hp motor of exactly the same construction as the motor for the freight locomotives. Pony trucks will be used at each end as illustrated. The total weight of

each locomotive will be approximately 70 metric tons and it is to haul a 200-ton train at a speed of 100 km (62 miles) per hour. These locomotives have been guaranteed to run 100,000 km (62,000 miles) a year.

Before any other steps are taken a temporary steel road will have to be built from Gellivare to Porjus to transport material and machinery for the construction of the power house. According to contract the line must be completed by the year 1914. The work is being carried out jointly by the Siemens-Schuckertwerke, G. m. b. H., of Berlin, Germany, and Allmänna Svenska Elektriska Aktiebolaget, of Vesteras, Sweden.

### IRON-BAR OVERHEAD CONSTRUCTION ON BROOKLYN BRIDGE LOOPS

The Brooklyn Rapid Transit System has charge of the eight surface loops over which all cars reaching the New York terminal of the Brooklyn Bridge return to Brooklyn. The maintenance of the overhead work on these loops has always been a hard problem because of the heavy traffic, the sharp curvature and the limited clearances. The upward slope of the bridge promenade is so great that at the eighth loop there is a clearance of only 12 ft. between the head of the rails and the floor girders of the elevated railway terminal station overhead. The original trolley installation was of the ordinary wire construction. This was soon succeeded by a design comprising a wooden trough lined with sheet iron.

After a couple of years' service the troughs were replaced by iron trolley contact pans which varied in width from 1 ft. to 4 ft. These pans were in use for over ten years, until something better was found in the iron-bar construction originated for places with heavy traffic by the line engineers of the Brooklyn Company. The pans were expensive to construct and maintain. It was especially difficult to insulate them properly against the leakage of water. In some cases the only barrier against the floor girders overhead was one inch of wood and a sheet of rubber. The collection of mois-

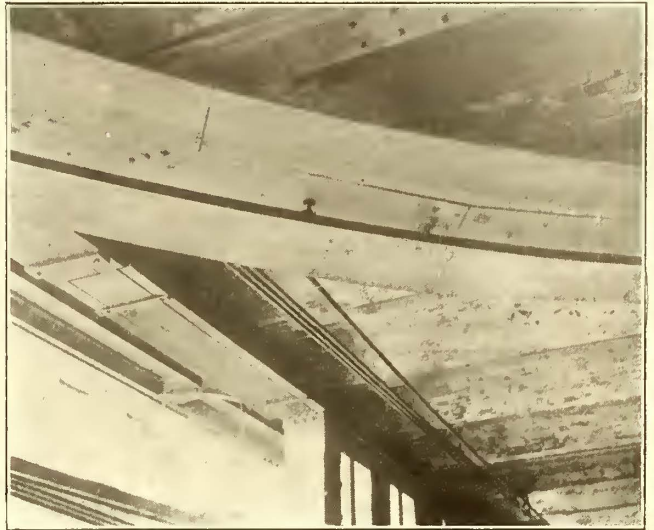


Double-Bar and Single-Bar Overhead Construction at the Brooklyn Bridge Terminal

ture at the pans occasionally resulted in grounds which were severe enough to cause interruptions to traffic.

The new overhead work is of the iron-bar type illustrated and described in detail on page 1017 of the *ELECTRIC RAILWAY JOURNAL* for June 11, 1910. In brief, it consists of an oak bottom board with insulated clevis hangers to hold the bar iron. This bottom board is carried from the girders overhead. The use of the iron bar permits either the same or greater clearances than were possible with the pans. The

loops with the least clearance have  $2\frac{1}{4}$ -in. x  $\frac{3}{8}$ -in. conductor bars, but elsewhere a longer life is being obtained by using  $2\frac{3}{4}$ -in. x  $\frac{3}{8}$ -in. bars. The bar is suspended in the center line of the curves at places of minimum clearance in order to allow for high trolley stands, bent poles and the like. The elimination of the usual offsets naturally prevents the trolley wheels from running true under such sections, but this is not scri-



Bar Conductor Over Track at the Brooklyn Bridge Terminal

ous in view of the slow car movement conditions at this terminal.

In general, the frogs and other fittings on this job do not differ materially from other iron-bar work of this company. The principal departure is the use of a double iron-bar conductor, one for each four loops, over a short portion of the up-grade common roadway into which all the loops enter. The new construction is proving entirely satisfactory. The upper four loops and the lower four loops have each an automatic circuit-breaker and in the event of either breaker opening the other set of loops will be operative on the up grade. There appears to be no question but that the iron-bar construction will prove superior to the pans in sightliness, in freedom from destructive sparking, in maintenance cost and in the reduction of interruptions to traffic.

### INSPECTION OF HIGH-TENSION OIL SWITCHES

In the regular inspection of transmission lines, which is the price of continuous service, it is important not to overlook the periodical examination of high-tension oil switches, particularly with regard to ascertaining the character of the oil and the condition of the contacts and terminals. The frequency of the inspection may properly depend on the use of the switches and the voltage carried, but, in any event, an annual overhauling, in which the contacts are tested and cleaned and, if necessary, the oil is renewed, is essential to the best results. Some companies may go so far as to keep monthly records of the number of times the switches are operated and establish a system of inspection on such a basis. In a representative case the practice is to test the oil weekly in all oil switches by taking out a sample and measuring its dielectric strength with a spark gap of from 0.15 in. to 0.30 in., and also to make this test on any switch immediately after it has been opened on short-circuit or through other trouble. A series of tests made on a sample taken from one switch which had opened a severe short-circuit showed very low resistance at first, but the resistance gradually increased for forty-eight hours, when the resistance came back to practically normal. The reduction in dielectric strength was doubtless due to the free carbon which was formed in the oil by the arc at the time of the rupture and finally settled at the bottom. The importance of filtering the oil as soon as possible after a break of violent character was thus clearly indicated.

**LIGHT-WEIGHT CARS, THEIR CONSTRUCTION AND OPERATION \***

BY R. T. SULLIVAN, GENERAL SUPERINTENDENT HOUSTON ELECTRIC COMPANY

Two years ago we put into service a car seating forty passengers and weighing approximately 43,000 lb. To-day we plan to put in service a car seating the same number and weighing 30,000 lb., or a decrease in weight of 30 per cent. The principal changes which have effected this decrease are as follows:

The monitor roof has been eliminated; the cars have been built for single-end operation, and the side post spacing has been reduced from 32 in. to 29 in., giving a reduction in the length over the corner posts of 2 ft. The truck centers have been kept the same, which permits lighter body construction. The changes made reduced the weight of the car body approximately 5500 lb. The air-brake equipment has been left off, reducing the weight about 1500 lb. A single-motor truck has been adopted, which further reduced the weight about 2000 lb., and this arrangement permitted a reduction in electrical equipment of approximately 4000 lb.

The economy effected by this decrease in weight is in power plant investment, power consumption, maintenance of electrical equipment and rolling stock investment. The first two items are reduced approximately one-third; the third item one-half, and the fourth item one-eighth. We assume the car body maintenance to be the same for the two cars, and the track maintenance to be the same.

We feel that if we are correct in the assumption that the car seating forty passengers is the proper size car we have arrived at a satisfactory type for city service, and shall standardize on it. The one disadvantage of the lighter car is its weakness in collisions. We have decided, however, that this factor is not sufficiently important (in the operation of single-unit trains) to offset the benefits of decreased weight. To reduce car weights further we should be obliged to change the seating capacity.

Public opinion, which has sometimes led operators into putting on heavy, handsome cars, might, I believe, be easily swayed by a proper educational campaign in which the advantage of a short headway with lighter and shorter cars was made more conspicuous than slightly increased comfort while riding.

Smaller cars and shorter headway would permit greater rapidity in loading and unloading and hence allow an increase in speed. They would increase the platform expense and the auditing expense. They would increase the accident risk due to the increase in the number of units, but would decrease the risk because of the lighter weight of the unit and greater facility in handling it. They would increase the superintendence of transportation and the number of trippers. Given the above variables and constants, it is an interesting problem in maxima and minima to determine the proper seating capacity of cars to be operated.

We are studying the law governing this change by keeping statistics of travel on lines on which we are obliged at any time to change the headway. The law governing the accident hazard must be determined by cumulative records. The statistics which we have on this point cover a period of two years, but are not yet conclusive. The effect upon the other factors mentioned must be determined in like manner, viz., by experiment and cumulative records.

After having applied this test to any particular line it should be applied to a group of lines. Probably the result would show that certain sections would warrant the operation of large cars, while others would require a very much smaller car. Possibly the ideally operated system would have two standard types. We have but begun the solution of this problem in Houston. Does any manager know the answer to the problem in his own city?

**THE CAUSE AND PREVENTION OF ACCIDENTS \***

BY C. W. KELLOGG, JR., MANAGER TEXAS SECURITIES DEPARTMENT, STONE & WEBSTER

The large part of operating expenses of the street railway companies in Texas which is expended in the settlement of damage claims resulting from accidents is the reason for this paper being written. A few figures will show how accidents as a financial factor are affecting public service corporations in Texas. Statistics recently published by thirty-two of the largest steam railroads in the State show that in the twelve years from 1891 to 1903 the percentage of gross earnings paid out in connection with damages increased 400 per cent. From figures published by the Interstate Commerce Commission covering the period from 1900 to 1907, both inclusive, it appears that the number of persons killed per million revenue train miles in Texas was 6.45 as against 9.69 for the rest of the United States. And yet the cost per passenger killed in Texas was over five times as much as in the rest of the country. The prevention of accidents, therefore, is five times as important in Texas as in the United States as a whole. The electric railway companies in the State are in even worse case, so far as the cost of accidents is concerned, than the steam railroads. The proportion of gross earnings paid out in settling claims resulting from accidents has reached in one case the huge total of 19 per cent, and from 3 to 4 per cent seems about as good a showing as any company of any size has been able to make in Texas. The problem of decreasing this cost is fully as much concerned with the handling of claims as with the prevention of accidents.

The causes of accidents may be said to be the failure or unexpected behavior of:

- (1) Equipment, including track and rolling stock.
- (2) The human element, including the company's passengers or other members of the body politic.

The prevention of accidents, therefore, involves the study and correction of any factors which seem in any way to affect either of these two main causes.

Several of the larger Texas street railway companies, representing about 275 miles of track, have made a study of the accidents occurring on these lines, with the following results:

	Per Cent of Total.		
	1907.	1908.	Average.
Car collisions.....	4.66	4.57	4.62
Other collisions.....	28.48	27.93	28.20
Derailment.....	6.82	5.95	6.39
Motorman lost control.....	.01	.11	.06
Defects.....	3.22	2.39	2.80
Step accidents.....	34.79	33.08	33.99
Other passenger accidents.....	6.26	7.84	7.05
Miscellaneous.....	15.76	18.13	16.89
Total.....	100.00	100.00	100.00

The foregoing table shows that the number of accidents due solely to failures of equipment is comparatively small. But here the question of other complications comes in. The most numerous single class of accidents was step accidents. While it was felt that such accidents might be due to the carelessness of either the trainmen or the public, or both, yet it was thought that the situation could be helped by rebuilding the cars in such a manner that it would be practically impossible for a passenger to get on or off while the car was in motion. The prepayment type of car with full vestibules and provided with doors at the exit and entrance, which are kept closed except when the car is at rest, solves this problem. The writer knows from actual experience that this type of car construction, if carefully handled by the trainmen, can be made practically to eliminate step accidents. It can be therefore fairly considered the most useful innovation in accident prevention which has been made in recent years. Like any other piece of apparatus, however, it must be properly operated in order to show satisfactory results, and it has been shown by experience that the prepayment type of car will not materially reduce step accidents unless it is

\*Abstract of paper read at annual meeting of Southwestern Electrical & Gas Association, Houston, Texas, April 27-29, 1911.

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carefully and intelligently operated by the trainmen in charge. The success of this type of car construction will doubtless make it advisable not only to adopt it in all new cars purchased, but also to spend the necessary money to reconstruct along these lines such existing cars as are of the proper type and can be converted without unreasonable expense.

With regard to the type of car on which the fewest accidents occur per car mile, the result of a recent investigation of five of the larger street railway companies of Texas shows the following figures as to the comparative number of accidents which occurred during one year with various type of equipment:

Type of Car.	Twelve Months Ending Oct. 31, 1910.		Accidents per 10,000 Car Miles.
	Number of Accidents.	Cars Miles Operated.	
All cars.....	7,142	11,945,000	5.98
Double truck.....	3,493	6,291,000	5.66
Single truck.....	3,649	5,654,000	6.47
Air brake.....	3,141	5,442,000	5.78
Hand brake.....	4,001	6,503,000	6.15
Closed or semi-convertible.....	5,498	9,581,000	5.73
Open.....	1,270	1,793,000	7.08
California type.....	374	571,000	6.55
Prepayment.....	1,992	4,486,000	4.45

\*Includes prepayment cars.

NOTE—Open cars have 59 per cent more accidents than prepayment cars, and the average closed or semi-convertible car (including prepayment cars) has 29 per cent more accidents than prepayment cars alone.

From this it will be seen that the cross-bench, open car is nearly twice as prolific as an accident breeder as the closed or semi-convertible car, but in this connection the much larger carrying capacity of the open car and the great convenience of quick loading and unloading in time of heavy travel should not be lost sight of. The figures for the prepayment car shown on the above table are the lowest of any type of car. They covered the period when these cars were just being introduced and are not indicative of their true value as preventers of accidents. Subsequent results have shown a considerably smaller number of accidents per car mile than the figures contained in the above table.

The matter of furnishing adequate notice of the approach or presence of a car is becoming of increasing importance. Nothing smaller than a 14-in. gong should be used on cars, and some companies have transferred the gong from underneath the car to the vestibule roof, in order to prevent the gong from becoming foul with dirt. The repeating gong which can be used on air-brake cars has been found very effective in calling the attention of pedestrians and others to the presence of a car. Street railway companies are no longer justified in neglecting to install some form of fender or life guard. Life guards are now manufactured in a form which is practically certain in operation and simple and easy to maintain. In several cities a small mirror is placed at the corner of the front vestibule in such a position that the motorman by glancing into it can see back down the side of the car, in order to ascertain whether anyone is in the act of boarding or alighting, before he starts his car. The companies which have not adopted prepayment operation and which have not gates or doors on their car platforms find these mirrors a great help in accident prevention. Most roads of any size have had serious accidents resulting from controller flashing or other trouble with the electrical equipment of their cars. Controller flashing can be traced either to the result of an excessive current entering the electrical system of the car, or to an arc forming between parts of the controller itself. To eliminate the first difficulty, all cars should be equipped with automatic circuit-breakers, or some device for interrupting the flow of current; and to largely help in eliminating the second, there have been designed, although not put into general use, contactor devices which render arcing between controller points almost impossible.

It should be distinctly borne in mind that the best equipment obtainable will fail frequently if not properly maintained. Many street railway companies have been remiss in the rigidity of the system used for daily or weekly car maintenance, and possibly also in the strict accountability to which the mechanical

department is held for accidents which occur as a direct result of the condition of the equipment. In the case of accidents due to equipment failures the burden of proof should be on the mechanical department to show that the fault was not theirs. Many companies have failed to follow up completely and consistently the advantages in preventing accidents which can be secured from improved equipment. When some new device in car construction or equipment is discovered which produces good results in accident prevention, careful consideration should be given to the question of adopting the same in all of the cars of the company, as well as on new cars purchased.

#### THE HUMAN ELEMENT

Having hitherto discussed the effect of the equipment on the accident situation, we will now take up the other general causes of accidents which may be classified. The human element can be divided into two parts, namely the company's employees and the public. The employee who fully obeys complete and satisfactory rules will have practically no accidents. The question of instruction in obeying the rules (that is, in car operation) and the enforcement of the rules (that is, in inspection and discipline) is a very live question and one intimately connected with the accident situation.

The handling of trainmen is the most difficult and most fascinating part of the street railway business. There are two old notions which have been prevalent to some extent, which the writer believes are founded on fallacies:

- (1) That a new man is necessarily more of an accident breeder than a man old in the service.
- (2) That trainmen as a class have no sense, or they would not be on the job.

Both of these propositions rest on the error of thinking of trainmen as a conglomerate mass, instead of as a number of distinct and different individuals.

A Texas company which makes a most excellent showing with regard to the cost of damages made the following record with respect to the length in the company's service of the trainmen connected with the accidents:

TWO YEARS' ACCIDENTS, CLASSIFIED ACCORDING TO THE PERIOD OF EMPLOYMENT OF THE TRAINMEN CONNECTED WITH THEM.

Period of Employment.	Accidents per Man per Month.		
	Motormen.	Conductors.	Average.
First month.....	1.04	0.77	0.90
Second and third month.....	1.05	1.29	1.17
Fourth to sixth month, inclusive.....	1.46	1.86	1.66
Seventh to twelfth month, inclusive.....	2.02	1.67	1.85
Second year.....	1.29	1.08	1.19
Third year.....	1.53	1.04	1.28
Fourth year.....	1.21	1.13	1.17
Fifth year.....	1.21	1.25	1.23
Sixth year.....	1.13	0.69	0.91

According to these figures, the highest number of accidents per trainman per month occurs during the period from the seventh to the twelfth month, inclusive, and there is no time until the sixth year when this average gets as low as it is for the first month. The low average in the early months is due largely to the fact that in the beginning the trainman, working through the extra list, operates considerably fewer car miles than the older men; but even making allowance for this difference in car miles operated, the new trainmen make practically as good a showing in the first few months as at any time during the first year or two.

The table shows what satisfactory results can be obtained by paying careful attention to the instruction of new men. Even a comparatively small company can afford to have one man whose duty it shall be to break in new men and, when necessary, further instruct old men. Moreover, he should be held personally responsible for the men whom he instructs having the necessary knowledge and experience before they are allowed to operate a car by themselves. Needless to say, the handling of a car in such a way as to avoid accidents is one of the fundamentals taught the new men. Furthermore, all the men should be made to understand that the instructor is available for the old men as well as the new. One company has men who have been in the service ten years and more who have come in for additional instructions.

Many street railway superintendents fail to realize how much patience and perseverance is necessary in instructing the men to avoid accidents. After a new man has been turned over to the transportation department by the instructor, his further practical training must be largely in the hands of the inspectors. The proper training of inspectors is a matter in which there is considerable room for improvement. The issuing of orders and instructions by written bulletins will, of course, always be necessary in street railway operation; but these should be supplemented by constant, patient work on the part of the inspectors. To obtain a really good inspector requires much more time and effort on the part of the management than to obtain a satisfactory trainman. Where a trainman can be made to reach a reasonable degree of proficiency in one or two months, it often takes one or two years to turn out a really satisfactory inspector. The ideal inspector, who is friendly with the men under him, but who never allows familiarity to breed contempt for him, and who can watch and suggest to the trainmen practically hour by hour, can work wonders in the improvement of the way the cars are handled. The kind of inspector who hangs around the streets or rides the cars as if he were bored to death, rarely venturing a suggestion to the trainmen, is doing very little to improve the situation and often, by his example, hurting it. The proper training of inspectors should receive more attention. One method that has been successfully tried for getting better inspection results is to divide the system into inspection divisions, each in charge of one inspector, and then, by comparing results on the different divisions, obtain the stimulating effect of rivalry between the various inspectors. Further stimulus can be obtained by holding the inspector morally responsible for accidents which occur in his division in which the trainmen concerned should have known better or acted differently.

The claim department should have a large share in assisting in the reduction of accidents. To secure this there must necessarily be the closest co-operation between the claim and transportation departments. The claim department from its very nature is in constant touch with the accident situation more than anything else connected with the operation of the company, and its advice to the transportation department should therefore be in the nature of expert testimony. Assuming that the claim department gives to each trainman before he starts work the fullest possible instructions regarding accident prevention, a suggestion has recently been made for further co-operation between the claim and transportation departments. It has been suggested that a special inspector be designated, whose sole duty it shall be to investigate for the transportation department each accident that occurs in which any persons or property are injured. This special inspector would have a crew always available to substitute for the crew on any car which had an accident, who could then be taken off to discuss the matter while it was fresh in their minds. It would be the duty of this special inspector to decide from this immediate examination just how the accident happened, and just to what extent it was the fault of either one of the trainmen. This would give him the opportunity of impressing upon the trainmen wherein they were at fault, in a manner which would be remembered by them in the future. The question of whether or not the men should be discharged for the accident would, of course, rest entirely with the superintendent of transportation; but the recommendation of the special inspector would probably have considerable weight with him. This scheme is along the line of closer relations between the trainmen and the company and quicker action in enabling them to gain experience from the accidents which actually occur. The man of sense is not necessarily the one who never makes a mistake, but the one who does not make the same mistake twice; and the scheme in question is an attempt to help the men to learn by experience the dangers to be avoided.

Probably the most essential thing in accident prevention, in spite of all the care and forethought that may be used in instruction and inspection, is the loyalty of the trainmen to the company. The loyal man will be careful in operating his car

and will endeavor to follow carefully the company's rules; but until a man's loyalty is stimulated and built up he will be an indifferent car operator, no matter how much sense and even experience he may have had in car operation. All this, of course, requires that the man in charge of the discipline of the trainmen shall be absolutely fair and just and a good judge of human nature. He should have the degree of personal magnetism and natural leadership which will make the men working under him enthusiastic and loyal. In general, the companies which have the best accident record are those with the most loyal trainmen and the ones whose men stay with the company longest.

It would be very desirable to put into effect some plan by which the careful, loyal trainman would receive a bonus for his greater care and skill in handling his car, because the enlightened self-interest of the individual man, which would be thereby stimulated to greater and greater care, would help more than anything else to improve the quality of car operation. No one has yet been able to devise such a plan which would possess the two essential qualities of

- (1) Being perfectly fair and impartial;
- (2) Impressing every trainman with the fact that it was perfectly fair and impartial.

The nearest approach to such a scheme in connection with the accident situation is the suggestion of dividing equally between the company and the trainmen (pro rata, according to the wages received by each man) the amount of money by which the cost of damages for any one year fell below that for the preceding year. This plan has the strong point in its favor of tending to make the good men insist upon improvement on the part of the poor men because (the division being prorated to all the trainmen) the careless man would by his carelessness rob all the other trainmen of part of the expected bonus.

The objections to the scheme are:

- (1) That the reward for increased efficiency will be a constantly decreasing one (due to the fact that the bonus is always a differential), while the effort required for a given increase in cost saved would be a constantly increasing one.
- (2) That the trainmen could never be persuaded to share with the company any increase in damage cost over the preceding year.

Without the latter provision, however, the proposal would be unfair to the company, for the reason that the men could deliberately conspire to make a poor showing one year, so as to get the benefit of half of the improvement the next year.

The first objection could be largely removed by fixing after a few years an arbitrary amount (which past experience had indicated was a reasonable showing) and then offering to share each year with the trainmen the saving in damage cost made over this figure. This modification, however, would not eliminate the second objection above mentioned, and in addition it would introduce a third objection, namely the impossibility of persuading the men that the arbitrary amount chosen was fair. The solution of the problem of stimulating the personal ambition of the trainmen, without thereby introducing troubles into the situation, will be a great stride in accident prevention.

Statistics show that the American is the most reckless individual in the world. This feature of the accident situation is a difficult one because, in the first place, it involves educating all the people to greater care, and in the second place their carelessness arises principally from thoughtlessness, which prevents educational efforts on the part of the street railway companies from having a lasting effect. Some very encouraging beginnings have already been made in the way of lessening the public carelessness. Several of the Texas companies have published statements in the newspapers showing by illustrations and other means the kind of accidents which are likely to occur but which can be avoided by forethought on the part of the traveling public. Letters have been written to all employers of wagon drivers and owners of automobiles asking them to watch for street cars before crossing street car tracks. The school teachers have been persuaded to talk to their children

about the dangers of playing in the street and stealing rides on street cars, and other special interests have been appealed to. A number of companies have warning cards placed in their cars calling the public's attention to avoidable accidents, and the back of transfers has also been used for this purpose.

A very interesting movement has been started within the last few months, known as the "Public Safety League." These leagues have been started by the street railway companies in Seattle and Spokane, Wash., and in Portland, Ore. They began their operations by having a paid lecturer visit all the schools and talk to the school children about the care necessary in avoiding accidents. Each pupil was furnished with a badge, consisting of a small white pennant with the letters "P. S. L." on it. Inquiry from other persons as to what these badges meant served to pass the word along, and, of course, the children reported fully to their parents at home such an unusual occurrence as a lecture during school hours. The movement was later spread to the business men and other classes, so that in the city of Seattle alone 50,000 of these Public Safety League badges were distributed free to the general public. Great good has come from this scheme, due to its getting the people to thinking about their own safety. It has even reacted on the trainmen by making them realize that the public is familiar with what constitutes safe operation, and that as the people are becoming more careful, it devolves on the car operators also to become more careful.

### INVESTIGATION AND CARE OF RETURN RAILWAY CIRCUITS\*

BY G. G. NELSON, ELECTRICAL ENGINEER NORTHERN TEXAS TRACTION COMPANY, FT. WORTH, TEX.

Unless extreme care is taken with the return circuits the losses in these circuits will become enormous. Very often they are attributed to other causes, such as the waste of power by motormen.

The greatest trouble with all rail bonds is that not enough care and attention is used in their purchase and installation. The ideal place for installing bonds is underneath the angle-plates. In this location the bond can be made very short, usually not over 10 in., and it is protected from copper thieves. Some roads use two bonds on the same joint to insure good conductivity in case of failure of a single bond. Unless double bonding is required for conductivity this practice is not recommended. It is better to install a single bond of sufficient capacity and to maintain it.

For contact surfaces about 100 amp per square inch is good practice. A No. 0000 bond has a contact surface of about  $1\frac{1}{2}$  in., so that about 150 amp may be allowed for each No. 0000 bond. The angle-plate, when well bolted up, will carry about 50 amp. Hence 400 amp is a load for two rails bonded with single No. 0000 bonds. Of course, such a track will carry considerably more current, but there will be heating at the joints and the life of the bond will be very much lessened in the same way that the life of any machine is lessened when it is overloaded. If more current has to be carried a larger bond should be used. If this is not possible, double bonding would have to be employed. Angle plates for electric railway joints should have a sufficiently large space between the plates and the web of the rail, so that the bonds will not be pinched.

In drilling the holes in the rail, oil under no circumstances should be used, because it is impossible to wipe all of this oil out of the hole. A thin film will be left which will cause a high resistance contact, which in turn will cause heating, and in a short time increase the resistance of the bond so much that electrically the bond is of no use whatsoever. The writer has not found any trouble in having holes drilled dry, but if some sort of a lubricant is demanded sal soda and water are to be

\*Abstract of paper read at the annual meeting of the Southwestern Electrical & Gas Association, Houston, Tex., April 27-29.

recommended. After such use, however, the hole, immediately after drilling, should be very carefully wiped out with a clean rag. Then the bond should be installed without any delay, so that the contact will not be damaged by rust. Before installing the bonds the bond contact terminals should be polished with emery cloth. When using a screw compressor a very small amount of flake graphite mixed with oil placed in the punch hole on the bond head will prevent the compressor plunger from cutting the bond, and will enable the compressor screw to be turned up much more readily. Care should be used, however, that none of this graphite and oil gets on the contact surface. The writer has found that the wrenches furnished by the makers for screw bond compressors do not have enough leverage power. It is his custom when a new screw compressor is received to have the length of the wrench increased to 5 ft. He also instructs the compressor man by all means, if possible, to break the compressor by turning up on the wrench when compressing bonds in the rails.

Care should be used in sharpening the drill bits used for boring bond holes, as a drill bit not properly ground will drill a hole considerably larger than it is supposed to. For this reason bonds expanded by means of driving a steel pin into the center of the bond head are in the writer's judgment very undesirable. These steel pins do not allow for various sizes of holes drilled with different bits. Men to work on the bonding gangs should be selected with great care. Only such men should be used as are able to realize the importance of bonding and are able to be taught how to do it. They should be conscientious enough to do the best they can whether or not the boss is watching them.

Immediately after a bond is installed and it is covered up by the fishplate it is impossible to tell whether a first-class or only a fair job has been done. Poor workmanship will show up in six months' or a year's time. Soldered, brazed and welded bonds have been used to a considerable extent, but it is very difficult to get them properly installed with the kind of labor usually available.

Railroad crossings and all track special work should be bonded by means of copper cable extending around them, unless the crossings and special work are of the solid-weld type. The carrying capacity of this cable should be the same as the rail itself, as on a bolted-up crossing or special work very little dependence can be placed upon the rails themselves carrying any current. If desired, old rails, well bonded into the tracks on each side of such special work, can be used to good advantage for special bonds. On all track attention should be paid to having the angle-plate bolts well tightened up, for if the joints are loose mechanically the bonds will soon be damaged so that they are of no practical use.

If there is much leakage of current from the rail to the ground the base of the rail will wear out, due to corrosion, much faster than the ball. Salts will increase this corrosive effect. It has been found that ties treated by the chloride of zinc process to prevent decay will, when used under rails carrying electric current of 100 amp to 200 amp, cause the base of the rail to be eaten away in three years' time, so that the rails are practically useless. This happened under the writer's observation on tracks that were both well and poorly bonded. The poorly bonded track became corroded much faster than the well bonded track.

A power house negative bus was connected some time ago by a 500,000 circ. mil cable to telephone lead-sheathed cables about 4000 ft. away from the power house. The output of the station at the time was 1500 amp, and of this amount 350 amp was being picked up on the telephone cables and returned through the 500,000 circ. mil ground wire.

Once a year all rail bonds should be tested by reliable men. All defective bonds should be repaired. It is desirable to use a tester which will show conclusively whether or not there is any current in the rail. A No. 0000 bond in a 70-lb. rail, if in first-class condition, should show a resistance of from 1 ft. to 2 ft. of rail. Poor bonding workmen will spoil the best bond ever made.

### BOILER ECONOMY AND THE APPLICATION OF FLUE-GAS ANALYSIS \*

BY M. L. HIBBARD, ENGINEER SAN ANTONIO GAS & ELECTRIC COMPANY

The chief source of unnecessary waste in the operation of the average boiler plant is either too much air supplied to the furnaces or, probably in a few cases, too little air. With more air than is required for the combustion of the fuel the energy lost is greater than it should be by an amount proportioned to the weight of this excess air and its elevation in temperature from that of the boiler room to that of the stack. With insufficient air a certain amount of carbon monoxide is produced, and since 1 lb. of carbon burned to carbon dioxide (CO<sub>2</sub>) represents the evolution of 14,600 heat units, as compared with 4450 heat units, when burned to carbon monoxide (CO), the difference, namely, 10,150 b.t.u., will be carried up the stack. With a throttling of the air supply and the production of CO, the operation of the furnace is carried on after the fashion of a producer gas generator. CO may also be produced by incomplete mixture of the furnace gases or the lack of a temperature sufficiently high to cause its combustion.

The mean proportions of oxygen and nitrogen in air by volume are 20.96 per cent of oxygen and 79.04 per cent of nitrogen. The volume of CO<sub>2</sub> formed by the combination of carbon and oxygen is exactly equal to that of the oxygen so used. Hence, as a result of the combustion of 1 lb. of carbon furnished with exactly the right quantity of air, no more nor less, the gaseous products of combustion would have 20.96 per cent of their volume composed of CO<sub>2</sub> and the remaining 79.04 per cent of nitrogen. The volume of CO<sub>2</sub> is always a measure of the air supplied.

The following table is based on pure carbon with the theoretical quantity of air required for complete combustion taken as 1:

Per Cent of CO <sub>2</sub> by Vol. in Products of Combustion.	Air Supplied.	Per Cent Excess Air.
20.96	1.00	0.0
19	1.10	10.3
18	1.16	16.4
17	1.23	23.3
16	1.31	31.0
15	1.39	39.7
14	1.49	49.7
13	1.61	61.2
12	1.74	74.6
11	1.90	90.5
10	2.09	109.6
9	2.32	132.8
8	2.62	162.0
7	2.99	199.4
6	3.49	249.3
5	4.19	319.2
4	5.24	424.0
3	6.98	598.6
2	10.48	948.0
1	20.96	1996.0

With the boiler furnace as constituted complete combustion with the theoretical quantity of air cannot be obtained and, therefore, the volume of CO<sub>2</sub> will not equal the theoretical value. In the case of a furnace using coal as fuel the varying thickness of the fire and varying resistance to the passage of the air through the fuel due to this and the presence of ash and clinker in the fuel bed will all tend to increased air supply. With good coal 40 per cent to 50 per cent excess air represents fair average operation. In the case of liquid fuel, such as petroleum, the air is brought more intimately in contact with it and a smaller amount of excess air is required.

