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### Brake Shoe Records in Brooklyn

In another column in this issue an account is presented of the work of the Brooklyn Rapid Transit Company from 1903 to date in standardizing brake-shoe equipment and keeping accurate comparative statistics of brake-shoe wear on both the elevated and surface lines. The use of a ton-mile basis for computing the relative cost of brake-shoe maintenance is believed to be new in keeping surface elec-

tric railway rolling stock records. It involved in the beginning some tedious work in ascertaining the exact weight of each of the numerous classes of cars in service, but the ton-mile is certainly a more rational basis of comparison than the car-mile for brake-shoe maintenance records if not for every other detail of the trucks and motors. Another interesting feature of the system of records kept in this connection is the guide chart furnished to inspection depot foremen to enable them to determine the limit of wear of brake shoes by weight. With standard shoes it is possible to ascertain from time to time the average weight of all shoes scrapped on the system and to insist that no shoes which appreciably exceed this average weight be removed from service. An incentive is also given to each foreman to keep the weight of scrap shoes as much below the system average as possible and thus to get the maximum wear out of the shoes on cars under his charge. With a wide diversity of shoes such a competitive system would be impracticable.

### Concrete as a Structural Material

Concrete as a structural material is being put to use in an increasing number of ways, among others to replace the wooden trolley and line pole. There are many reasons why experts in concrete work are warranted in making extensive experiments along this line. The life of a wooden pole is short, and stock for pole-making grows more and more scarce every day. If a concrete pole can be made so that it will fitly replace its wooden forerunner on the score of strength, then the choice between the two kinds of poles depends on a comparison of the costs of the two for first installation, upkeep and replacement. We heartily believe that reinforced concrete can be designed so that the arguments in such a comparison will be on their side. It must be remembered in designing concrete poles that the stresses to be sustained by span poles are far more severe than those impressed on a pole carrying only a transmission line. Hence especial care should be given to the design of the reinforcing materials. In some poles which have been tried in railway work the steel reinforcement, although ample in cross-sectional area, has not been properly disposed. For this reason the cross-stresses normal to axes of the poles resulted in cracks whenever the span wires were pulled up very tightly. The subject has been taken up actively abroad, and an English firm has just begun the manufacture of hollow reinforced concrete poles, which taper in length up to 40 ft. Steel rods are placed lengthwise of the pole around the circumference of a circle. About this squirrel-cage arrangement of rods is wound a steel wire, disposed spirally from end to end. In the process of manufacture a sheet-steel core of the full length of the pole is mounted close to the concrete mixing machine,

the core being geared and supported for both rotational and longitudinal movement. The parallel reinforcing rods are supported about this core. Concrete is deposited from the mixer onto a bandage of webbing, which is carried by a conveyor belt. This belt serves to wrap the concrete inside of the webbing on the core in a spiral form. A pressure of 5000 lb. is exerted on the belt, thus firmly packing the concrete into tubular shape. The steel wire which serves to take the bursting stresses is wound into the mixture, and compressing rollers pack the entire mass into the form of a concrete tube, reinforced longitudinally and spirally, and wrapped with webbing. After the concrete is set the webbing is removed. The disposition of the concrete and reinforcing materials in the pole is such that for a given loading a minimum weight of pole is obtained. It is stated that the cost of such a pole 29 ft. long is \$20. A 36-ft. pole is said to cost \$26. Such poles can be set with a derrick, and when in place present a good appearance. The life of a concrete pole may safely be said to be 50 years, with no maintenance cost. This life and reported cost when compared with similar costs for wooden poles emphasizes the desirability of considering the more general use of concrete poles for permanent work.

### The Convention Arrangements of the Future

Now that the 1908 convention of the American Street & Interurban Railway Association has passed into history and the delegates as well as the others in attendance have returned to their regular work, it is an appropriate time to consider carefully the question of arrangements for holding future conventions. No other subject attracted greater attention at the convention and none perhaps in the history of the association has given rise to greater differences of opinion, the plan of the reorganization of the association in 1905 not excepted. The various proposals made at Atlantic City have been referred, by ruling of the association, to a committee of seven, of whom at least two shall be ex-presidents of the association and all of whom are to be appointed later by President Shaw. This committee will make a report at the 1909 convention, and in the meantime will obtain the views of the members of the association as well as of all others interested. This plan insures the holding of the 1909 conventions on the same basis as those of 1908.

Three distinct propositions were suggested at Atlantic City. One of these was embodied in the presidential address of Mr. Goodrich, which was to the effect that the five associations should hold their annual meetings at different times and places and that the exhibits should be abolished. This latter step, in fact, would practically have to follow the adoption of the plan of five conventions because the manufacturers would hardly care to make five different exhibits, or probably even to make one exhibit for the small number of delegates who would attend any single convention. The principal argument given by Mr. Goodrich in favor of this plan was that the large operating properties should not be denuded of all of the responsible heads of the departments at the same time, a very serious matter where a convention is held at some distance from the home city.

The second plan available is that the present policy be continued.

The third is that of Mr. Beggs, who believes that a compromise arrangement can be adopted to advantage; that is, that two conventions should be held during the year instead of five, as suggested by Mr. Goodrich. If this plan is followed, Mr. Beggs' idea is that the American Association, the Engineering Association and the Transportation & Traffic Association could meet at one time and that the Accountants' Association and the Claim Agents' Association could meet at another. Mr. Beggs considers that this plan will avoid the first objection raised by Mr. Goodrich because it would always leave at home the heads of at least two departments, to one of whom could be assigned the direction of affairs in the absence of the president and manager. On the other hand, it would not interfere with the exhibits, because the accountants and claim agents are not so vitally interested in this feature of the convention as are the members of the other associations. Mr. Beggs stated very positively that he was in favor of the exhibits as now conducted at the conventions and did not wish to see them lessened or their value impaired in any way. He admitted there were many advantages in the present plan, but was in favor of the change only because of the reasons advanced by Mr. Goodrich.

If it is a vital matter to the larger companies to have two conventions instead of one, a way out of the present dilemma would be to follow Mr. Beggs' suggestion in regard to division into two conventions, and to hold these two conventions on successive weeks at the same place. That is, the American, Transportation and Engineering associations would meet one week and the Accountants and Claim Agents would meet at the same place on the previous or following week. This would permit those who have a long distance to travel to a convention to attend the meetings of all of the affiliated bodies if they desired. In fact, they could do so to better advantage than at present because the programs of the different associations are now so crowded into one week that many delegates do not have time to attend the meetings of all of the associations in which they are interested. It would also permit the attendance in detachments of the delegates from the large systems if that should be considered desirable in any individual case. This plan is offered as a suggestion only, and in case the larger companies consider it practically impossible to continue the present method, which has many advantages in its favor.

### Saving Waste Paper

Oftentimes a little study will show where a considerable saving can be made as the direct result of a small expenditure. The electric railway repair shop presents a fertile field for such studies, but it is not the only place. There are other departments in which many economies can be secured if time is available on the part of the operating organization for a close studying of the problems at hand. As an example of the possibilities along this line, the following statement with regard to the handling of waste paper on a large city railway system may be of interest. As a rule, the method followed with the paper found by the car cleaners is to collect it at each of the car houses with the other refuse, pack it into a wheelbarrow and take it to the nearest available space where it can be burned.

The company referred to pursues a different and a more

economical plan. As the car cleaners go through each car the waste newspapers are picked up by hand and are taken to the platform, where they are wedged in behind one of the grabhandles. When the cleaners have passed through all the cars on one aisle the paper is collected from the grabhandles and taken to a storage room. Here, as it is accumulated, it is packed into bundles about the size of a bale of hay and tied firmly with pieces of old trolley rope. At regular intervals these bundles of waste paper are collected by the supply car and taken to a central point, where they are stored in a fireproof room until a considerable number of bales have accumulated. When packed tightly a considerable amount of paper can be contained in a small space. The bundles also are convenient for handling.

It is found that paper assembled in this way, ready for quick shipment, can be sold to junk dealers at a comparatively good figure, say about \$10 a ton. The revenue thus derived by saving paper is said to exceed by 50 per cent the former cost of handling, which was by burning. Up to the time of collection, of course, the costs for handling are the same, but when a day laborer is given a wheelbarrow load of paper to take into the back lot for burning he very frequently considers the task as offering an opportunity for slow work, and as a matter of safety it is advisable for some one to watch the bonfire for fear the sparks may spread the fire. Thus, if there is much paper to be burned, considerable time is necessary on the part of one man to manage the job. It has been found by careful observation that the time thus taken is ordinarily greater than that needed to bundle the waste paper so that it can be conveniently handled. Thus there is an economy in labor. Finally, when once packed into bundles, the paper becomes valuable, and as earlier stated is an asset from which some credit may be obtained. Such schemes for saving are worthy of consideration.

### Transfers and the Increasing Cost of Operation

It is fortunate that the receivers of the Metropolitan Street Railway, in contesting the order of the New York Public Service Commission, First District, for the introduction of joint rates and through fares with the Central Park, North & East River Railroad, have not rested their case wholly upon the legal rights, if any, involved in the denial of the authority of the commission. A short while ago it appeared as if the receivers were disposed to base their case entirely upon the position of their counsel that the commission had not the legal authority to make the order which it had promulgated. Subsequent developments, however, made it clear that the action of counsel for the receivers was taken merely to protect all the legal points concerned; at the most recent hearings arguments and expert testimony have been introduced, as reported elsewhere in this issue, to show the injustice and impracticability of the order of the commission.

On account of the public inconvenience and the continued agitation which have followed the segregation of the Central Park line from the Metropolitan system, it is a matter for regret that some temporary arrangement could not have been made that would have obviated the necessity for the payment of a 15-cent fare by those who use the Central Park Company's Fifty-ninth Street crosstown line as a

connection between two lines of the Metropolitan system; it may develop, however, that the causes for such regret will pass and that some reasonable adjustment will be made which will not permit the transfer abuses of the past, but will establish the principle of the inadequacy of a 5-cent fare to meet the expense, with proper accounting, of indeterminate rides coupled with the drain caused by a universal transfer system and the abuses thereof. If such shall prove to be the case, the way will be clearer for eventual profitable operation of the properties for those whose capital is invested therein; with no other results of operation than those which mean a profit to the owners of public utilities should any community remain contented.

Disregarding the collateral and legal questions involved, which may or may not affect the final result of the controversy, it is very plain that the facts upon which the solution of the New York problems must rest resemble closely those which would be developed in a similar inquiry in various other important communities of this country. The fact is undeniable that with the increase of the transfer privilege has come unparalleled abuse and consequent irreparable loss in revenue; with the development of these conditions there have been increases in substantially all the expenses that enter into the cost of operation. It is, we believe, incontrovertible that the development of neither one of these two conditions could have been forecast seven or eight years ago. If they had been foreseen the development of American cities within that period, dependent so largely upon traction enterprise, would have taken place on a much more restricted scale than has been the case.