An accompanying table shows the approximate quantity of heat carried up the stack with various quantities of air. The fuel is assumed to be 1 lb. of pure carbon, having a heating value of 14,600 b.t.u. The stack temperature is taken as 550 deg. Fahr., the temperature of the air supplied to the furnace as 70 deg. and the specific heat of the furnace gases as 0.24.

The apparatus required for making tests of the flue gases and the building up of boiler efficiencies should consist of a thermometer for taking stack temperatures, a draft gage, an analyzing apparatus, so constructed as to give the percentages

of CO<sub>2</sub>, O and CO, a suitable form of hand exhaust pump and a small rubber gas bag, all of which can be bought for about \$50.

The apparatus listed above requires no particular skill for its successful and proper manipulation. Having made an analysis and from it determined the excess air, the draft can be cut down or increased. After making a number of these determinations for varying rates of steaming, etc., the

Per Cent CO <sub>2</sub>	Supply of Air in Per Cent of Theoretical.	Weight of Products of Combustion.	Heat Generated in B. t. u.	Heat Lost in B. t. u.	Heat Lost in Per Cent of Heat Generated.
20.96	100	12.56 lb.	14,600	1446	9.9
15.0	139.7	17.15 "	14,600	1975	13.5
12.0	174.6	21.18 "	14,600	2440	16.7
10.0	209.6	25.23 "	14,600	2906	19.9
5.0	419.2	49.45 "	14,600	5696	39.0

air supply can be regulated with considerable accuracy. The firemen can occasionally be checked up by making an analysis to see that the instructions regarding firing and draft regulation are being carried out.

There are a number of forms of CO<sub>2</sub> recorders on the market which automatically make analyses at intervals of two or three minutes, and record the percentage of CO<sub>2</sub> in the flue gases on a chart. The chart is graduated in hours so that the CO<sub>2</sub> at any particular time can be obtained from the chart. Some difficulty has been experienced in the past by engineers in keeping these instruments in operation. Considerable improvement has been made of late in their construction and better results obtained. The CO<sub>2</sub> recorder is doubtless better adapted to the maintenance of furnace efficiencies than it is to the building up of same.

In the matter of the saving effected by increased boiler economy as against increased operating expenses due to the cost of flue gas analysis, a concrete case may be of interest. Assume a plant having a monthly output of 1,000,000 kw-hours and an ordinary efficiency of 2000 watts per gallon of oil, costing 2½ cents, and that the efficiency is increased to 2600 watts. The saving would be \$2,884 a month. That this is not an unusual case is shown by the following record of a central station using crude oil as fuel over a period of several years:

WATTS PER GALLON OF OIL.					
Month	1906	1907	1908	1909	1911
Jan.	2132	2748	2408	2334	2722
Feb.	2225	2786	2611	2324	2559
March	2142	2909	2612	2413	2550
April	2303	2789	2455	2175	2526
May	2405	2777	2575	2408	2494
June	2410	2820	2159	2530	2269
July	2443	2931	2356	2792	2422
August	2321	2608	2216	2951	2547
Sept.	2629	2431	2292	2866	2440
Oct.	2556	3202	2332	2868	2435
Nov.	2498	2501	2353	2942	2550
Dec.	2682	2562	2428	2898	2682
Average for Period	2401	2658	2413	2650	2518
Kw-hours Generated	7,115,668	9,483,192	10,350,781	11,645,894	14,019,350
					3,925,037

During 1906 little or no work was done by the company in the analysis of flue gases. In 1907 considerable attention was given to the matter, with the result that the efficiency was increased 257 watts per gallon. In 1908, due to increased activity in other lines, the subject was dropped, and the efficiency dropped back almost to what it had been two years earlier. In May, 1909, the work was again taken up systematically, and has continued ever since. The marked decrease in efficiency during June, 1910, was due to a breakdown which required the operation of a large number of small machines. During the period covered by these figures little or no change has been made in either the engines or the boilers or in any other operating conditions, except in increased output. The maximum demand on the station having kept pace with the output, the load factor has remained practically the same. Hence, it may be assumed with tolerable certainty that the increased economy has in this particular instance been due almost entirely to the flue gas analysis.

The detail records of the economy attained during the period

\*Abstract of paper read at annual meeting of Southwestern Electrical & Gas Association, Houston, Tex., April 27-30.

given show that the economy of the first shift, namely that from midnight to 8 a. m., was increased approximately 45 per cent, that of the second shift was increased 40 per cent, while the third shift, namely that from 4 p. m. to midnight, was only increased about 17 per cent. From this it would appear that during peak load conditions the air supply was regulated with some degree of accuracy, even though it was guesswork, but that during the periods of light load it took a systematic analysis of the flue gases and a proper application of the facts so obtained to bring about results that have saved a great deal of money.

### SUB-COMMITTEE MEETING OF THE JOINT COMMITTEE ON ENGINEERING ACCOUNTING

A meeting of a sub-committee of the joint committee on engineering accounting of the Accountants' and Engineering Associations was held in New York at the headquarters of the American Electric Railway Association on Friday, April 28. Those present were the following: H. H. Adams, superintendent of rolling stock and shops Metropolitan Street Railway, New York; John W. Corning, electrical engineer Boston Elevated Railway Company, Boston; N. E. Stubbs, auditor United Railways & Electric Company of Baltimore, and Norman Litchfield, engineer car equipment Interborough Rapid Transit Company, New York, and secretary of the Engineering Association.

This sub-committee was appointed to review the 1910 report of the joint committee on shop accounting. The first order of business was a consideration of points which were brought up in the discussion of this report at the 1910 convention.

James D. Andrew, superintendent of power stations Boston Elevated Railway, in a letter dated Aug. 17, 1910, had suggested that the item "pumps" should be transferred from sub-account No. 3001, covering maintenance of prime movers, to sub-account No. 3004, covering maintenance of auxiliaries. Upon motion it was decided that this point be referred for consideration to Charles Hewitt, superintendent of motive power Philadelphia Rapid Transit Company, who drew up the original classification. Mr. Andrew also suggested a separate sub-account number for coal and ash handling machinery instead of including it in sub-account No. 3004. In this connection the sub-committee discussed a more detailed rearrangement of maintenance accounts as proposed on April 26, 1911, by A. Wolff, superintendent motive power United Railways & Electric Company of Baltimore. It was the sense of the sub-committee that Mr. Wolff's suggestion could be reconciled with Mr. Hewitt's classification by dividing the latter's sub-account No. 3005, "maintenance of electric plant," into subdivisions 3005-a, 3005-b, etc., to cover individual items like switchboards and transformers.

The sub-committee offered the following suggestion for subdivisions under main account No. 30: That No. 3001-a cover maintenance of engines; No. 3001-b, turbines; No. 3002-a, furnaces, including grates and grate supports, etc.; No. 3002-b, maintenance of stokers; No. 3002-c, boiler settings; No. 3002-d, miscellaneous boiler repairs; No. 3004-a, maintenance of pumps; No. 3004-b, economizers; No. 3004-c, condensers; No. 3004-d, heaters; No. 3004-e, ash and coal machinery; No. 3004-f, coal towers; No. 3004-g, miscellaneous auxiliary repairs; No. 3005-a, maintenance of d.c. generators; No. 3005-b, a.c. generators and compensators; No. 3005-c, exciters; No. 3005-d, rotary converters; No. 3005-e, transformers and cooling systems; No. 3005-f, switchboards, including busbars, oil switches and instruments; No. 3005-g, storage batteries and charging outfits; No. 3005-h, wiring; No. 3005-i, miscellaneous electric items; sub-account No. 3006-a, cranes, hoists, etc.; No. 3006-b, miscellaneous steam instruments, etc.; No. 3101, maintenance of sub-station equipment, divided into No. 3101-a, rotary converters; No. 3101-b, transformers and cooling systems; No. 3101-c, switchboards, including busbars, oil switches and instruments; No. 3101-d, storage batteries, including charging outfits; No.

3101-e, wiring; No. 3101-f, miscellaneous electric items; No. 3102-a, cranes and hoists; No. 3102-b, air compressors, vacuum cleaners and other non-electric devices; No. 3102-c, heating systems. Other sub-accounts might be divided in like manner according to local needs.

The next subject discussed was the 1910 report of John Lindall, superintendent of rolling stock and shops Boston Elevated Railway, on subdivision of operating expense account for car maintenance shops. The subdivisions were approved, except that the numbering was revised, so that the terminal figures for the same items in each group would be the same. Following this the sub-committee took up the suggestions of subdividing shop accounts as made at the quarterly meeting of the Street Railway Association of the State of New York held Dec. 6 and 7, 1910, and noted in the *ELECTRIC RAILWAY JOURNAL* for Dec. 10, 1910.

In connection with these suggestions the sub-committee recognized that the subdivisions of account No. 32, as submitted by the 1910 committee, were tentative. It was merely the intention of the committee to show how subdivisions could be applied to any particular system. The sub-committee believed that in any event if it should be desirable to make further subdivisions they could be carried out as follows: Repairs of trucks of different types under the same class of car bodies, account No. 3204-a; truck repairs, including brake rigging, type X; account No. 3204-b, truck repairs, including brake rigging, type Y; for No. 36, covering electrical equipment of cars, use No. 3601-a, control and electric equipment, exclusive of motors, type X, and No. 3601-b, control and electric equipment, exclusive of motors, type Y. Account No. 3207, air-brake equipment, could be divided as follows: No. 3207-a, air compressor, including motor; No. 3207-b, air piping, reservoirs, etc.; No. 3207-c, governors; No. 3207-d, engineer's, triple, electro-pneumatic and emergency valves, and other air-brake details. These subdivisions also applied to sub-accounts Nos. 3217, 3227 and 3247.

Under miscellaneous items, sub-account No. 3260 could be divided into No. 3260-a, for projecting fenders, and No. 3260-b, for wheel guards; sub-account No. 3261 could be divided into No. 3261-a, for car signs, type X, and No. 3261-b, for car signs, type Y.

In regard to subdividing sub-account No. 3611, motors, the sub-committee suggested the following: No. 3611-a, repairs to motors, type X; No. 3611-b, repairs to motors, type Y; No. 3611-c, repairs to motors, type Z, etc. In submitting this subdivision based on all repairs to a given motor, say, per 1000 car miles, rather than assembling the detailed costs of the armatures, fields, brushes, etc., of all motors, the sub-committee felt that for general use such a scheme would determine the important point of the relative cost of each motor as a whole. It was of the opinion that when necessary the individual companies could readily determine what particular part of a given motor was costing too much.

It was suggested that car heating sub-accounts be added as follows: Nos. 3208, 3218, 3228 and 3238 for each main group of car types; also new sub-accounts Nos. 3209, 3219, 3229, 3239, 3249 and 3259 to cover car repairs on account of accidents.

Mr. Stubbs was assigned to communicate with W. F. Ham, comptroller Washington Railway & Electric Company, relative to the method of estimating credits for scrap as mentioned by Mr. Ham at the 1910 convention.

The meeting was then adjourned.

The Massachusetts Institute of Technology has published a bulletin in regard to instruction during the months of June, July and August, supplementing the work of the regular school year. The requirements for admission and in general the work performed and the final examinations correspond with those of the regular school year. The summer courses are open also to persons not students in the institute who possess the necessary qualifications.

## AMOUNT OF MAXIMUM TENDER

Two cases recently decided in Richmond throw considerable light upon what constitutes the maximum amount which a passenger can legally tender for fare in Virginia. The defendant company in each case was the Virginia Railway & Power Company, which has in force the Standard Code rule that conductors are not required to make change in excess of \$2 in payment of any fare.

In the first case, which was tried in the Circuit Court of the city of Richmond on Dec. 30, 1910, the plaintiff handed the conductor a five-dollar gold piece. The conductor asked the plaintiff if that was the smallest coin which she had and she replied in the affirmative. The conductor then took the coin and continued collecting fares from other passengers. He subsequently returned to the plaintiff and told her that he would get the change when he reached the next switch. As he was unable to do so, and as the passenger could not, or would not, tender a smaller amount, she was ejected. The court held that the action of the conductor, as described above, was a waiver of any right which he might otherwise have had due to the amount of the tender and instructed the jury to return a verdict for the plaintiff, to whom \$250 was awarded.

In the second case, which was tried April 10 and 11, 1911, in the Law and Equity Court of Virginia, a passenger tendered a five-dollar bill in payment of fare, and the conductor, who was unable to change it, declined to accept it. As the passenger refused to tender any smaller sum he was ejected, and as he resisted the ejection he was placed under arrest by the conductor for disorderly conduct. In this case the court instructed the jury to return a verdict for the defendant. The plaintiff made the following contentions, all of which were denied: (1) That the regulation of the company limiting to \$2 the amount for which change will be given was unreasonable; (2) that the reasonableness of the regulation was a matter for the jury and not for the court; (3) that the regulation should be brought to the knowledge of the passenger; (4) that refusal to submit to ejection was not disorderly conduct; (5) that under the statute the conductor was without authority to arrest.

The first case, which was decided against the company, was not appealed because the verdict was for only \$250, while the appellate jurisdiction of the Supreme Court of Appeals of Virginia is limited to judgments in excess of \$300. The other case, in which the Law and Equity Court practically directed a verdict for the defendant company, was not appealed by the plaintiff, nor is it thought likely a writ of error will be sought.

The following list of cases relating to the obligation of street railway companies to change bills or coins of large denomination at the request of passengers is from the brief of A. B. Guigon, attorney for the company in the second case described above.

"Burge v. Georgia Ry. & Elec. Co., 65 S. E., 879; 6 St. Ry. Rep., 447. Plaintiff tendered a five-dollar gold coin; conductor refused to change it and ejected the plaintiff. Held, whether such a rule is reasonable or not is a question of law for the court and that a rule of the company prescribing two dollars as the maximum amount which will be changed is a reasonable rule, and that where a five-dollar gold coin was tendered by a passenger and two companions for transportation conductor could refuse to change it and require the persons to leave the car. This is a good opinion. Wynn v. Ga. Ry. & Elec. Co., 6 Ga. App., 77; 64 S. E., 278; Barker v. Central Park, etc., Co., 151 N. Y., 237; 45 N. E., 550; 35 L. R. A., 489; 56 A. M. St. Rep., 626; Muldowney v. P. B. Traction Co., 8 Pa. Super. Ct., 335.

"Wynn v. Ga. Ry. & Elec. Co., 64 S. E., 278; 6 St. Ry. Rep., 592, holds that tender for a five-dollar bill is not a good tender of a fare where the rule is that the conductors will not make change exceeding two dollars. This is also a good case.

"See the note, 5 St. Railway Rep., 837, and the case of Knoxville Traction Co. v. Wilkinson, 117 Tenn., 482, which upholds the same principle. In this case ten dollars was tendered.

"to Am. & Eng. Ann. Cas., 642, has a note citing practically the same cases as those referred to in the Street Railway Reports.

"The right of a carrier to make such reasonable rules and regulations as it may consider proper for the conduct of its business is admitted; full note to be found in 4 St. Ry. Rep., 434, 992, and 5 St. Rep., 33, in a note to Little Rock, etc., Co. v. Goerner, 80 Ark., 158. See also 6 Cyc., 545 and 547.

"In Barrett v. Market St. Ry. Co., 81 Cal., 296, held that while a tender must be reasonably approximate to the amount of the fare the carrier was under obligation to furnish change, and the tender of a five-dollar gold piece for a five-cent fare was reasonable. This case was, however, explained in Barker v. Central Park, etc., Co., 151 N. Y., 237, as being the result of the peculiar monetary conditions existing in California.

"It is also held that it is not necessary that the plaintiff know of the rule of the company. Knoxville Traction Co. v. Wilkinson, 117 Tenn., 482.

"Virginia and S. W. Ry. Co. v. Hill, 105 Va., 729, holds that where the ticket agent punches a ticket wrongfully and the conductor ejects the passenger before he reaches his destination to which he attempted to purchase a ticket the passenger's right of action against the carrier is not for the ejection, which is lawful, but for breach of contract.

"Ability of conductor to make change does not make it necessary for him to do so where the company has a rule that five dollars will not be accepted. Fundenburg v. Augusta & A. R. Co., 21 L. R. A. (N. S.), 868 (1908).

"I understand that a North Carolina case has just been decided the same way.

"Nor does the mere fact that the conductor at first accepts a tender of the ticket rate through mistake, but within a reasonable time demands the extra sum required of those who pay on the train, operate as a waiver of the rule or entitle the traveller to passage at the ticket rate. Elliott, 2d Ed., Vol. IV, Sec. 1603, p. 450.

"Memphis, etc., v. Chastine, 54 Miss., 503. Counterfeit money paid not a good ticket."

## ALUMINUM WIRE FOR FIELD COILS

A report just issued by the International Street & Interurban Railway Association gives some interesting particulars of the use of aluminum wire in field coils of railway motors. This practice of European roads has been mentioned in previous issues of this paper, but the report mentioned, which is by M. A. Mariage, general manager of the General Omnibus Company of Paris, gives details which have not heretofore been published. Twenty-five electric railway companies in Europe are employing aluminum field coils in their motors. Of this number eight companies have had them in use less than six months, nine less than a year, and eight more than a year. Most of the companies have equipped only a few of their motors in this way, but the Hamburg Street Railway Company has equipped 120 motors, all of the GE-800 type, in this way, and the Elberfeld Railway has equipped all of its fifty-four motors.

The section of aluminum wire to provide the same amount of conductivity as copper must be 1.687 times as large at zero degrees C. or 1.645 times as large at 100 deg. C. The actual coil, however, is no larger, because it has been found possible to oxidize the surface of the aluminum wire so that no textile insulation is required. The weight of the coils is about 50 per cent to 55 per cent that of a corresponding copper coil. This weight amounts to about 250 lb. for a two-motor car. The cost is also lower, even including the value of the scrap, which is higher for copper than for aluminum.

Most companies use cambric, paper or other insulation between the different layers of the aluminum field coils, but none between wires composing the same layer.

Several methods are employed for oxidizing the wire in order to provide the non-conductive surface. One company,

while the coil is being wound, moistens the cambric insulation between the coils and also the wire itself with the brush. When the coil is finished and before the outer insulation is put on a current is passed through the coil sufficient to raise the temperature of the wire to about 100 deg. C. The insulation resistance of the surface of the wire then gradually attains its normal value. Another company anneals the aluminum wire by raising it to a temperature of 200 deg. to 300 deg. C. before the coil is wound. Water is applied as before, but the coil is baked in an oven and the process is repeated once or twice. The General Omnibus Company coats the wire and coil with a plastic material having a clay base which gives a mummified coil.

Mr. Mariage calls attention to the fact that in addition to the other advantages of the use of aluminum the maintenance of the coil is low because its lightness reduces the injurious effect of the jars to which these coils are subject. He says, however, that care must be taken in winding to avoid joints in the wire, because it is difficult to make satisfactory joints; also, that care should be taken, when soldering on the field coil terminals, to avoid the formation of oxide on the surface of the aluminum wire.

### CHICAGO SUBWAY PLANS

Mayor Harrison of Chicago has announced that he favors the early construction of the first sections of a comprehensive system of subways as outlined in the report of Bion J. Arnold, which was abstracted in the *ELECTRIC RAILWAY JOURNAL* of Feb. 11, 1911. A review of these plans was given by Mr. Arnold at the weekly luncheon of the Electric Club of Chicago on April 26.

The subway sections to be built at the start would include the existing tunnels under the Chicago River at Van Buren, Washington and La Salle Streets. The first subways would relieve the surface lines of a portion of their cars and provide for faster running through the business district. The subway route that it is proposed to build first is from Archer Avenue and Clark Street north on Clark to Madison, thence west on Madison to La Salle and north through the Chicago Railways tunnel to Chicago Avenue. Simultaneously, two loops about the business district should be built for the west side surface cars, using the Van Buren and Washington Streets tunnels. Mr. Arnold estimated that the north and south route would cost \$3,000,000 and the west side route \$4,000,000.

The city now has \$6,109,000 available for subway construction in its traction fund. This fund has been built up during the last three years by the division of profits of the surface lines with the city. The net receipts, after operating expenses and fixed charges have been met, are divided in the proportion of 45 per cent to the companies and 55 per cent to the city.

Mr. Arnold referred to four methods of financing the subways: (1) Granting an indeterminate franchise to a private corporation with the city retaining the right to purchase; (2) construction by the city but operation and maintenance by private contract, the city reserving the right to purchase equipment; (3) construction and equipment by city and operation by private contract; (4) assessment of property for construction in much the same method that a sewer or paving district is created.

The plans for the construction of the subways had required considerable study because of the limited space available between the street surface and the roof of the 60 miles of tunnel now operated by the Illinois Tunnel Company. It was proposed to drive the low-level east and west lines as tunnels and not disturb the surface. The north and south lines, closer to the surface, would be built by open construction. It was thought that if suitable arrangements could be made the work could be accelerated greatly by using the Illinois Tunnel Company's service for removing the excavated material. As the excavation was made the dirt could be dropped into cars of the present subway and hauled to the lake front, where it would be available for filling in Grant Park.

### MEETING OF SOUTHWESTERN ELECTRICAL & GAS ASSOCIATION

The seventh annual convention of the Southwestern Electrical & Gas Association was held at Houston, Tex., April 27-29. More than 600 delegates and guests registered. The meetings were held in the new municipal Auditorium, the first floor of the building being given over to an interesting and attractive electrical show.

The convention opened on Thursday morning with President W. B. Tuttle, of San Antonio, in the chair. In his presidential address he commented on the present favorable tendency toward publicity in corporation management. Heretofore, he said, the public had seen only the collection side of the corporation's business and had often neglected to consider the huge outlays for operation, maintenance and new construction. It failed to realize, for example, that a corporation often put back into a community more than its net earnings during the same year, while the coming of the company's service might greatly increase real-estate values and improve the healthful conditions of the homes it reached. Although all other commodities had steadily risen in price, central-station service alone had decreased in cost, and the ride purchased for a nickel has grown in value, satisfaction, speed and comfort from the horse car to the modern electric railway car. Public-corporation managers, concluded Mr. Tuttle, were conducting "a square business in a square way," and the people were displaying willingness that the company should have the income which it rightly earns.

#### BOILER ECONOMY AND FLUE-GAS ANALYSIS

At the afternoon session M. L. Hibbard, engineer for the San Antonio Gas & Electric Company, presented a paper on "Boiler Economy and the Application of Flue-Gas Analysis," which is printed in abstract elsewhere in this issue. In discussing the subject Prof. A. C. Scott, of the University of Texas, referred to comparative tests of a Dutch-oven and chain-grate stoker furnace, using in each both lignite and high-grade fuels. The Dutch oven showed superior results using lignite of 8000 units to 9000 units fuel value, and attained a flue-gas content of 8 per cent CO<sub>2</sub> with hand firing, while the modern grate is much below this with the same low-grade fuel. F. G. Frost, of Houston, told of the results obtained there with oil burners, attaining a boiler efficiency of from 12 per cent to 14 per cent, beyond which the magnitude of other losses decreases the net input into the heating surface. H. S. Cooper, of Galveston, said that the type of oil burner employed affected the results less than the character of the draft and the spraying action of the fuel to be obtained.

#### RAILWAY RETURN CURRENTS

E. E. Nelson, North Texas Traction Company, Ft. Worth, then read a paper on the "Investigation and Care of Return Railway Circuits," which is abstracted in another column.

In the discussion which followed M. L. Hibbard, of San Antonio, told of using a city arc circuit for conducting voltage-drop tests in a street railway system, the lamps being lowered from their brackets as for trimming, and contact made with their wires through test jumpers. At the station the two sides of the arc circuit were linked through a voltmeter. H. S. Cooper pointed out that the leakage from a return conductor to the surrounding earth was a function of its potential difference from the surrounding medium rather than inversely as its carrying capacity. W. L. Wood, of Texarkana, suggested the application of solder with a blow torch around bond terminals, sealing the contact against the entrance of moisture. Objections to this method were raised by Mr. Nelson, who pointed out the disadvantages of heating the bonded joint after completion.

#### LIGHT-WEIGHT CAR CONSTRUCTION

A paper on the construction and operation of light-weight cars in Houston by R. T. Sullivan, superintendent of the Houston Electric Company, was read by David Daly, general manager of the company, in Mr. Sullivan's absence. An abstract of this paper will be found elsewhere in this issue.

R. B. Stichter, general manager of the Texas Traction Com-

pany, called attention to the great significance of the saving effected by weight reduction in the case of interurban cars having long daily runs, where the energy saving would be expected to amount to 100 watts per ton mile, besides consequent reduction all along the line of investment, operation and maintenance.

#### THE CAUSE AND PREVENTION OF ACCIDENTS

On Friday morning C. W. Kellogg, Jr., manager of the Texas securities department of Stone & Webster, read a paper on "The Cause and Prevention of Accidents." This paper is abstracted elsewhere in this issue.

C. P. Brown, of San Antonio, thought that during the first six months of a new motorman's service the gong might well be dispensed with altogether, since it was often the cause of accidents because too much dependence was placed on it to "shoo" people off the tracks.

W. L. Wood, of Texarkana, cited an instance of a suit, however, where the motorman's failure to ring the gong, although meanwhile he was using every means to stop the car, resulted in an adverse verdict for \$10,000. During the trial of the case it was quite clearly shown that the car would have struck the man before he could possibly have got off the track even if warned, but the omission to ring the gong constituted a technical breach and the judge instructed the jury to bring in a verdict for the plaintiff. Mr. Wood also remarked that the installation of powerful arc headlights on his cars had resulted in the avoidance of all night accidents during the last three years. In Texarkana he had adopted the plan of having chronically careless passengers reported, and writing each one a personal letter advising him against continuing the practice. In two cases where careless passengers were injured later and sued the company, the production in court of these warning letters had resulted in a verdict for the company. Mr. Wood had all of his men who were off duty attend court cases in which the company was being sued for personal injury damages, and he found that the familiarity which this experience gave the men with accident cases set them thinking and was valuable when they were themselves called upon to handle accident cases.

C. W. Kellogg, Jr., told of a practice employed in Austin, Tex., which was effective in reducing accidents as far as the trainmen's own care was concerned. A graduated wage scale was in effect, a man's pay being subject to an increase after he had been in the company's service a certain period. When a trainman was thus eligible for increased pay, his record was examined by a committee, among whose members were two of the older trainmen in the company's employ. This committee investigated for evidences of accidents or display of carelessness, and if it did not recommend the increase the raise in pay was not granted. The representation of two of their own men on the committee was found to please and satisfy the trainmen with the committee's findings, even if unfavorable to their own members in some cases.

John I. Beggs, formerly president and general manager of the Milwaukee Electric Railway & Lighting Company, who was a visitor in Houston on Friday afternoon, was invited to address the convention. Mr. Beggs spoke appreciatively of the responsibilities of public-utility corporation management, expressing the warmest interest in the work of the Southwestern association and the properties represented by it.

#### ELECTION OF OFFICERS

On Saturday morning the following officers of the association were unanimously elected for the ensuing year:

President, J. E. Carroll, Beaumont; first vice-president, E. T. Moore, Dallas; second vice-president, D. G. Fisher; fourth vice-president, H. M. Moore, Austin. Dan G. Fisher, of Dallas, was re-elected secretary. The following were chosen members of the executive committee: W. B. Head, Stephenville; W. B. Tuttle, San Antonio; J. B. Carroll, Beaumont; A. E. Judge, Tyler; E. D. Kelly, Terrell; G. H. Clifford, Ft. Worth; E. T. Moore, Dallas; D. G. Fisher, Dallas; W. L. Wood, Texarkana, and J. E. Johnson, Stamford.

#### ENTERTAINMENT

The entertainment committee adopted the plan of arrang-

ing its recreation features following the principal sessions of the convention. A number of ladies visited Houston and were entertained on Thursday afternoon at the Country Club and in the evening at a reception at the Electrical Show. On Friday evening the Sons of Jove rejuvenation was held. On Saturday there was a boat trip down the Houston ship channel to the San Jacinto battleground, where a shore dinner was served. On Sunday the delegates visited Galveston over the line of the new interurban railway, inspecting the midway power house for the road and the great concrete causeway which will carry the cars across the waters of Galveston Bay. At Galveston automobiles were ready to take the party on a tour of the island.

## METROPOLITAN STREET RAILWAY REORGANIZATION PLAN

Further testimony concerning the plans of the bondholders for reorganization of the Metropolitan Street Railway was given before the New York Public Service Commission, First District, on April 24. The witnesses were H. Hobart Porter, of Sanderson & Porter, and James C. Boyd, of Westinghouse, Church, Kerr & Company.

#### TESTIMONY OF H. HOBART PORTER

H. Hobart Porter, of Sanderson & Porter, testified that the allowance for incidentals in the exhibits submitted on behalf of the committee would prove in actual practice inadequate to cover the items set forth. In his own experience he would have been inclined in making up a similar estimate of work to be performed to take out some of the items included, and then, having in mind the conditions prevailing for this work, would have allowed at least 10 per cent to cover the remainder. He did not believe that any experienced contractor competent to handle a piece of work of this character could afford to handle it on the basis of the 10 per cent allowed. He knew that the 10 per cent would be used up in the contractor's expenses of administration. Five per cent would not pay the cost of the engineering in this particular case. Such items varied largely with the character of the work and the conditions surrounding it.

The total allowed for interest and taxes during construction was inadequate to cover that item. The item of land carried interest for only three years. In work of this magnitude it was necessary that general plans be in hand before the money could be raised. It would be necessary that the more important portions of the land be under option. In order to obtain the land at a proper value it must be bought; it could not be held under option for a long period. The interest therefore would run during the entire period, allowance being made, of course, for interest charged to operation, as portions were used in operation. On the average three years' interest would be inadequate. It was possible that the track paving, ducts and feeders could be built and placed in operation so that the interest period would be as short as that placed upon it in this estimate, but Mr. Porter should regard it as a remarkable performance.

A power plant such as was necessary could not be built in two years. General contractors asked to be paid from time to time as the work progressed, and their profit should carry a considerable amount of interest. From Mr. Porter's own experience in work of this character, if he were to estimate the working capital he would figure how many months the work would require. If the work was to divide up evenly he would assume that probably three months' average expenditure would be adequate, and it was possible that under some circumstances less would be necessary. Judging from the estimate of time required, he thought the amount of working capital stated would be found to be very inadequate.

Estimate of the time within which work of the kind could be done was one of the most hazardous problems ever submitted to an engineer, but Mr. Porter felt that if an estimate of five years were made and any capitalists advanced money on faith in that estimate there would be a great deal of disappointment before the day of completion arrived.

Mr. Porter considered that if a company was spending an-



nually and continuously sufficient money from operating expenses to maintain 100 per cent operating efficiency it was as valuable as though no physical deterioration existed. He had estimated that it would be necessary to expend annually for repairs, renewals and replacements of the Metropolitan system \$2,650,000. All going public service corporations with real value required large amounts of additional capital continuously because they must grow. The production of that capital by the use of a fund for renewals, etc., was the cheapest thing the corporation could do, because thereby it saved itself discount on bonds and secured capital at the very lowest rates.

Mr. Porter thought the road was in efficient operating condition. He would not say 100 per cent, but it was in a good deal better condition than the average. Giving a general expression of opinion, he would say that less than \$10,000,000 of the \$50,000,000 cost of construction would represent physical deterioration. That was a maximum amount reached in his mind from study of the physical property. Judging from general observation, he should think that the receivers had brought the property up to a condition where the depreciation would represent less than \$10,000,000.

It was Mr. Porter's experience that it was not economical as a rule to have companies build their own extensions, and in companies in which he had to do with the management he frequently found that it was far cheaper to let the extension work so as not to interfere with the proper conduct of the regular business of the company. If the regular staff was put upon construction work in a company that was caring for the public efficiently there was almost invariably a series of complaints about bad service.

A company acquired a value as a result of having been operated and having learned some things that could not have been known originally. This experience always cost money. A property that was in good operating condition was worth more money when it was "seasoned" than when new. This experience was apt to decrease the operating expenses, but would also sometimes increase the gross earnings. Every community had its own peculiarities, and it cost money to learn how to make the best of each place. That produced what Mr. Porter meant by going concern value. The determination of this value was a case of financial judgment with a certain limited amount of engineering skill out of which the basis was built. The going concern value of each property would have to be estimated separately and might vary from 5 per cent to 25 per cent or 30 per cent owing to the difficulties of the situation.

While a property had to be studied all the time it took a long period to get the machine into such good operating condition that that kind of study could take place and be effective immediately.

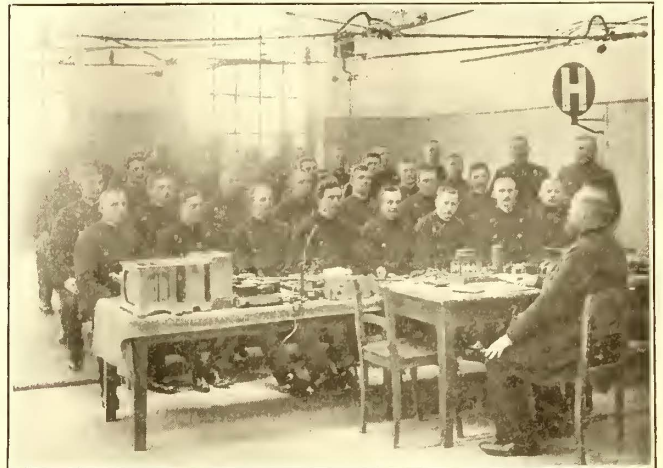
Under examination by Commissioner Maltbie, Mr. Porter stated that the amount of \$2,650,000 which he estimated the Metropolitan system should expend annually for maintenance, repairs, renewals, etc., included a certain allowance for replacement before absolute physical degeneration would compel such replacement. No allowances were made for changes in the art or inadequacy.

#### TESTIMONY OF JAMES C. BOYD

James C. Boyd, of Westinghouse, Church, Kerr & Company, testified that the allowance of 8.8 per cent for incidentals was altogether too small. He expressed the same opinion regarding the allowance of 10 per cent for general contractor's profit. Even under a more favorable contract the larger part of this would be used up, and on a lump bid a great deal more should be allowed for this item. The allowance of 5 per cent for engineering was also too small. It did not provide for contractor's engineering, and there would be some engineering expense in connection with land. The calculation for interest and taxes during construction was very conservative. To complete construction of the property would require a somewhat longer period than five years. Interest would accrue on contractors' profits. Going concern value offset the depreciation in a telephone property which had been appraised recently in which each of these items amounted to 20 per cent of the cost of construction.

## INSTRUCTION ROOM FOR BERLIN MOTORMEN

The two accompanying illustrations show portions of the instruction room used by the Grosse Berliner Strassenbahn, Berlin, Germany, for the class instruction of motormen. In exercising its choice of candidates the Berlin company prefers men who have been honorably discharged from the army. Such men are considered very desirable on account of their military bearing, neatness and discipline. The instruction



Instruction Room of Berlin Street Railway

course of the company extends over a period of from 14 to 21 days, according to the ability of the student. The platform and schoolroom work is alternated throughout the day, two-thirds of the time being spent on the cars and the rest in the classroom. As shown in one of these views, part of the classroom instruction is given on a dummy platform which is equipped with a controller, brake handles, sander, trolley catcher, trailer coupling and even the "current-on" clock, which indicates the coasting ability of motormen. The instruction room also contains samples of overhead line installation, which are described to the students to enable them to prepare reports on line troubles. The room is also furnished with the speci-



Giving Instruction in Overhead Work and Car Operation

mens of roadway signs such as the one marked "H," which is an abbreviation of "Haltestelle," signifying stopping place. The general instructor also supplements the talks and black-board demonstrations by describing individual parts of both car equipment and line equipment. On completing the instruction course the student must pass an examination given by the car engineer and traffic inspector of the district where he is to be employed. He then receives charge of a car for about two weeks under the observation of the local roadmaster, who must report him as satisfactory before he is finally accepted.

## PITTSBURGH MEETING OF COMMITTEE ON EQUIPMENT

A meeting of the committee on equipment of the American Electric Railway Engineering Association was held at the Fort Pitt Hotel, Pittsburgh, Pa., on Monday and Tuesday, May 1 and 2. The committee members present were: Chairman, Milan V. Ayres, electrical and mechanical engineer Boston & Worcester Street Railway; A. T. Clark, superintendent rolling stock and shops United Railways & Electric Company, Baltimore, Md.; F. R. Phillips, superintendent of equipment Pittsburgh Railways; F. G. Grimshaw, master mechanic West Jersey & Seashore Railroad; W. Thorn, division engineer cars Board of Supervising Engineers Chicago Traction, and H. L. Patterson, chief engineer Mahoning & Shenango Railway & Light Company. Others present were: I. H. Milliken, McConway & Torley Company; William Bloss and C. H. Tomlinson, Ohio Brass Company; J. L. Davis and M. B. Lambert, respectively of the engineering and sales departments Westinghouse Electric & Manufacturing Company, and J. B. Crawford, Mahoning & Shenango Railway & Light Company.

Mr. Ayres said that in accordance with arrangements made with the American Society for Testing Materials he had appointed the following gentlemen as a conference committee on wrought-iron specifications: A. T. Clark (member of the committee on equipment); Carl F. Woods, Arthur D. Little's Laboratory, Inc., Boston, and C. G. Young, consulting engineer, New York. Mr. Ayres also announced that he had appointed the following gentlemen as a conference committee on steel wheels: H. A. Benedict, mechanical engineer Public Service Railway, Newark, N. J. (member of the committee on equipment); E. W. Holst, superintendent equipment Boston & Northern Street Railway, and Henry J. Gulick, Gulick-Henderson Company, inspection engineers, Pittsburgh, Pa. Each of these joint conference committees will have one vote in the deliberations of the American Society for Testing Materials. In this connection, Mr. Ayres announced that a conference committee on specifications for steel axles had been appointed by the chairman of the committee on heavy electric traction.

### DISCUSSION ON COUPLERS

Mr. Grimshaw reported on couplers. He had first looked up the *Proceedings* of the Master Car Builders' Association to see how that association had taken up the subject of automatic couplers for steam cars. After this he had called a meeting of his sub-committee in Pittsburgh. After conference it was decided that it would not be advisable to send out a data sheet asking questions on track and grade conditions, length of car overhang, etc., because the answers would be more or less perfunctory and the information itself would be of no great value in reaching a decision. It was decided that, as the Central Electric Railway Association had been studying this matter, it would be well to write to Secretary A. L. Neereamer asking him why that association had adopted a standard coupler, why it had decided on the M. C. B. type of contour and what traffic conditions made it necessary to use automatic couplers. This communication to Mr. Neereamer was answered by R. M. Hemming, chairman of the Central Electric Railway Association standardization committee. The sub-committee thereupon decided it would be interesting to visit several roads in the Central West to observe conditions. The Peoria lines of the Illinois Traction System were first examined. It was found that the passenger train service seemed to be limited to the operation of one train a day each way between Peoria and St. Louis. This train consisted of one motor and one trailer. There was also considerable freight service. J. M. Bosenbury, superintendent of motive power Illinois Traction System, was using an M. C. B. type coupler which had been modified to the extent of lengthening the guard arm by putting a bracket outside of the coupler head and by using a very deep knuckle 16 in. high. This knuckle was adopted because of special grade-crossing conditions which had existed at one time. The ordinary depth of knuckle had uncoupled vertically. From conversation with Mr. Bosenbury Mr. Grimshaw received the impression that this grade crossing had been so modified that it was no longer

absolutely necessary to make use of the extremely deep knuckle.

The sub-committee then visited several roads about Chicago and found that very few of them were running trains. The Chicago, Lake Shore & South Bend Railway was running trains out of Chicago, but did not have particularly severe grade conditions and there were sharp curves only near South Bend. This company was using a coupler of practically M. C. B. contour. It had never experienced trouble from buckling or uncoupling while pushing cars around sharp curves. The Michigan United Railways stated that it was planning to run a few trains soon consisting of one motor and one trailer or of two multiple-unit motor cars. The Chicago & Southern Railway, South Chicago, of which W. B. Tarkington is general superintendent, was using a coupler of M. C. B. type which was not interchangeable on account of its smaller size. This line has curves of 35-ft. radius and one grade of 9 per cent, with short-radius vertical curves at the top and bottom. The couplers operated satisfactorily under these conditions when pushing or pulling a motor car and trailer. The Aurora, Elgin & Chicago Electric Railway was using automatic couplers, but not of M. C. B. type.

After visiting Mr. Neereamer at Indianapolis the sub-committee went to the shops of the Terre Haute, Indianapolis & Eastern Railway, a company which had adopted the Central Electric Railway Association's standard type of coupler. A few of these couplers were found on the company's locomotives. The company seemed to be operating practically no trains except in freight service. The sub-committee also found no train service operated from the Indianapolis union station.

On going to the shops of the Indiana Union Traction Company, at Anderson, it was found that the coupler in use was similar to Mr. Tarkington's design but of standard M. C. B. size to permit coupling up with standard steam cars. This company used an extended guard-arm bracket on the side of the head and a shelf extension at the top. The Mahoning & Shenango Railway & Light Company was found to be using automatic couplers not of the M. C. B. type. They were operated under the most severe conditions, such as sudden breaks in grade of over 7 per cent. It was observed that a spring carrier was used which permitted lateral displacement of 1½ in. on one side and 2 in. on the other side. The overhang of each car was 10 ft., which the speaker did not think severe.

Mr. Grimshaw said that, while he had formulated no definite conclusion, it seemed to him that the interurban train service now being operated was, to say the least, very intermittent and the requirements were not nearly as severe as he had expected to find them. For instance, the crossing situation on the Illinois Traction System had been so modified as to eliminate the necessity for the extra deep knuckle. He thought that when an electric railway reached the stage of regular train service it would find it best to modify its track and curves to approach steam railroad conditions. Thus very few special attachments would be required on the drawbars except that greater radial action would be necessary on account of more severe curve conditions. It would be well to confer with the coupler manufacturers, but he did not think that the situation was serious enough to demand hurried action. It appeared questionable to him whether a majority of the electric railways now operating trains had such unusual conditions as to require special attachments on their drawheads. The feature of the sub-committee's inspection trip which impressed him most was the lack of train service.

Mr. Bloss described the freight trailer service of the Indiana Union Traction Company and other lines in the Central West. The interchange of car-load lots made a standard coupler necessary for connecting lines even if some of the roads in the group did not require special interlocking attachments for their individual conditions. In reply to Mr. Ayres, Mr. Grimshaw said that the radial M. C. B. coupler could be operated in conjunction with steam railroad couplers in trains. Mr. Patterson said that the steam railroads objected to its use because of the danger of buckling and Mr. Bloss added that if used at all the cars so coupled were placed at the end of the train. It appeared

from the general discussion that when car builders ship cars on their own trucks they are often obliged to furnish steam railroad couplers for the trip to destination.

Mr. Ayres stated that the M. C. B. coupler question presented three conditions: Is it necessary to put on some attachment to prevent buckling when pushing, to prevent uncoupling on vertical grades, and to have something like a spring carrier? To this Mr. Grimshaw added a fourth condition, namely: Is a centering device necessary?

Mr. Tomlinson related how the need for a special form of M. C. B. coupler on electric roads came to exist. The original coupler had no vertical movement on itself. An emergency knuckle was designed, but it was found that when coupled to steam railroad cars it came out immediately on vertical grades. In discussing the depth of knuckles, he said that there was 22 in. space between the Peoria cars of the Illinois Traction System, as the long knuckle prevented getting the cars close together unless the platforms were of prohibitive height. An objection to a coupler with a projecting guard arm and a shelf extension at the top was its rigid connection on straight track to certain types of steam railroad couplers.

Mr. Grimshaw said that in any event a shackle bar would be required if a steam car had to be taken around a sharp curve. He said further that the Lake Shore Electric Railway had experienced no buckling in going around curves with couplers of standard M. C. B. contour even in pushing, whereas the Illinois Traction System had been obliged to apply means to prevent buckling.

Mr. Bloss said that the electric railways wanted a coupler to embody the following features: First, M. C. B. contour; second, coupler heads must be interlocking to avoid buckling and to avoid vertical movement, thus requiring rigidity at the coupler head itself; third, the coupler must have flexibility for the carrier. In general, the coupler should have maximum rigidity in the head as well as maximum flexibility in its other parts.

Mr. Patterson thought that too much effort was being made to get a coupler for every possible condition when much trouble could be eliminated by improving the physical conditions of the line to make them suitable for train operation. Mr. Bloss replied that in any event it would be necessary to care for a sudden rise in grade, as when the train passed over a steam railroad crossing.

Mr. Thorn pointed out one important difference in steam and electric coupler operation. On a steam train there is a condition of tension throughout the draft rigging, whereas on an electric train, with, say, two motor cars, a pushing action with tendency to buckle arose if the rear motor car accelerated faster than the front car. Mr. Ayres understood that Mr. Thorn's statement was borne out by the early experiences of the Boston Elevated Railway, which had suffered from the buckling of drawbars due to pushing strains on sharp curves.

Mr. Bloss considered coupler safety. He said that in M. C. B. couplers the wear of the tail of the knuckle was a vital matter and the cost of knuckle maintenance was very heavy. One of the points of the Central Electric Railway Association's standard coupler was the use of interlocking lugs in the head to prevent uncoupling of a train in case a knuckle broke.

Mr. Milliken held the opinion that more attention was given to the buckling question than its importance demanded. The Washington, Baltimore & Annapolis Electric Railroad, for instance, was using a plain M. C. B. coupler successfully, although it had curves of about 35-ft. radius and sudden changes in grade. He did not think it of great importance to have the platforms close together on interurban trains. He saw no objection to the movement of one knuckle on the other. The knuckles on the Washington couplers were 11 in. high and moved out about 4 in. under the worst conditions. Rigid carriers were used. It was not necessary to have much movement of the coupler at its outward point.

Mr. Patterson said that experiments made by him had failed to find any place on his interurban system where a standard

9-in. M. C. B. knuckle would disengage by reason of a break in grade.

Mr. Phillips objected strongly to the tendency to load up the car with all kinds of special devices to overcome deficiencies in the track.

Mr. Bloss pointed out that the sharp curves and abrupt changes in grade encountered by the interurban cars were in the streets of terminal cities where it was difficult, if not impossible, to change the conditions.

Mr. Ayres thought that a middle ground could be taken regarding improving the track conditions for interurban cars in city streets. The short radius curves, perhaps, could not be eliminated in many cases, so that radial drawbars would be necessary, but there was more possibility of so moderating the vertical breaks in grade as to avoid serious trouble. He did not think that it was the committee's province to prescribe a type of coupler which all electric railways should use. There were many interurban railways which had no interchange problems and such lines would not put in M. C. B. couplers until their conditions changed. The problem before the committee was how far could it go in recommending details of an M. C. B. coupler for roads which wanted that type. He did not believe that there was the slightest chance of getting the M. C. B. contour approved as a standard for all interurban railways.

Mr. Clark thought that the committee might lay down four or five general features which a satisfactory coupler should meet without referring to any specific designs.

Mr. Bloss suggested that the committee hold its next meeting in Indianapolis, where it would have the opportunity of seeing couplers operated under a great diversity of conditions. Mr. Tomlinson indorsed this suggestion and said that the coupler manufacturers would doubtless be willing to supply full-size tracings and models for the committee. It was tentatively decided that the next meeting of the committee should be held in July, beginning at Cleveland and ending at Indianapolis. This arrangement will permit the members to study the behavior of the different types of couplers in all kinds of service.

In connection with his report on couplers Mr. Grimshaw was to have included the subject of signal and control connections. He said that he had no definite report to make on this matter, but that many companies appeared to be using the standard M. C. B. air hose.

Mr. Lambert said that the Westinghouse Electric & Manufacturing Company had gone so far as to make its control interchangeable with the General Electric Company's type M system on seven or eight systems and he believed that the General Electric Company had done likewise.

J. L. Davis thought it would be difficult to standardize control circuits, as the speed characteristics of the connected motor cars ought to be identical.

Mr. Grimshaw stated that inasmuch as the committee on heavy electric traction was considering the standardization of the location of apparatus it would be well to communicate with that body before recommending any control circuit standards.

Mr. Patterson felt that improvements could be made in the multiple unit receptacles and plugs now generally used.

Mr. Ayres pointed out that a standard control coupler would have to contain the maximum number of contacts, even if all were not used. As a general rule, however, operating companies would soon find use for the extra contacts for signal circuits, etc.

The general subject of couplers and their signal and control connections was carried over to the next meeting for further report.

#### DESIGN OF CAR BODIES FOR LIGHT WEIGHT

Mr. Phillips presented a report on the design of car bodies for light weight. He said the most important thing to begin with was to have a universally acceptable unit of comparison. There were many types of cars and innumerable ways of proportioning the seating and standing areas. If it were desirable to compare cars on the basis of seating capacity there ought to be a set of standard or equivalent seat dimensions even if

the dimensions themselves were purely theoretical. The dimensions suggested by Mr. Phillips for this purpose were as follows: Width of seat at hip line, 17 in.; height of seat, 17 in.; height of back, 17 in.; width of back, 17 in.; distance between centers of transverse seats, 30 in.

He said that the four main divisions which make up the equipment in weight of a car might be divided as follows: Car bodies, trucks, motive-power equipment, power brakes. The car body should include the seats, lighting and heating arrangements, foundation brake rigging and hand brake, fare-collection equipment, headlights, fenders, pilots, signs, etc. The dividing line might logically be taken at the center plate, which is a part of the truck. A wheel guard could be considered as part of the truck. The motive-power equipment would include all wires and cables except the lighting and heating circuits. On air-brake cars the dividing line might be established by the pull-rods running from the end of the cylinder levers. The connecting rods and cylinder levers should be considered a part of the air-brake equipment and the pull-rods a part of the truck equipment. In general, it would be desirable to follow the standard accounting classification as closely as possible and also the common practice of truck and car builders in furnishing certain parts when special instructions are not given in the specifications. Thus, truck builders usually furnished the pull-rods, and hence that item should be considered a part of the truck weight.

Mr. Phillips said that he had obtained from the builders the names of all companies using steel cars. It was his intention to correspond with these companies and to assemble all data which he could get relative to the weight and operation of this class of rolling stock. He said that in designing the Pittsburgh cars stress diagrams had been made throughout for all members of the framing and shearing strains had been calculated for the rivets. The later steel cars would weigh 3600 lb. less than the original Pittsburgh design.

Mr. Phillips then discussed the Pittsburgh center-vestibule steel trailers, a description of which was published on page 1155 of the *ELECTRIC RAILWAY JOURNAL* for Dec. 10, 1910. These cars weigh, completely equipped, 22,300 lb., or 360 lb. per passenger. A feature is the use of trucks with 22-in. diameter wheels. These cars have already proved their durability by remaining practically uninjured in collisions which have badly damaged wooden cars. Mr. Phillips said that one of the hindrances of light car design was the prejudice against unusual outlines, such as flat arches, etc. Mr. Thorn submitted some blueprints showing the details and stress diagrams of the underframe of a proposed pay-as-you-enter car for the Chicago Railways Company.

There was a general discussion as to whether cars should be designed with an allowance for impact, but it was the consensus of opinion that this could not be done because the force of collisions could not be predetermined. There was then a general discussion on seat dimensions as a basis of comparison. Some members were of the opinion that cars could be compared to better advantage on the basis of floor area with or without platforms. A comparison on the basis of cubical contents was also suggested. Mr. Phillips proposed that the committee discuss at the next meeting the most desirable unit basis for comparison. Mr. Ayres suggested that Mr. Phillips draw up a report embodying the merits and demerits of the different methods of comparison so that the committee could make a final report merely by eliminating or modifying certain portions. The Monday session was then closed.

#### CAR HEATING AND VENTILATION

The Tuesday morning session was opened by Mr. Thorn, who presented a report on car heating and ventilation. He said that he had drawn up a rough draft covering the different methods of heating except by the old-fashioned coal stove and had laid down the cardinal points which should be considered in each. His final report would discuss the general ability of the heater to heat the car, the cost of operation and maintenance, the weight of the apparatus, the space occupied, the attention required, the effect on insurance rates, the relation of the heater

to cleanliness and its freedom from noxious gases and ventilation. He was planning to consider the application of a hot-air, hot-water and an electric heater system to typical single-truck and double-truck cars, assuming certain conditions of temperature, power cost, fuel cost, operating conditions, etc.

Referring to the fire risk, Mr. Thorn said that three years ago, when he made a report to the Board of Supervising Engineers Chicago Traction on car heating systems, the Chicago Board of Fire Underwriters had notified him that it would be necessary to charge an extra premium of 10 cents to 25 cents per \$100 insurance according to whether cars with hot-water heaters were stored in fireproof or non-fireproof buildings. Furthermore, the rate on the cars themselves would be increased 17½ cents per \$100 insurance if hot-water heaters were installed. The difference in cost between electric and hot-water heating under these conditions was so small that the former was adopted.

Mr. Thorn said that he had figured out the average energy consumption for the car heaters in Chicago, based on daily temperature reports from the United States government. He had found that the number of cold days during the winter is actually much less than is usually assumed. The cost of heating a car per day per annum, including the cost of hauling the equipment around, but not allowing for differences in insurance rate, was 30 cents for hot water and 30.4 cents for electricity.

It appeared from the general discussion that many railways have their maximum loads in the summer, so that it would be unfair to charge against electric heaters any other items than extra coal cost and attendance. Mr. Thorn pointed out that hot-water heaters do not always receive as much attention as they should, so that a low coal consumption is shown, whereas the tendency with electric heaters is to keep them at the highest notch a greater part of the time. Storm sash, he thought, could be used to advantage in any climate where the temperature dropped to zero. He found in one case that of two cars otherwise alike the one with storm sash had a temperature 9 deg. higher than the other.

Mr. Thorn pointed out that ventilation was an important function to consider in connection with car heating. He described the methods used in Chicago to determine whether the companies comply with the ordinance that 350 cu. ft. of air must be brought into the car per hour per passenger based on maximum standing and seating capacity. The rules of the Board of Health also state that no more than ten parts of carbon dioxide shall be permitted in 10,000 parts of air. He described the various systems of car ventilation now being tried in Chicago and mentioned that one of them was of the natural-draft type. The air inlets are located near the car floor. His observations at Chicago had convinced him that good heating and good ventilation were possible at the same time.

Mr. Phillips stated that the forced-draft heating and ventilating system used in the Pittsburgh steel cars was perfectly satisfactory. The motor is ⅓ hp and delivers 275 cu. ft. of air per minute. He thought that the forced-draft heaters gave more heat for a given amount of coal than the hot-water heaters. The Chicago method of drawing the air over the electric car heaters was an excellent one.

Mr. Davis calculated that 1 kw-minute would raise the temperature of 1800 cu. ft. of air 1 deg. Cent.

In concluding the discussion of car heating, Mr. Thorn mentioned that the Chicago cars average thirteen hours a day; usually eighteen hours are consumed in calculating the heater requirements for a day.

#### DESIGN OF TRUCKS WITH REFERENCE TO LIGHT WEIGHT

The subject of design of trucks with reference to light weight had been assigned to a sub-committee consisting of Messrs. Phillips, Clark and H. A. Benedict, mechanical engineer Public Service Railway, Newark, N. J. Mr. Benedict, chairman of this sub-committee, was absent, but wrote that he expected to have his report ready by June 1.

Mr. Phillips described the trucks used on the steel motor and trail cars in Pittsburgh and discussed the merits of pressed

steel construction for the framing. Mr. Thorne said that the tendency of the truck builders was to get away from the extra heavy designs which they had formerly considered necessary for electric railway conditions.

Mr. Davis referred to the use of light plate frames on European locomotives. The greater elasticity of this design permitted the stresses to be distributed instead of being concentrated at some one point to cause breakage. He thought that every joint in a truck ought either to be welded or riveted. Mr. Thorne believed that the day would come when a motor truck would not weigh more than 30 per cent of the maximum load on the center plate.

Mr. Davis pointed out that if inside-hung motors were used the trucks could be lighter and would have less tendency to get out of square than where there is a distorting effect due to hanging the motors outside. Mr. Thorne stated that an estimate submitted by a truck builder showed a saving of 200 lb. per truck if the motors were inside-hung.

Mr. Davis also said that another disadvantage of short wheel-base trucks, say, 4 ft. 6 in. long, was their tendency to pitch and nose when traveling at, say, 30 m.p.h.

Mr. Phillips found that in starting a car considerable weight was transferred from the front to the rear axle. In one test the weight on the rear axle increased 4000 lb. on the first control point. The temperature of the motors also differed on account of draft conditions. He thought that more uniform loading was obtained when the motors were inside-hung.

#### MOTOR AND GEAR-CASE DESIGN

There was a general discussion on the use of welded sheet-steel gear cases. Mr. Phillips said that this type was doing well in Pittsburgh, where it had been in service for the past year. Mr. Davis said that if the sheet-steel acetylene-welded gear cases continued to give as good service as hitherto the Westinghouse company would apply them on a much wider scale.

Referring to the possibility of reducing motor weights, Mr. Davis said that the prime object in saving weight was to reduce power consumption. The Westinghouse company was working along the lines of making a given motor do more work, especially by determining the proper gear ratio for the service. A change of gear ratio on one of the Pittsburgh lines had brought about a power saving of 12 per cent without affecting the schedule. At the same time the temperature rise was decreased 20 deg. C. The Pittsburgh armatures were now wound with asbestos-covered wire to take care of trailer operation. These coils, however, required the most rigid inspection against bare spots. The Westinghouse company was now developing special compounds for what it termed heatproof and fireproof armatures. The company was also gradually adopting strap instead of round wire for armatures. In general its object was to make the armature just as durable for a rise of 100 deg. as the present armatures are for a rise of 65 deg.

Mr. Davis said that the Westinghouse company was also developing a system of field control for d.c. motors similar to that so successfully used on the Pennsylvania Terminal electric locomotives. It was experimenting with a slow-speed motor which would be very economical in power consumption for congested districts where most of the running time was spent. On reaching the outlying district the controller would be moved to one high-speed point which would cut out part of the field winding. The idea was to get at least 20 per cent difference in speed. On the experimental line a 40-hp slow-speed motor is doing exactly the same work as a 65-hp motor operated by ordinary control. The saving in power is about 12 per cent. The temperatures of the smaller motor are a little higher, but not dangerously so. The 40-hp motor weighs 2700 lb. and the 65-hp motor 3450 lb.

Mr. Davis thought aluminum coils were too bulky for the fields. The most efficient conductor should be used, for the less crowded the space in the motor the less the heating would be. The aluminum coil had worked out very well, however, for the shunt coils of generators and small stationary motors in wire sizes ranging from, say, No. 32 to No. 40. The most

economical railway motor winding from the space-saving standpoint was a scrap-wound field with asbestos insulation between the turns.

The meeting then adjourned for a trip to one of the Pittsburgh Railways Company's shops and the works of the Westinghouse Electric & Manufacturing Company.

## ATLANTIC CITY FOR THE 1911 CONVENTION

Secretary H. C. Donecker has just issued the following bulletin:

"TO THE MEMBERS OF THE

"AMERICAN ELECTRIC RAILWAY ASSOCIATION,  
 "AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION,  
 "AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION,  
 "AMERICAN ELECTRIC RAILWAY CLAIM AGENTS' ASSOCIATION,  
 "AMERICAN ELECTRIC RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION.

"ANNOUNCEMENT OF THE 1911 CONVENTION CITY.

"PLACE OF MEETING.

"The annual convention of your association will be held at Atlantic City, N. J., on Monday, Tuesday, Wednesday, Thursday and Friday, Oct. 9, 10, 11, 12 and 13, 1911. Information as to the specific days upon which the various associations will hold their meetings will be given in later bulletins.

"Our members are familiar with the advantages enjoyed by Atlantic City as a convention place, and it is unnecessary, therefore, to call attention to the facilities offered in the way of hotels, meeting halls and exhibit space. However, it does appear to be desirable that the membership, as a whole, be acquainted with the events which have led to the selection of Atlantic City again this year in order that all may realize the difficulties which confront a committee in the selection of a convention city having proper hotel accommodations for from 3000 to 4000 delegates and guests, and exhibit space approximating as nearly as possible 100,000 sq. ft., and that they may also know the care the officers of the association have endeavored to exercise so to locate our annual meetings in various sections of the country as more or less to equalize between members the expense, distance traveled and time spent in attending same.

"With this last thought particularly in mind the executive committee at the January meeting, after having considered invitations from Rochester, N. Y.; Atlantic City, N. J.; Richmond, Va.; Toronto, Ont.; Niagara Falls, N. Y., and Minneapolis, Minn., resolved that the 1911 convention should be held in some city in the Middle West, provided proper facilities could be obtained, and thereupon appointed a committee on convention location to investigate fully the whole subject. This committee visited Chicago, Minneapolis, St. Louis, Kansas City and Rochester, and obtained information concerning Indianapolis, Detroit, Cleveland, Richmond and Toronto. After thoroughly analyzing the data obtained it was found that the city of Chicago was the only one of those in the Middle West which at this time has available a combination of hotel, meeting hall and exhibit space facilities which could be made to answer the demands of an annual convention of this association, even though the exhibit space is only about one-half that offered at Atlantic City. The committee decided, therefore, to hold the 1911 convention in the city of Chicago.

"For the purpose of making definite arrangements the committee again met in Chicago on Saturday, April 22, when it was learned that the Coliseum Building, which it had been proposed to use for exhibit purposes, had been contracted for by other associations for practically the entire period between Sept. 12 and Dec. 1, there being but two or three open days available during all that time. It was discovered, also, that some of these contracts had been made as far back as August, 1910, though the committee had been assured on the occasion of its first visit to Chicago that the building could be utilized during any part of the month of October for our convention purposes. There being no other space obtainable and the com-

mittee recognizing that the manufacturers' exhibits form an important feature of our convention, it became apparent that this condition eliminated Chicago from further consideration for this year's meeting.

"Inasmuch as the facilities in the other cities, including those of the Middle West, are inadequate at this time, the choice of the committee was necessarily limited to the city of Rochester or Atlantic City, and, feeling that the membership would be better satisfied to go to that city which could provide the best combination of facilities, the committee selected Atlantic City for your convention place. The committee also recommended that negotiations be immediately entered into looking toward an option on the Coliseum Building in Chicago for October of next year, in order that nothing might arise to prevent a Middle West convention in 1912.

"ADDITIONAL INFORMATION.

"Subsequent bulletins will deal with the matter of hotels, railroad facilities, convention halls, manufacturers' exhibits, programs and other features of our annual convention.

"Considering the total membership, the growing interest, the increased committee work and the well-defined subjects which have been laid out for discussion, our thirtieth convention should exceed in practical results the excellent ones held in previous years.

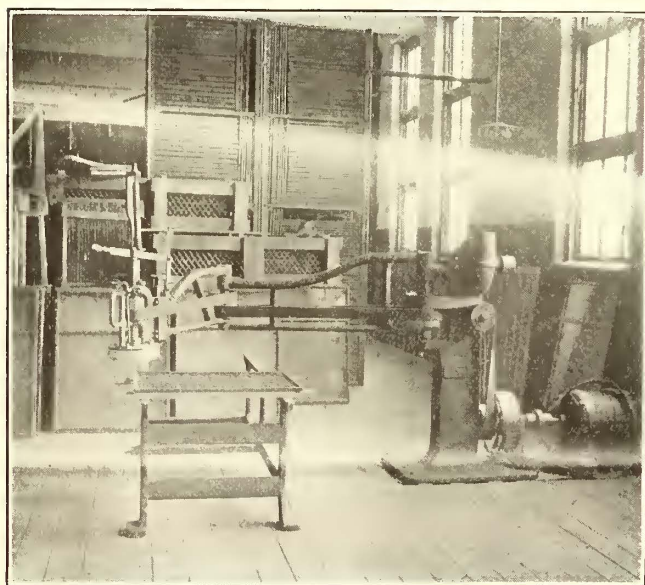
"Respectfully submitted.