Leaving out of the question at this time the rights of the unfortunate security holders of the Metropolitan properties, which are entitled to as just recognition by any public-regulating body as the rights of those who travel on the cars, it may be admitted that to set up a 10-cent or 15-cent fare where a 5-cent fare existed before is a hardship on some individuals who have been accustomed to use various routes which have now been separated. These individuals have had homes and offices so connected that they have been able by the use of the transfer privilege to travel from one point to the other for a single fare of 5 cents. The use of transfers by the majority of such individuals may have been wholly legitimate. But while the gradual consolidation of properties, with resultant extension of the transfer privilege, has carried the transfer system to a point beyond that which its projectors originally had in mind, another aspect of the situation needs emphasis in all discussions of the subject; that is, that the companies have been called upon to give transfers not only for legitimate purposes, but for unlawful uses which neither the officials nor, probably, the framers of existing laws contemplated.

The curtailment of the transfer privilege will bring some inconvenience and added expense to the public, but the abuse of the transfer privilege, long existent and continuing to increase in gravity, is one of the factors which has brought distress to the owners of securities of the properties concerned. The fact is that these two conditions—the increasing extension and accompanying abuse of the transfer system and the increase of the cost of operation—constitute the most serious factors with which electric railways to-day have to contend.

## THE BOYERTOWN & POTTSTOWN RAILWAY

Owing to the comparative nearness of towns and the many short mountains spurs in eastern Pennsylvania, comparatively few high-speed interurban railways have been built in that territory, the inter-town railways being urban lines which have been extended gradually to meet those of neighboring communities. As a rule, these railways follow

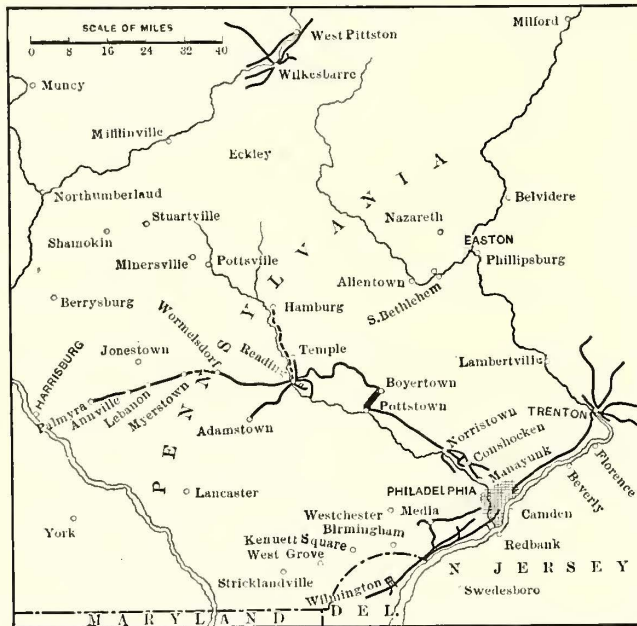


Fig. 1.—Boyertown & Pottstown Railway—Map of Interstate Railways System, with Boyertown - Pottstown Railway Shown by Heavier Line

the public road, running on adjoining right-of-way where the cost of the latter is not prohibitive. A typical example of this class is the Boyertown & Pottstown Railway, recently completed to connect the two prosperous towns named in its title, and which hitherto have been without direct means of railway transportation. Aside from this, the new system is an important link in a chain of lines starting from Chestnut Hill, Philadelphia, and terminating at Harrisburg. A clear idea of the latter feature will be obtained from the following description and accompanying map:

### GENERAL ROUTE AND CONNECTIONS

The Boyertown & Pottstown Railway is operated as a part of the United Traction Company, of Reading, which in turn is a part of the Interstate Railways Company, a Philadelphia holding company. Starting at Pottstown, in the Schuylkill Valley, the line pierces a mountain ledge of red shale to enter the Swamp Valley, in which Boyertown is located. In Pottstown connection is made with the Schuylkill Valley Traction Company, whose headquarters are at Norristown and eastern terminal at Chestnut Hill, Philadelphia. This system is also a part of the Interstate Railways Company, together with the Oley Valley Railway, from Boyertown to Reading. The Pottstown & Reading Street Railway, however, is owned by other interests.

The system of the United Traction Company, of Reading, extends westward to Wormelsdorf. From the latter village

there is a break of 8 miles to Myerstown, from which the Lebanon Valley Street Railway of the Interstate system operates to Annville. At Annville connection is made with the Central Pennsylvania Traction Company, of Harrisburg. Consequently, when the Interstate Railways Company closes the gap between Wormelsdorf and Annville it will be able to offer a trolley tour of 125 miles over its own lines between the metropolis and capital of the State. The United Traction Company also operates one line to Temple; a second to Adamstown, Pa., connecting with the Conestoga Traction Company at Lancaster; a third from Reading to Easton via the Allentown & Reading Traction Company and connections, and a fourth to Birdsboro via Black Bear, a distance of 8 miles. It will be seen from the foregoing that Philadelphia is now connected by electric transit to almost every important town in eastern Pennsylvania. John A. Rigg, of Reading, Pa., is president of the Interstate Railways Company, with general offices in Philadelphia, Pa.

### TRACK

The Boyertown & Pottstown Electric Railway has different types of rails and roadbeds, corresponding to its operation in municipalities, on the turnpike and over right-of-way. In Pottstown, Boyertown, Gilbertsville and New Hanover township, the rails are of the Lorain Steel Company's section 95-297, weighing 95 lb. per yd., laid on ties spaced 24 in. centers, with eight-hole Continuous joints and double-bonded with Protected railbonds. In both terminal cities the rails are laid in brick paving covering a sub-structure of 12-in. slag in Pottstown and 6-in. concrete in Boyertown. The paving in both towns is carried out by the local authorities without any annual charge against the railway, that obligation having been fulfilled by a cash consideration paid to the boroughs when the franchises were granted. The balance of the road consists of 75-lb. A. S. C. E. Carnegie rails, laid in stone ballast on ties spaced 24-in. centers. The rails are furnished with four-hole Continuous joints and the same bonds as the town



Fig. 2.—Boyertown & Pottstown Railway—Viaduct at Ringing Rocks

sections. Interference from wagon traffic is largely eliminated by the use of open track construction wherever the line runs alongside the highway.

About 40 per cent of the railway is on right-of-way varying in width from 20 ft. to 100 ft., and there are five grade crossings with the turnpike. The roadway for the single track of 5 ft. 2½ in. gage is 14 ft. wide, with cuts and slopes 1½ to 1. Berm ditching is used in all the cuts,

and, in general, careful provision for drainage has been made in this region of sudden and heavy rains. The maximum grade is 5 per cent, and the greatest cut 20,000 cu. yd. This cut was made in crossing the summit into Swamp Valley, and the excavated material was used for the fill approaching Romig's Creek. All curves are spiraled and guarded. On the T-rail section they are fitted with cast-iron fillers and plain and braced tie plates are used alter-

The section from Pottstown to Ringing Rocks, 4 miles distant, is a reconstruction of the Ringing Rocks Electric Railway which extended from Pottstown to Ringing Rocks, where there is a popular amusement resort. In general, the present company occupies the old roadbed except in two or three places where sharp curves are avoided by deflections in the route. The roadbed was also filled on the westward and the turnpike shifted eastward to avoid two

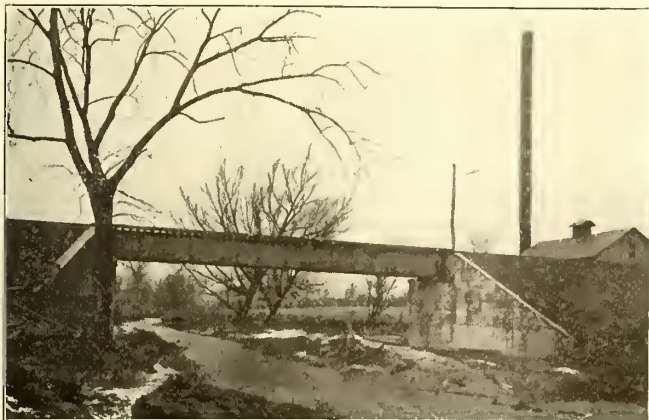


Fig. 3.—Boyertown & Pottstown Railway—Plate Girder at Emergency Power House



Fig. 4.—Boyertown & Pottstown Railway—Central Pier Bridge over Minister's Creek

nately on the ties. The manganese steel special work was furnished by Wm. Wharton, Jr., & Company, of Philadelphia. The turnouts have 15-ft. split switches with 15-ft. double-spring frogs, while the track layout at the Ringing Rocks car shed has tongue switches and manganese steel jump frogs from the main line, thereby eliminating the excessive wear which usually occurs where car house

grade crossings. Outside of one slight deflection, the railway then continues westward from Ringing Rocks on a 2½-mile tangent toward Boyertown.

The contract for the grading of the entire line was let in March, 1907, to a contractor who abandoned the work in November, 1907. A new contract was made with Nolan Bros., of Reading, Pa., who started in January, 1908, and finished in May. Car operation between Pottstown and Boyertown was instituted on May 28, 1908.

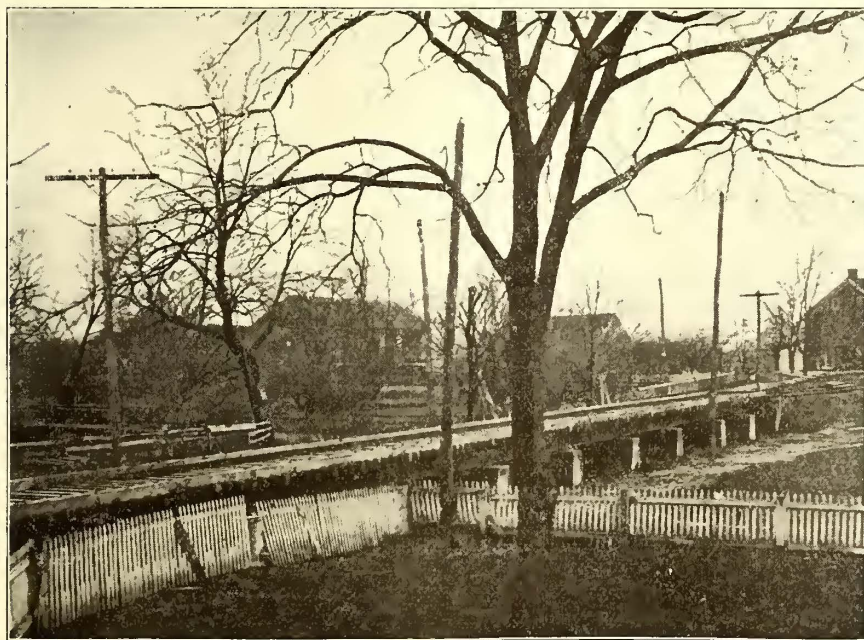


Fig. 5.—Boyertown & Pottstown Railway—Lowland Bridge near Minister's Creek

tracks extend off the main line. There are two turnouts of girder rail in Pottstown and eight of T-rail on the road to Boyertown, making a uniform spacing of about 1 mile between turnouts. There is also a siding 650 ft. long at Ringing Rocks Park. At Boyertown a short extension is to be built to secure an undergrade crossing, so that connection can be made with the Oley Valley Street Railway's line to Reading.