"May 4, 1911.

"H. C. DONECKER, Secretary."

### MOTOR-DRIVEN MACHINE FOR CLEANING SCREENS

An accompanying illustration shows a motor-driven Fay & Egan door sander, which has been installed in the sash and screen section of the new shops of the Chicago Railways Company for cleaning screens. Each spring about 26,000 storm sash have to be removed from the cars and be replaced with screens. The screens are cleaned and painted before they are sent out to the carhouses for installation. This process is facilitated



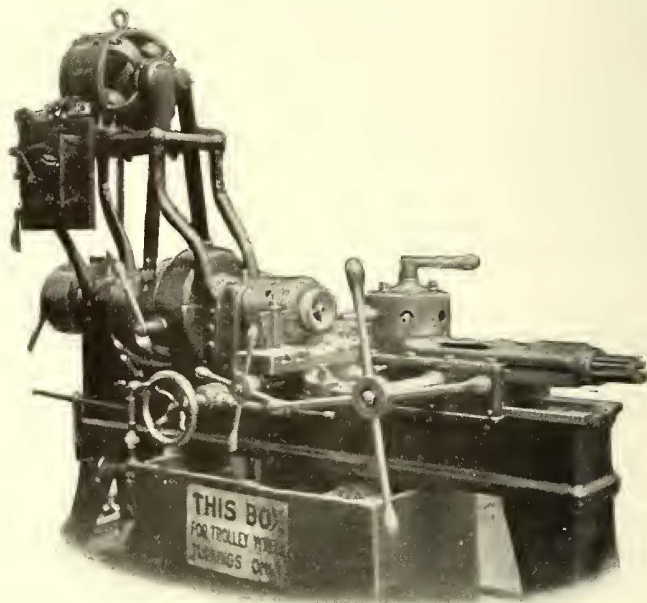
Motor-Driven Machine for Cleaning Screens

greatly by the use of a scrubbing brush which is attached to the revolving head of the motor-driven sander and is rapidly passed over the screen to clean the paint. This machine is driven by a 3½-hp motor.

The Louisville (Ky.) Railway has put in service a 2-ton truck to be used in repair work to take the place of the wagons drawn by mules. The truck was purchased second-hand and the commercial body which surmounted it was replaced by a tower built by the company.

### RAPID FINISHING OF TROLLEY WHEELS

The Chicago Railways Company casts its own trolley wheels. These are made largely from scrap. Six wheels are cast in each block and after cooling they are taken to a band saw in the electrical shop and separated from the gates. Each wheel has a square extension about ½ in. long cast on the end of one hub. This square hub fits the grips of the air chuck on the turret lathe which is used for finishing the trolley wheels.



Turret Lathe with Air Chuck for Finishing Trolley Wheels

This lathe has an all-day capacity of about twenty wheels per hour. The lathe, which is of Warner & Swazey manufacture, is driven by a 3-hp motor installed by the shop forces. The air chuck, which makes possible the rapid finishing of trolley wheels without stopping the lathe during the finishing process or when a fresh casting is to be inserted, was designed and manufactured by the machine-shop force.

The process of finishing a trolley-wheel casting on this turret lathe is as follows: The air chuck is opened by turning its control valve. The square extension on the hub of a cast wheel is inserted while the lathe is running and the chuck is closed again by throwing the air valve. Then the cored opening through the trolley-wheel hub is bored out and the hub also is faced with one of the tools held in the lathe turret. Next a mandrel held in the turret is moved into the hole just bored in the wheel hub. This gives a firm support for the wheel while the groove is being finished. When the mandrel is in place a groove-forming tool which is mounted in the back tool post is drawn forward until the groove is completely finished. The mandrel is then withdrawn. Next a reaming tool is put through the hub. Then the finished wheel is cut off and the hub is faced by a cut-off tool mounted in the front tool post. The finished wheel and all of the turnings fall into a box beneath the lathe. This box is mounted on wheels and can easily be drawn away for sorting and emptying its contents.

### ADDITIONAL SIGNALS FOR ILLINOIS TRACTION SYSTEM

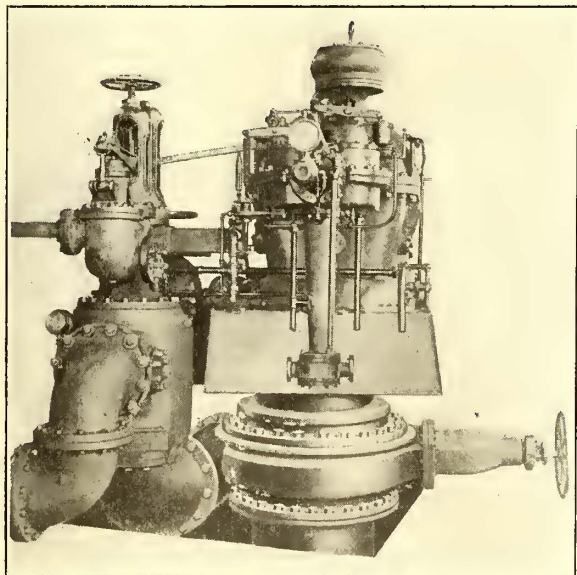
The Illinois Traction System has ordered from the Union Switch & Signal Company thirty-seven Style B electric signal mechanisms and all the necessary supplementary apparatus of the same type as it is now installing. Twelve of these signals will be put in for the protection of curves between Princeton and Ottawa on the Chicago, Ottawa & Peoria Railway and the remaining twenty-five will be used for continuous protection on the line between Edwardsville and Granite City, where the traffic entering and leaving St. Louis is very heavy.

## PAPER ON LOW-PRESSURE TURBINES

A paper on "Various Phases of Low-Pressure Turbine Work" was delivered on March 11 before the Providence (R. I.) Association of Mechanical Engineers by E. D. Dreyfus, commercial engineer with the Westinghouse Machine Company. Mr. Dreyfus first discussed combined engine-turbine units where the low-pressure turbine and engine form either a compound or triple expansion unit with all governing cared for by one regulator on the engine. In this connection he described the most desirable engine modifications, such as valve setting, for securing the best results from combination equipments. In those plants where the addition of the low-pressure turbine doubles the possible output of the original equipment and the actual load is correspondingly increased it is desirable to have some factor of safety. This is ideally secured by the use of an auxiliary live-steam admission valve.

The speaker pointed out that the a.c. low-pressure turbine with condenser by-pass operation might prove profitable in existing direct-current railway plants where extension becomes necessary for outlying rotary converter substations. The service in the bordering and sparsely settled territory naturally is infrequent in comparison with important parts of the city. Consequently, the a.c. low-pressure turbine units operate on a comparatively variable load and the by-pass system will thus effect the most economical station results. This is analogous to the conditions surrounding the installation of two 600-kw low-pressure turbines at the Havana Railway's plant. The arrangement of the by-pass valve as connected to one of these turbines is shown in an accompanying shop view. The steam connections have not been completed, and part of the turbine auxiliaries, such as the pump and cooler, have been removed to simplify the illustration. The angle at which this view was taken does not clearly show that the governor valve by-pass connects with the turbine exhaust pipe.

It is not necessary in low-pressure turbines with by-pass governors that the turbine should be large enough to utilize all the exhaust of the engine at, say, atmospheric pressure. The most desirable intermediate pressure and the percentage



By-Pass Valve on Low-Pressure Turbine

of exhaust to pass through the turbine is elective to a great degree. Mr. Dreyfus also considered the application of the low-pressure turbine to intermittently operated and reversing engines: to installations where there is a periodic cessation of the exhaust steam supply; to plants which can utilize waste heat from gas engines, etc. In conclusion, he quoted some economy records and compared the efficiency range of the engine versus the turbine. Some sixty plants, eleven of them electric railways, are now using one make of low-pressure turbine.

## 10,000-KVA WATER-COOLED TRANSFORMERS

The Pennsylvania Water & Power Company generates power from the Susquehanna River at McCall's Ferry, where it will have an ultimate capacity estimated at 100,000 kw. At present the power generated is transmitted 40 miles to Baltimore. Transmission lines to other large cities are also contemplated.



10,000-kva Transformer Installed in a Baltimore Substation for Power from McCall's Ferry

The Baltimore substation is now equipped for 40,000 kva, but space is provided for additional transforming and switching apparatus. The present equipment consists of four 10,000-kva, three-phase Westinghouse transformers, which are of particular interest because they are the largest transformers ever built. They are of the water-cooled type and are used to step down the 25-cycle current from 70,000 volts to 13,200 volts. The transformer tank is elliptical, having an over-all length of 15 ft. 11 in. and an over-all width of 8 ft. 8 in. The height to the top of the terminal is over 16 ft. and the joint between the case and cover is 11½ ft. from the floor. The total weight of each transformer complete with oil is about 145,000 lb., or nearly 75 tons.

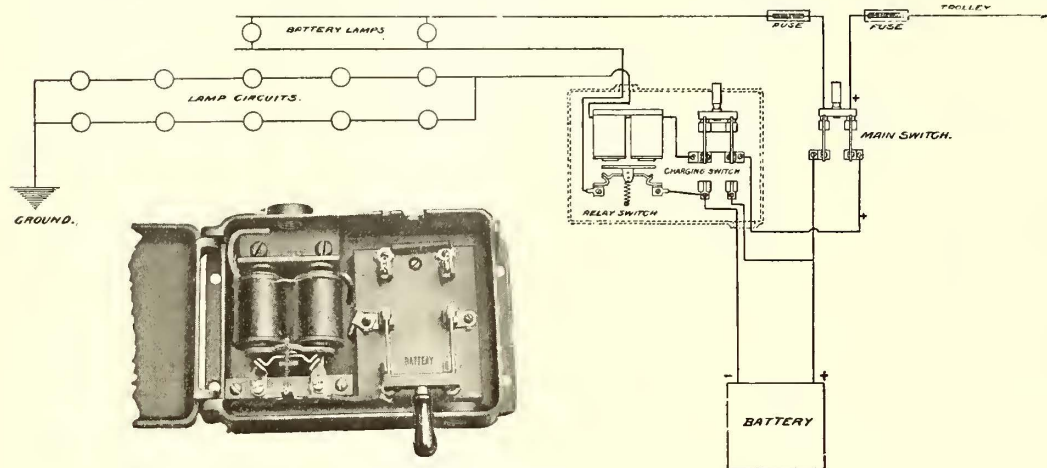
The transformers are of the core type, water-cooled. The cooling water is visible at its exit, so that any stoppage or inequality of flow in the parallel cooling coils can be detected easily. The tanks are of boiler iron with welded seams and crowned cover and bottom. The Westinghouse condenser type of terminal bushing is used, as the specifications called for bushings to withstand a test of 180,000 volts each for one minute. These bushings are made up of alternate layers of insulating and conducting material, which, by producing a uniform distribution of dielectric stress in the insulation, enable the use of a much smaller bushing.

On account of railroad clearances and the great weight of each unit, the core and coils, the tank, cover, base and details and the oil were received from the factory separately. At the Baltimore substation a railroad siding runs directly into the station. Paralleling the siding in the station are the transformer compartments, built of concrete. On receipt of the transformers in the substation it was necessary to assemble them, one at a time, on a truck running on a track having the same center line as the siding but of wider gage. After each transformer was assembled the truck was pushed along its track to the proper compartment and the transformer rolled in on its own wheels. The oil, received in tank cars, was pumped into the tanks after the transformers had been thoroughly dried out. Underneath each transformer is a pit con-

nected with a 10-in. main for draining the tanks in case of emergency. The top of each transformer is connected through a back pressure valve to an 8-in. main to relieve any possible rise of pressure in a tank. The arrangement is such that oil blown out of one transformer cannot enter another. The cooling system is arranged to preclude a shutdown from lack of cooling water.

### AUTOMATIC SWITCH FOR EMERGENCY CAR LIGHTING

The Consolidated Car-Heating Company has recently put on the market a switch for automatically charging the auxiliary car-light batteries from the live trolley and for automatically cutting in a group of lamps for lighting the car in emergencies when current has been cut off from the trolley. The device is mounted in an iron box and cover and is provided with outlets for conduit, when the connecting wires are carried in conduits.



Emergency Car Lighting Circuit and Switch

By referring to the diagram of wiring for this switch, it will be seen that the current comes from the live trolley to the main switch and then to the charging switch. Flowing through the magnet coils, it attracts the relay plate away from the contacts and goes to the trolley lamps and then to the ground. In this position it will be noted that the storage bat-

how the relay switch automatically throws the storage battery lights into circuit when current is no longer on the trolley. Under these circumstances, there is no flow of current through the magnet coils and the relay plate falls down upon the contacts. The circuit is now as follows: Current flows from the positive terminal of the batteries to the main switch; then through the fuse to the battery lamps, to the relay plate to the negative terminal of the batteries. The system has been installed on the subway cars in New York. The lamps on the battery circuit are 8-volt, 15-watt, 12-cp tungsten lamps and four are used per car.

### CAR WATT-HOUR METERS WITH MERCURY FLOTATION

An account was published in the issue of this paper for Feb. 25 of the Sangamo car watt-hour meter, in which the rotating element is floated on mercury. The growing use of car meters will make a short description of this feature of the Sangamo car meter of interest.

In the meter the armature floats in the mercury, a small solid non-metallic float being riveted to the center of the copper disk so as to give the necessary lifting effect for the entire moving system, including the immersed armature, the aluminum damping disk and the shaft above, as shown in Fig. 1. By properly proportioning the amount of buoyancy a very light pressure,

about 3 grams, or 1/10 oz., is exerted on the jewel bearing at the top, thereby rendering the meters proof against the transmission of shock to the moving system or jewel bearing.

The variation in the amount of effective pressure upon the jewel between a temperature of 110 deg. above zero and 10 deg. below zero Fahrenheit, due to change of density of the mercury,

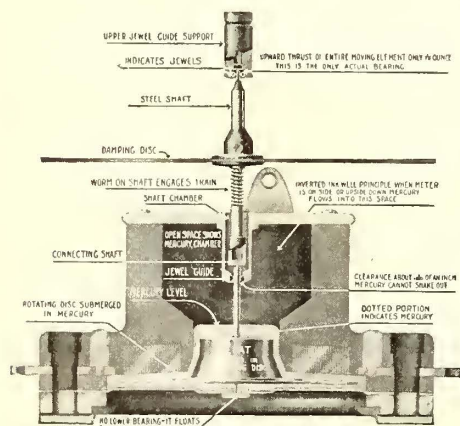


Fig. 1—Mercury Motor Element

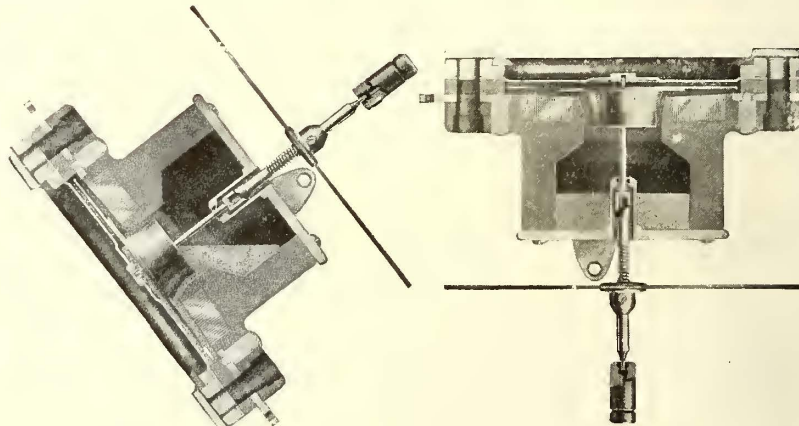


Fig. 2—Mercury Motor Element Half Inverted and Inverted

teries are not in circuit. By throwing the battery switch to the lower position, as shown in the interior view, current comes from the trolley through the main switch to the storage batteries, then flows through the magnet coils to the trolley lamps and ground. This gives a 1-amp flow through the batteries. As the battery is designed for 8 volts, it can be connected in series with the car lamp circuit in this way without dimming the lamps materially. When the battery has been sufficiently charged the charging switch is of course thrown back to the upper position.

By referring to the wiring diagram again, it will be seen

is not sufficient to show any appreciable difference in the buoyancy. The large ring jewel surrounding the inner spindle where it passes through from the mercury chamber and the small ring jewel at the top of the outer spindle, guiding it where it presses upward against the flat end jewel at the top, have so little friction upon them that the wear is inappreciable and it is said that breakage of these jewels is unknown.

The mercury chamber element is designed somewhat like an invertible inkwell, so that it is impossible to spill mercury, no matter in what position the meter may be turned or placed in shipment, or at the time of installation.

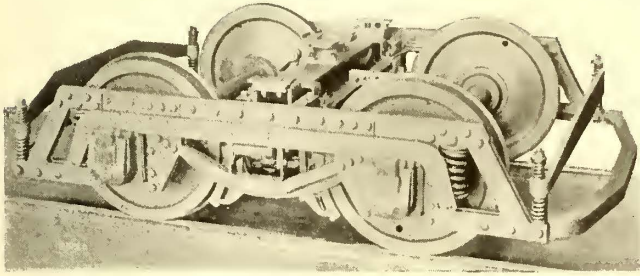


The shaft of the meter is made in two parts. The lower one, which carries the armature, passes up through the sapphire guide ring in the long shell projecting down from the cover of the mercury chamber, while the upper and larger shaft, which carries the damping disk and the worm for driving the recording train, is keyed freely to the lower shaft and is thus properly driven from the armature. The ring jewel guide is very accurately gaged to give a clearance of about 0.001 in. to 0.002 in. on the armature shaft.

The manufacturers claim that the non-spillable feature of the mercury flotation meter, coupled with its ruggedness, renders it especially desirable for use in car service where a meter is inevitably subject to excessive shocks and jars when running over bad joints and special work.

### MOTOR TRUCKS FOR WINNIPEG

The Winnipeg (Man.) Electric Railway has recently received from the Baldwin Locomotive Works sixty-four trucks for city service which are of exceptionally light weight. These trucks are designated by the builders as Class 54-18-E and are of the



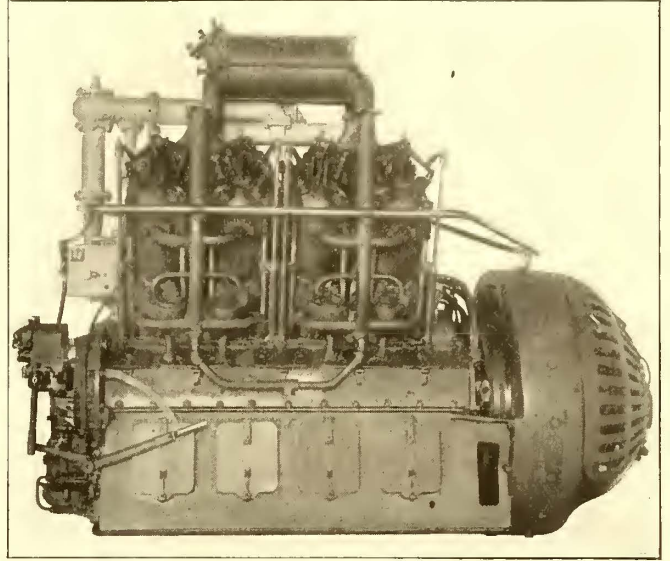
Truck for Winnipeg Electric Railway

pedestal type with double equalizing beams on each side. The equalizers support the side frames through coiled springs, each of which is placed  $9\frac{1}{2}$  in. outside of the center of the adjacent journal, so that while the wheel base is only 54 in. the spring base is 73 in. The side frames are forged of wrought iron and are 4 in. deep by  $1\frac{1}{2}$  in. thick. The pedestals are formed of

### GAS-ELECTRIC CAR FOR B., R. & P. RAILWAY

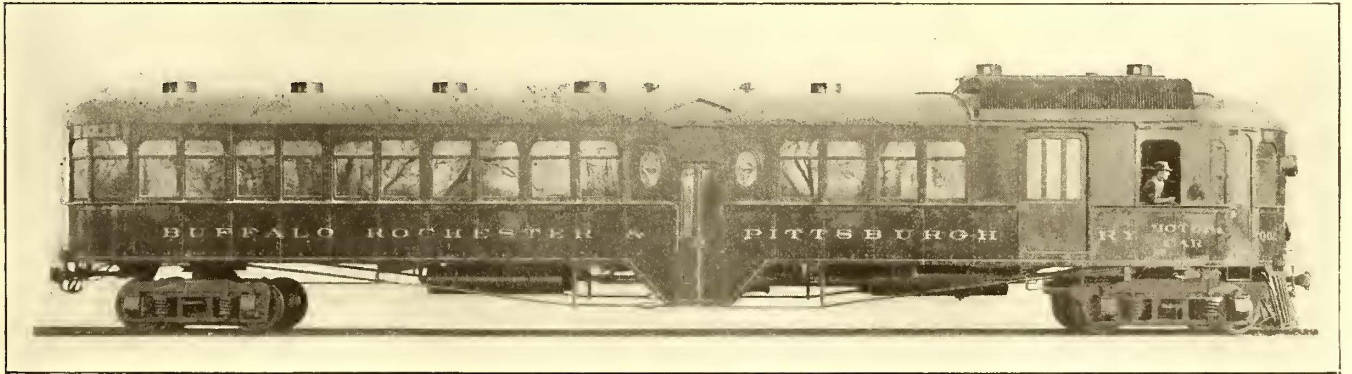
The General Electric Company has just delivered a gas-electric car to the Buffalo, Rochester & Pittsburg Railway. On April 18 the car proceeded to its destination over the lines of the New York Central Railroad & Hudson River Railroad, carrying a party of prominent railroad men. The car is 66 ft. long, 14 ft. 1 in. high and has a seating capacity of 49 in the passenger compartment and 20 in the smoking compartment, with two passengers per seat.

This car derives its power from a gasoline engine and



Gas-Electric Engine and Generator

transmits it to the wheels by means of an electric drive, thus avoiding any direct mechanical gearing or connection between the engine and the wheels. The engine is direct-coupled to an electric generator, forming a compact power plant located in the engine compartment. The electric power thus generated is applied to standard railway motors which are mounted upon



Side View of Gas-Electric Car

steel plates and are rigidly bolted to the side frames. They have malleable iron wear plates and binders. Steel angles are used for transoms and the bolster is cast steel. It is carried on full elliptic springs supported from the transoms with swing links. The brakes are inside-hung and are applied through a live lever located on the center line of the truck. Following the usual practice of the builders all bolts are tapered and driven in reamed holes and all metal surfaces in contact are accurately machined.

The weight of the truck complete without motors is 6950 lb. It is designed for mounting two G.E.-80-A motors outside hung and the maximum service speed is 25 m.p.h. The wheels and axles were manufactured and assembled by the Standard Steel Works Company.

the axles. The car is operated by means of a suitable controller like ordinary electric trolley cars. A 100 gal. storage tank supplies sufficient gasoline to carry the car over 200 miles. The car is provided with automatic and straight air brake equipments and auxiliary hand brake for use in case of emergencies. It is also equipped with standard automatic air signals.

All members of the party were greatly pleased with the performance of the car, which made the trip of 244 miles from Schenectady to Rochester via the Auburn division on time at every point and without delay of any kind. The smoothness of operation and ease of control were subjects of most favorable comment. The speed attained on the heavy grades of the Auburn road was highly satisfactory.

## ELECTRIC RAILWAY LEGAL DECISIONS

### CHARTERS, ORDINANCES AND FRANCHISES

#### Kentucky.—Taxation—Foreign Holding Companies—Money Paid for Stock Therein.

A Kentucky railway company desiring to raise money to better its lines and equipment by means of an additional issue of stock, a foreign company was organized to hold the same, and it exchanged its own stock therefor and for money paid to it by holders of the common stock, to be turned over to the railway company to make the necessary betterments. Held, that the money thus paid to the railway company was in no sense a debt from it to the holding company, and so subject as such to assessment to the holding company, but was taxable to the railway company as money or betterments in the hands of its owner. (*Commonwealth v. Louisville Traction Co.*, 125 S. W., Rep., 711.)

#### Michigan.—Ordinance as to Fares—Extension of Corporate Limits—Effect.

An ordinance accepted by a street railway company providing that at certain hours during the day the company should charge certain fares over its lines within the city must be construed strictly against the company and therefore has equal effect in territory subsequently annexed to the city. (*People v. Detroit United Ry.*, 127 N. W. Rep., 748.)

#### New York.—Taxation—Statutory Provisions.

General Street Railroad Act, Sec. 8, as originally passed (Laws 1884, Ch. 252), provided that no percentage of gross earnings need be paid by a railroad in a municipality of less than 250,000 inhabitants, except when required by the local authorities as a condition to its construction, operation or extension, but that in a city of 250,000 inhabitants or over such a payment must be made whenever a line was constructed or extended after passage of the act. Held that where by annexation a city whose population is less than 250,000 becomes part of a city having a greater population a street railway therein becomes liable to pay a percentage of its gross receipts to the city. (*City of New York v. Pelham Park R. Co.*, 124 N. S. Sup., 958.)

#### New York.—Mortgages—Construction—Property Included—After-Acquired Property Clause.

A clause in a mortgage given by a street railroad company operating an extensive system acquired largely by leases from various other companies by which the mortgage is made to include all the railroads, contracts and leaseholds then owned by the mortgagor is sufficiently broad to cover an indebtedness due from a constituent company, or lessor, to the mortgagor arising under the terms of the lease for betterments made by the mortgagor on the leased property.

The after-acquired property clause of a street railroad mortgage construed with respect to the property subsequently coming within the mortgage thereunder. (*Farmers' Loan & Trust Co. v. Metropolitan St. Ry. Co. et al.*, 181 Fed. Rep., 575.)

#### New York.—Power of Revocation.

The franchise to operate a street railroad springs from the State and not from the city where its lines lie, though it is essential that the consent of the municipal authorities should be secured, and hence the right to revoke the franchise rests in the State, and the municipality cannot move to compel a removal of such a company's tracks on the ground that they constitute a nuisance, not from operation in a manner not authorized by the grant, but for mere non-usage. (*City of New York v. Montague et al.*, 124 N. Y. Sup., 959.)

#### Pennsylvania.—Regulation—Rate of Fare—Strip Ticket.

Where a street railway company contracted with a city that the existing rates of fare might be changed from time to time, but only with the consent of both parties to the contract, and at the date of the contract the company charged 5 cents for a continuous ride and sold tickets in strips at the rate of six for 25 cents and gave free transfers at certain intersections on either cash fares or tickets, the company does not violate the contract by discontinuing the sale of strip tickets without the city's consent.

"Rate of fare" ordinarily signifies the unit or basic price on which the total charge is based, and in the carrying of passengers by street railway companies the rate is fixed at a

certain price per ride, without reference to the distance traveled, and this price for a single ride is the rate of fare, as the term is ordinarily used, so that the total charge of 25 cents for six rides is not a rate of fare as used in the contract relating thereto. (*City of Philadelphia v. Philadelphia Rapid Transit Co.*, 77 Atl. Rep., 501.)

### LIABILITY FOR NEGLIGENCE

#### Georgia.—Injury to Passenger—Pleading—Proximate Cause.

The petition alleged that the plaintiff, who was an old lady unacquainted with the streets or their condition in the City of Rome, where the defendant operates a line of street cars, took passage on one of the cars and made a contract with the conductor in consideration of the fare of 5 cents to convey her as a passenger from that point to Cherokee Street in South Rome, that the conductor failed to comply with his contract and did not carry her to Cherokee Street but put her off the car at East Third Street and gave her a transfer by which she was compelled to walk a quarter of a mile to another car, "that in going to said car petitioner fell, dislocated her hip and broke her hip," that if she had known that she could not have been carried to South Rome without having to walk this distance she, on account of her age, infirmity and defective eyesight, would have employed a hack or other means and would not have attempted to get on the car. No direct connection between the defendant and the fall is alleged. The plaintiff sues for the personal injury received through the fall. Held, that the defendant's wrong, if any, was not the proximate cause of the injury, that the petition does not state a cause of action and that it was properly dismissed on demurrer. (*Burnett v. Rome Ry. & Light Co.*, 66 S. E. Rep., 803.)

#### Illinois.—Injury to Passenger—Contributory Negligence—Standing on Footboard.

Where a street car is crowded and there are no vacant seats, standing on the footboard is not of itself negligence on the part of a passenger.

A street railroad accepting one as a passenger on the footboard of the car is bound to exercise toward him the high degree of care required of carriers of passengers. (*Math v. Chicago City Ry. Co.*, 90 N. E. Rep., 235.)

#### Indiana.—Master and Servant—Injuries to Servant—Latent Defects.

In an action for injuries to an employee of a trolley company engaged in braking a spool of wire held by a jack on a car by the jack falling on him, it was proper for the court to charge that if all spools of wire theretofore used by the foreman were free from staples attaching the wire to the spools, except those on the outside, and that down in the wire on this spool, concealed from view so that it could not be detected, the wire was fastened to the spool by a staple, which fact neither plaintiff nor defendant knew, and that this fastening was the proximate cause of the plaintiff's injury, he could not recover, where defendant was not negligent in connection with the preparation of the roll of wire on the spool. (*Dunlap v. Indiana Union Traction Co.*, No. 6879, 90 N. E. Rep., 904.)

#### Iowa.—Injuries to Travelers—Contributory Negligence.

Plaintiff, a farmer whose eyesight and hearing were both defective, started to drive his team across a street railroad track in the middle of a block when he was struck and injured by a car approaching from the rear. He had traveled on such street from 900 to 1000 ft. without looking or listening for a car approaching from the rear, and his only excuse for not doing so was that he thought there was but one car on the line and he saw this approaching from the opposite direction. It was not unusual, however, for defendant to operate two cars on the line, especially on Sundays and circus days, as was the day of the accident, and at the time plaintiff was struck the car which he saw approaching was about to take a switch directly in front of plaintiff, in order that the other car might pass. Held, that plaintiff was negligent as a matter of law. (*McCormick v. Ottumwa Ry. & Light Co.*, 124 N. W. Rep., 889.)

#### Massachusetts.—Regulation and Operation—Injuries—Contributory Negligence

A person driving a carriage across a street railway track, after the passage of a car going in one direction, has the

right to rely somewhat on the fact that he heard no gong from the car going in the opposite direction, where one of the rules required a gong to be sounded when passing another car, and to expect that cars will not be driven at so dangerously high a rate of speed without the usual warning signals as to involve danger of a collision. (*Murphy v. Boston Elevated Ry. Co.*; *Sortwell v. same*; 90 N. E. Rep., 398.)

**Massachusetts.**—Negligence of Passengers—Standing on Running Board.

Where a person riding on the running board of a street car was recognized as a passenger by collection of his fare, he was not, because of his position, as a matter of law, negligent if subsequently injured through the carrier's carelessness.

A passenger so situated has the right to assume that during transit the carrier will not expose him to the peril of injury from passing vehicles, if by the exercise of reasonable diligence the movements of the car can be so controlled as to avoid collision with them. (*Eldredge v. Boston Elevated Ry. Co.*, 89 N. E. Rep., 1041.)

**Michigan.**—Street Railroads—Collisions—Contributory Negligence.

That a driver of fire apparatus was familiar with the ordinance requiring street cars approaching an intersecting street occupied by tracks to come to a stop at least 20 ft. from the tracks, and knew of the custom of bringing the cars to a stop, and that he relied on the performance of such duty in approaching a crossing, were material as bearing on contributory negligence in driving in front of a car approaching a crossing.

Where the driver of fire apparatus of a city saw a car approach from 40 to 70 ft. away from the usual stopping place of cars, before proceeding to cross a street on which tracks were operated, the court could not say as a matter of law that he was not justified in attempting to cross in front of the car where his horses were under control, and in reliance on the motorman stopping his car as required by a city ordinance, but the question was for the jury. (*Theisen v. Detroit United Ry.*, 127 N. W. Rep., 708.)

**Missouri.**—Street Railroads—Operation—Contributory Negligence—Driver of Vehicles—Injuries—Proximate Cause.

If the driver knows that a horse is likely to become frightened at street cars, he drives on a street having a car line thereon at his own risk.

That plaintiff's horse was scary would not prevent him from recovering for injuries caused by its becoming frightened at a street car and running over a dirt pile in the street, if the negligence of defendant city and the street car company proximately caused the injury.

Cities must keep their streets in a reasonably safe condition for use by the traveling public, and are liable for injuries resulting from their failure to do so to travelers thereon who are themselves exercising due care. (*Turner v. Southwest Missouri R. Co. et al.*, 120 S. W. Rep., 128.)

**New Jersey.**—Children—Contributory Negligence.

Whether a schoolboy, six years and ten months old, is chargeable with contributory negligence is to be determined by the standard of care applicable to a boy of his age, considering his surroundings at the time of the accident. (*Ritscher v. Orange & P. V. Ry. Co.*, 75 Atl. Rep., 209.)

**New Jersey.**—Injury to Vehicle on Track—Contributory Negligence.

Where plaintiff had been driving for some distance along the right side of a street so close to the car track that a car could not pass him, he was not, as a matter of law, guilty of contributory negligence by failing to keep a lookout for a car behind him nor in attempting to cross the track to the left, but such negligence is a question for the jury. (*Knoll v. New Jersey St. Ry. Co.*, 75 Atl. Rep., 450.)

**New Jersey.**—Infant—Contributory Negligence—Damages.

Where a child is under seven years of age there is a presumption that it is not guilty of contributory negligence, and in the absence of proof to the contrary the judge is justified in taking this question from the jury.

A verdict of \$8,000 for the loss of the leg of a girl six years of age not allowed to stand under the circumstances of this case. (*Baker v. Public Service Ry. Co.*, 75 Atl. Rep., 441.)

**Pennsylvania.**—Injuries to Passenger—Negligence.

Where a passenger in boarding a car is injured as a result of the starting of the car on a signal by an unauthorized passenger, the railway company is not liable for injuries sustained. (*Cohen et al. v. Philadelphia Rapid Transit Co.*, 77 Atl. Rep., 500.)

**Pennsylvania.**—Master and Servant—Injuries to Servant—Reputation in a Particular Calling.

Where a servant's injuries were alleged to have been caused by the master's negligence in employing or retaining an incompetent servant, the burden of proof thereof was on plaintiff.

Where it was claimed that a motorman was so incompetent that the street railway company was negligent in employing him, evidence that his reputation for competency as a motorman, among the conductors and motormen who daily congregated to the number of 30 or 40 in the car barn, was bad was admissible. (*Pittsburgh Rys. Co. v. Thomas*, 174 Fed. Rep., 591.)

**Texas.**—Personal Injuries—Amount of Damages.

Evidence in an action for personal injuries to a young, healthy and strong woman held, in view of the showing as to permanency thereof and probability of resulting paralysis, to sustain a recovery of \$15,000. (*San Antonio Traction Co. v. Probandt*, 125 S. W. Rep., 931.)

**Virginia.**—Principal and Agent—Misconduct of Agent.

A principal, though liable to make compensation for injuries done by his agent within the scope of his employment, is not liable for exemplary or punitive damages merely by reason of wanton, oppressive or malicious intent on the part of the agent, nor unless such misconduct has been so ratified as to make the principal particeps criminis in the agent's act. (*Norfolk & P. Traction Co. v. Miller*, 174 Fed. Rep., 607.)

## ASSAULTS—EJECTMENTS

**Alabama.**—Assault by Conductor—Liability.

Where a conductor attacked a passenger before he alighted from the car and continued the assault after the passenger had left the car, the carrier was liable not only for the initial assault but for the consequences following therefrom in natural sequence and as a part of one continuous transaction.

Where, in an action by a passenger for an assault by the conductor, the evidence showed that the assault followed a wrangle concerning the failure of the passenger and his companions to leave the car at their destination, it was proper to show the facts, whether their failure to leave the car was due to their carelessness or to the conductor's failure to announce the station, as shedding light on the contentions of the parties and mitigating the damages, though neither reason for failing to get off would be conclusive on the right to recover.

Where, in an action by a passenger for an assault by the conductor, the carrier sought to show that the assault was in necessary defense of the conductor's person, a charge that if the passenger first struck the conductor, and the conductor only struck the passenger to protect himself from assault, the jury should find for the carrier was proper. (*Alabama City, G. & A. Ry. Co. v. Sampley*, 53 So. Rep., 142-3.)

**New York.**—Passengers—Who Are—Transfer—Ejection of Passenger—Regulations—Time of Presenting.

If a transfer given to a street car passenger was valid, he was entitled to carriage on a car on the line to which he was transferred, and hence was a passenger thereon, though the conductor refused the transfer.

If a street car conductor was justified, under reasonable rules of the company, in refusing a transfer, the holder could not remain on the car after being requested to get off, so as to be entitled to recover for assault in putting him off, even if the original contract of carriage was valid.

Where a passenger waited only 10 or 15 minutes for a street car on a line to which he had a transfer, and no car passed which he could board until 10 minutes after the time limit of the transfer, the company not maintaining its regular schedule, the limitation in the transfer was illegal as to him, so that a rule of the company requiring the refusal of the transfer if the time limit had expired when the passenger boarded the car was unreasonable and illegal. (*Daniel v. Brooklyn Heights R. Co.*, 121 N. Y. Sup., 577.)

## LONDON LETTER

*(From Our Regular Correspondent)*

Most of the trackless trolley schemes which are before Parliament have passed the first and second reading. The two most important cities at present interested in trackless trolley schemes are Bradford and Leeds, and the executive council of the County Councils Association has determined to present evidence to the joint committee of the Lords and Commons. It is contended that it should be in the power of a road authority to refuse its consent to the introduction of trackless trolleys over its roads, except under certain conditions. Among the conditions which might properly be required by a road authority are the following: (1) That where such powers are granted the promoters should be obliged to contribute toward the cost of maintenance of the roads; (2) that the road authority should have power to control the weight of the cars; (3) that strict regulations should be laid down as to dimensions and material of tires; (4) that the traffic should be subject to general regulations made by the road authority. Sir George Gibb, president of the road board, has invited the Council to send delegates to the meeting at the Institute of Civil Engineers to arrange to hold the International Road Congress in 1913 in London.

It will be remembered that Messrs. Griffiths and Bedell were recently awarded a verdict of £12,000 against Sir John Benn for alleged libelous statements made in regard to the G. B. surface contact system. This decision has now been reversed in the Appeal Court before the Master of the Rolls and Lords-Justices Fletcher-Moulton and Buckley, who held that while Sir John had attacked the G. B. system he had not cast any reflection upon Messrs. Griffiths and Bedell personally.

The tramway committee of Belfast has had before it a project to grant halfpenny fares for women. Mr. Nance, the general manager of the tramways, pointed out to the committee that the tramway system had been successfully worked upon penny fares for all adult passengers and that every halfpenny passenger was carried at a loss. The committee has resolved not to accede to the application.

The Wolverhampton Corporation Tramways have been so successful during the year that an amount equivalent to 1½d. rate has been allocated by the committee to the borough funds, after placing the usual amount to the renewal and reserve fund. The Lorain surface contact system has been in service in Wolverhampton since 1902 and has proved very satisfactory.

The returns of the tramways of Great Britain are very much better this year than for the last few years, due undoubtedly to the improved condition of trade in Great Britain. The British Electric Traction Company, which controls systems in various parts of the country, shows increased receipts and increased profits on nearly all of the systems, the increase in traffic for the current year amounting to more than £20,000. The Metropolitan Electric Tramway, which operates in the north of London, shows an increase during the year of 14,000,000 passengers and £67,400 in gross revenue. The dividend on the ordinary shares has been increased from 5 per cent to 5½ per cent and larger sums have been placed to the reserve and renewals account.

For some time the ratepayers of Dover have engaged in a controversy as to whether or not electric trams should be operated in that town on Sundays, and it appeared at one time as if Dover would have no Sunday trams. The Corporation at first used a prepaid postcard to canvass the people, but this did not work satisfactorily and a proper ballot was arranged. By a majority of 1164 out of nearly 5000 votes the ratepayers have now decided that cars shall be operated on Sunday.

Philip Dawson read a paper recently before the Institution of Civil Engineers entitled "The Electrification of a Portion of the Suburban System of the London, Brighton & South Coast Railway." During the last year of steam traction the number of bookings at Peckham Rye Station was more than 500,000, whereas during twelve months following electrification the number of bookings was more than 1,000,000. The London, Brighton & South Coast Railway was the first English railway of any magnitude to adopt the single-phase system.

The report in regard to the electrification of the Brighton Railway's lines extending over some 480 miles has been denied by Mr. Forbes, the general manager of the company. The company is, however, encouraged by the success of the electrified portion and is equipping an additional 15 miles of railway with electricity, including the City and West End routes to the Crystal Palace. The electrification of the Croydon route and the conversion of other sections of suburban routes will follow. The contractors for the electric line and the engineers are prepared to electrify the main line from Croydon to Brighton, but this will not come before the directors for about a year. At present, however, there is no intention to proceed with any general scheme of electrification.

Lynden Macassey, arbitrator, has fixed the price to be paid for the Cavehill & Whitewell Tramway by the Belfast Corporation at more than £56,000, plus all the expenses incident to arbitration, which will probably amount to £10,000.

Sir George Goldie, the new chairman of the finance committee of the London County Council, pointed out recently that the receipts per car mile were decreasing and that during the last two years the working expenses per car mile had increased owing to larger payments for rates on the permanent way, with the result that the surplus on working per car mile, which had hitherto stood at a fraction over 5d., was now expected to be only 4½d. He concluded that while the general financial position of the tramways was sound it was essential to proceed with caution in considering proposals for unremunerative extensions or to add to the working expenses of the undertaking, or offer further facilities to the traveling public which would result in reducing the receipts. The estimated financial results of the tramways for the yearly account show an anticipated surplus on working amounting to £900,885 (viz., electric traction surplus, £915,690; less horse traction deficiency, £14,805). Of this sum debt and other charges absorb £713,041, leaving a balance of £187,844, of which £138,270 has to be carried to the renewals fund under resolution of the Council of June, 1908, and £49,574 is available for the general reserve fund.

The Underground Electric Railways, which owns various electric tubes in London, is again making an effort to procure a physical connection between the Charing Cross, Euston & Hampstead line (the terminus of which is in the station yard of the Southeastern Railway Company at Charing Cross), the Trafalgar Square Station of the Bakerloo line and the Charing Cross Station of the Metropolitan District Railway. Last year a bill before Parliament for a somewhat similar scheme was abandoned on account of the serious opposition. This time it is hoped that the opposition will be overcome. By making a loop in the vicinity of all three stations traffic could be worked much more satisfactorily. The same company is also promoting a bill to extend the Bakerloo Railway from Edgeware Road half a mile to the Paddington Station of the Great Western Railway.

A special meeting of the tramways committee of the Glasgow Corporation was held on April 13 to consider the conditions of service in the department. The motormen and conductors have petitioned for a forty-eight hours' week instead of a fifty-four hours' week, and fourteen days' holiday instead of five days, with pay. In reply to a question, a member of the deputation stated that the motormen and conductors had not threatened to strike. The committee deferred its decision.

The annual congress of the Tramways & Light Railways Association will be held at Edinburgh on July 13 and 14, 1911. In the course of the competition between the Royal Automobile Club and the Imperial Automobile Club of Germany for the cup given by Prince Henry of Prussia, the competitors will stop at Edinburgh for two nights. It is proposed to hold a joint dinner of the representatives of these two clubs and of the association on the second evening, Friday, July 14. The Hon. Arthur Stanley, M. P., will be in the chair, and it is hoped that among the guests will be H. R. H. Prince Henry of Prussia and H. S. H. the Duke of Teck (president of the Royal Automobile Club). Papers will be read and discussed during the mornings of July 13 and 14.

A. C. S.

# News of Electric Railways

## Subway Negotiations in New York

Additional concessions concerning the Brooklyn Rapid Transit Company's subway offer were made on May 1, 1911, by Col. Timothy S. Williams and a committee of the directors of the Brooklyn Rapid Transit Company at a conference with the Public Service Commission and the committee of the Board of Estimate, of which Borough President McAneny is chairman. The points conceded on May 1 by the conferees were:

First—That the company will operate as original lines, at any time the city wants to build them, the following:

Jerome Avenue extension of the Triborough in the Bronx to Jerome Park Reservoir.

Southern Boulevard extension of the Triborough to the Bronx River.

Astoria and Corona lines in Queens Borough.

Nostrand Avenue extension in Brooklyn from the main line under Eastern Parkway to Flatbush Avenue.

Livonia Avenue extension from Eastern Parkway to New Lots Avenue.

Fourteenth Street extension from Union Square under the East River, and through the Eastern District of Brooklyn to East New York.

Second—That if the city chooses to build the original extensions of the Fourth Avenue Subway from Fortieth Street, Bay Ridge, to Fort Hamilton and Coney Island, respectively, the Brooklyn Rapid Transit Company will agree that \$12,000,000, which it proposed to put into the Broadway, Manhattan, line, may be transferred to such part of the subway system as will not interfere with the future ability of the city to acquire without supplemental cost the main stem lines in Manhattan. The city's conferees, it is known, have made up their minds to build the original Coney Island and Fort Hamilton extensions of the Fourth Avenue, Brooklyn, subway so as to get the benefit of the Brooklyn Rapid Transit Company's offer to contribute \$12,000,000 to subway construction elsewhere in the system.

The offer on the original lines, which included the main stem of the triborough, the Fourth Avenue with Coney Island extensions in Brooklyn; the Flatbush Avenue, with its Brighton Beach extension and its Eastern Parkway extension; the Nassau Street and Broadway-Fifty-ninth Street loop lines in Manhattan; the Queens Borough loop line, from the Queensboro Bridge to Woodside and back to Broadway, Williamsburg, and the whole of the Brooklyn Union elevated system in Brooklyn, was as follows:

The entire receipts to be taken together, and the charges attributable to operation, including taxes, paid; the company then to retain an amount equal to the net earnings on its elevated lines owned in the Brooklyn Union Elevated system and turned over to the new consolidated system for the year previous to that in which operation was begun; the company next to receive interest and amortization on the new capital it supplied; the city next to receive interest and amortization on its capital investment, and the net receipts to be divided equally between the city and the company.

After the conference on May 1 it was pointed out that with the \$80,000,000 of subway building credit which the city will have available on July 1 it would be possible to start all the construction embraced in the Brooklyn Rapid Transit's scheme of "original lines" without any delay about the acquirement of further borrowing capacity.

Col. Williams made it plain that his company would not consent to a parceling out of the transit territory, as suggested by Mayor Gaynor. Col. Williams said:

"The Mayor is reported as saying that the Brooklyn Rapid Transit Company should have the Centre Street loop in any case." This is gracious, but I fear the Mayor has not been studying the transit question of late on his knees, as he is said to have done prior to a certain date. Now that Brooklyn passengers, under our offer, have the opportunity of being distributed over three-quarters of Manhattan, by through cars and with no additional fare, the Mayor could no more restrict them to the Centre Street loop, as a distribution line, than he could reconcile Brooklyn to the substitution of farthing candles in place of electric lights."

Samuel Rea, vice-president of the Pennsylvania Railroad, issued the following statement criticising the offer of the Brooklyn Rapid Transit Company:

"If what I have read contains the full proposition, then I can scarcely credit that it has been received with serious attention, or is worthy of it. I think it a specious proposition, absolutely selfish, and it makes Manhattan Borough and the Bronx a tail, or side issue.

"It specially ignores the lower west side of Manhattan, as well as the new civic development created by the Pennsylvania Railroad through its millions of expenditures in connecting Manhattan, Brooklyn and Queens by rail, not only with each other, but with the rest of the continent.

"If the city finally determines on a new system independent of its present subway, then why not adopt the plan recommended by the Chamber of Commerce for a Brooklyn, west side Manhattan and upper east side Lexington Avenue route, which would be unquestionably better for all interests than that now proposed, which takes the cream of Manhattan without properly serving it or the Bronx, and would require a double fare from the citizens in other boroughs who travel daily to and from these neglected sections?

"The Pennsylvania Railroad and the Long Island Railroad, which serve the boroughs of Manhattan, Brooklyn and Queens, and will eventually reach the Bronx, spent \$150,000,000, with the idea that the city would carry out promptly the construction of the necessary subways to accommodate the traffic to and from its station. It located its Seventh Avenue station advisedly.

"If the Brooklyn Rapid Transit Company's proposition is carried out, a through four-track west side subway for one fare, connecting Brooklyn, Manhattan and the Bronx, that would serve the new Pennsylvania center, must necessarily be postponed indefinitely."

Commenting on Mr. Rea's statement, Col. Williams had this to say:

"Evidently the humor of Mr. Rea's very serious interview is apparent to most people except to himself. He describes our proposal as 'absolutely selfish,' and then proceeds to denounce it because it, in his judgment, does not furnish sufficient access to the Pennsylvania Railroad Station. There may be another reason. Our plan calls for a 5-cent fare from the neighborhood of the Pennsylvania station to Jamaica, whereas the Pennsylvania Railroad Company charges 30 cents for this ride and even commuters have to pay 13 1-3 cents. Therefore, when we consider 'selfishness' we are quite ready to have our attitude compared with that of the Pennsylvania Railroad.

"Of course the public has already realized, even if Mr. Rea and his associates have not, that the location of the Pennsylvania Railroad Station is not along the heaviest currents of travel in Manhattan and never can be. It is desirable in the interests of people generally that adequate transportation to and from it should be furnished, but not at the sacrifice of the wants of forty or fifty times as many people, and we are willing to meet that demand if it can be done without injury to the great number of people we desire to serve.

"At present people in Brooklyn who want to go to the Pennsylvania Railroad Station without change of cars have to take a train from Flatbush station leaving every hour, going east as far as Woodhaven, then turning north and west to the Pennsylvania station in Manhattan, and the fare ranges from 10 to 35 cents, and the time consumed is thirty minutes. We propose to bring 1,000,000 people within one block of Mr. Rea's station by through cars in half the time and for one 5-cent fare."

Mr. Rea replied as follows:

"It is evident that the Brooklyn Rapid Transit Company, with which we have friendly relations, is not aware that the Pennsylvania Tunnel & Terminal Railroad is precluded by its franchise from engaging in local business, and further that the policy of the Pennsylvania Railroad and Long Island Railroad is not to compete with, and their expenditures were not made for the purpose of competing with, the rapid transit lines, but, among other features, to aid the latter lines in solving the transit problems of New York City. Our complaint, therefore, is not that rapid

transit facilities are to be furnished but because the present proposition does not furnish rapid transit to all parts of the city and in other respects is not fair to the city or the taxpayer.

"The Pennsylvania Railroad built its New York and Long Island tunnels without any help from the city, furnished all the capital required, and did not look for any guarantee thereon, but instead pays heavy franchise taxes and general city and State taxes. The company believes that the requirements of the city make it imperative for the Pennsylvania Railroad Station to have rapid transit distributing facilities to and from every borough of the city without omitting any section. If a broad proposition of that kind is offered it certainly would not be opposed by the Pennsylvania Railroad or the Long Island Railroad, or by the citizens using their lines."

#### Progress of Toledo Negotiations

Negotiations between the city of Toledo, Ohio, and the Toledo Railways & Light Company for a renewal of the grant were pursued uninterruptedly during the week which ended on April 29, 1911. The first examination of the Schreiber ordinance was completed on April 26, 1911, and the negotiators reached the point where appraisers are to be chosen to value the properties.

On April 25, 1911, the negotiators threshed out the question of selecting the third member of a board of arbitration in cases of labor troubles where the employees and the company fail to agree upon the third member. The company agreed that the city should select the third arbitrator. A. E. Lang, president of the company, objected to the clause which declares that the company shall, at the exclusive option of the Council, forfeit all rights, if it fails to abide by the decision of the arbitrators. He said the position of the company would be greatly weakened by so many forfeiture provisions. At the suggestion of Mayor Whitlock this point will be left until the general forfeiture provision is reached and all grounds of forfeiture will be included in one clause or section. The company is to pay the expenses of arbitrations.

On April 25, 1911, the negotiators settled the length of the workday for employes at 10 hours, or 70 hours per week, instead of 8 hours, as provided by the Schreiber draft. In discussing this matter, Mr. Lang urged that in shortening the workday the expense would be increased and that this might make impossible the rate of fare that the Mayor has in mind. Mayor Whitlock took the ground that the service demands men who are not worn out by long hours of work, and that the people must pay enough fare to insure satisfactory service. After discussing the arbitration of labor difficulties to some extent at this session, the Mayor agreed that the city and the company should be bound by the finding of the board, in order that there should be no further possibility of reopening the matter.

In talking over the provision under which the city is to be permitted to purchase the property when the State has conferred the right of municipal ownership. Mr. Lang suggested that intervals at which the city may avail itself of this privilege should be definitely stated, that the city should be bound by the award of a board of arbitration to take the property, and that the conditions of purchase should be such as to protect the capital invested.

The section giving the city the right to take charge of operation if the company fails to furnish the required service for one day was referred to the attorneys. Mayor Whitlock said he would favor the omission of this point, if, in redrafting the portion of the ordinance relating to arbitration, definite assurance was given that the operation of cars could not be tied up by a strike. This was the purpose of putting the provision in the ordinance.

Mr. Lang objected to the provision that the tracks should become the property of the city at the end of the grant or in case of forfeiture. He said that the company could not borrow money under the franchise unless investors were fully protected to the end of the period and that a sinking fund would be necessary to take care of the value of the tracks and other property at the end of the time, and that the rate of fare would have to be sufficient to cover the fund. It was finally agreed that the city

should designate a purchaser under the conditions mentioned and that the attorneys should work out a provision to protect fully both the city and the company. Such a purchaser must take the entire property and not merely the tracks, as provided in the draft. Attorneys will work out the details of the option to be given the city on the plant.

At a meeting of the Council committee of the whole on the evening of April 26, George W. Tonson, city engineer, was instructed to fix the value of the company's physical property. He was one of the State appraisers of railroads in Michigan in 1900 and 1903. He stated that men to do the detail work will have to be employed by the city. He and Mayor Whitlock will confer as to methods of procedure and the work will then be begun. Arrangements will be made with the company to have Mr. Tonson's representatives work jointly with the engineers of the company.

Mayor Whitlock was authorized by the Council to negotiate with engineers to fix the value of the intangible property. He submitted the names of H. E. Riggs, of Riggs & Sherman, Toledo; Frederick T. Barcroft, Detroit, and Professor Edward W. Bemis, Cleveland, as experts.

The monthly meeting of the board of directors of the Toledo Railways & Light Company was held on April 27, 1911. Mr. Lang said the directors felt that the franchise negotiations were taking too much time.

The engineers who work on the appraisal of the property will report their findings to the negotiators as they are completed and the figures will be considered in an effort to arrive at conclusions as early a date as possible. A new ordinance will be drafted to include the subjects upon which an agreement has been reached and this draft in turn will be amended and corrected, so that only the valuation and rate of fare will be left for consideration until the last.

#### Contracts for Power from McCall's Ferry

The Pennsylvania Water & Power Company, which operates the McCall's Ferry power plant, has made public its first annual report. The following interesting reference is made by the company to the contracts which it has closed for the sale of power:

"A contract has been closed with the Consolidated Gas, Electric Light & Power Company. A contract has also been agreed upon and only awaits formal confirmation by the Susquehanna Railways, Light & Power Company, Lancaster, Pa. These two contracts call for the delivery of about 16,000 hp of current, and we expect that this amount will be added to by the contract with the United Railways & Electric Company, Baltimore, which contract will practically double the amount of power and put into action approximately 32,000 hp. The contracts so far negotiated have been confined to companies having available steam plants which can be utilized to cover the low stages of the river. We therefore expect to continue making contracts up to the total of 50,000 hp, available during the greater part of each year and for two-thirds of the time available the year round.

"There will be involved in carrying out the contract with the United Railways & Electric Company an expenditure for cables, etc., amounting to \$150,000, and in the case of the Lancaster contract an expenditure for transmission line amounting to \$150,000. The income from these contracts will amount to approximately \$700,000 per year, while the plant available should be able to care for additional contracts which would substantially increase this amount."

#### Joint Commission Recommends New Subway Plan for Boston

The Massachusetts Railroad Commission and the Boston Transit Commission, sitting as a joint board by order of the present Legislature, have issued a report recommending the construction of a subway under Boylston Street, Boston, in the Back Bay district, and the abandonment of the plans for building the so-called Riverbank subway authorized by Chapter 573 of the Acts of 1907. The joint board fixes the desirable route from the intersection of Commonwealth Avenue and Beacon Street under Commonwealth Avenue, the Fenway, Newbury Street, Hereford and Boylston Streets to Park Street, and recommends a double track line which will parallel the existing Tremont Street subway between Boylston and Park Streets. The estimated

cost of the subway, with stations at Massachusetts Avenue, Copley Square, Tremont Street and Park Street, is \$4,700,000. By the terms of the 1907 act the Riverbank subway is to be built from Park Street to the intersection of Commonwealth Avenue and Beacon Street via Beacon Hill and the south embankment of the Charles River Basin, at an estimated cost of \$3,700,000. The proposed Boylston Street subway would traverse the central business axis of the Back Bay, and would, in the opinion of the joint board, constitute a symmetrical development in the Boston transportation scheme. The board points out that a Boylston Street subway would serve a larger population than the Riverbank tube, citing the increasing development of both Boylston Street and Huntington Avenue, as well as the area in the vicinity of Tremont Street. It considers that the Legislature should enter into an arrangement with the Boston Elevated Railway in connection with the repeal of the Riverbank subway act and the desired passage of a Boylston Street subway act, so that the company may relinquish its rights in the former case and lease the new subway.

#### Proposed Changes in Cleveland Ordinance

D. E. Morgan, member of the street railway committee of the Cleveland City Council, who has been investigating the request of the Cleveland Railway for an increase in the operating allowance under the Tayler grant, has concluded that if this step is not taken the wages of motormen and conductors will have to be reduced. He took the matter up with Mayor Baehr on April 28, 1911, and both agreed that no reduction of wages should be made.

Officials of the company appeared before the street railway committee recently to urge an increase of 1 cent per mile in the operating expenses, which would make the allowance 12½ cents per car mile. An ordinance introduced some time ago provides for an increase of ½ cent, but the officials state that this is not sufficient to cover the cost of operation. Thomas Kilfoyle, auditor of the company, presented figures to show that the average operating expenses per car mile for the last seven months have been 12.42 cents, or 0.92 of a cent less than is provided for by the Tayler grant. The advance in wages which went into effect on June 15, 1910, resulted in an increase of 1 cent per car mile in the operating expenses. Street Railway Commissioner Dahl told the committee that the deficit in the operating expenses for the year ended March 1, 1911, aggregated \$124,315.47.

On April 24, 1911, Councilman Hanratty introduced an ordinance in the City Council to direct the company to connect the Superior and Detroit, the Payne and Bridge and the Denison and Central Avenue lines. This would be following to some extent the routing that existed under the old franchise and would make possible a trip between the extreme limits of the city without the necessity of transfers. Chairman Kramer introduced a resolution to approve the relaying of 70,032 ft. of track. The company will spend \$59,819 for this improvement.

The report of the special committee of the Chamber of Commerce will probably be submitted to the Chamber within a short time and will then be referred to the City Council, with such recommendations for changes in the Tayler grant as may be deemed desirable.

#### Southern Pacific Electrification

The first electric train was sent over the new Alameda electric loop of the Southern Pacific Company on April 13, 1911. The cars were run in trains at first and later were separated and individual car tests were made.

Industrial Agent F. W. Hoover, of the Southern Pacific Company, has announced that the Alameda electric service on the south side line will start on June 1, as announced some time ago. The north side of the loop will not be given an electric train service until the Oakland side of the present steam horseshoe route is made over into a part of the electric system.

That the Southern Pacific Company has determined to further extend its trolley system on the San Francisco peninsula is indicated by an application for a franchise made recently to the board of trustees of Redwood City by Judge

Edward F. F. Fitzpatrick, the legal representative of the railroad in San Mateo County. The application is for a fifty-year franchise for a double-track electric railway through Redwood City with extensions to the Woodside district. Since the purchase of the lines in San José the Southern Pacific Company is in control of the electric transportation from that city as far north on the peninsula as Palo Alto.

The first big construction plan for local electric railroads in San José under Southern Pacific ownership will be a loop line of 15 miles, connecting Alum Rock Park, Berryessa and San José. This was announced recently by F. E. Chapin, general manager of the local lines. The line will be double-track and standard gage, and will go into the park via the present narrow-gage route to the mouth of the canyon. The cost of the proposed new route is estimated at between \$500,000 and \$600,000.

#### Newark Subway Offer Withdrawn

Thomas N. McCarter, president of the Public Service Corporation of New Jersey, Newark, N. J., has withdrawn the proposal which he made to Mayor Haussling of Newark for the construction of a subway in Newark to be used by the cars of the Public Service Railway. Mr. McCarter gave as his reason for withdrawing the offer the failure of the Legislature at the recent session to pass the necessary enabling act to permit the city to build the subway and lease it to the company for a term of years. In his letter Mr. McCarter said:

"As more than four months have elapsed since I wrote you on Dec. 20, 1910, bringing to your attention the imperative need of subway development in Newark to relieve congestion at the Four Corners, and as during the interval nothing has been done by the city authorities in considering or negotiating about this important subject, and as the Legislature has adjourned for the year without enacting any legislation that would permit of the carrying out of any plan, I herewith withdraw the proposition contained in that letter, as it is too important a proposition to remain in indefinite suspense. This will leave the whole subject open to future consideration when in the judgment of the city authorities the proper time has arrived. Meanwhile we will do the best we can to handle the constantly increasing traffic with our facilities."

In his reply to Mr. McCarter the Mayor said:

"I need scarcely point out to you that negotiations looking to the construction of subways would be futile without legislation, and that the failure of such legislation as was requested in this direction left the city with its hands tied."

#### Association Meetings

Arkansas Association of Public Utility Operators—Little Rock, Ark., May 3, 4 and 5.

Massachusetts Street Railway Association—Boston, Mass., May 10.

New England Street Railway Club—Boston, Mass., May 25.

Illinois Electric Railways Association—May 26.

Central Electric Accounting Conference—Springfield, Ill., June 10.

Central Electric Railway Association—St. Joseph, Mich., June 22.

Street Railway Association of the State of New York—Cooperstown, N. Y., June 27 and 28.

American Electric Railway Association—Atlantic City, N. J., Oct. 9 to 13.

**New Jersey Commission Organizes.**—At the meeting of the State Board of Public Utility Commissioners of New Jersey, in Trenton, on May 1, 1911, to organize in accordance with the new law, Winthrop M. Daniels, of Princeton University, was seated as a new member to succeed Frank H. Sommer, Newark, and Commissioner Robert Williams, Paterson, was elected president. Alfred N. Barber, Trenton, was continued as secretary, while Philander Betts and Charles D. McKeivey were retained as chief inspectors. Assistant Attorney-General Nelson B. Gaskill submitted an opinion that the new law does not bar State officers from using railroad passes.

**National Railways of Hayti.**—The National Railways of Hayti has been organized to build a steam railroad in Hayti to connect Port au Prince, Gonaives, St. Marc and Cape Haitien, and develop the northern part of Hayti. The company will take over about 30 miles of track in that section of the island and will build about 350 miles of new track. The contractor for the work is the Caribbean Construction Company, National City Bank Building, New York, N. Y. C. G. Young, 60 Wall Street, New York, N. Y., has been appointed consulting engineer in New York. The construction company sent fifty engineers to Hayti recently and is preparing specifications for the railroad material which will be required. Some electric railway construction in the towns served by the steam railroad may be done later, but the company has no immediate plans for such work.