BRIDGES, VIADUCTS, ETC.

As the territory traversed by this railway is of rather broken character and subject to heavy run-offs after rain storms, several bridges were required over usually insignificant waterways, and in one case a viaduct was necessary to span the lake and ravine at Ringing Rocks. All of these structures are designed for loading up to 44 tons; the concrete used for the piers and abutments is of 1-2-5 mixture; and the steel work was manufactured by the McClintic-Marshall Construction Company, of Pottstown, Pa. Aside from these road structures, a concrete retaining wall with cattle pass was built at the point between Ringing Rocks and Boyertown, where the private right-of-way departs from the turnpike.

The smaller bridges comprise one of central pier construction with two 22-ft. spans over Minister's Creek, at Swamp, as illustrated in Fig. 4, and two 70-ft. bridges with 5-ft. plate girders, built respectively over Romig's Creek and a stream near the Ringing Rocks power house. The construction details relative to the track, guard rails and guard timbers of the latter bridges are shown in the section, Fig. 9.

The largest piece of steelwork is the viaduct over Ringing Rocks Lake, located on a curve of 2 deg. 15 min. This

structure is 35 ft. high and 460 ft. long, made up of four 40-ft. towers and five 60-ft. spans with 4-ft. plate girders. General views of the viaduct are presented in the half-tones, Figs. 2 and 12. The arrangement of the running rails with plain and braced tie plates, guard rails and guard timbers, is shown in the section, Fig. 8.

An interesting feature of this viaduct is the method of carrying the steel poles, of which there are four, spaced in 100-ft. intervals, to carry the bracket trolley construction. Every pole is placed in the center of a tower span girder and its butt rests in a concrete pocket formed at the end

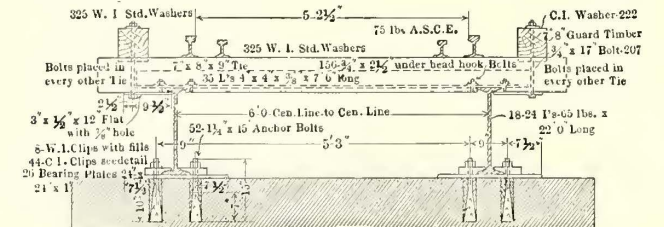


Fig. 6.—Boyertown & Pottstown Railway—Cross-Section of Lowland Bridge at Minister's Creek

of a double-channel box beam, attached to the bottom of the plate girders. The pole is secured further by a second beam resting on the top of the girders, composed of two angles riveted together with plates. The outer end of this upper member contains a white oak block, bored to the diameter of the pole, so that the latter can be securely wedged in position. The block is furnished with a band to prevent it from slipping. Swaying is provided against by two sets of guide rods which connect the top and bottom members, through which the pole passes to a pair of clamps

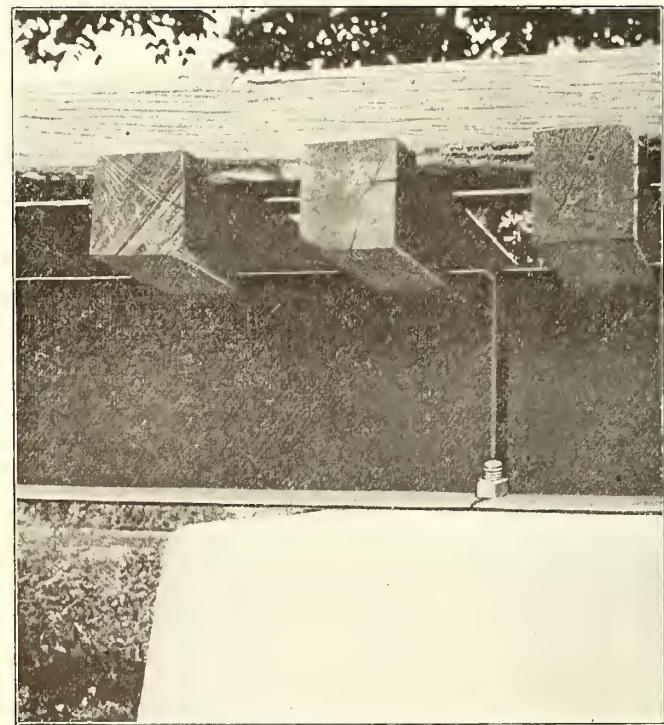


Fig. 7.—Boyertown & Pottstown Railway—View at one of the Lowland Bridge Piers, Showing Dapping of Ties

fastened to the top flange of the bridge girder. As all of these rods have turnbuckles, there is no possibility of the poles getting out of adjustment. The various details of this pole bracket and fastening are illustrated in Figs. 10 and 11.

The structure which may be said to typify best the topographical conditions in this section is the 240-ft. lowland bridge near Minister's Creek, which crosses land where torrents of 4-ft. to 5-ft. depth often arise within half an hour after the beginning of heavy rain. The main struc-

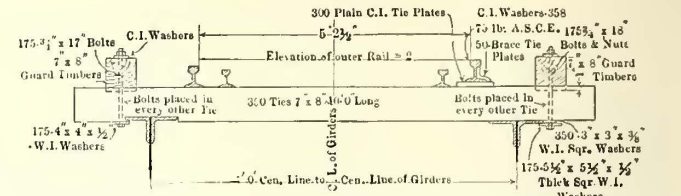


Fig. 8.—Boyertown & Pottstown Railway—Section of Roadway of Viaduct

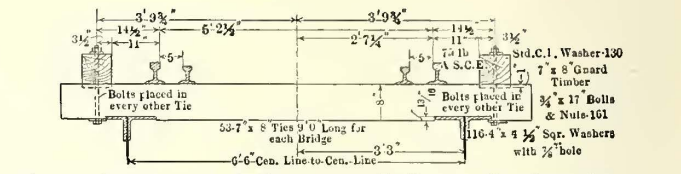


Fig. 9.—Boyertown & Pottstown Railway—Section of Roadway over Bridges at Power House and Romig's Run

ture of the bridge consists of concrete piers carrying 24-in., 65-lb. I-beams spaced 6 ft. centers. The erection of this bridge as a series of 22-ft. span units was carried out in a most economical manner, the steel being installed practically as fabricated. The actual cost of the metal erected was only 3 1/8 cents per lb., while the selling price of the material f.o.b. shops at Pottstown was slightly less than 3 cents. The construction was carried on as follows:

After erecting the concrete piers and aligning the I-beams, holes were drilled in the foundations for the anchor

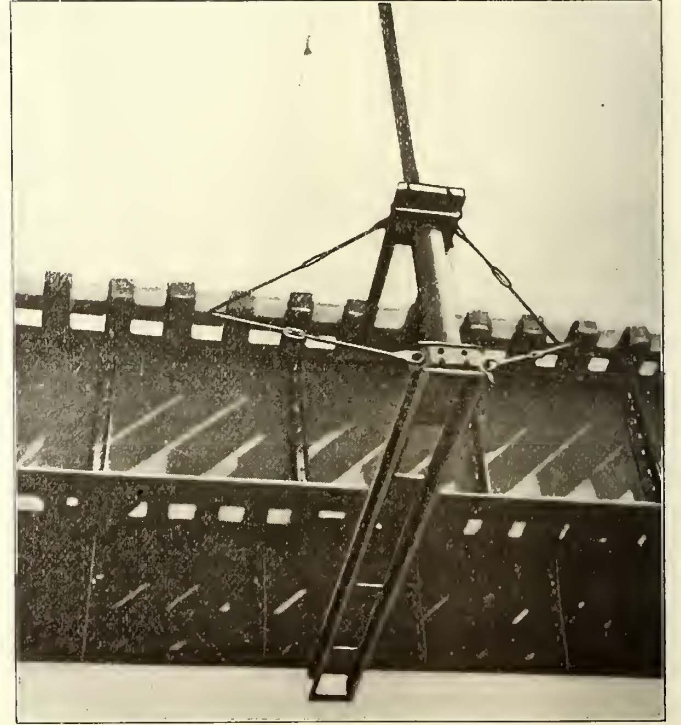


Fig. 10.—Boyertown & Pottstown Railway—Box-Beam Support for Trolley Poles on Ringing Rocks Viaduct

bolts. The bearing plates were then grouted in position, the I-beams set and the clips secured to the base of the beam as shown in the cross-section, Fig. 6. The anchor bolts were allowed to project far enough out of the foundation to permit shimming, should any of the piers begin

to settle. The transverse bracing was secured by L-beams attached to the top flange of the I-beams with hook bolts at intervals of about 10 ft.

The ties, which were dapped over the I-beams, carry running rails, guard rails and guard timbers. The latter are secured at every other tie by a bolt which passes through the timber and a bottom plate clamped against the inside of the I-beam's top flange.

#### POWER SUPPLY AND DISTRIBUTION

The power used by this railway is transmitted partly from Reading and partly from Collegeville. The current from the Reading end is transmitted at 15,000 volts, 2-phase, 25-cycles, from a substation at Shanesville, about 19 miles from Reading and 1 mile from Boyertown. This station contains a 300-kw Stanley rotary converter and water-cooled transformers. The current from Collegeville, which is 12 miles distant, is transmitted at 13,200 volts, 2-phase, to the Sanatoga substation, 1 mile from Pottstown. The Sanatoga station contains one 300-kw rotary converter, National Electric self-cooled transformers, G. E. arresters. It is constructed of molded concrete blocks and a reinforced concrete roof. The rotary and switch-board sections are separated by a hollow brick wall.

There is also an old brick power station at Ringing Rocks, which is now used only for emergencies, and eventually may be equipped as a substation. It contains two Siemens & Halske 110-kw 550-volt d.c. generators.

The plans of the company as to future power developments are rather indefinite at present, owing to the fact that the McCall's Ferry Power Company has built a dam across the Susquehanna River, and it is probable that if satisfactory terms are secured all of the power used will be from hydro-electric sources.

The overhead trolley line is of span construction, except on right-of-way.

#### ROLLING STOCK

At the present time the company has two double-truck

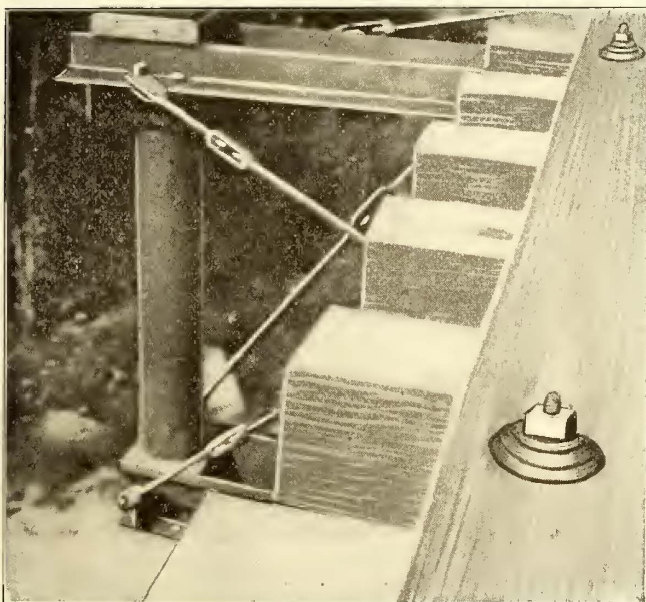


Fig. 11.—Boyertown & Pottstown Railway—Trolley Pole on Viaduct Set in Concrete in the Lower Box Beam

semi-convertible cars, seven closed cars and one open car. All of the closed cars are vestibuled and are furnished with Consolidated electric heaters. The larger cars have two 160-hp G. E. motors, and the smaller cars two 70-hp motors. Later on, when connections are made with the

Oley Valley Railway Company, cars 51 ft. long and equipped with four 60-hp motors will be operated over this line. The rolling stock is housed in an old wooden car shed at Pottstown, but all general repairs are made either

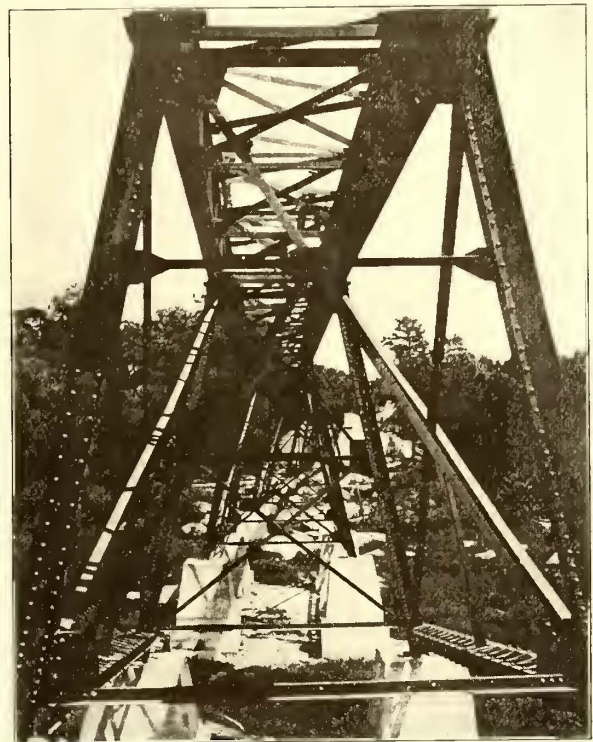


Fig. 12.—Boyertown & Pottstown Railway—Details of the Steel Towers of the Ringing Rocks Viaduct

at the Norristown repair shops of the Schuylkill Valley Railway or in Reading.

#### MANAGEMENT, SCHEDULES, ETC.

The Boyertown & Pottstown Railway is operated under the general management of W. A. Rigg, who is general manager of the United Traction Company, of Reading, with W. J. Hardaker as local superintendent. The line has been in operation since May 28, 1908. Up to the present time there have been no accidents whatever, due partly to the practice of the company not to run any open cars beyond the park at Ringing Rocks, thus avoiding the possibility of accidents in crossing the viaduct or bridges beyond on the road to Boyertown.

The trip between the terminals is made in 55 minutes, a car being operated every hour. Between Pottstown and Ringing Rocks a half-hourly service is maintained. On holidays cars are run every 30 minutes to Boyertown and every 15 minutes to the park. The fare for the 11 miles between the two towns is 15 cents cash or three tickets as sold six for 25 cents by the United Traction Company, of Reading, or by the Schuylkill Valley Railway. The tickets of these companies are honored as fare since they are issued by Interstate Railways' properties.

Package transportation has not been developed to any great extent and the present custom is to charge passenger rates for any package less than 100 lb. and double rates for heavier shipments. Goods are delivered at specified points along the line, such as hotels or post offices. It is believed, however, that a profitable freight business can be worked up in this territory and plans for securing freight terminal facilities are now being considered.

The construction of the road was carried out by Thos. K. Bell, chief engineer of the Interstate Railways Company.

## THE CARACAS ELECTRIC TRAMWAY

Caracas, the capital of Venezuela, is the ninth in size of the twenty capitals of America, and was founded in 1564, some 60 years after the settlement of La Guaira, only 10 miles away on the coast. Though well within the tropics, its climate, owing to the city's elevation of nearly 3000 ft., is salubrious, and the average temperature is about 70 deg. Fahr. Seen at first from the top of the pass leading from La Guaira to the capital, Caracas looks like a flat, level city of white plastered walls and red tiled roofs, broken on all sides with green. Actually, there is a difference in altitude of over 500 ft. between the northern and the southern ends of the city.

During the last 10 years Caracas has come into prominence through the faculty of the president of Venezuela, Cipriano Castro, of getting into difficulties with pretty nearly every foreign power whose citizens have interests in Venezuela.

The population of Venezuela is about 2,500,000, of which about 80,000 inhabit Caracas. As throughout the Spanish main, the population is very mixed as regards race; the native Carib, the Spanish conqueror and the black slave are all represented here; even the yellow race is not absent. Immigration, however, is practically non-existent, for neither black nor Spaniard gives up his nationality, and each looks forward to his return home at a more or less early date. Of the other colonies the German is the most influential from a commercial point of view. Italy and France are fairly well represented in the provision and dry goods trades, while the British and Americans are mainly interested in railways and other concessions.

Previous to the year 1905 there were two small horse railway companies in operation in Caracas. One was the Bolivar, running east and west from the station of the Central Railway to that of the La Guaira and German lines. The other was the Caracas Tramway Company, which, starting from the Plaza Bolivar, radiated out to the different quarters of the city. In 1905 the two companies were combined under the presidency of Dr. Zuloaga, a leading member of Caraquenian society, and the directorship of Edgar A. Wallis and Albert Cherry, two of the most prominent members of the British community. A concession was obtained from the municipal authorities with a view to the electrification of the whole system, and E. H. Ludford, formerly manager of the Bolivar Company, was appointed general manager of the whole. Mr. Wallis then went to London, where he interested English capitalists in the scheme, on which J. G. White & Company, Ltd., drew up a full report. Their recommendations were accepted, and a contract was drawn up, whereby J. G. White & Company undertook to supply a complete equipment, including track, office buildings, car house, power station and plant and cables. Work was started in the spring of 1907 and completed by February, 1908.

### TRACK

The routes selected, with a total length of 10 miles, were practically those of the old companies. These naturally converged into the Plaza Bolivar, the center, political and social, of the city, in which and around or near which all the ministerial and government buildings are situated. From this point as a radius, the lines extend north, south, east and west. The maximum grade is 4 per cent.

The rails are in 30-ft. lengths and weigh 87 lb. to the yard. They were supplied by the United States Steel Products Export Company, and are of the grooved and

T type. The tiebars are of the Bayliss, Jones & Bayliss make. The rails are laid on a concrete stringer 6½ in. deep by 19 in. broad, and are anchored every 15 ft. The paving is of four kinds—cobble, block, macadam and concrete. The special work was manufactured by the Hadfield's Steel Foundry, Ltd., of Sheffield. All switches are of manganese steel, and the rails are bonded with No. 0000 B. & S. concealed bonds supplied by the United States Steel Products Export Company. The fact that no general drainage system is in use in Caracas, and that the drains in existence are principally private property and close to the surface, caused considerable hindrances to the otherwise rapid progress of the work.

### OVERHEAD EQUIPMENT AND FEEDERS

The overhead construction consists principally of side poles with cross bracket arms. Only tubular poles are employed, of which 450 are of the Grand National type, their dimensions being 7¾ in. diameter, bottom section, 6¾ in. in center and 5 9/16 in. top section, and 30 ft. in length. The rest of the poles are 31 ft. in length and are of British standard pattern. All were supplied by Stewarts & Lloyds. The bracket arm tubes are 2¾ in. diameter. The feeder boxes, supplied by Estler Brothers, are three in number, and are fitted with 250-amp quick-break switches; the section boxes, 14, with 100-amp quick-break switches. The trolley wire is of the No. 00 B. & S. grooved type.

The feeder cables, some 4 miles in length, are all aerial, and are suspended from cross arms on the poles above the brackets. They are all of pure aluminum, with a size of 0.33 and 0.25 sq. in., and have a conductivity 60 per cent of that of copper wire with a conductivity of 99 per cent of Mathiessen's standard of pure copper. They were supplied by the British Aluminum Company and covered by the Silvertown India Rubber & Gutta Percha Company with triple-braided weatherproof insulation and compounding over all.

### BUILDINGS

The power station, office buildings, car house and manager's residence are all built on one site on the north of the Avenida Este, and are of brick. The roof coverings of the power station and carhouse are of galvanized iron, but the office buildings and manager's dwelling are tiled. The doors and window frames are of cedar.

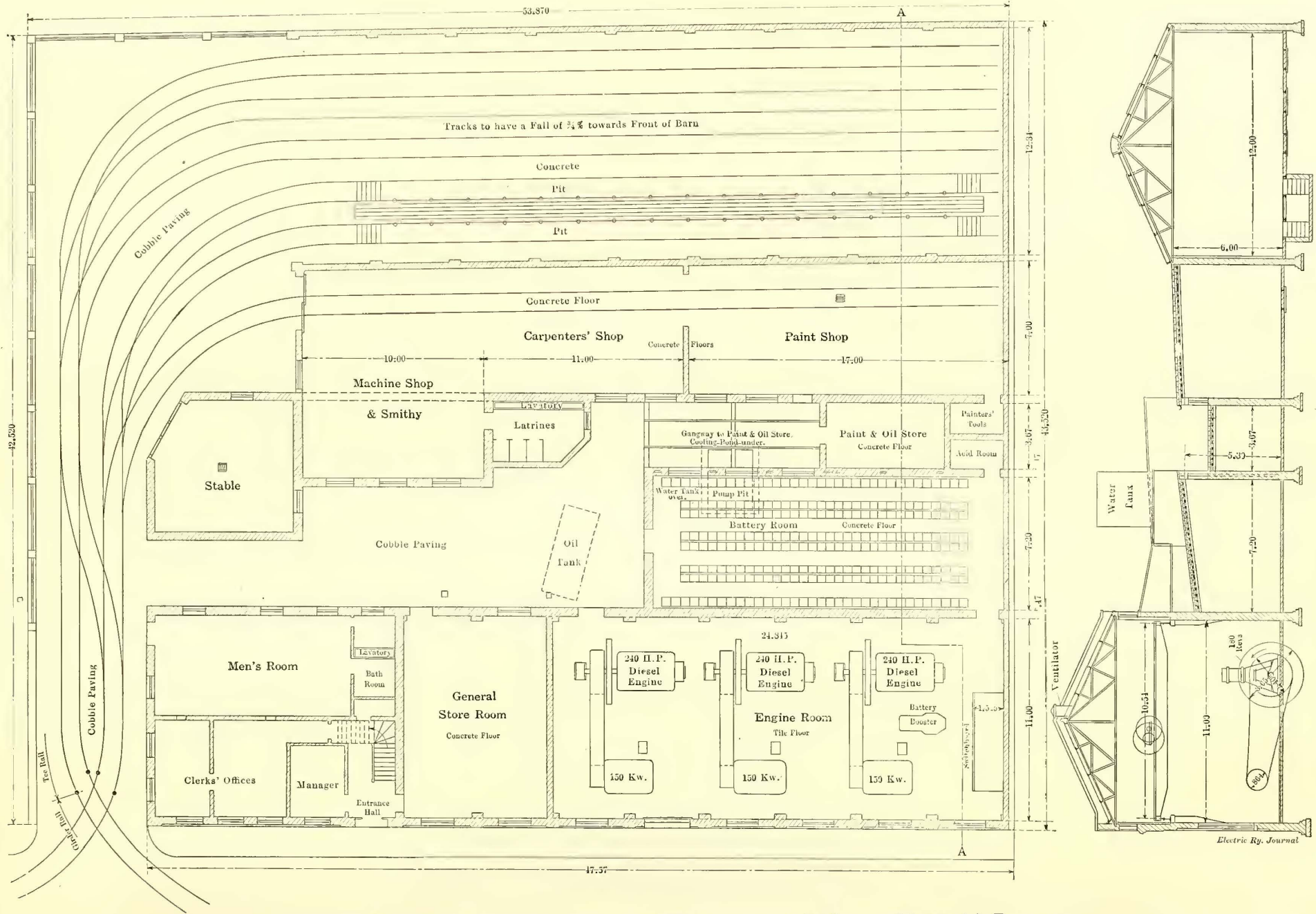
The carhouse is situated at the back and its dimensions are shown on the accompanying plan, on which they are given in the metric system. It contains five tracks, two of which have a pit and are supported on iron columns. The floor and pit are concreted. The rails in the entrance and carhouse are the A.S.C.E. 70-lb. T-rail, and the paving at the carhouse entrance is cobble.