**Fire at Bangor, Maine.**—The fire which swept Bangor, Maine, on the evening of April 30, 1911, destroyed the Graham Building, belonging to John R. Graham, president of the Bangor Railway & Electric Company, and crippled the local electric light and power and electric railway service. The General Electric Company shipped to the company before the fire was under control one 500-kw rotary converter, three 185-kw transformers and switchboard and three 100-kw lighting transformers to replace substation equipment which was destroyed. Nearly the entire business section and a large portion of the residential section of the city were wiped out, among the property burned being the general offices of the Bangor & Aroostook Railroad, the local offices of the Western Union Telegraph Company and the Postal Telegraph Company, the telephone exchange, the post office and other public buildings. The total loss is estimated at several million dollars.

**Association Bulletins and Data Sheets.**—The secretary of the Engineering Association is sending to all member companies and associate members a bulletin outlining the subjects which are being considered this year by each of the standing committees and such special committees as have been appointed. The committee on way matters of the Engineering Association has sent out data sheet No. 73, requesting information for the use of sub-committee No. 3, which will consider the subject of shop facilities and working equipment for the way department. The committee on passenger traffic of the Transportation & Traffic Association is devoting its attention this year to a study of the methods employed by member companies to create and maintain "every day" business. It has sent out a data sheet requesting information regarding civic organizations and the relations of the member companies with such organizations; advertising; activities of industrial and passenger agents, and commutation rates.

## LEGISLATION AFFECTING ELECTRIC RAILWAYS

### MASSACHUSETTS

Committee findings with respect to the future of the Boston Elevated Railway's relations with the West End Street Railway and with the transportation situation as a whole in eastern Massachusetts are anticipated with much interest, as are the forthcoming recommendations with respect to the electrification of steam railroads at Boston and the project to permit the New York, New Haven & Hartford Railroad to build a tunnel under Boston Harbor and install an initial electrified service between Readville and Beverly. The announcement of closer traffic and financial relations between the New Haven and the Boston & Albany division of the New York Central lines foreshadows a more favorable attitude toward terminal electrification in the future in case the New Haven plans are permitted to be carried out on the basis of a moderate initial electrification, with a natural extension of the system as its benefits and economies appear from experience under Boston conditions. An order has been sent to the Railroad Commission requiring the board to investigate and report by May 15, 1911, means to protect passengers from injury at the elevated stations of the Boston Elevated Railway. Hearings have been closed upon the bill to permit the New Haven interests to acquire the Boston, Revere Beach & Lynn Railroad. The attitude of the committee upon this bill will in large measure determine its action upon the bill which is designed

to require the Railroad Commission to issue a certificate of public convenience and necessity to the Boston & Eastern Electric Railroad.

The Attorney-General has issued a finding that the proposed law requiring street railways to carry mail carriers in uniform free of charge is unconstitutional. Particulars of the ruling are given on page 819, in this issue. A report has been published on the work of the Railroad Commission, prepared by Clinton H. Scovell, who was retained by Governor Foss. The report contended that the board failed to make sufficient inquiries in connection with security issues upon which it passes. The absence of detailed stenographic reports of hearings on this type of cases was also criticised. The general opinion is that the report will fall short of its purposes through its pointlessness, when examined in detail. It is admitted, however, that the practice of the Massachusetts Gas & Electric Light Commission in making stenographic reports of hearings might be followed with advantage by the Railroad Commission. As a result of the Scovell report, Governor Foss sent a special message to the Legislature again recommending the abolition of the commission and the transfer of its functions to a public utilities board.

### OHIO

The Winters public utility bill passed by the House recently has been so amended by the Senate committee on railroads and telegraphs that its application to street and interurban railways is very limited. With water transportation, union depot, freight line and equipment, sleeping car and express companies, they would operate under the laws at present applicable to them. Interchange of service between steam, interurban and street railways would be required only where the lines are of the same grade and gage, the commission to decide whether such interchange is for the public convenience. The section relating to stock control would follow the provisions of the House bill. Rates would be determined upon the basis of the market value of stocks and bonds instead of the physical value as in the House bill. The State Railroad Commission would be succeeded by the Public Utilities Commission. The House committee has recommended for passage the Irvin bill to permit street and interurban railways to borrow money regardless of their capitalization and to mortgage both their real and personal property. The Donson bill to permit greater leeway in the construction of crossings over public highways was also recommended. This bill would permit piers or abutments to be located in the center of public roads outside of municipalities, provided sufficient clearance remained for travel. The idea is to make it more convenient to eliminate grade crossings. The Shaffer bill to give interurban railways the right to condemn trees along their rights of way has been acted upon favorably by the Senate. An amendment was inserted to give the companies the right to condemn private property within the limits of municipalities.

### PENNSYLVANIA

The State Legislature has entered upon the last month of its present session with plenty of hard work unfinished, including the important Public Service Commission Bill, which is being so bitterly opposed. Both of the transportation classes have had their hearings before the House Judiciary Committee, and the committee gave its final hearing on May 3. It is stated that the bill will be amended to remove municipalities from its influence, but the Governor is firm in his desire to have the bill passed. It is even intimated that should the Legislature adjourn without passing the measure he will call an extra session for its further consideration. In the House Senator McNichol's bill to provide for the merger and consolidation of street railway and electric power companies, which had passed the Senate, was defeated on final passage through lack of a constitutional majority. Subsequently, however, the House adopted a resolution to reconsider its action and placed the bill on the postponed calendar. The House passed the bill to empower second-class cities to levy and collect taxes for general revenue purposes on street railways, telephone, telegraph, electric light or power, water, gas and heat companies. The House also passed the bill to empower municipal corporations to construct street railway tracks and lease them to companies or persons.



# Financial and Corporate

## New York Stock and Money Markets

May 2, 1911.

Active demand for bonds is the sustaining feature of the New York markets, the issues having a ready sale at slightly advanced prices, denoting a desire for investment of idle funds. The crop outlook is favorable, but steel orders are about one-third smaller in volume than for the preceding month, and most of the railroads are putting into effect important retrenchments. The stock market is irregular, with prices showing no changes of importance. Money is plentiful and rates easy. Quotations to-day were: Call, 2@23/8 per cent; ninety days, 2 1/2@23/4 per cent.

### Other Markets

In Philadelphia trading has been irregular, with marked activity and advances in several of the local issues in the early part of the week. Philadelphia Rapid Transit rose to 18, while Union Traction has been fluctuating at 46.

Strength is evidenced on the Chicago Exchange, prices having advanced generally throughout the list. Northwestern Elevated 4s were the feature of the bond market, advancing to 99 1/4.

Transactions in Boston have been on a broad scale, prices having advanced, although to-day's quotations show a slight falling off from the gains of the week.

There has been a good demand for bonds on the Baltimore list and prices are firm with fractional gains.

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

	April 25.	May 2.
American Light & Traction Company (common).....	a288	292
American Light & Traction Company (preferred).....	a106	*106
American Railways Company.....	a44 1/2	44
Aurora, Elgin & Chicago Railroad (common).....	a40	a44
Aurora, Elgin & Chicago Railroad (preferred).....	a86	a86
Boston Elevated Railway.....	127 1/2	127
Boston Suburban Electric Companies (common).....	a15	a15
Boston Suburban Electric Companies (preferred).....	72	a75
Boston & Worcester Electric Companies (common).....	8	a10
Boston & Worcester Electric Companies (preferred).....	a47	44
Brooklyn Rapid Transit Company.....	77 1/4	78 3/4
Brooklyn Rapid Transit Company, 1st ref. conv. 4s.....	84	84 1/2
Capital Traction Company, Washington.....	a126 1/2	a130
Chicago City Railway.....	a190	a190
Chicago & Oak Park Elevated Railroad (common).....	3	3
Chicago & Oak Park Elevated Railroad (preferred).....	6	6
Chicago Railways, optg., ctf. 1.....	a90	a85
Chicago Railways, optg., ctf. 2.....	a22 1/2	a22
Chicago Railways, optg., ctf. 3.....	a5	a3 1/2
Chicago Railways, optg., ctf. 4.....	a5 1/4	a5
Cincinnati Street Railway.....	a31	*131
Cleveland Railway.....	a97	a96 7/8
Columbus Railway (common).....	a96	*96
Columbus Railway (preferred).....	100	*100
Consolidated Traction of New Jersey.....	a76	a76
Consolidated Traction of N. J., 5 per cent bonds.....	a105	a105
Dayton Street Railway (common).....	a30	a30
Dayton Street Railway (preferred).....	100	100
Detroit United Railway.....	71	71
General Electric Company.....	151 3/4	158
Georgia Railway & Electric Company (common).....	a132	a133
Georgia Railway & Electric Company (preferred).....	91	91
Interborough Metropolitan Company (common).....	18	18 1/2
Interborough Metropolitan Company (preferred).....	49 1/2	51 1/2
Interborough Metropolitan Company (4 1/2s).....	78 3/8	79
Kansas City Railway & Light Company (common).....	a21	20 1/2
Kansas City Railway & Light Company (preferred).....	a70	a68
Manhattan Railway.....	137	137 1/2
Massachusetts Electric Companies (common).....	16 1/4	a18 1/4
Massachusetts Electric Companies (preferred).....	a87 1/2	a88
Metropolitan West Side, Chicago (common).....	824	825
Metropolitan West Side, Chicago (preferred).....	a68	a68
Metropolitan Street Railway, New York.....	*15	*15
Milwaukee Electric Railway & Light (preferred).....	110	110
North American Company.....	70 1/2	73 1/2
Northern Ohio Light & Traction Company.....	a44	44
Northwestern Elevated Railroad (common).....	a21	a20 1/2
Northwestern Elevated Railroad (preferred).....	65	a65
Philadelphia Company, Pittsburgh (common).....	a53 1/4	a52 7/8
Philadelphia Company, Pittsburgh (preferred).....	a43	a43
Philadelphia Rapid Transit Company.....	a17 1/2	a18
Philadelphia Traction Company.....	83 1/2	82 1/2
Public Service Corporation, 5% col. notes (1913).....	100 1/2	100 1/2
Public Service Corporation, cts.....	a106	a106
Seattle Electric Company (common).....	a107	a107
Seattle Electric Company (preferred).....	a98	a98
South Side Elevated Railroad (Chicago).....	*a71 1/2	a72
Third Avenue Railroad, New York.....	10 1/4	11 1/4
Toledo Railways & Light Company.....	a8	a7 1/2
Twin City Rapid Transit, Minneapolis (common).....	a108 1/2	a109 5/8
Union Traction Company, Philadelphia.....	a45 1/2	46
United Rys. & Electric Company, Baltimore.....	a185 1/2	185 1/2
United Rys. Inv. Co. (common).....	a42	42
United Rys. Inv. Co. (preferred).....	a72	71 1/2
Washington Ry. & Electric Company (common).....	a35 1/2	a35 1/2
Washington Ry. & Electric Company (preferred).....	a90	89 3/4
West End Street Railway, Boston (common).....	a90	a90
West End Street Railway, Boston (preferred).....	a103 1/2	a103 1/2
Westinghouse Elec. & Mfg. Co.....	a67	69 1/2
Westinghouse Elec. & Mfg. Co. (1st pref.).....	a117 1/2	a118

a.Asked. \*Last sale.

## ANNUAL REPORTS

### Hudson & Manhattan Railroad

The statement of income of the Hudson & Manhattan Railroad for the year ended March 31, 1911, compares with the preceding year as follows:

Year Ended March 31.	1911.	1910.
Gross revenue, all sources .....	\$4,165,492	\$3,051,486
Operating expenses and taxes on operated properties.....	1,850,440	1,464,222
Gross income applicable to fixed charges.....	\$2,315,052	\$1,587,264
Interest on total interest-bearing bonds outstanding.....	\$2,918,007	\$2,464,811
Less interest chargeable to construction.....	819,192	1,076,981
Balance, being interest on capital employed in operation and chargeable against income.....	\$2,098,815	\$1,387,830
Other charges.....	258,127	122,045
Total deductions from income.....	\$2,356,942	\$1,509,875
Net income after deduction of fixed charges applicable against that portion of the property employed in present operations.....	*\$41,890	\$77,389
Depreciation included above in operating expenses and set up in amortization reserves.....	\$127,713	\$194,599
Percentage of railroad operating expenses vs. railroad revenue .....	40.45	47.80
Percentage of railroad operating expenses, exclusive of depreciation reserves.....	37.20	40.56

\*Deficit.

W. G. McAdoo, the president, says in his report in part:

"The physical condition of the property has been maintained at the highest standard of efficiency. In August, 1910, the new station at Henderson and Grove Streets, Jersey City, was opened for business, and in November the extension from Twenty-third Street and Sixth Avenue to Broadway and Thirty-third Street was completed and put into operation. The car storage yard and repair shops at Henderson Street and Railroad Avenue, Jersey City, were completed in the fall of 1910, and now provide a much needed facility for the proper care and repair of equipment.

"The opening of the Broadway and Thirty-third Street station in the heart of the business, shopping and theater districts of New York City has greatly improved your company's position. At this station facilities are provided for the handling of baggage, mail and express matter, as has been done at the Hudson terminal at Cortlandt and Church Streets, but these sources of revenue have not yet been tapped, and cannot well be until the connection with Newark (now under construction) is completed. The Erie Railroad and the Lehigh Valley Railroad have each established ticket offices on the concourse floor of the Thirty-third Street station, and provision has also been made for ticket offices of other trunk lines.

"The Hudson terminal has become the most important traffic, business and office center in the downtown district of New York. These buildings have maintained their popularity and there has been such a steady demand for space that on May 1, 1911, the buildings will be 99.3 per cent rented. The gross income from the buildings for the year ending May 1, 1912, will be \$1,566,318, as against \$1,509,628 for the year ending May 1, 1911. Rates have been maintained and the high character of the tenantry has been upheld. The amount payable for assumed leases for the year ending May 1, 1912, will be only \$16,647.

"Since the last report your company has purchased fifty additional steel passenger cars, with full motor equipment, under a purchase agreement with the Guaranty Trust Company of New York, which has issued car purchase certificates, 'Series B,' against this equipment. Orders for thirty-six more cars, this company's portion of the equipment to be used in the joint service to Newark, have been placed, and car purchase certificates covering these will also be issued, with the same provision for semi-annual payments on account of principal.

"Work on your company's portion of the joint high-speed line with the Pennsylvania Railroad to Newark has progressed satisfactorily, and it is expected that this service will be inaugurated during the summer of 1911. When the operation of this joint line begins it will provide an additional station of great importance to the company at or near the Boulevard, Jersey City Heights. With an efficient rapid transit service connecting it with uptown and downtown centers in New York, this part of Jersey City will build up

rapidly as a residential section. The Hudson terminal will then become the downtown terminal of the Pennsylvania system. Trains will be scheduled from the Hudson terminal to connect with the Pennsylvania trains at the Manhattan transfer just east of Newark, and it is intended that all Pennsylvania Railroad traffic to the downtown district of New York shall be handled by this company from the Manhattan transfer through the Hudson tunnels.

"A new local station in the heart of Newark will be an important feature of this joint rapid transit line, which will offer such advantages in the way of through and frequent service and quick time between Newark and its suburbs and New York that a large and continually increasing traffic may be confidently expected.

"Construction has not yet begun on the Forty-second Street Grand Central extension, for which a franchise has been granted to your company. The present uncertainty about the new subway lines in New York City presents a problem which makes it unwise to begin this work, or even satisfactorily prepare plans for it, until the city has reached a decision on the main subway question. In order to make it most useful and efficient for the purposes intended, this extension should dovetail with any new subways which may be built. The extension from Sixth Avenue to Fourth Avenue, under Ninth Street, is in somewhat the same category as the Grand Central extension. The Public Service Commission has extended the time for its construction until June 15, 1913, before which time a definite course can be decided upon.

"There has been a gratifying growth of traffic. For the year ended March 31, 1911, the total number of passengers carried was 50,926,980, as against 34,574,815 for the year ended March 31, 1910. This, however, is not a fair comparison, as the Cortlandt Street tunnels (downtown lines) were not put into operation until July 19, 1909. Traffic continues to show satisfactory increases over corresponding periods of the previous year in all cases in which the physical conditions were comparable. The number of passengers per mile of road operated for the year ended March 31, 1911, was 7,643,251, as against 6,799,373 for the preceding year, an increase of 12.4 per cent. This represents a real growth, but as the ratio is based upon an average of miles operated (increasing as new portions were put into operation), it is not truly indicative of the normal increase of traffic to be expected. During September and October of both 1909 and 1910 the road was operated on practically the same mileage, and the traffic of the latter period showed an increase of 24 per cent over that of the former.

"Satisfactory comparisons of the ratios of operating expenses to revenues cannot as yet be made. As from time to time new portions of your property have been put into operation, it has been the policy of the management to begin such operations with the maximum number of train crews, station and other employees as it was anticipated would be required. Such items, together with heavy expenses for preliminary testing and practice running, in order that the new services might begin smoothly and without interruption, have materially increased the operating expenses. Many reductions in the cost of operation have been made, however, and when the system is completed and the operation becomes more uniform the ratios of operating expenses should show further decreases.

"During the year covered by this report the company has operated an average of 1808 trains per day, making a total of 6,592,271 revenue car-miles in the year. Although these trains have been sent through the tunnels under a ninety-second headway during rush hours and under a two-and-a-half-minute headway during the rest of the day, the percentage of trains on time was 99.46 per cent.

"As important portions of the system are still under construction and the operated portion represents only a part of the total capital expenditure and capacity, interest charges on bonded debt have been apportioned between operation and construction. There is now being deducted from operating income interest on a total of \$50,000,000 of bonds, and there is being charged to construction the interest on \$14,500,000 of bonds. With the extension of service over those parts of the line now under construction the amount of interest deductible from income will be increased, and the amount charged to construction will be reduced, so that the charge of interest to construction will progressively disappear. It

is a universal practice to charge to construction the cost of money during the period of construction, and the division of this charge between operation and construction has been made on a basis which in the opinion of your management is sound and conservative.

"As required by the regulations of the Public Service Commission, this company has charged off and set up depreciation and amortization reserves, with the result that on March 31, 1911, in addition to actual expenditures in maintaining the property at the highest point of efficiency, we have absorbed into operating expenses and set up a reserve of \$385,081. A better showing of net earnings might have been made by less conservative methods of accounting, but we believe that future results will reflect the wisdom of the policy which has been adopted."

Traffic statistics for the two years compare as follows:

Year Ended March 31.	1911.	1910.
Average miles of road operated.....	6,663	5,085
Number of revenue car miles operated....	6,592,271	4,483,961
Passenger traffic:		
Number of passengers carried.....	50,926,980	34,574,815
Number of passengers carried per mile of road.....	7,643,251	6,799,373
Number of passengers per revenue car-mile	7.73	7.71
Revenues and operating expenses:		
Gross revenue per mile of road.....	\$382,162	\$339,968
Gross railroad operating revenue per mile of road.....	404,478	354,195
Operating expenses (excluding taxes) per mile of road.....	163,615	169,298
Net railroad operating revenue per mile of road.....	240,863	184,897
Passenger revenue per revenue car-mile...	\$0.3863	\$0.3855
Gross railroad operating revenue per revenue car-mile.....	0.4088	0.4017
Operating expenses (excluding taxes) per revenue car-mile.....	0.1653	0.1920
Net railroad operating revenue per revenue car-mile.....	0.2435	0.2097
Passenger revenue per passenger.....	\$0.05	\$0.05
Gross railroad operating revenue per passenger .....	0.0529	0.0521
Operating expenses (excluding taxes) per passenger .....	0.0214	0.0249
Net railroad operating revenue per passenger .....	0.0315	0.0272

#### Spokane & Inland Empire Railroad

The income account of the Spokane & Inland Empire Railroad for the year ended June 30, 1910, compares with the previous year as follows:

REVENUE FROM TRANSPORTATION.		
	1909.	1910.
Freight .....	\$325,020	\$472,918
Passenger .....	530,543	755,608
Street railway system.....	387,390	486,119
Other revenue.....	26,147	48,999
Total operating revenue.....	\$1,269,100	\$1,763,614
Per mile (average).....	6,345	8,519
OPERATING EXPENSES.		
Maintenance of way and structures.....	143,662	283,158
Maintenance of equipment.....	118,855	112,615
Traffic expenses.....	23,668	25,227
Transportation expenses.....	459,265	548,392
General expenses.....	98,901	112,775
Total .....	\$844,351	\$1,082,167
Per mile (average).....	4,221	5,227
Net operating revenue.....	424,749	681,447
Per mile (average).....	2,124	3,292
Taxes accrued.....	37,800	55,000
Per mile (average).....	189	265
Operating income.....	\$386,949	\$626,447
DEDUCT.		
Interest on funded debt.....	\$234,700	\$247,450
Other interest.....	.....	43,429
Hire of equipment.....	5,716	15,456
Accident, Gibbs, Idaho.....	.....	295,073
Miscellaneous .....	1,035	147
Total .....	\$241,451	\$601,555
Net .....	\$145,498	\$24,892
Ratio of operating expenses to total operating revenue .....	66.54	61.37
Ratio of taxes to total operating revenue.....	2.98	3.12

Jay P. Graves, the president, says in part in his statement to shareholders:

"The interurban passenger revenue was \$755,608, an increase of \$225,065, or 42.42 per cent, over the previous year.

"The freight revenue was \$472,918, an increase of \$147,898, or 45.50 per cent, over the previous year.

"The revenue from the operation of the street railway system was \$486,119, an increase of \$98,729, or 25.48 per cent, over the previous year.

"The total operating revenue was \$1,763,614, an increase of \$494,514, or 38.97 per cent, over the previous year.

"The charges for maintenance of way and structures were \$283,158, an increase of \$139,497. This increase was caused by the unprecedented high water in February and March throughout the 'Inland Empire,' and especially the floods along the Palouse River, destroying on the Colfax branch six span bridges and 6 miles of track. The line was closed into Colfax for 60 days. On the Moscow branch the deep cuts slid in and the line was closed into Moscow for 30 days. On the street railway system 1.46 miles of paving between the rails were laid and new steel installed, as required in our franchises from the city of Spokane.

"The charges for maintenance of equipment were \$112,615, a decrease of \$6,240 from the previous year.

"The charges for transportation expenses were \$548,392, an increase of \$89,127, caused by the increased passenger train service on the different divisions of the system and the increase in the number of tons of revenue freight carried, which was 51.73 per cent over the previous year.

"On the Cœur d'Alene division the summer schedule was increased from 50 to 60 trains per day to carry the heavy traffic to Liberty Lake, Hayden Lake and other resorts.

"The new lines and extensions of the city traction system required the regular operation of 15 additional cars over the previous year.

"During the past fiscal year the salaries of the traction trainmen were raised 10 per cent.

"The capacity of the power plant at Nine Mile, on the Spokane River, has been increased during the past fiscal year to 20,000 hp, and is furnishing for the operation of the Inland division from 4000 hp to 5500 hp. Our power contract with the Washington Water Power Company, entered into when our lines were first constructed, has yet five years to run. We are using, under our contract, 3800 hp, the minimum amount permitted by the contract. This power is used to operate the Cœur d'Alene and Traction divisions. We will, however, during the ensuing year, require 2000 hp in addition for the operation of the Traction division, which will be furnished by our plant at Nine Mile. We have contracts for the sale of 2800 hp for commercial and irrigation purposes, for which we are receiving approximately \$4 per horse-power per month. We have also about 1000 hp additional business in view for the ensuing year. In addition to this we expect to furnish power for several large industrial plants to be located in Spokane.

"A second high-tension power line has been constructed from Nine Mile to Spokane during the past year, which, together with the first line, is capable of carrying the entire output of the plant, and also insures continuous service in case of damage or accident to one of the lines.

"We have now in operation 66 miles of 60,000-volt, high-tension power lines capable of supplying the present and prospective business of the company for a number of years.

"Total charges to capital account during the year were \$794,100.

"The physical condition of the property is excellent. The roadbeds have been kept in first-class condition, tie renewals have been made when necessary, and our lines are all fully ballasted and compare favorably with the very best railway lines in this country. It has been the policy of the company, in order to build up industries along its lines, to put in spurs and sidings whenever business promises. There were 38 different industrial tracks completed during the past year, aggregating in length about 2.92 miles. This policy not only helps to build up the country through which the road runs but will add materially in time to the earning power of the system.

"The management expected to resume the payment of dividends on the preferred rights during the year of 1910, as the earnings of the company warrant. The Gibb's accident, however, and the disastrous floods at Colfax and along the Palouse River, referred to, have, as shown by the income account statement, eaten up our earnings, and, much as we regret it, the payment of dividends will be postponed. Next year the dividends on the preferred rights will accumulate, commencing Jan. 15. The total operating revenue of the company, showing an increase of 40 per cent over the revenue of the previous year, is a very substantial increase, and would have more than paid the dividends on our preferred rights if not for the extraordinary demands upon our resources above mentioned.

"The country along our lines is rapidly developing, and

we anticipate an increase in earnings for the ensuing year."

Traffic statistics for the last two fiscal years are as follows:

PASSENGER (RAILROAD DIVISION), YEAR ENDING JUNE 30.		
	1909.	1910.
Number revenue passengers carried.....	1,088,682.00	1,518,582.00
Number revenue passengers carried one mile.....	24,608,962.00	33,741,821.00
Number revenue passengers carried one mile per mile of road.....	149,145.00	195,039.00
Average distance carried miles.....	22.6	22.2
Total passenger revenue.....	\$501,982.28	\$712,054.73
Average amount paid by each passenger (cents).....	46.11	46.90
Average rate per passenger per mile (cents). Total passenger earnings, including mail, baggage and express.....	2.04	2.11
Mileage of passenger cars.....	\$530,542.84	\$755,607.82
Mileage of passenger trains.....	1,555,078.00	1,678,957.00
Passenger earnings per train mile (cents).....	707,874.00	781,012.00
Passenger earnings per average mile of road operated.....	74.95	96.7
	\$3,215.41	\$4,367.68
FREIGHT (RAILROAD DIVISION), YEAR ENDING JUNE 30.		
Revenue tons carried.....	379,136.00	575,276.00
Revenue tons carried one mile.....	15,099,677.00	22,597,855.00
Average distance hauled—one ton mile.....	39.8	39.3
Total freight revenue.....	325,020.18	472,918.28
Average amount received per ton freight (cents).....	85.73	82.21
Average receipts per ton per mile (cents).....	2.15	2.09
Mileage of loaded cars.....	797,841.00	1,151,316.00
Mileage of empty cars.....	539,615.00	730,437.00
Total mileage.....	1,337,456.00	1,881,753.00
Mileage of freight trains.....	194,407.00	237,014.00
Freight revenue per train mile.....	\$1.67	\$1.00
Freight revenue per average mile of road operated.....	1,969.82	2,733.63
CITY TRACTION SYSTEM.		
Revenue passengers carried.....	7,821,526.00	9,825,707.00
Passenger car mileage.....	1,602,323.00	2,126,481.00
Passenger earnings.....	\$384,933.55	\$482,966.15
Passenger earnings per car mile (cents).....	24.02	22.71
RAILROAD DIVISION.		
Gross earnings per average mile of road operated.....	\$5,343.70	\$7,211.90
Operating expenses per average mile of road operated.....	3,544.91	4,283.04
Net earnings per average mile of road operated.....	1,798.79	2,928.86
CITY TRACTION SYSTEM.		
Gross earnings per average mile of road operated.....	\$12,913.00	\$14,297.61
Operating expenses per average mile of road operated.....	8,648.07	10,035.33
Net earnings per average mile of road operated.....	4,264.93	4,262.28

**Athol & Orange Street Railway, Athol, Mass.**—Control of the Athol & Orange Street Railway has passed to interests identified with the Connecticut Valley Street Railway and F. E. Pierce, president of the latter company, has been elected president of the Athol & Orange Street Railway to succeed G. D. Bates, and D. P. Abercrombie, Jr., secretary and treasurer of the Connecticut Valley Street Railway, has been elected treasurer to succeed A. N. Ellis. New directors have been elected as follows for the Athol & Orange Street Railway: E. C. Crosby, F. E. Pierce, J. A. Taggart and D. P. Abercrombie, Jr. It is stated that the Millers River Street Railway will be incorporated to take over the Athol & Orange Street Railway and build an extension to connect the lines of the Athol & Orange Street Railway and the Connecticut Valley Street Railway.

**Augusta-Aiken Railway & Electric Corporation, Augusta, Ga.**—Redmond & Company, New York, N. Y., offer for subscription at 94 and accrued interest, paying about 5.5 per cent, the unsold portion of \$2,400,000 of 5 per cent sinking fund gold bonds of the Augusta-Aiken Railway & Electric Corporation dated Nov. 15, 1910, and due Dec. 1, 1935. The bonds are secured by a direct first mortgage on the entire railway and lighting property, subject only to an issue now limited to \$967,000 which is being reduced annually.

**City Railway, Dayton, Ohio.**—The City Railway has paid a special dividend of \$9.09 1-11 per share on the common stock. This dividend will be applicable at the option of common stockholders on or before June 1, 1911, to purchase from the company, at par, additional common stock which will bring the total outstanding from \$2,195,900 up to practically \$2,400,000.

**Galveston-Houston Electric Company, Galveston, Tex.**—The Galveston-Houston Electric Company has filed at Augusta, Maine, a notice of the increase of the capital stock of the company from \$6,000,000 to \$7,000,000 by the addition of \$1,000,000 to the common stock. Previous to the increase in stock there was \$3,000,000 of preferred stock and \$3,000,000 of common stock.

**Indianapolis, Newcastle & Toledo Electric Railway, Newcastle, Ind.**—The property of the Indianapolis, Newcastle & Toledo Electric Railway was sold under foreclosure at Indianapolis, Ind., on April 22, 1911, for \$22,511.39 to David M. Parry, Indianapolis, Ind., president of the company, and William E. Stevenson, Indianapolis, Ind., secretary, who represent the bondholders.

**Interborough Rapid Transit Company, New York, N. Y.**—The Interborough Rapid Transit Company has sold \$10,000,000 of one-year 4½ per cent notes to J. P. Morgan & Company, New York, N. Y. Part of the proceeds will be used to redeem \$4,584,000 of 5½ per cent notes, which were issued three years ago and matured on May 1, 1911, and the balance will be used to finance miscellaneous undertakings of the company.

**Jacksonville (Fla.) Traction Company.**—The Jacksonville Traction Company, which has succeeded the Jacksonville Electric Company, has taken over the Ortega Railroad, which extends from the terminus of the tracks of the Jacksonville Electric Company on St. John's Avenue to Ortega, a distance of 3¼ miles.

**Martha's Vineyard Street Railway, Cottage City, Mass.**—The Martha's Vineyard Street Railway has petitioned the Railroad Commissioners for approval of the lease of the Oak Bluffs Street Railway for a term of five years and eight months. The Martha's Vineyard Street Railway is to pay the Oak Bluffs Street Railway the sum of \$440 for the eight months ended Dec. 31, 1911, \$460 for the year 1912 and \$480 for each and every year thereafter until the expiration of the term of the lease.

**New York, New Haven & Hartford Railroad, New Haven, Conn.**—Theodore N. Vail has been elected a director of the New York, New Haven & Hartford Railroad to succeed Nathaniel Thayer, deceased.

**Ottawa (Ont.) Electric Railway.**—E. N. Soper and T. F. Ahearn have been elected directors of the Ottawa Electric Railway to fill vacancies on the board.

**Pennsylvania Tunnel & Terminal Railroad, New York, N. Y.**—Terms of a renewal agreement between the Pennsylvania Railroad and the Pennsylvania Tunnel & Terminal Railroad for the operation of the Pennsylvania Railroad terminal in New York by the Pennsylvania Railroad have been approved by the Public Service Commission of the First District of New York. The renewal agreement grants extensions of time for temporary operations of the terminal by Pennsylvania Railroad from June 1, 1911, for eleven months, or until May 1, 1912, prior to the making of a long lease for operation of the terminal by the Pennsylvania Railroad. W. Heyward Myers has been elected a director of the Pennsylvania Tunnel & Terminal Railroad to succeed Charles E. Pugh.

**Public Service Railway, Newark, N. J.**—The petition of the New Jersey & Hudson River Railway & Ferry Company, which is controlled by the Public Service Railway, for approval of proposed issuance, sale and delivery of its 4 per cent mortgage bonds to the amount of \$100,000 has been approved.

**Springfield (Mass.) Street Railway.**—The House has refused to admit a petition of the president of the Springfield Board of Trade and the Selectmen of eight Massachusetts towns for legislation to authorize the Berkshire Street Railway to purchase property and franchises of the Springfield Street Railway. The matter will go over until the next Legislature meets.

**Third Avenue Railroad, New York, N. Y.**—A motion was made before Judge Lacombe in the United States Circuit Court by counsel for the Central Trust Company, on April 28, 1911, for an order sustaining the reports of the special master relative to the compensation of the receivers of the Third Avenue Railroad. The bondholders' committee made no opposition to the presentation of the report and Judge Lacombe reserved his decision.

**Toledo & Chicago Interurban Railway, Kendallville, Ind.**—The Toledo & Chicago Interurban Railway has secured an order from Judge Carl Yapple, of the Superior Court at Ft. Wayne, Ind., extending \$82,000 of the receiver's certificates for one year. Of this amount \$65,000 was due on

April 22 and \$17,000 on May 8. At present there is \$100,000 of certificates outstanding.

**Union Utilities Company, Morgantown, W. Va.**—The Union Utilities Company has declared an initial quarterly dividend of one-half of 1 per cent on its \$800,000 of common stock.

**Watsonville (Cal.) Transportation Company.**—The Watsonville Railway & Navigation Company has been incorporated with a capital stock of \$200,000 by F. E. Snowden, C. H. Fisher, C. A. Shuey, G. W. Bell and E. M. Heaney, presumably to succeed the Watsonville Transportation Company, the property of which, consisting of rolling stock, power plant and four miles of track, was sold under foreclosure as noted in the ELECTRIC RAILWAY JOURNAL of March 25, 1911, page 536.

**Wisconsin Electric Railway, Oshkosh, Wis.**—The Railroad Commission of Wisconsin has authorized the Wisconsin Electric Railway to issue \$83,000 par value of 5 per cent, twenty-year first-mortgage gold bonds, in denominations of \$1,000 each. The issue is to be secured under a mortgage executed to the Wisconsin Trust Company, Milwaukee, Wis. The bonds are to be sold for cash and for not less than 85 per cent of their par value for the purchase of electric railway property and equipment, and to defray the cost of extensions and additions to the property of the company.

**Yonkers (N. Y.) Railroad.**—The Public Service Commission of the Second District of New York has authorized Leslie Sutherland, receiver of the Yonkers Railroad, to issue receiver's certificates to the amount of \$100,000 payable on or before two years from date, to bear interest not to exceed 6 per cent.

## ELECTRIC RAILWAY MONTHLY EARNINGS

ATLANTIC SHORE RAILWAY.							
Period.		Gross Revenue.	Operating Expenses.	Net Revenue.	Fixed Charges.	Net Income.	
1m.,	Mar.	'11	\$20,700	\$20,250	\$450	\$8,121	\$7,671
1 "	"	'10	24,407	15,590	8,816	12,576	3,763
3 "	"	'11	54,969	52,857	2,112	23,819	21,707
3 "	"	'10	62,086	47,746	14,340	37,687	23,348
AURORA, ELGIN & CHICAGO RAILROAD.							
1m.,	Mar.	'11	\$122,679	\$74,913	\$47,766	\$35,948	\$11,818
1 "	"	'10	118,709	69,443	49,266	32,263	17,002
9 "	"	'11	1,290,629	744,151	546,478	308,693	237,785
9 "	"	'10	1,181,898	655,610	526,289	273,955	252,333
CLEVELAND, PAINESVILLE & EASTERN RAILROAD.							
1m.,	Mar.	'11	\$24,075	\$13,887	\$10,188	\$8,172	\$2,016
1 "	"	'10	25,070	13,284	11,785	7,839	3,947
3 "	"	'11	68,242	40,453	27,789	24,519	3,269
3 "	"	'10	64,856	37,423	27,435	23,747	3,686
CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY.							
1m.,	Mar.	'11	\$84,315	\$50,285	\$34,031	\$30,164	\$3,866
1 "	"	'10	80,827	48,194	32,633	29,794	2,839
3 "	"	'11	240,383	144,279	96,104	90,058	6,045
3 "	"	'10	216,119	141,470	74,649	89,382	14,733
LAKE SHORE ELECTRIC RAILWAY SYSTEM.							
1m.,	Mar.	'11	\$86,528	*\$49,821	\$36,707	\$34,790	\$1,917
1 "	"	'10	85,984	*49,142	36,842	34,803	2,039
3 "	"	'11	247,356	*147,310	100,046	104,200	74,155
3 "	"	'10	235,855	*144,957	90,898	103,921	113,023
MONTREAL STREET RAILWAY.							
1m.,	Mar.	'11	\$371,992	\$234,484	\$137,508	\$46,423	\$91,085
1 "	"	'10	336,197	220,790	115,407	40,675	74,731
6 "	"	'11	2,202,915	1,370,473	832,442	229,205	603,237
6 "	"	'10	1,992,236	1,216,984	775,252	212,586	562,666
NORTHERN OHIO TRACTION & LIGHT COMPANY.							
1m.,	Mar.	'11	\$190,186	*\$110,856	\$79,336	\$44,329	\$35,007
1 "	"	'10	173,425	*99,159	74,266	43,292	30,974
1 "	"	'11	548,871	*322,623	226,248	133,115	93,133
3 "	"	'10	484,575	*286,173	198,403	129,875	68,528
SEATTLE ELECTRIC COMPANY.							
11.,	Feb.	'11	\$428,557	\$246,177	\$182,381	\$107,170	\$75,210
1 "	"	'10	431,075	262,799	168,276	111,643	56,633
12 "	"	'11	5,596,701	3,162,447	2,434,254	1,307,613	1,126,641
12 "	"	'10	5,970,447	3,487,395	2,483,052	1,265,205	1,217,847
TAMPA ELECTRIC COMPANY.							
1m.,	Feb.	'11	\$57,335	\$28,330	\$29,004	\$6,283	\$22,722
1 "	"	'10	56,284	27,256	29,028	4,566	24,462
12 "	"	'11	593,878	327,404	266,473	67,870	198,604
12 "	"	'10	601,509	343,867	257,643	55,949	201,694
TWIN CITY RAPID TRANSIT COMPANY.							
1m.,	Mar.	'11	\$625,164	\$328,252	\$296,912	\$140,079	\$156,833
1 "	"	'10	598,403	304,774	293,628	140,229	153,399
3 "	"	'11	1,821,039	970,531	850,508	420,238	430,270
3 "	"	'10	1,719,320	889,024	830,296	420,688	409,608
WHATCOM COUNTY RAILWAY & LIGHT COMPANY.							
1m.,	Feb.	'11	\$31,350	\$17,480	\$13,870	\$10,655	\$3,215
1 "	"	'10	32,816	21,249	11,567	9,326	2,243
12 "	"	'11	406,930	226,240	180,690	112,376	68,314
12 "	"	'10	411,792	233,099	178,693	100,471	78,222

# Traffic and Transportation

## Retiring Manager Commends and Advises Employees

W. F. Kelly, whose resignation as general manager of the San Francisco, Oakland & San José Consolidated Railway and the Oakland Traction Company, Oakland, Cal., is noted elsewhere in this issue, addressed the following statement to the employees of the company under date of April 22, 1911:

"Looking back over a quarter of a century of active railroad service the one fact in my whole career that is most gratifying and appeals to me most strongly is the feeling that you are my friends—friends who have shared with me the troubles, discouragements and difficulties of the past and whose faithful and efficient service has contributed in a large degree to whatever success has been mine. In laying aside the cares and responsibilities of railway service I wish to convey to you a few words of counsel and appreciation. It has been my pleasure as well as my constant effort to secure for you the most favorable conditions, the fairest consideration of all grievances and the best wages which the business will permit. If you have a higher regard for the dignity and responsibility of your employment, a clearer conception of your duties to your employers and the public, a better appreciation of the value of courtesy and fair dealing toward all whom you meet and a proper pride and regard for yourselves as citizens, then shall I feel well repaid for my term of service with you. Upon your conduct depend in a large degree the peace, good order and good name of this community. See to it that this trust be not thrown lightly aside. Lend not a willing ear to him who would sow the seeds of dissension and discord within your ranks. Think for yourselves, weigh calmly all matters affecting your welfare, stand strongly for justice and fair dealing. Whoever may be my successor I trust that he may be worthy of your confidence and measure up to the full stature of a man. I trust that he will find in all his dealings with you that you will meet him in a fair, frank and manly way. Do this and your conduct will meet with the approval of a clear conscience and the respect and approval of your friends and fellow citizens. I wish for you all an increasing measure of success in your employment, good health and happiness to you and your families and an honored name among your friends and neighbors."

## Free Transportation of Letter Carriers Declared Unconstitutional by Attorney-General of Massachusetts

In accordance with an order adopted by the House of Representatives of Massachusetts, on March 24, 1911, directing the Attorney-General to inform the House whether, in his opinion, a statute requiring street railways to carry free United States letter carriers would be constitutional and valid, James M. Swift, Attorney-General, has rendered the following opinion:

"Under date of April 10, 1901, Attorney-General Knowlton advised the honorable Senate that a bill requiring transportation of letter carriers at a rate less than that collected from ordinary passengers was in his opinion unconstitutional so far as it concerned the Boston Elevated Railway, on the ground that such bill, if enacted, would impair the obligation of the contract contained in the charter of that company. (II Op. Atty-Gen., 261.) This opinion was undoubtedly correct, and is applicable with equal or greater force to a statute such as is described in the order above set forth.

"I am, however, of opinion that such a statute would be unconstitutional as applied to street railways generally. The right of the Legislature to regulate fares charged by street railways is undoubted, but it cannot 'under pretence of regulating fares and freights,' require a street railway 'to carry persons or property without reward.' See *Stone v. Farmers' Loan & Trust Company*, 116 U. S. 307, 331. The rate fixed must be reasonable. Obviously, a requirement that any class of persons (here 'United States letter carriers in uniform') be carried free is not a reasonable or proper exercise of the distinctively rate-making power.

"If the statute is to be justified at all it must be justified under the police power in its broader sense, i. e., the power

to legislate 'for the safety, health or proper convenience of the public.' (*Lake Shore & Michigan Southern Railway v. Smith*, 173 U. S. 684, 698-9.) Legislation for these purposes is not necessarily bad because it imposes an incidental pecuniary loss upon the carrier. (*Atlantic Coast Line Railroad v. North Carolina Corporation Commission*, 206 U. S. 1, 24, 25. *Interstate Railway v. Massachusetts*, 207 U. S. 79, 87.) It cannot, of course, be assumed that any class of persons can be carried free by a street railway without some, though perhaps slight, pecuniary loss to the company. A requirement of such free transportation cannot be sustained under the police power unless such requirement is reasonably adapted to promote 'the safety, health or proper convenience of the public.' The free transportation of United States letter carriers as a class, even though limited to carriers who are in uniform, does not tend to promote the public safety, the public health or the public convenience. It does not benefit the public generally, but is 'an arbitrary enactment in favor of the persons spoken of' (i. e., United States letter carriers in uniform). See *Lake Shore & Michigan Southern Railway v. Smith*, supra, p. 699. No reason appears which justifies the discrimination between United States letter carriers in uniform, as a class, and all other persons. See *Lake Shore & Michigan Southern Railway v. Smith*, supra, pp. 694-5. *Interstate Railway v. Massachusetts*, supra.

"For these reasons I am of opinion that a statute 'requiring street railways to carry free on their passenger cars United States letter carriers in uniform, in the city or town in which they are employed,' would not be constitutional and valid."

## Accidents in New York City in February

The following comparative summary of accidents for February, 1911, February, 1910, and February, 1909, on the street railways and the subway and elevated lines in Greater New York, which come under the jurisdiction of the Public Service Commission of the First District of New York, was submitted by the secretary of the commission at the regular meeting of that body on April 18, 1911:

	February, 1909.	February, 1910.	February, 1911.
Car collisions.....	101	108	98
Persons and vehicles struck by cars.....	837	905	1371
Boarding.....	504	549	599
Alighting.....	412	546	424
Contact electricity.....	14	24	18
Other accidents.....	1489	1506	1704
Total.....	3357	3638	4214
<b>INJURIES.</b>			
Passengers.....	1349	1501	1553
Not passengers.....	390	378	385
Employees.....	245	267	282
Totals.....	1984	2146	2220
<b>SERIOUS (INCLUDED IN ABOVE).</b>			
Killed.....	16	15	15
Fractured skulls.....	7	0	3
Amputated limbs.....	1	0	1
Broken limbs.....	14	22	20
Other serious.....	116	68	69
Totals.....	154	105	108
Number of revenue passengers.....	105,726,614	113,659,016	*118,400,000
Revenue car miles operated.....	20,519,675	21,437,207	*22,900,000

\*Estimated as to small portion (about 1 per cent) of traffic.

**Lanterns as Premiums.**—The Illinois Traction System, Peoria, Ill., will this year present silver lanterns to employees with perfect records for use on the road instead of the \$10 that has been previously given.

**Property at Park Damaged by Fire.**—The buildings and other property at Rothschild's Park, which is owned by the Wausau (Wis.) Street Railroad, were damaged by fire recently. The loss is placed at \$17,000, with insurance to the extent of \$12,000.

**Lehigh Valley Transit Company's Freight Service.**—The Lehigh Valley Transit Company, Allentown, Pa., has arranged to handle freight and freight cars on the lines of the Slate Belt Street Railway into and through Bangor, Pen Argyl, Wind Gap and Belfast.

**Night Service in Vancouver.**—The British Columbia Electric Railway, Vancouver, B. C., inaugurated a half-hourly night service on April 17, 1911. The schedule covers all the city lines, and service is continued until 2 a. m. Double fare is charged after midnight.

**Service Agreement Renewed in Salt Lake City.**—The agreement between the Utah Light & Railway Company, Salt Lake City, Utah, and its employees in regard to wages and terms of service, which expired on May 1, 1911, has been amended and renewed for a period of two years.

**Full Uniforms for Employees of Maine Road.**—The platform employees of the Lewiston, Augusta & Waterville Electric Railway, Lewiston, Maine, are to wear full uniforms. Formerly the uniform has consisted of cap and coat, and on portions of the line only the cap was used by the motormen.

**Suggestions from Men in Regard to Uniforms.**—The Pacific Electric Railway, Los Angeles, Cal., has in contemplation a change in the uniforms of its employees, and conductors and motormen in the employ of the company have been requested to communicate to the company any suggestions which they have to make in this connection.

**Illinois Traction System Advertisement.**—The Illinois Traction System, Peoria, Ill., is carrying in 300 newspapers an advertisement  $4\frac{1}{2}$  in. wide by 5 in. high headed "Summer Time Is Travel Time," in which it calls attention to the exceptional opportunity for summer travel, both for business and pleasure, which is afforded by the Illinois Traction System.

**Court Decision in Regard to Transfers on Staten Island.**—The Court of Appeals has rendered a decision which requires the Staten Island Midland Railway and the Richmond Light & Railroad Company, Staten Island, N. Y., to exchange transfers as ordered by the Public Service Commission of the First District of New York. It is stated that the companies will carry the case on appeal to the Supreme Court.

**Rerouting Proposed in Milwaukee.**—James D. Mortimer, vice-president, secretary and general manager of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has submitted to the city administration a plan to help relieve the congestion of street railway traffic in downtown Milwaukee by rerouting cars. The company desires a franchise on Seventh Street, from State Street to Clybourn Street, so as to route the Eighth Street-Muskego Avenue cars over the Sixteenth Street viaduct.

**New Car Signs in Boston.**—The Boston Elevated Railway has been making a study of destination signs for surface cars and has made a tentative decision to adopt as standard a type of hood sign which will display the name of the destination of the car in large letters and also a number the first figure of which will denote the division and the second and third the route over which the car runs. For some time the company has been displaying on the cars a large disk on which was painted the number of the division over which the car was operated.

**Wheel Guards in Philadelphia.**—The Philadelphia (Pa.) Rapid Transit Company is experimenting with wheel guards with a view to adopting them for general use on its cars. Ford, Bacon & Davis, New York, N. Y., who were employed by the State Railroad Commission to investigate street railway conditions in Philadelphia, have sent to the commission a copy of a letter from Director of Public Safety Henry Clay, of Philadelphia, requesting the names of cities in which the automatic wheel guards, referred to in their report, are used. Director Clay was informed that these wheel guards are used in Manhattan and Brooklyn boroughs, New York City, and Chicago.

**Passes Discontinued in New Jersey.**—The Public Service Railway, Newark, N. J., has issued a statement in regard to the discontinuance of passes after May 1, 1911, in accordance with the provisions of the new public utility law. The statement is concluded as follows: "The company has been advised by counsel that it would be a violation of subdivisions 'd' and 'g' of the eighteenth section of the act to continue to carry without compensation policemen, firemen or other persons not covered by the exception, subdivision 'g' and Section 41, and in compliance with the mandate of the law free transportation heretofore afforded to the classes referred to will be withdrawn beginning May 1, 1911. Any disobedience of the provisions of the act is made a criminal offense, and Sections 34, 35 and 36 provide for the punishment of offenders by fine or imprisonment or both, violations of the law being made misdemeanors."

## Personal Mention

**Mr. F. M. Lott** has been appointed master mechanic of the Ocean City (N. J.) Electric Railroad.

**Mr. D. J. Stewart** has resigned as manager of the Lulu Island branch of the British Columbia Electric Railway, Vancouver, B. C., after thirteen years of service.

**Mr. F. E. Pierce**, president of the Connecticut Valley Street Railway, Greenfield, Mass., has been elected president of the Athol & Orange Street Railway, Athol, Mass., to succeed Mr. G. D. Bates.

**Mr. D. P. Abercrombie, Jr.**, secretary and treasurer of the Connecticut Valley Street Railway, Greenfield, Mass., has been elected treasurer of the Athol & Orange Street Railway, Athol, Mass., to succeed Mr. A. N. Ellis.

**Mr. Edward M. Boggs**, civil engineer of the Oakland (Cal.) Traction Company and the San Francisco, Oakland & San José Consolidated Railway, has been appointed chief engineer of the construction and maintenance of way departments of the companies.

**Mr. W. E. Salber**, formerly electrical engineer of the Toledo Railway & Light Company, Toledo, Ohio, has been appointed superintendent of motive power of the Canton division of the Northern Ohio Traction & Light Company, Akron, Ohio, to succeed Mr. W. H. Tucker, resigned.

**Mr. Lester A. Harrington**, who has been acting as chief dispatcher and assistant to Mr. M. McIntyre, general superintendent of the San Francisco, Vallejo & Napa Valley Railroad, Napa, Cal., has been appointed general freight and passenger agent of the company to succeed Mr. H. C. Guiteau, resigned.

**Mr. J. P. Potter**, who has been connected with the Oakland (Cal.) Traction Company and the San Francisco, Oakland & San José Consolidated Railway for many years as superintendent, has been appointed general superintendent of the marine and railway transportation departments of the companies.

**Mr. O. E. Robinson** has resigned as assistant superintendent of the Danville lines of the Illinois Traction System. Mr. Robinson has been with the Danville street Railway & Light Company and the Illinois Traction System for the last ten years. It is understood that Mr. Robinson will go into the same line of work in the Southwest.

**Mr. F. L. Sheppard**, general superintendent of the New Jersey division of the Pennsylvania Railroad, has been appointed general superintendent of the West Jersey & Seashore Railroad, Camden, N. J., and general superintendent of the Philadelphia & Camden Ferry Company, in connection with his duties as general superintendent of the New Jersey division.

**Mr. J. Q. Brown**, assistant general manager of the Oakland (Cal.) Traction Company and the San Francisco, Oakland & San José Consolidated Railway, has been appointed chief engineer of the mechanical and electrical departments of the companies with the additional office of purchasing agent. Mr. Brown has superintended the engineering work of the companies for the last twelve years.

**Mr. R. W. Watson**, of New York, who was recently elected vice-president of the Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., to succeed Mr. J. Levering Jones, will, for the time being at least, be the active head of the company, taking over the duties relinquished by Mr. C. D. Emmons, whose resignation as general manager of the company is noted elsewhere in this column.

**Mr. J. T. Wallis**, superintendent of motive power of the Erie division of the Pennsylvania Railroad and the Northern Central Railway, Williamsport, has been promoted to the position of superintendent of the West Jersey & Seashore Railroad, Camden, N. J., and superintendent of the Philadelphia & Camden Ferry Company, to succeed Mr. D. H. Lovell, who has been granted extended leave of absence.

**Mr. C. H. Stocum** has been appointed superintendent of the Pittsburgh, McKeesport & Westmoreland Railway, Mc-

Keesport, Pa. Mr. Stocum began his railway career with the Brooklyn (N. Y.) Heights Railroad in 1893 as a helper in the shops and remained with the company and the Brooklyn Rapid Transit Company until 1904, advancing to the position of foreman of car wiring and testing. Since leaving Brooklyn Mr. Stocum has been employed by the New York Central & Hudson River Railroad in its operating department as inspector; with the Hudson & Manhattan Railroad, operating under the Hudson River, as foreman of inspection barns, and with the Pennsylvania Railroad at the works of the Westinghouse Electric & Manufacturing Company at East Pittsburgh as locomotive inspector.

**Mr. W. R. Alberger**, vice-president of the Oakland (Cal.) Traction Company and the San Francisco, Oakland & San José Consolidated Railway, has been appointed to have general supervision over the affairs of both companies, the positions of general manager and assistant general manager having been abolished following the resignation of Mr. W. F. Kelly. Mr. Alberger is also vice-president of the United Properties Company.

**Mr. Charles A. Hobein** has been appointed superintendent of power stations of the United Railways, St. Louis, Mo., to succeed Mr. E. D. Smith, who, as announced in the *ELECTRIC RAILWAY JOURNAL* of Jan. 7, 1911, has become chief engineer of the Board of Education of St. Louis. Mr. Hobein has been connected with the company for eight years and has recently been assistant superintendent of power stations of the company.

**Mr. Charles J. Jones**, chief engineer of maintenance of way of the Aurora, Elgin & Chicago Railroad, Wheaton, Ill., since the road was constructed, has been appointed superintendent of transportation of the company to succeed Mr. J. W. Brown, whose appointment as assistant superintendent of transportation of the Public Service Railway, Newark, N. J., was announced in the *ELECTRIC RAILWAY JOURNAL* of April 15, 1911.

**Mr. A. N. Manahan** has been appointed special resort agent of the Pacific Electric Railway, Los Angeles, Cal., in charge of Alpine Tavern, Casa Verdugo, the parks in Riverside, Redlands and San Bernardino and other resort properties owned by the company. Mr. Manahan was manager of the bureau of admissions at the World's Fair in St. Louis, and of the same bureau and of the department of concessions at the Alaska-Yukon Exposition in Seattle.

**Mr. William J. Wilgus** has received from the Institution of Civil Engineers of Great Britain the award of the Telford gold medal in recognition of the meritorious paper read by him at the last session of the Institution. Mr. Wilgus was formerly fifth vice-president and chief engineer of the New York Central & Hudson River Railroad and was in charge of the electrification work of that company in and around New York City. At the present time he is engaged in consulting engineering work in New York City.

**Prof. Winthrop More Daniels**, who has been appointed a member of the Board of Public Utility Commissioners of New Jersey to succeed Mr. Frank H. Sommer, was born in Dayton, Ohio, forty-three years ago and was graduated from Princeton University in the class of 1888. After graduation he taught for two years in a preparatory school at Princeton. He then went to Leipzig University for a year's study in history and economics. In 1891 he was appointed instructor in economics in Wesleyan University, Middletown, Conn., but in 1892 he was called to Princeton. In 1895 he was made professor of political economy at Princeton, a position which he still holds. Professor Daniels has served at various times, chiefly in the summer vacations, in an editorial capacity with the *Evening Post*, of New York. From 1906 until 1909 he was secretary and treasurer of the American Economic Association and is a member of the executive committee of that association. Contributions by Professor Daniels have appeared at various times in the *Atlantic Monthly* and in scientific economic journals. Besides this he has published "Elements of Public Finance" and has several times revised and brought down to date "Johnston's History of American Politics."

**Mr. Carl A. Sylvester** has resigned as general manager of the Boston (Mass.) Suburban Electric Companies to become assistant to the general manager of the Rio de Janeiro

Tramway, Light & Power Company, Rio de Janeiro, Brazil. Mr. Sylvester will succeed Mr. Walter Pearson at Rio de Janeiro and will leave Boston about June 1, 1911, to enter upon his new duties. Mr. Sylvester was born in Newton Center, Mass., and was educated in the public schools there and was graduated from Harvard in 1902. He immediately entered the employ of the Newton system of street railways and worked in the shops and in the operating and construction departments. He also served for a time with the power department. In 1903 he was appointed assistant general superintendent of the Boston Suburban Electric Companies and later entered the general offices of the company in connection with the purchasing of supplies and as acting paymaster. Subsequently he became clerk to the president and in 1904 was made assistant to the general manager. He was given the title of assistant general manager in 1906. In September, 1909, Mr. Sylvester was appointed general manager of the Boston Suburban Electric Companies to succeed Mr. Matthew C. Brush, resigned.

**Mr. George A. Damon**, managing engineer for the Arnold Company, Chicago, Ill., has been appointed dean of the School of Engineering of Throop Polytechnic Institute, Pasadena, Cal. Mr. Damon was born in Chesaning, Mich., on April 7, 1871. He was educated in the grammar school at Detroit and the high school at Ypsilanti, and was graduated from the latter in the class of 1889. Meanwhile Mr. Damon gained experience as a freight clerk with the Michigan Central Railroad at Ypsilanti. Subsequently he entered the University of Michigan, but his work at the university was interrupted in 1893 when he took charge of the educational exhibit of the university at the World's Fair in Chicago. Shortly thereafter Mr. Damon became connected with the Fisher Electric Company, which he served in the drafting room and shop. In the fall of 1894 he returned to the University of Michigan and completed his course. In September, 1895, Mr. Damon became connected with Mr. Bion J. Arnold, who had recently opened an office in Chicago as a consulting engineer, and he has been connected with Mr. Arnold continuously since that time. At first Mr. Damon's work with Mr. Arnold was along consulting engineering lines, but when the Arnold Electric Power Station Company was organized Mr. Damon became prominently affiliated with the work which it carried out in different parts of the country. In 1908 and 1909 Mr. Damon served as first assistant to Mr. Arnold in the work which he carried out as consulting engineer to the Public Service Commission of the First District of New York. In 1910 Mr. Damon directed the investigation by Mr. Arnold of transportation facilities in the Pittsburgh district for the Mayor in connection with the plans for a greater Pittsburgh. Since January, 1911, he has been in Los Angeles, Cal., in charge of the appraisal of the property of the Southern California Edison Company and has recently taken up the preliminary studies for Mr. Arnold of the transit problems of Los Angeles. His work at Throop Institute will not interfere with his duties in connection with the Arnold Company. Mr. Damon is an associate of the American Institute of Electrical Engineers and a member of the Western Society of Engineers and the Western Railway Club.

**Mr. W. F. Kelly**, general manager of the Oakland Traction Company, Oakland, Cal., and of the San Francisco, Oakland & San José Consolidated Railway, has resigned from those companies for the reasons set forth in a letter which was addressed by him on April 6, 1911, to the board of directors of these two companies, made public April 21. The letter follows: "Observing that most men retire from the active cares of business only when they have failed, or are incapacitated for active duty, I promised myself on entering the street railway service that, whatever the result of my efforts, in no event would I remain in active duty for a longer period than twenty-five years. That time has now elapsed and I deem it my duty to redeem that promise. Some esteem it a glory to 'die in the harness,' but for myself I prefer the freedom and larger leisure which come from laying it aside. While yet there is joy in living I desire the opportunity to direct my time and efforts as fancy may dictate. To this end I present herewith my resignation as general manager of both the Key Route and Oakland Traction companies, effective May 1. During the month of May my services, if desired, are at your com-

mand in an advisory capacity upon any of the work now in contemplation or under way. More than half of my street railway experience has been in the service of your company and I wish to express my hearty appreciation of your cordial support and co-operation in whatever measure of success has attended my efforts. Time, patience and unceasing effort have solved many of the difficulties of the past and your properties are now in an excellent condition with a corps of operatives honest, efficient, trustworthy and loyal to the highest degree. I would especially commend to your most favorable consideration the various heads of departments and trust that opportunity may speedily afford a substantial recognition of their well merited and efficient service. It is most gratifying that our business and personal relations have been most cordial and harmonious throughout the entire period of our association and I trust they may so continue. Your various enterprises are now entering upon a period rich in great possibilities and I bespeak for them the fullest success." Mr. Kelly also issued a letter to the employees of the company expressing his appreciation of their loyalty during his administration. Mr. Kelly was formerly general manager of the Columbus Street Railway, Columbus, Ohio, but has been connected with the Oakland properties for about thirteen years. He was a member of the executive committee of the American Street Railway Association in 1895-1896.

**Mr. C. D. Emmons** has resigned as general manager of the Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., which succeeded the Fort Wayne & Wabash Valley Traction Company recently, to become general manager of the Chicago, South Bend & Northern Indiana Railway and the Southern Michigan Railway, South Bend, Ind. Mr. Emmons was born in Lafayette, Ind. in 1871. He lived eighteen years in Pittsburgh and was graduated from the Western University of Pennsylvania with the degree of civil engineer. After graduation he entered the service of the Pennsylvania Railroad as a rodman, and was advanced to the position of supervisor of signals for the territory around Philadelphia. In 1900 he was appointed general superintendent of the Lafayette (Ind.) City Railway, and in July, 1903, he was appointed general superintendent of the Fort Wayne & Wabash Valley Traction Company and superintendent of construction of the Ohio & Indiana Construction Company, which was then building the Fort Wayne, Van Wert & Lima Railway. In April, 1905, he was appointed general manager of the Fort Wayne & Wabash Valley Traction Company, which now operates 212 miles of line. Under Mr. Emmons' direction there have been constructed two new lines—the Fort Wayne, Van Wert & Lima Railway and the link between Fort Wayne and Bluffton, which connects with the Indiana Union Traction Company's system. Mr. Emmons also directed the reconstruction of the remaining interurban property of the company as well as the city lines of Fort Wayne and Logansport. A new power house has been erected and almost an entire new equipment of city cars has been furnished to the Fort Wayne city lines under his direction. Mr. Emmons has taken an active interest in the affairs of the American Electric Railway Transportation & Traffic Association and the Central Electric Railway Association and was chairman of the committee on interurban rules of the Transportation & Traffic Association in 1909-1910. At present he is co-chairman of the joint committee of that association and the American Electric Railway Engineering Association on block signaling for electric railways. In commenting on his resignation the *Fort Wayne News* said: "It is sincerely to be hoped that the policy to which he so carefully adhered will be followed by the administration that shall succeed his, for it is highly desirable that the relations between the company and the community should be upon a basis of fairness and amiability. Mr. Emmons has built up a magnificent organization, has established friendly working conditions, and leaves the property in excellent shape. The departure of Mr. Emmons is a distinct loss not only to the traction company but to Fort Wayne."

#### OBITUARY

**Alexander E. Brown**, president of the Brown Hoisting Machinery Company, Cleveland, Ohio, and inventor of several devices for handling coal and ore, is dead.

## Construction News

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

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

#### RECENT INCORPORATIONS

\***Watsonville Railway & Navigation Company, Watsonville, Cal.**—Incorporated in California to build an electric railway in Watsonville, and presumably to take over the Watsonville Transportation Company. Capital stock, \$200,000. Officers: F. E. Snowden, C. H. Fisher, C. A. Shirey, C. W. Bell and E. M. Heaney.