The frontage is taken up with the office buildings and the power station, over which is the manager's dwelling. The office quarters are all on the ground floor and are subdivided into manager's, clerks' and accountants' rooms, and men's waiting room. The roof over the shops has been adapted to serve as a roof garden for the manager and his family, and provides a cool and pleasant place of retreat in the tropical evenings. The rest of the road frontage is taken up with the engine room, with a length of 44 m. and a depth of 11 m. and a height of 10 m., while behind the engine room is the battery room with a floor area of 19 m. x 7 m. and the machine, carpenters' and other needful shops, the whole making one compact and self-contained system.

### POWER

There are two aspects from which the power house may





Plan and Section of Combined Car House, Shops and Power Plant of the Caracas (Venezuela) Tramways

be regarded, either as a substation for a high tension current or again as an independent producer. As a substation it is employed to transform from 4500 to 500 volts. The high tension alternating current is obtained from the Electrical Company of Caracas. This company has two stations at Encantado and Los Naranjos, about 16 km from the capital. There are four generators at each station and more machinery is now being introduced. The motive force is the water of the Guaira River, which has a fall of 38½ m and 154 m at Encantado and Los Naranjos respectively. During the day the power is supplied by the Electrical Company.

In the evenings, however, when the town is lighted electrically, and also during stoppages which may occur occasionally, the power is produced in the power house itself. This is effected by three Diesel engines of 240 hp each running at 180 r.p.m. The Diesel engines were selected on account of the high price of coal. They have, moreover, an additional advantage in that no delay need occur in starting them; an advantage which is obvious in the case of a sudden interruption of the high tension transmission. The engines are belted to three motor generators. On the induction motor side these are designed for 5000 volts, 3-phase with 50 cycles, while in the direct current side they yield an output of 150 kw at 550 volts at a speed of 500 r.p.m. The station is also furnished with a battery of 260 Tudor cells, with a capacity of 520 amp for one hour and 252 amp for three hours, the maximum charging current being 252 amp. The Lancashire Dynamo & Motor Company supplied one of its automatic reversible boosters. The regulation with the battery and booster is such as to keep the load on one or two generators operating in parallel (i. e., 150 kw or 300 kw at 550 volts) constant within 8 per cent over or under the normal load of 272 or 544 amp, provided the maximum load does not exceed 100 per cent of the normal load of the set or sets running. In case of 150 per cent overload, the variation does not exceed 10 per cent, and in case of 200 per cent overload the variation does not exceed 12 per cent.

The switchboard consists of 10 panels, viz., one high tension incoming feeder panel 3-phase, 5000 volts between wires. Three induction motor panels; one battery and booster panel; 3 d.c. generator panels, and two feeder panels, all fitted with the necessary instruments. The board and motor generators were supplied by the General Electric Company of New York.

CARS

The cars, 30 in number, each with a seating capacity of 32, are of the open single deck type. The carbodies supplied by Milnes, Voss & Company, Ltd., Birkenhead, have the following dimensions:

Length of car body over cross pieces.....	7315	mm
Width of car body over sills.....	1460	"
Width of body over posts at seat ends.....	1725	"
Width over steps.....	1858	"
Length of platform at center from outside of end posts.....	1350	"
Height of car from rail over trolley board....	3430	"

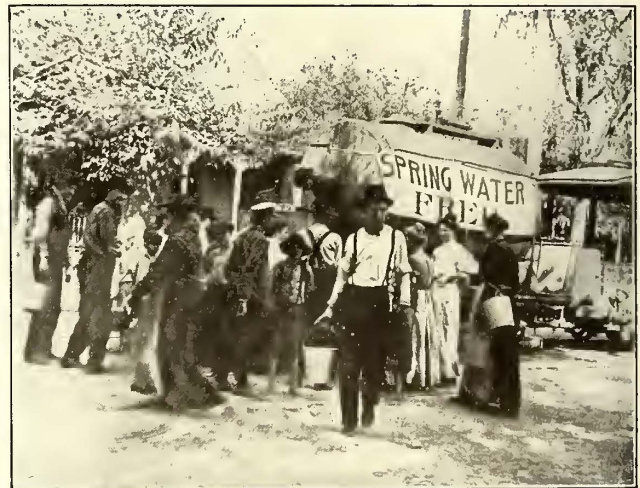
The body framing and flooring are of teak and the roof of aluminum. The seats are of the garden seat pattern, four being reversible and four stationary. They extend transversely the whole width of the car. Storm curtains are provided at the open sides. There are destination indicators and also life guards of the Hudson & Bowring type at each end of the car. The trucks are all of the Brill pattern, and were manufactured by the United Electric Car Company, Ltd.

The electrical equipment of each car is composed of double motor GE-58, 4-turn, 37 hp for 500 volts. It includes also two B-18 controllers with one set of handles, magnetic blow-out circuit breaker, etc. With a view also to the sharp street corners and heavy gradients, each car has in addition to the mechanical brake one Westinghouse magnetic track brake.

From the commencement of the work by J. G. White & Company, Ltd., under the supervision of J. G. Rose, in March, 1907, to its completion, in February, 1908, the ordinary horse-drawn tramway traffic was in full operation. The construction work and arrangements for handling the traffic were so arranged that during the whole period of conversion little, if any, diminution took place in the receipts of the tramway company.

**SPRINKLER RELIEVES WATER FAMINE AT AUGUSTA**

As a result of the disastrous flood at Augusta, Ga., on Aug. 26 and 27, the city suffered a water famine unequalled in its history. Water is taken from the river 7 miles above the city, carried through a canal to the pumping station, about 4 miles distant, and supplied to the residents of the city by the municipality for all purposes. The canal was



Distributing Free Water from Augusta-Aiken Railway's Sprinkling Car

badly washed by the flood between the pumping station and the river, and the pumping station had to be closed down. The reserve reservoir, which carries a supply for two weeks, was called upon, but at the end of the two weeks approximately 60,000 people were without water. The Augusta-Aiken Railway & Electric Company owns a small water plant on the north side of the Savannah River, opposite Augusta, and when matters became serious, about Sept. 15, the company began to haul water into the city in a tank car, which it uses for sprinkling purposes, and distributed the water to persons with buckets and other vessels who met the car along the streets through which it ran. In this way the company furnished 6000 gal. to 8000 gal. of water per day to the residents of the city for some time after the flood.

The first of the pay-as-you-enter cars of the Twin City Rapid Transit Company, Minneapolis, Minn., were placed in service on the University Avenue line on Oct. 1. Two conductors man each car, and will continue in service until the public becomes fully acquainted with the new system.

**THE PRACTICABILITY OF ELECTRIFYING THE HOOSAC TUNNEL**

BY GEORGE C. SHAAD, ASSISTANT PROFESSOR OF ELECTRICAL ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

One of the special cases where electrification of steam railways has proved desirable is that of tunnel sections, and a study of the conditions existing at the Hoosac tunnel with a view to possible electrification was made the subject of an undergraduate thesis by M. C. Hayes and E. L. Warren, students of the class of 1908, Electrical Engineering Department, Massachusetts Institute of Technology. The following is an abstract of their thesis:

In considering the practicability of electrifying the Hoosac tunnel it was necessary to make a study of the following features: The traffic conditions on the Fitchburg division of the Boston and Maine Railroad, in which the tunnel is located; the physical characteristics of the tunnel; the extent of electrification desirable and the selection of a system which would prove satisfactory in its operation; the maximum amount of power required for operation; the advantages to be derived from electric operation.

The Hoosac tunnel is a double-tracked tunnel nearly  $4\frac{3}{4}$  miles in length, running in a straight line through the base of the Hoosac Mountain, and at present it is the longest and most important railway tunnel in the United States. It is located in the Fitchburg division of the Boston & Maine Railroad, the main line of which runs from Boston, Mass., to Rotterdam, N. Y., a distance of 212 miles. All of the through traffic of this division in either direction must pass through this tunnel. The Hoosac tunnel route between New England and the West has the advantages over the other routes of directness, favorable central location, and easy grades, and as a result this division has a larger through freight tonnage than any other railroad in New England.

the tunnel. A study of the records for east-bound freight passing through the tunnel for the year 1907 shows that the average number of trains per day was 28.6, the average weight per train being 1066 tons. The maximum number of trains per day was as high as 40 and the maximum weight of train was 1250 tons. In addition to the freight traffic there were 11 passenger trains per day in each direction on the schedule. The average weight of passenger train behind the locomotive was 400 tons. The average running time through the tunnel for freight trains was 19 minutes, and for passenger trains nine minutes.

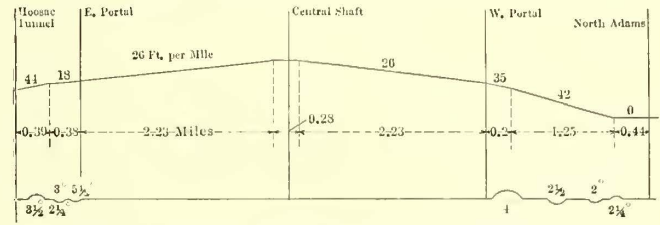


Fig. 1.—Hoosac Tunnel—Profile and Alignment

There are possibilities of diverting both freight and passenger traffic to this route in case the tunnel is electrified.

The profile and alignment of the section of the track in which the tunnel is located is shown in Fig. 1. The exact length of the tunnel is 25,081 ft., and from the ends of the tunnel there is a rising grade of 26 ft. per mile, about 0.5 per cent grade, and in the middle of the tunnel there is a level section 1500 ft. in length. The grades of the approaches to the tunnel, shown in Fig. 1, are practically the "ruling" grades of the whole division. The cross section of the tunnel, together with the clearance or safety line, is shown in Fig. 2.

The ventilation of the tunnel is very poor. Trains are in the tunnel practically the whole of the 24 hours of the day, and the smoke and gases from the locomotives simply drift back and forth, controlled by the relative motion of the trains to a much greater extent than by the ventilating fan installed at the central shaft. Mechanical devices to reduce the amount of smoke in the tunnel and the use of oil-burning helper locomotives have resulted in but slight improvement. The tunnel is of necessity, due to the smoke, operated as one long block, but one train on each track being allowed in the tunnel at the same time. No freight train is allowed in the tunnel at the same time as a passenger train, and freight trains are not allowed to enter the tunnel for several minutes before a passenger train is due. Again, trains must often wait for some of the smoke to clear from the tunnel, and it is not at all uncommon with the present traffic to find as many as three freight trains waiting for a clear signal at the tunnel entrances. This means a delay of at least 40 minutes for the third train. Under such operating conditions but a slight if any increase in traffic can be provided for.

Two schemes were considered by the writers as regards the extent of electrification. At first it was proposed to make a study of the electrification of the entire section lying between the eastern end of the tunnel and the western terminus of the division, a distance of 77 miles. It was found that the density of traffic did not warrant such an extensive electrification at present. The scheme finally considered involves the electrification of the section between North Adams and Hoosac Tunnel, a distance of 7.4 miles. The authors propose to use electric locomotives in the electric zone, these locomotives to be coupled on ahead of the regular steam locomotives used for the remainder of the run, a practice similar to that found satisfactory in

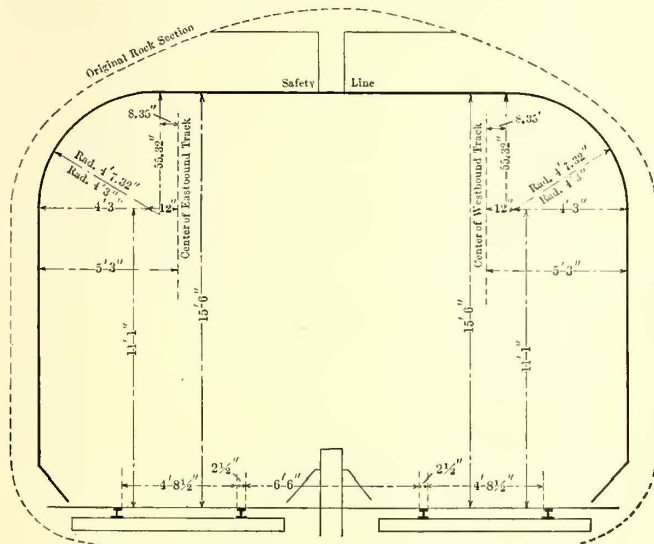


Fig. 2.—Hoosac Tunnel—Section of Tunnel

The traffic has been growing steadily and there is every reason to expect a continuation of this growth so long as the railway is in a position to handle increased traffic. There is a limit to the amount of traffic which can be cared for by the present method of operation and that limit is nearly reached. The east-bound freight is largely low class, such as grain, wool, coal, meat products, steel, etc., while the west-bound freight is of a higher class, such as the products of cotton and woolen mills, boot and shoe factories, etc. The greater tonnage of the east-bound freight makes it the controlling factor when studying the freight capacity of

the operation of trains in the Baltimore & Ohio tunnel at Baltimore.

On account of the difficulty of using an overhead conductor in the tunnel a third-rail system is proposed. There is considerable trouble from moisture and ice in the tunnel, and this makes a high potential working conductor undesirable, hence a standard 600-volt, direct-current system of electrification is considered in preference to either an alternating-current or a direct-current system of higher voltage. The limited space in the tunnel makes it desirable to install the third rail between the tracks and it is proposed to use a protected single rail of special section designed to accommodate the under-running shoes of locomotives going in either direction. In order to take care of a greater traffic the number of blocks between North Adams and Hoosac Tunnel could be increased from four to five by dividing the tunnel into two blocks, such division being feasible

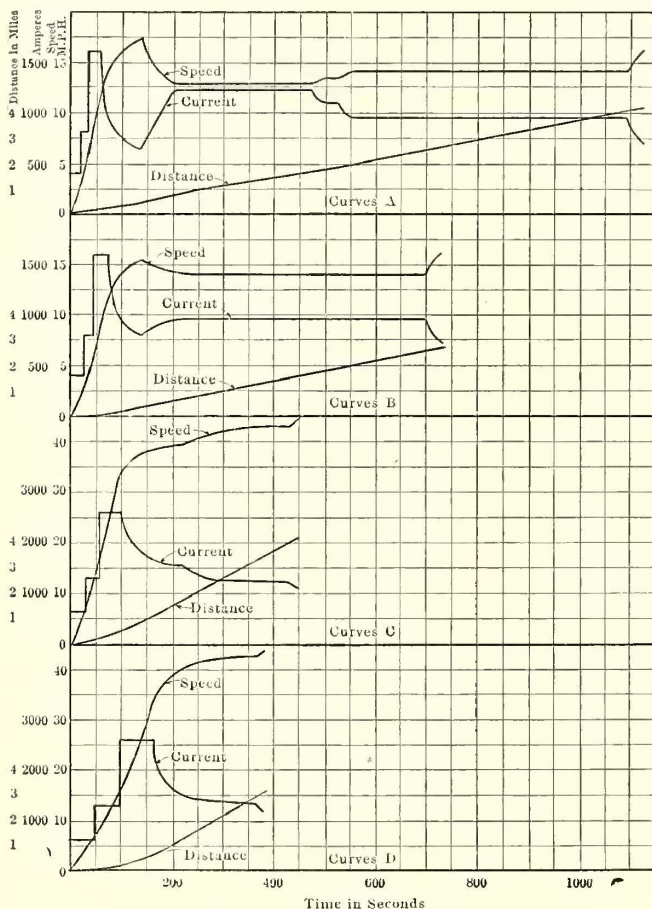


Fig. 3.—Hoosac Tunnel—Run Sheets

to the higher accelerating rates of the electric locomotives would more than counterbalance the loss of time due to connecting and disconnecting the electric locomotives, and it is thought possible to provide readily for double the traffic now passing through the tunnel.

The maximum grade encountered between North Adams and Hoosac Tunnel is 0.8 per cent, and on this grade there is a curvature of 2.5 deg. The locomotive equipment must be capable of starting the heaviest trains on this grade. Taking the maximum weight of freight trains as 1250 tons and of passenger trains as 500 tons, steam locomotives included in each case, and assuming 17 lb. per ton starting resistance, equivalent grade, allowing for curvature, 0.86 per cent, the tractive effort at starting will be found to be 34.2 lb. per ton, or a total of 42,750 lb. for freight and 17,100 lb. for passenger service. Allowing a tractive effort of 22 per cent of the weight of the locomotive it is seen

that the weights of locomotives for freight and passenger service should be about 97 tons and 49 tons respectively. From specifications available the approximate power consumption for freight and passenger traffic has been determined using a 100-ton locomotive for freight and a 68-ton locomotive for passenger service. Typical run sheets for freight and passenger trains of maximum weight only were worked out, as it was desired to obtain the maximum power consumption and practical schedule speeds only.

Table 1 gives the track data for which the run sheets shown in Fig. 3 are determined. Four run sheets, two for freight and two for passenger service, were constructed and are sufficient to show what can be accomplished with electric locomotives.

Curve *A*, Fig. 3, represents a freight run from North Adams to Central Shaft, and Curve *B* shows a run from East Portal to Central Shaft, it being planned to deliver west-bound freight to the electric locomotives in the yards at East Portal rather than at Hoosac Tunnel, where a heavy grade exists. West-bound passenger trains would be operated electrically from Hoosac Tunnel, since this is a regular stop for passenger service. Curve *C* shows a passenger run from North Adams to Central Shaft and Curve *D* represents a run from Hoosac Tunnel to Central Shaft. These run sheets are constructed to Central Shaft only, the remainder of the run being on level track or down grade in every case. The exact time for the complete run has not been determined. It would depend upon the details of operation, such as the maximum speed reached, rate of braking, etc. It has been assumed that the running time between corresponding stations will not be greater in the direction opposite to that for which the run sheets are constructed and Table II gives the total running time on the basis of the same interval between corresponding stations in opposite either direction. The maximum current consumption for freight service is seen to be 1600 amp per locomotive and 2600 amp per locomotive will be required for the passenger trains.

Assuming the most unfavorable distribution of load that is liable to come on the system, that is, when it is required to start two trains at the same time on grades in the tunnel with the possibility of two freight locomotives per train, and a load of equal value on the approaches to the tunnel, it is found that the maximum demand for current would be in the neighborhood of 12,000 amp, or 7200 kw at 600 volts. To supply this power it is proposed to run a transmission line from Hinsville, Vt., a distance of 28 miles from Hoosac Tunnel, where a large hydraulic plant is in the course of construction, and install two substations, one at either end of the tunnel. This distribution of the substations is desirable on account of the grades, and space for their erection is available on the company's right of way. With feeding points at either end of the tunnel the demand causing the maximum drop of potential would consist of 3000 amp at a distance of about 2 miles from the substation. By making use of all the rails for the return current and no return feeders the drop of potential in the return circuit would be 90 volts, and if a third rail having a cross section of 20 sq. in. were installed, the total potential drop would be 180 volts, or 30 per cent of 600 volts. While this drop is high it is thought permissible, since it represents the drop in voltage under the most unfavorable distribution of trains and the demand for power under normal conditions of operation would be much less than that assumed for maximum demand. Six freight and two passenger locomotives would be required for the present traffic, assuming a fairly uniform

distribution of trains. This would permit the operation of two freight trains of ordinary weight, two extra heavy freight trains, and two passenger trains. The average traffic would require not more than five locomotives in operation at any time.

The details of investigation and design have been gone into only to such an extent as to show the practicability of electrification, and it has been shown that suitable schedule speeds can be maintained at a reasonable maximum demand for power, and that this power can be distributed to the locomotives without an excessive cost of conductors. It remains to point out some of the principal advantages of electric operation which make electrification desirable.

The elimination of smoke and gas in the tunnel should result in a decided increase in the passenger traffic of this division. There are at present but two west-bound and one east-bound through express trains, as the inconvenience of the tunnel passage deters many passengers from taking this

absence of smoke and gas. The increased fixed charges on electrical apparatus should be offset by the decrease in cost of operation and repairs.

TABLE I.—DISTANCES.

Grade.	Distance in Miles from North Adams.	Total from North Adams.	Distance in Miles from Hoosac Tunnel.
Level	0.44	0.44	7.40
0.80% up	1.25	1.69	6.96
0.70% up	0.20	1.89	5.71
0.50% up	2.23	4.12	5.51
Level	0.28	4.40	3.28
0.50% down	2.23	6.63	3.00
0.35% down	0.38	7.01	0.77
0.80% down	0.39	7.40	0.39

TABLE II.—RUNNING TIME.