\***East St. Louis & St. Louis Traction Company, East St. Louis, Ill.**—Incorporated in Illinois as a subsidiary of the East St. Louis & Suburban Railway, to build a line in East St. Louis from the East St. Louis relay passenger station south on Missouri Avenue to Tenth Street and west on Tenth Street to the east approach of the Free Bridge at Tenth Street and Piggott Street.

\***Richmond & Cincinnati Traction Company, Richmond, Ind.**—Application for a charter will be made by this company in Indiana to build an electric railway to connect Richmond, Ind., and Cincinnati, Ohio, and later to extend it to Union City. Capital stock, \$50,000. [E. R. J., April 1, '11.]

\***Miller's River Street Railway, Miller's Falls, Mass.**—Application for a charter will be made in Massachusetts by this company to build a 14-mile electric railway to connect Miller's Falls, Montague, Erving, Wendall and Orange. Capital stock, \$70,000. Incorporators: Daniel P. Abercrombie, Jr., Montague; Charles W. Clapp, Greenfield; Marcus A. Coolidge, Fitchburg; Edward C. Crosby, Brattleboro, and Frederick E. Pierce, Greenfield.

\***Syracuse, Watertown & St. Lawrence River Railroad, Syracuse, N. Y.**—Chartered in New York to build a 7-mile electric railway to connect Syracuse, Watertown, Cicero and Brewerton. The line will connect with the Syracuse & South Bay Electric Railroad in Cicero and extend to Brewerton. Capital stock, \$1,250,000. Incorporators: J. S. Moore, W. W. Foster and M. H. Knapp.

\***Sioux Falls & Southern Minnesota Traction Company, Pierre, S. D.**—Application for a charter has been made by this company in South Dakota to build an electric railway between Sioux Falls, S. D., and Albert Lea, Minn., via Worthington, Sheppard, Spring Valley, Drésden, Loon Lake, Petersburg, Dwinell, Ceylon, Silver Lake, East Chain and Pilot Grove, Minn. Capital stock, \$300,000. Incorporators: L. B. Wyckoff, Syracuse, N. Y.; J. J. Davenport, H. W. Knight and Charles S. Sollas, Chicago, Ill., and G. P. Peterson, Pierre.

#### FRANCHISES

**Fresno, Cal.**—The Fresno, Hanford & Summit Lake Interurban Railway has received a franchise from the Board of Supervisors to build its line through Fresno County.

**Glendale, Cal.**—The Pacific Electric Railway has asked the Council for a franchise to build its tracks between Glendale and Burbank. The right-of-way will be wide enough for two tracks, and will be graded for a double track, but only one track will be rushed to completion.

**Redwood, Cal.**—The Southern Pacific Railroad has asked the Board of Trustees for a fifty-year franchise to build a double-track line through Redwood City.

**Sacramento, Cal.**—The Sacramento Electric, Gas & Railway Company will ask the Board of Trustees for a franchise to build a crosstown railway in Sacramento.

**Santa Barbara, Cal.**—The Santa Barbara Consolidated Railway has asked the City Council for a franchise to rebuild and extend some of its lines in Santa Barbara.

**Algiers, La.**—The Algiers Railway & Light Company has received a franchise from the City Council to extend its tracks over certain streets in Algiers.

**Donaldsonville, La.**—The Lafourche Valley & Gulf Railway, Donaldsonville, has received a franchise from the Town Council to build its tracks in Donaldsonville. This 90-mile electric railway will connect Donaldsonville and Leesville, on the west bank of the Bayou Lafourche. F. M. Welch, Donaldsonville, president. [E. R. J., Jan. 21, '11.]



**New Iberia, La.**—The Southwestern Traction & Power Company, New Orleans, has asked the City Council for a franchise to build its tracks in New Iberia. This 75-mile railway will connect New Iberia and Lafayette. F. W. Crosby, New Orleans, president. [E. R. J., Feb. 25, '11.]

**Shreveport, La.**—The Shreveport Traction Company has asked the City Council for a franchise to extend its tracks in Shreveport.

**Detroit, Mich.**—The Detroit United Railway has asked the Common Council for a franchise to extend its Greenwood Avenue line out Hamilton Boulevard and to double-track some of its lines in Detroit.

**Watertown, N. Y.**—The Black River Traction Company has received a franchise from the Common Council to extend its tracks on Washington Street in Watertown.

**Memphis, Tenn.**—The Memphis Street Railway has asked the City Commissioners for a franchise to extend its tracks over certain streets in Memphis.

**\*Bremerton, Wash.**—L. H. Gray, Seattle, representing the Puget Sound Southern Railroad, has asked the Council for a franchise to build an electric railway in Bremerton. This is part of a plan to connect Puget Sound with the Grays Harbor country.

**\*Ellensburg, Wash.**—Paul L. Richards, Ellensburg, has asked the County Commissioners for a franchise to build an electric railway through Kittitas County.

**Wheeling, W. Va.**—The Pan-Handle Traction Company, Wheeling, has asked the Board of Commissioners of Ohio County for a franchise to build a third-rail on River Road, at the northern boundary of the city limits of Wheeling, northward to Third Street, in Glennova, and westward to the site of a proposed car house.

**Milwaukee, Wis.**—The Milwaukee Electric Railway & Light Company has asked the Council for a franchise to extend its tracks on Seventh Street from State Street to Clybourn Street, in Milwaukee.

#### TRACK AND ROADWAY

**Phoenix (Ariz.) Railway.**—This company will soon begin to construct two extensions, one to Ingleside and Scottsdale, and the other, a south side line on Central Avenue across the new bridge and through Tempe to Mesa.

**Glendale & Eagle Rock Railway, Los Angeles, Cal.**—This company is securing right-of-way for an electric railway which will connect its lines and the Glassell and Workman ranches. The company will also extend its tracks over certain streets in Glendale.

**Monterey & Pacific Grove Railway, Monterey, Cal.**—This company has begun the broad gaging and reconstruction of its tracks in Monterey.

**Ontario & San Antonio Heights Railroad, Ontario, Cal.**—The construction work on the Pomona-Clairemont branch and the reconstruction of the Euclid Avenue line of this company are now completed and the lines placed in operation. Through cars between Ontario and Pomona are running on regular schedule.

**\*San Francisco, Cal.**—Law Brothers, San Francisco, are said to be negotiating for a right-of-way to build an electric railway through Marin County. It is planned to operate a ferry service between Belvedere and Harbor View.

**Tidewater & Southern Railroad, Stockton, Cal.**—This company, which is now building an electric railway from Stockton to Modesto, via Atlanta, French Camp and Turlock, will extend its line 25 miles to Merced. K. C. Brueck, Stockton, president. [E. R. J., April 22, '11.]

**Sacramento Valley West Side Electric Railway, Willows, Cal.**—This company has been organized to build a 50-mile electric railway from Woodland north to Kennett, via Red Bluff, Redding, Colusa and Willows. C. L. Donohue, Willows, and E. L. Sisson are interested. [E. R. J., April 15, '11.]

**Citrus Southern Electric Railway, Sanford, Fla.**—All preliminary arrangements have been completed by this company and the laying of rails will begin Sept. 1 for building this 45-mile railway between Kissimmee, Sanford and Orlando. J. J. Brophy, Winter Park, general manager. [E. R. J., April 8, '11.]

**\*West Point, Ga.**—Plans are being considered for building an electric railway to connect West Point, Hamilton, Talbotton, Culloden, Forsyth, Juliette and Monticello.

**Aurora, Elgin & Chicago Railway, Elgin, Ill.**—Work has been begun by this company on the double tracking of its line through Montgomery.

**Cincinnati, Louisville, Lexington & Maysville Traction Company, Dry Ridge, Ky.**—The citizens of Independence have raised the necessary \$50,000 to secure the extension through Independence. W. T. S. Blackburn, Dry Ridge, resident. [E. R. J., March 25, '11.]

**Lexington & Interurban Railways, Lexington, Ky.**—Plans are being made by this company for building a 22-mile extension between Lexington and Nicholasville.

**Louisville & Interurban Railway, Louisville, Ky.**—This company is negotiating with the municipal authorities of Shelbyville for extending its railway through Shelbyville.

**Nortonville (Ky.) Traction Company.**—This company advises that it will begin construction of its electric railway in Nortonville within the next month. It will locate its power station in Nortonville and will furnish power for lighting purposes. Capital stock, \$100,000. Officers: Frank E. Mohr, Nortonville, president; T. F. Callard, vice-president, and Frank G. Hoge, Nortonville, secretary and treasurer. [E. R. J., April 8, '11.]

**Berkshire Street Railway, Pittsfield, Mass.**—This company has begun work in Otis and will begin construction within a week on the western extremity of its line between East Lee and Huntington.

**Benton Harbor-St. Joe Railway & Light Company, Benton Harbor, Mich.**—A contract has been awarded to Bean & Jones by this company for building its railway from Benton Harbor to Sister Lakes, Dowagiac and Cassopolis.

**Lansing & Northeastern Electric Railway, Detroit, Mich.**—The extension of this company's third rail system from Lansing to Owosso has been surveyed from Owosso to Saginaw. Construction will begin this summer.

**Duluth (Minn.) Street Railway.**—The work of laying heavy rails on the South End, Billings Park and other lines of this company in Superior has been completed. The company will extend its tracks over the West Fourth Street bridge when it is completed.

**Granite City Railway, St. Cloud, Minn.**—This company will soon begin the construction of a 7-mile extension to its Waite Park line at St. Cloud. The franchise for the extension has been secured.

**West Missouri Electric Railway, Kansas City, Mo.**—This company has awarded the contract to the Spitcaufsky-Wagner Construction Company for building its proposed 34-mile electric railway to connect Kansas City and Harrisonville via Grandview, Belton and Roymore. Three bridges will be required of 200 ft., 100 ft. and 60 ft., respectively, and of steel girder and concrete. W. N. Nagle, chief engineer.

**Virginia City, Mont.**—L. H. Leber and R. J. Watson have secured right-of-way and completed surveys for an electric railway between Alder and Virginia City.

**Coney Island & Brooklyn Railroad, Brooklyn, N. Y.**—The Public Service Commission has granted the application of this company to sell \$500,000 of notes. About \$355,000 will be spent for improving 5 miles of line on Coney Island Avenue.

**Nassau Electric Railroad, Brooklyn, N. Y.**—This company, by order of the Public Service Commission, has been granted permission to construct its proposed extension between Liberty and Georgia Avenues extending along Georgia Avenue to Atlantic Avenue and connecting with the existing track of the Brooklyn, Queens County & Suburban Railroad in Georgia Avenue.

**Little Falls & Johnstown Railroad, Little Falls, N. Y.**—Frederick D. Hone, New York, is making surveys for this 28-mile electric railway between Little Falls and Johnstown via St. Johnsville. [E. R. J., April 22, '11.]

**Piedmont & Northern Railway, Charlotte, N. C.**—Irwin, Hart & Company, Knoxville, Tenn., are reported to have been given a subcontract for 4 miles of grading of this railway near Pelzer, S. C. A. V. Miller and T. L. Nelson, Lenoir, N. C., will have a sub-contract near Gastonia, N. C.,

and Hoffman & Sudderth, Gastonia, will do some of the concrete work. J. R. Ervin, Lenoir, is reported to have a sub-contract on the line in South Carolina. This company will let contracts for bridges over the main Catawba River and the South Fork of the Catawba, in North Carolina, and over the Reedy and Saluda Rivers in South Carolina. This electric railway, which is to connect Charlotte, N. C., and Greenwood, S. C., was chartered in South Carolina as the Greenville, Spartanburg & Anderson Railway, and in North Carolina as the Piedmont Traction Company. A recent charter has been obtained in South Carolina, in which these two companies will be merged at some future time as the Piedmont & Northern Railway. The officers of both companies are: J. B. Duke, president; W. S. Lee, Charlotte, vice-president; Thomas B. Lee, chief engineer. Headquarters, Charlotte, N. C. [E. R. J., March 25, '11.]

\***Hendersonville, N. C.**—C. F. White is making plans to organize a company to build a 2-mile electric railway from the depot in Hendersonville to Osceola Lake via Columbia Park. About \$10,000 has been subscribed. It is expected to extend this line in the near future, making a belt line through that vicinity.

\***Cincinnati Short Belt Railroad & Traction Company, Cincinnati, Ohio.**—This company proposes to build an electric railway through Duck Creek Valley, Madisonville, Oakley, Norwood, Bond Hill and the Mill Creek Valley, from Red Bank to Chester Park. Later on the line may be extended to the Ohio River line and will connect all railroads in the Cincinnati zone and facilitate switching traffic. Peter Eichels, Cincinnati, Ohio, is interested.

\***Cleveland, Ohio.**—It is said that a company will shortly be incorporated to build a railway between the southern city limits of Cleveland and the race track at Randall, a distance of 7 miles. Men interested in racing matters are at the head of the project. The Cleveland Railway will probably be asked to furnish the power to operate it.

\***Fostoria & Fremont Electric Railway, Fostoria, Ohio.**—This company has completed its 20-mile electric railway between Fremont and Fostoria. All right-of-way has been secured and work will begin at once on an 18-mile extension between Fremont and Port Clinton. J. D. McDonald, secretary.

\***Chatham, Wallaceburg & Lake Erie Railway, Chatham, Ont.**—Plans are being considered by this company for building extensions to Blenheim and Sarnia. The Blenheim extension will be begun this summer.

\***Hamilton, Ont.**—It is reported that a syndicate of Toronto capitalists is prepared to build an electric line connecting Hamilton, Galt and Guelph, providing satisfactory arrangements can be made with the municipalities along the line. The Toronto people are said to be ready to proceed at once.

\***Canby Canal Company, Oregon City, Ore.**—This company is considering plans for building an electric railway from Canby to Molalla, with branches to Beaver Creek, Meadowbrook, Colton, Needy and Macksburg. It is expected that this line will eventually be extended across the Willamette River and connect with the Oregon Electric Railway, Portland, near Wilsonville.

\***Philadelphia (Pa.) Rapid Transit Company.**—This company contemplates the construction of a branch line extending from its present Short Line, at its new bridge spanning Ridley River, to Fourth Street and Highland Avenue, in the extreme western section of Chester. It is understood that the company will bear the expense of a bridge over Chester River, which is the dividing line between the eastern and western sections of Chester, providing City Councils extend it the necessary franchises on Fourth Street.

\***Philadelphia & Western Railway, Philadelphia, Pa.**—This company has awarded the contract to the Stone & Webster Engineering Company, Boston, for building its extension from Villa Nova to Norristown. Work has begun.

\***Woodlawn & Southern Street Railway, Woodlawn, Pa.**—J. G. McGuire & Contracting Company, New Brighton, Pa., has been awarded the contract by this company for building its three-mile electric railway from Woodlawn to Aliquippa, with a branch on Franklin Avenue, Woodlawn,

extending to New Sheffield. It is stated that construction will be begun at once. J. I. Moore is interested. [E. R. J., March 4, '11.]

\***Abbeville, S. C.**—Messrs. Cothran & Cothran have been awarded the contract for surveying for a proposed 12-mile electric railway between Abbeville and Antreville.

\***Camden, S. C.**—R. E. Sharpe, Rembert, is said to be making plans to build an electric railway to connect Camden and Sumter.

\***Columbia & Augusta Electric Railway, Columbia, S. C.**—This company, which is considering plans for building an electric railway between Columbia and Augusta, has secured permission from the Secretary of State to change the name of the company to the Augusta-Aiken Electric Corporation. L. C. Maynie, president, and M. H. Mendee, secretary and treasurer.

\***Greenville, Spartanburg & Anderson Railway, Greenville, S. C.**—This company has applied to the Secretary of State for permission to increase its capitalization from \$300,000 to \$4,000,000 and to construct a line from Gelton to Greenwood.

\***Beaumont (Tex.) Traction Company.**—An order has been placed by this company for \$10,000 worth of rails for special work on its tracks. Pearl Street and several other streets in the business section of Beaumont will be double tracked.

\***Denton (Tex.) Traction Company.**—This company has awarded the contract for building an extension to the northern part of Denton and to the College of Industrial Arts. Work will begin within a few weeks.

\***Gainesville, Tex.**—M. A. Hindman, Fort Worth, and associates are making plans to build an electric railway to connect Gainesville, Tioga and McKinney. Another plan is considered by a company to build an electric railway from Gainesville to Sherman via Whitesboro.

\***Bay Shore Rapid Transit Company, La Porte, Tex.**—Contracts have been awarded by this company to the W. E. Ule Construction Company for building its projected 25-mile line between Houston, La Porte and Sylvan Beach. Work will begin before June 1 and the original route, via South Houston, will be abandoned.

\***Marshall (Tex.) Traction Company.**—Plans are being made by this company to build a 2-mile extension in Marshall to the East End suburb.

\***San Antonio & San José Interurban Railway, San Antonio, Tex.**—This company is in the market for 150 tons of 50 or 60 lb. relaying rails to complete its line from San Antonio to San José, Tex. A. P. Powers, San José, general manager. [E. R. J., March 18, '11.]

\***Citizens' Railway, Waco, Tex.**—This company is negotiating to finance further extensions and improvements of its lines. J. H. Boughton, president.

\***Norfolk Railway & Light Company, Norfolk, Va.**—It is reported that this company will extend its line to Richmond and Washington.

\***Norfolk & Portsmouth Traction Company, Norfolk, Va.**—Work has been begun by this company on the extension of its Edgewater line. The track is being extended from Forty-third Street with a double track to Bowling Alley and a single track to Tanner's Creek.

\***Seattle, Wash.**—L. G. Gray, Seattle, and associates are securing right-of-way for an electric railway to connect Bremerton, Charleston, Port Orchard, Union City, Shelton, Clifton and Gray's Harbor.

\***Spokane & Inland Empire Railroad, Spokane, Wash.**—This company is said to be considering plans for building an extension down the Spokane River to the Columbia and will let contracts as soon as it has completed the financing of the project.

\***Pacific Light & Power Company, Walla Walla, Wash.**—This company is securing a right-of-way from the mouth of the White Salmon River to Trout Lake, a distance of 30 miles, for an extension. Much property along the proposed route has been taken over by the company. It is reported that the company intends to extend its line from its present terminus at Uniontown to and around Smith's Point and probably as far east as the county bridge across Young's Bay.

\*La Crosse & Black River Falls Railway, Black River Falls, Wis.—Interest has again been revived in building this proposed electric railway to connect La Crosse and Black River Falls. Black River Falls has the water power necessary to operate an electric and freight line. It is stated that the company will soon organize.

#### SHOPS AND BUILDINGS

Central California Traction Company, San Francisco, Cal.—Work has been begun by this company on the construction of three passenger depots to be erected at Morada, Campton and Florin Road. Samuel B. McLenegan, Stockton, general manager.

Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind.—This company is considering plans for building a new passenger station in Fort Wayne.

Northern Indiana Railway, South Bend Ind.—This company expects to have its new passenger and freight station at Elkhart ready for occupancy by May 15. The second floor will be used for offices and rooms for the employees.

Twin City Rapid Transit Company, Minneapolis, Minn.—This company has begun work on a building to be constructed on Nicollet Avenue and Blaisdell Avenue, between Thirty-first Street and Thirty-second Street, in Minneapolis. The principal building will be 30 ft. x 303 ft., and will be used for offices and for the trainmen. The remainder, or working part of the building, will be 1-story structure 100 ft. x 303 ft.

Long Island Railroad Company, New York, N. Y.—This company will build a new depot at Woodside. The cost is estimated to be about \$100,000.

Ohio Electric Railway, Cincinnati, Ohio.—This company will build a new freight depot at Hamilton in the near future.

Spokane & Inland Empire Railroad, Spokane, Wash.—This company will build new car houses near Recreation Park in Spokane during this year. C. L. Bankson, Spokane, purchasing agent.

#### POWER HOUSES AND SUBSTATIONS

San Bernardino Valley Traction Company, San Bernardino, Cal.—This company's substation at the mouth of Waterman canyon on the Arrowhead-Hot Springs branch was destroyed by fire on April 27. The loss is estimated to be about \$7,000.

Pacific Gas & Electric Company, San Francisco, Cal.—It is reported that this company will build a new substation at McNear's Point.

Connecticut Company, New Haven, Conn.—It is reported that this company is preparing to abolish its Seaview Avenue power house in Bridgeport and install in its place a substation in which the power from the power station at Cos Cob will be distributed to operate its lines in Bridgeport.

Keokuk Electric Railway & Power Company, Keokuk, Ia.—This company wants for immediate delivery one 800-hp cross-compound Corliss engine and condenser, for 140 lb. steam; one 300-kw, 133-cycle, s.p., 1100-2200-volt, three-bearing, composite-wound Westinghouse generator, with exciter and switchboard panel; one 400-kw, 550-volt railway generator with switchboard panel, for its power house in Keokuk. A. D. Ayres, Keokuk, general manager.

Marquette County Gas & Electric Company, Ishpeming, Mich.—This company has just purchased one 400-hp Babcock & Wilcox water tube boiler for its power house in Ishpeming.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—A contract has been awarded to B. J. Jobst by this company to build a transformer station on Fifth Street and Jones Street, in Omaha. The structure will be 60 ft. x 40 ft., one story high and of brick and steel construction. The cost is estimated to be about \$100,000.

Hudson & Manhattan Railroad, New York, N. Y.—This company has ordered a 1500-kw rotary converter from the General Electric Company.

Twin City Light & Traction Company, Centralia, Wash.—This company has begun work on its new power station on Coal Creek in Chehalis.

## Manufactures & Supplies

#### ROLLING STOCK

Washington & Virginia Railway, Washington, D. C., has purchased four 27 E-1 trucks from The J. G. Brill Company.

Union Electric Company, Dubuque, Ia., expects to purchase several new cars, but has not yet decided upon the details.

Northern Texas Traction Company, Ft. Worth, Tex., has ordered four interurban motor cars from the St. Louis Car Company.

Houston (Tex.) Electric Company has ordered ten single-end trailer and five single-end motor cars from the St. Louis Car Company.

Texarkana Gas & Electric Company, Texarkana, Ark., is reported to be considering the purchase of two pay-as-you-enter cars.

Boston (Mass.) Elevated Railway has ordered forty 70-ft. all-steel cars from the Standard Steel Car Company, for use in the Cambridge subway.

New York & Stamford Railway, Port Chester, N. Y., has ordered ten pairs of Standard O-50 trucks from the Standard Motor Truck Company.

Lancaster & York Furnace Street Railway, Lancaster, Pa., has ordered one 38-ft. flat motor car body and two 27 G-1 trucks from The J. G. Brill Company.

West Missouri Electric Railway, Kansas City, Mo., is considering the purchase of several new cars; also an electric locomotive. H. D. Pattee, president.

Du Bois Electric & Traction Company, Du Bois, Pa., has purchased one 25-ft. 4-in. motor car body and two Brill 39-E trucks with rolled-steel wheels, from the G. C. Kuhlman Car Company.

Walla Walla Valley Railway, Walla Walla, Wash., has ordered one 36-ft. combination passenger and smoking motor car body and two 25-ft. 4-in. vestibuled motor car bodies from the Danville Car Company.

Wilkes-Barre (Pa.) Railway has purchased twenty new cars from The J. G. Brill Company. They are 48 ft. 1 in. over all, with flat arched roof, and are equipped with MCB-27 trucks. Fourteen of these cars are for city service, and are equipped with four Westinghouse 101 B-2 motors, and H. L. control. Six of them are for interurban service, and are equipped with Westinghouse 305 motors, H. L. control and General Electric air brakes.

#### TRADE NOTES

A. O. Schoonmaker Company, New York, N. Y., has moved its office from 221 Fulton Street to 66 Park Place, New York.

Perry Ventilator Corporation, New Bedford, Mass., has received the contract for ventilators for the fifty cars for the Pittsburgh (Pa.) Railways, which are being built by the Pressed Steel Car Company.

American Bureau of Inspection & Tests, Chicago, Ill., has appointed George W. Greene as inspecting engineer to succeed Morgan T. Jones, retired. E. C. McMillan has been appointed to succeed Mr. Greene.

Kirby Equipment Company, Chicago, Ill., has moved its offices and the Chicago office of the Globe Seamless Steel Tubes Company, Milwaukee, Wis., from the Railway Exchange to the People's Gas Building.

Automatic Ventilator Company, New York, N. Y., has received an order to install its ventilators on the four interurban cars for the Utica & Mohawk Valley Electric Railway, being built by the G. C. Kuhlman Car Company.

Kilby Frog & Switch Company, Birmingham, Ala., has appointed H. G. Barclay traveling sales agent. Mr. Barclay, previous to his present appointment, was connected with the Lorain Steel Company, Johnstown, Pa., for twenty years.

John G. Kipp, heretofore sales manager of the Electric Railway Equipment Company, Cincinnati, Ohio, has just been appointed general eastern agent of the company with offices at 90 West Street, New York, where he will handle his company's entire line of products.

**C-A-Wood-Preserver Company, St. Louis, Mo.,** which early this year removed its general offices from Austin, Tex., to St. Louis, Mo., reports that its record of business so far this year exceeds in large degree that of any similar period in the history of the company.

**Henry R. Cobleigh** has resigned as mechanical editor of *The Iron Age*, which position he has held for the last seven years, to take charge of the advertising and publicity of the International Steam Pump Company, New York, N. Y. He entered upon his new duties on May 1.

**Walter L. Vaughn**, formerly superintendent of the Van Brunt Street & Erie Basin Railroad, Brooklyn, N. Y., for more than nine years, and previously for several years with the Coney Island & Brooklyn Railroad, has become associated with E. L. Post & Company, manufacturers of babbit metal, New York, N. Y., as traveling salesman in the East.

**Kerite Insulated Wire & Cable Company, New York, N. Y.,** which has acquired the interests of its Western representative, the Watson Insulated Wire Company, has established a Western office in the People's Gas Building, Chicago, Ill. B. L. Winchell, Jr., formerly vice-president of the Watson Insulated Wire Company, has been appointed Western sales manager.

**St. Louis Car Company, St. Louis, Mo.,** reports the receipt of orders through Stone & Webster, Boston, Mass., for ten single and trailer and five single-end motor cars for the Houston (Tex.) Electric Company, and four large inter-urban motor cars for the Northern Texas Electric Company, Ft. Worth, Tex. The company has also received an order from the Southern Railway, Washington, D. C., for fifteen 65-ft. all-steel combination passenger and baggage cars complete.

**Union Switch & Signal Company, Swissvale, Pa.,** has appointed George A. Blackmore Eastern manager with general charge of the affairs of the company in the eastern district, effective May 15, 1911. Aaron Dean has been appointed Western manager with general charge in the western district. Mr. Dean's appointment will be effective on or before June 1. Both Mr. Blackmore and Mr. Dean will report to S. G. Johnson, general sales manager, in all matters pertaining to sales.

**Foote Engineering & Construction Company, Kansas City, Mo.,** has recently been incorporated by H. B. Foote, Roy B. Pearse and C. G. Spencer. The company will engage in the design, construction and operation of complete railway plants and systems. Its officers and engineering staff have had considerable experience in the design and construction of power plants, transmission lines, rolling stock and general equipment. H. B. Foote, president, has been engaged in the electrical contracting business for several years as a partner in the firm of Denton, Foote & Company, of Kansas City.

**Hodenpyl, Walbridge & Company, New York, N. Y.,** bankers, have dissolved, and Anton G. Hodenpyl, George E. Hardy, Bernard C. Cobb, John C. Weadock and William H. Barthold have formed a co-partnership under the firm name of Hodenpyl, Hardy & Company, with offices at 7 Wall Street. The firm will operate and acquire public utility properties and deal in bonds, stocks and other securities. Henry D. Walbridge, James K. Andrews, Hiram S. Brown and Francis E. Hoag have formed a company, under the name of H. D. Walbridge & Company, to acquire, finance and operate railway, gas and electric properties, and deal in securities at the same address.

**International Pay-as-You-Enter Car Corporation, London.**—Active negotiations are in progress for the disposal of the European patents of the Pay-as-You-Enter Car Corporation to a group of tramway operators in London on terms which were approved by the stockholders at a special meeting held in Wilmington, Del., on April 26. Out of a total of \$3,261,900 of stock entitled to vote there was represented personally or by proxy \$2,840,800. All of these votes were unanimously in favor of the proposals. It is understood that the controlling interests in the International Pay-as-You-Enter Car Corporation, as the company will probably be entitled, intend to install the cars immediately on a line in London which is eminently suited to test the pay-as-you-enter system, as the traffic is congested, there is a universal fare and no double-deck cars are used.

**Universal Vanadium Company, Pittsburgh, Pa.,** was incorporated in Delaware recently to act as selling agent for the American Vanadium Company, and in a selling capacity in conjunction with the Vanadium Sales Company of America, both companies thus taking charge of the entire product of the American Vanadium Company. The Universal Vanadium Company has the following officers and directors: Edward M. McIlvain, president, 30 Church Street, New York; Millard Hunsiker, vice-president, Paris, France; James C. Gray, secretary and treasurer, Frick Building, Pittsburgh, Pa.; Joseph W. De Wyckoff, European representative, 64 Victoria Street, Westminster, London, Eng.; E. Marshall Fox, Wetley Rocks, Staffordshire, Eng.; Sylvester D. Townsend, Jr., Wilmington, Del.; William McIlvain, Reading, Pa. Since the formation of the American Vanadium Company the entire product of vanadium alloys produced by this company has been marketed by the Vanadium Sales Company of America. The offices of both companies have been in the Frick Building, Pittsburgh, Pa.

**United States Steel Corporation, New York, N. Y.,** called the annual meeting of its stockholders for April 17, 1911. At the meeting President Gary presented his annual report, and referred in part as follows to the prospects of the company: "We believe we have at present a better organization throughout our companies than we ever had before. We think we are well equipped at the present time to manage our affairs economically and promptly, and yet we have no disposition to remain passive, inactive or contented. We are well satisfied with the amount of business we have done and profits we have realized during the last fifteen months. When the steel corporation was organized the total capacity of finishing mills was about 23,000 or 24,000 tons a day. Now the producing capacity is nearly double that amount. Therefore, although mills are not running to more than about 70 to 74 per cent of their capacity, this is much more than the total capacity at the time the corporation was organized. We started out with about 60 per cent of the total business of the country and at present we have about 55 per cent on the average. Our new business during January, February and March averaged 35,000 to 40,000 tons a day, or 75 to 85 per cent of our capacity. If my figures are correct, the profits on our products in the last ten years have been about the same per ton." G. M. Lane, of Lee Higginson & Company, New York, N. Y., has been elected a director of the corporation to succeed the late Nathaniel Thayer. In addition to Mr. Lane the following directors have been re-elected for a three-year term: George F. Baker, W. E. Corey, J. F. Dryden, C. A. Griscom, Samuel Mather, D. G. Reid and Henry Walters. John Reis, for several years the supervisor of new construction for the corporation, has been made vice-president. Mr. Reis was formerly connected with the National Steel Company, New Castle, Pa., absorbed by the Carnegie Steel Company before the merger. Ward B. Berley has been made assistant to the president, James A. Farrell. Mr. Perley was assistant to W. B. Dickson, who recently resigned as a vice-president.

#### ADVERTISING LITERATURE

**General Vehicle Company, Long Island City, N. Y.,** has published *Elec-Tricks* for April, which contains reports from several companies showing the performance of its electric vehicles.

**Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.,** has issued a booklet entitled "Westinghouse Static Protective Apparatus," which covers the line of static protective apparatus manufactured by the company.

**Joseph Dixon Crucible Company, Jersey City, N. J.,** is distributing a folder entitled "Maintenance Painting for Electric Railways," which explains the special adaptability of Dixon paints for street railway uses. It contains illustrations of street railway viaducts, power plant stacks and car trucks painted with Dixon's silica-graphite paint.

**Transportation Utilities Company, New York, N. Y.,** which was recently organized to represent directly the Acme Supply Company and the General Railway Supply Company, is mailing an announcement to this effect and calling attention to the devices and materials which it will handle. The company is also distributing a catalog which describes and illustrates its "Tucco" friction curtain roller and fixture and "Tucco" ratchet fixtures.