Service.	Stations.	Running Time (Minutes).	Maximum Speed (Mi. per Hr.).	*Total Run'g Time.
Freight, eastbound....	North Adams to Central Shaft	19.25 (10 min. in tunnel)	17.5 (May be higher on level or down grade)	32.5
Freight westbound....	East Portal to Central Shaft	13.25 (10 min. in tunnel)	16.3 (May be higher on level or down grade)	
Pass., eastbound.....	North Adams to Central Shaft	7.33 (3.33 min. in tunnel)	44	13.66
Pass., westbound.....	Hoosac Tunnel to Central Shaft	6.33 (3.33 min. in tunnel)	44	

\* The total running time assumes the same time between points in either direction and is given between East Portal and North Adams for freight and between Hoosac Tunnel and North Adams for passenger service.

### THE MAINTENANCE OF HAND BRAKES

The increasing application of air brakes to electric car service has in some cases tended to obscure the importance of properly maintaining hand brakes on roads where a large number of cars are still equipped with the older type. It is not always feasible to equip all the cars of a large system with air brakes, at least inside a given date, and hence it is most necessary for the mechanical force and the men on duty in car houses to appreciate fully what it means to keep the old brakes in good condition. Again, most cars are provided with hand brakes as an emergency facility, even though air-brake equipment be used for all the important work. Realizing these points, and specially desirous of improving the hand-brake maintenance, the mechanical superintendent of a large operating company took occasion, awhile since, to discuss with his subordinates the proper care of hand brakes, and the following notes are drawn from this discussion in the hope that they will be equally helpful to other companies.

It is a notable fact that with all kinds of conveyances the question of braking has always increased in importance as the demands for heavier equipment and higher speeds have increased. One of the first brake devices used on common road vehicles has formed the basis of almost all brake appliances. The old arrangement of two brake blocks and a beam with suitable levers was early introduced, and all kinds of development from this arrangement are seen today on various kinds of vehicles.

The most efficient brake is that which applies the greatest amount of friction to the wheels up to a certain percentage of the weight on wheels, in the shortest possible time. The ideal hand brake is one, or would be, if it could be built, which applies the maximum pressure on the initial application and gradually reduces the pressure in proportion to the decrease of speed, and consequent increase of the coefficient of friction between the brake shoe and the wheel. The fact that this is not possible with hand brakes, but is possible with power brakes, is a very important consideration in favor of the power brake.

Brake-staff defects are due principally to the staff binding and not releasing freely, and are often caused by the



Fig. 4.—Hoosac Tunnel—View of West Portal, Showing Volume of Smoke and Gas Issuing from Tunnel

otherwise very agreeable route between Boston and Albany or Saratoga. The absence of smoke and gas would result in greater safety to workmen in the tunnel. It is not uncommon to have employees overcome by gases when in the tunnel, and it is thought that the presence of a live third rail would be less dangerous, as such a rail could be well protected. The limit of the freight capacity of the tunnel with steam operation is practically reached, but with electric operation the tunnel could be divided into two blocks and its capacity practically doubled. All extended delays at the tunnel entrances could be avoided and the superior accelerating power of the electric locomotives would counterbalance the slight delays in coupling and uncoupling them. Electrification should reduce the operating expenses for this section. The cost of operating this type of electric locomotive has been shown by test to be less than the cost of operating corresponding steam locomotives, extended delays would be minimized, and renewals of rails, angle-bars and tie-plates would be required less frequently in the

drawbar rest being displaced. Brake-chain troubles are largely due to the hand brake binding and jamming between the brake staff and sill. One of the most important points in the transmission of braking power from the brake handle to the wheels is the winding of the brake chain on the staff. Tests made by G. L. Fowler on the cars of the Brooklyn Heights Company, using dynamometers in the truck pull-rods, showed the braking pressure at the wheels to vary as much as 40 per cent with a given pressure applied to the brake handle on different applications on the same car. This was found to be due entirely to the manner in which the chain rolled on the brake staff, and for this reason a close link chain should be used and care taken to have sufficient lead to the chain to allow it to roll on the staff without one turn binding or running upon another. There should also be sufficient release spring pressure to pull slack chain promptly from the staff, so that the chain will grind on the staff directly below the eye bolt. Great care should also be taken to see that the lead of the chain is such as to prevent its winding above the eye bolt and jamming against the platform and rendering the brakes inoperative. Another point to be guarded against is that of the chain at the rear end of the car catching on the snow scrapers and thus preventing an application of brakes. Inspection of the brake chain should guard against badly worn links, or eye bolts, or the possibility of nuts working off from the eye bolts.

Brake rods should be designed not only for the maximum pull with ample factor of safety, but also with the idea of preventing excessive fiber stress at any point due to vibration. Rods should not be welded to brake jaws at any point where the cross-section of the metal is materially changed. The rod should be upset sufficiently to bring the weld back from the point where the metal is reduced to the size of the rod. Offsets should be avoided as far as possible, but where it is absolutely necessary the next best thing is to make the offset as long as possible. Care should be taken to have long rods properly supported; that is, when not in tension they should rest on a sufficient number of supports to prevent vibration by movement of the car, and in no case should the brake rods be permitted to strike the motors or the gear case during the car movement.

Brakes dragging or not releasing properly call attention to the fact that brake-release springs should have sufficient tension to hold the shoes off the wheel when the brake is released, and should be adjustable to compensate for brake-shoe wear, but it should be borne in mind that every pound of tension on brake-release springs means a pound of brake-shoe pressure lost; hence care ought to be taken to see that the release springs have only sufficient tension to release shoes.

Generally speaking, soft iron cast brake shoes have the highest coefficient of friction, and other things being equal, give the best braking results. But on account of rapid wear and consequent short life they are expensive, both for material and labor, and very often necessitate the adjustment of brakes more frequently than it is convenient to get cars for such adjustment. On the other hand, if the brake shoes are very hard, the low coefficient of friction makes hard braking cars, and there is liable to be trouble with the shoes breaking. Therefore, it is necessary to use shoes of a medium hardness, or a combination of hard and soft metals, as, for instance, the Lappin shoe, having a soft cast-iron body with chilled sections, or the Streeter shoe with a soft cast-iron body and hard iron insert. It is not always convenient to arrange brake leverage to give brake-

shoe pressure in proportion to the weight on the wheels, in which case shoes with a different coefficient of friction can be used to advantage. Thus, on certain short-truck cars, with 150 lb. applied to the brake handle, there is 25 per cent more brake pressure on the wheels on the brake lever end of the truck than there is on the wheels on the opposite end when they are equipped with a single motor and the motor is on the brake-lever end. The difference in weight compensates for the difference in brake pressure, but when equipped with two motors, a softer shoe should be used on the end opposite the brake lever. On Bemis No. 27 swivel trucks the softer shoes should be used on the inside wheels of both motor and trailer trucks; in fact, this applies to any truck where the shoes on one pair of wheels are used directly as a fulcrum for the shoes on the opposite wheels without compensating the levers, and where the weight is equal on both pairs of wheels. With severe braking service, such as some companies have, it is necessary to have reinforced brake shoes. Incidentally this reinforcement permits the shoe to be worn thinner and consequently means less scrap.

The method of hanging brake shoes not only affects the brake-shoe pressure, but very materially affects the life of the shoe, due to uneven wear. Brakes should be hung so that the direction of application and the resultant of the brake force will pass through the center of the wheel; or, in other words, the line of hanger would intersect the line of applied force at the circumference of the wheel. Cushioning brake hangers with rubber prevents chattering very effectively and permits a sufficient lateral movement of the hanger to prevent its being broken, but it is very expensive to maintain.

The cost of brake hose may be reduced by greater care in putting in link rubbers; if the rubbers are not properly and snugly fitted the life of the rubber is very short, and the matter deserves more thorough study than has thus far been given to see if some better way of hanging the brakes cannot be devised. On some cars where the rubber is not used in links it was found that considerable play is necessary to prevent the links from breaking, and the most satisfactory arrangement is two links with a bolt in top and bottom, thus making a rectangular link with a joint in each corner.

Brake leverage should be arranged to distribute the braking pressure on all wheels in proportion to the weight thereon, so that the brake pressure can be maintained on all the wheels just below the skidding point, otherwise flat wheels will result.

Brake levers, pins and fulcrum castings or forgings should be designed with large factors of safety and with liberal allowance for wear. Care should be taken that the movement of the lever is in a proper direction and will cause no serious binding on the sides of the fulcrum casting or guides at any point in the travel of the lever. This especially applies to single-truck cars. In investigation of the cause of hard braking of some 20-ft. cars it was found that the double offset link connection between the vertical and horizontal lever was such as to cause severe binding of both levers. When these had been brought in line by shortening the vertical lever and relocating the hole in the horizontal lever, a vast difference was found in the braking of cars, and with very little change of leverage ratio. Lost motion between journal boxes and truck pedestals should always receive attention. Sand boxes should not be considered a part of the brake equipment, but the sand box is a most important adjunct when making a short stop on a slippery rail, and should not be neglected.

## NEW CONCRETE SUBSTATION FOR THE NORTHERN ELECTRIC RAILWAY COMPANY

BY J. P. EDWARDS, ELECTRICAL AND MECHANICAL ENGINEER OF THE COMPANY

The Northern Electric Railway Company, operating 120 miles of interurban electric railway between Chico and Sacramento, with branches, has lately completed and installed substation No. 8, at Nicolaus, 25 miles north of Sacramento on the main line. As this is also the junction of the three high-tension lines of the Pacific Gas & Electric Corporation, from which current for operating the railway is purchased, special arrangements were made as to high-tension switching. This substation, which is to replace a temporary one, was designed, built and installed under the personal supervision of the writer.

The building is a reinforced concrete structure and is fireproof throughout. It is 53 ft. 6 in. by 28 ft. 6 in. outside and 29 ft. 6 in. from parapet wall to floor, which, in turn, is 4 ft. above the level of rails. The foundation of the building walls is set 18 in. below the ground level and extends up to the floor.

The walls of the substation building are 8 in. thick and are reinforced by two vertical and horizontal rows of  $\frac{1}{2}$



Northern Electric Company—Substation No. 8, Nearing Completion

in. square steel placed  $1\frac{1}{2}$  in. from each face of wall and 18 in. centers. In addition to the rods there are six structural steel columns in each side wall which support the gallery and roof. The concrete used is one part cement, two parts sand and five parts crushed rock to pass a  $\frac{3}{4}$ -in. ring. Imported Portland cement was used. The entire faces of the walls are floated with a finish coat of one part cement and two parts sand, after removing forms.

The roof of the building is 5-ply asphaltum and gravel laid on  $1\frac{3}{4}$ -in. by 6-in. ship-lapped yellow pine boards, which are supported by 3-in. by 6-in. yellow pine purlins on three steel trusses and the end walls. To the underside of the roof boards and purlins expanded metal lath is fastened. On this wood pulp cement plaster is applied to a thickness of 1 in., making the roof fireproof.

### SWITCHING GALLERY

Twelve feet above the floor and extending 39 ft. from the rear of the building, is the high-tension gallery floor, which is also of reinforced concrete. This gallery is supported by five 8-in. I-beams extending between the side walls and carried by structural steel latticed columns built up of 8-in. steel channels. Three of these columns on each

side extend up to support the steel trusses which carry the roof. The gallery floor is 4 in. thick and reinforced between beams with  $2\frac{1}{2}$ -in. mesh expanded metal.

The gallery is divided into nine compartments by reinforced concrete barriers, which are 2 in. thick and stand 8 ft. above the floor. These barriers are built up of slabs 2 ft. wide, which were built on the ground in forms, and, after being dried, placed in position and cemented together. They are held in position by angle irons. The slabs are reinforced by a wire screen of  $\frac{1}{4}$ -in. round rods electrically welded in mesh of about 2 in. square, and the concrete of one part cement and two parts fine gravel.

### TRANSFORMER ROOMS

In the rear of the building below the gallery are the transformer rooms, which are about 7 ft. square, and each provided with fireproof doors opening out into the main generator room. The floors of the transformer rooms are 2 ft. below the main floor. The transformer compartments open into an air duct, which extends across the station and out each side. This duct is 5 ft. wide and 5 ft. 6 in. deep, covered over on top with a 4-in. reinforced concrete floor. The reinforcing steel rails extend across the transformer rooms and support the transformers. This arrangement allows ample room to carry the leads from the transformers to the switchboards and also to provide for free circulation of air. In the gallery floor directly over each room is an opening 30 in. in diameter for the high-tension lead down to the transformers and also for transformer cell ventilation.

### GENERAL EQUIPMENT

Extending along the side and opening into the air duct is a wire-way 3 ft. 6 in. and 5 ft. deep covered with a removable wood grating.

The station is equipped with two 400-kw motor generators furnished by the Westinghouse Electric & Manufacturing Company, and provisions are made for the future installation of a third set. Each motor generator set is composed of an a.c. constant speed induction motor, type "CX," 580 hp, 2200 volts, 133 amp per terminal, 3 phase, 60 cycles, and running 500 r.p.m., direct connected to a d.c. generator delivering 400 kw at 600 volts.

The switchboards were furnished by the General Electric Company and contain one starting panel, one a.c. panel and one generator panel for each generator set, and two feeder panels for the direct-current feeders. On the a.c. panels is mounted the power factor indicator, voltmeter, ammeter and main oil switch lever, the oil switch being located in a separate switch chamber outside of the building. This switch chamber also contains the expulsion fuses.

The starting panel has an oil circuit breaker and a starting switch with series transformers which control the oil circuit breaker. The generator panels carry the main circuit breakers, ammeters, field rheostats, negative switches and recording wattmeters, the feeder panels having only the circuit breakers and positive feeder switches. The line and machine voltmeters are mounted on a bracket at the end of the board and are connected to a small wire busbar system at the back. The line voltmeter has a double-pole switch which will give the voltage on either section or feeder.

### SWITCHING APPARATUS

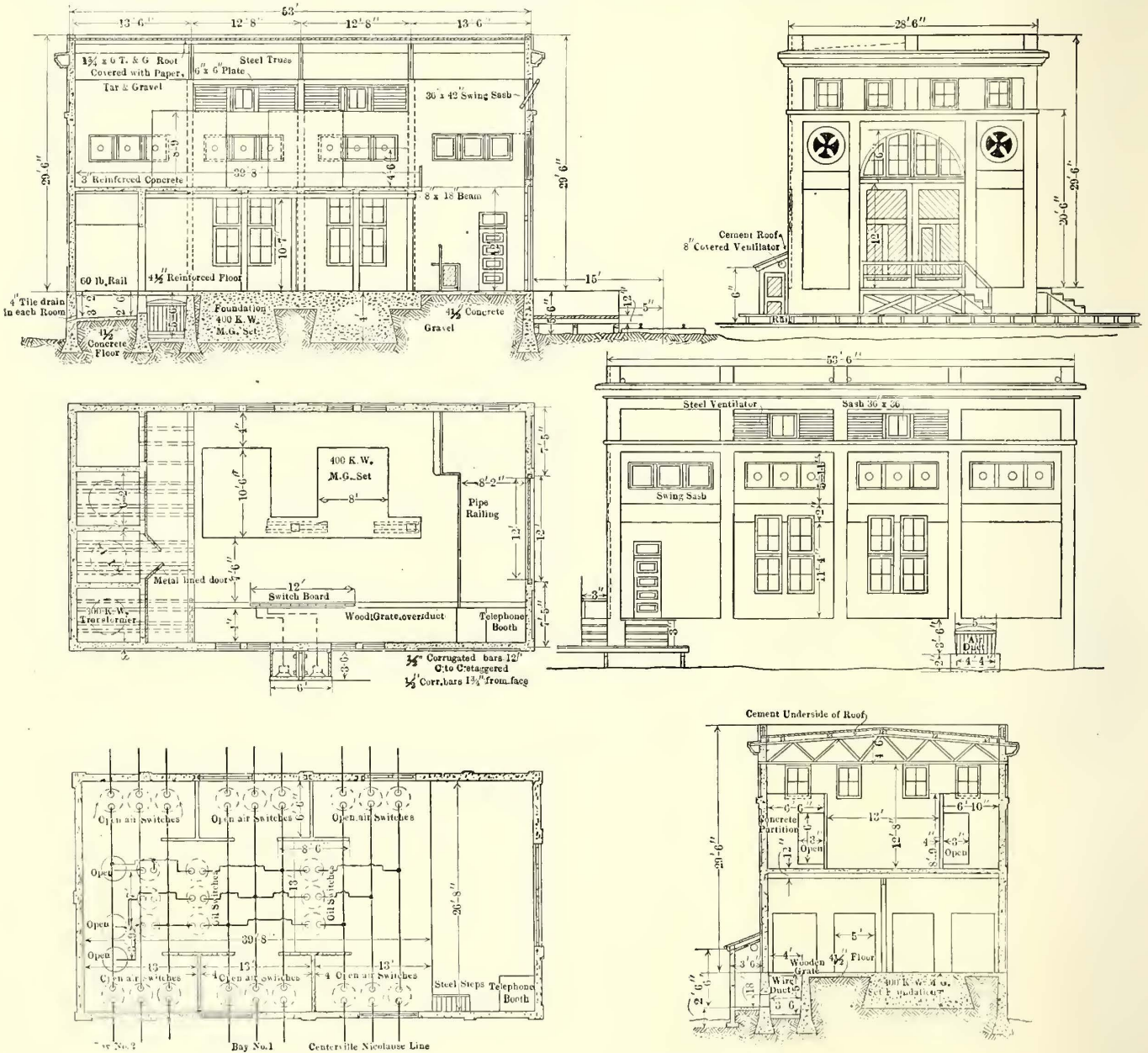
As stated before, the gallery is provided for the high-tension switches needed at the junction of the three transmission lines. These three transmission lines enter the building on the north side through special insulators composed of two lights of  $\frac{1}{4}$ -in. plate glass 36 in. x 36 in., mounted in a wooden frame. The outside glass has an 8-in.

opening, and the inner one a 6-in. opening in the center, through which the No. 0000 wire passes. The wires are fastened on each side of the window to three skirted porcelain insulators, which are carried on angle iron brackets. The three lines are connected to a cross bus line through oil switches, which are controlled by levers located down on the main generator floor. These oil switches are protected by open air switches set in gangs of three and operated from back of concrete barriers.

The switches are enclosed in compartments formed by the barriers, and all openings are closed by removable shut-

expulsion fuses to the main oil switches located in switch room at side of building, thence from the oil switches to the starting panels and around to the motors. The wiring is all No. 0000 insulated flexible copper. The two low voltage leads for starting are taken direct from the transformers to the starting panel. All of the lighting transformers, potential transformers and current coils used for instruments are placed in the wire duct back of switchboard.

The leads from the generators to the switchboard are all 500,000 circ. mil insulated cable run in fiber conduit,



Northern Electric Company—Plans, Section and Elevations of Substation No. 8

ters made of sheets of transite hung on 1-in. iron pipe, making each switch fireproof and protecting it against the formation of long arcs. The switching arrangement in the gallery permits the cutting out of any or all the high tension lines and crossing from any one line to the others.

The current used in the substation is furnished by the Pacific Gas & Electric Corporation at 60,000 volts, and is stepped down to 2200 volts by the three 300-kw water-cooled GE transformers, which are located in the transformer rooms at the rear of the building.

The 2200-volt leads are delta connected and run through

which is imbedded in the concrete floor. The switchboard instruments are all connected on the negative side of the generator. The feeder cables pass out the side of the building and are laid in conduit to the third rail.

A small telephone booth is provided in the station. It is built up of double walls of transite, which makes it fireproof. There is also an iron railing across the front of the main room to form a small waiting room for passengers, as it is intended to use the station as a ticket office also. Near the station are the operators' cottages, furnished by the company, and the pumping plant.



**BRAKE SHOE STANDARDIZATION AND WEAR IN BROOKLYN**

The mechanical department of the Brooklyn Rapid Transit Company has been working on the problem of brake-shoe standardization for some time and hopes eventually

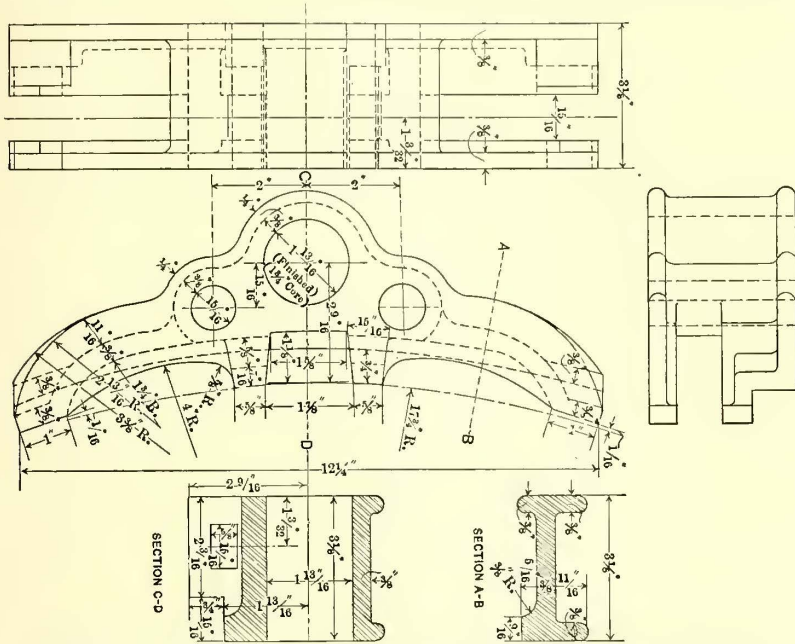


Fig. 1.—Brake-Shoe Head for Driving Wheels of Brill Maximum Traction Truck

to reduce the number of shoes to two patterns, one for the 33-in. wheels and one for the 20-in. pony wheels of maximum traction trucks. At the time this subject was taken up in 1903, the company had fully 40 styles of brake-shoe heads in service, 27 on the surface and 13 on the elevated. By changing the brake rigging in certain cases, the surface

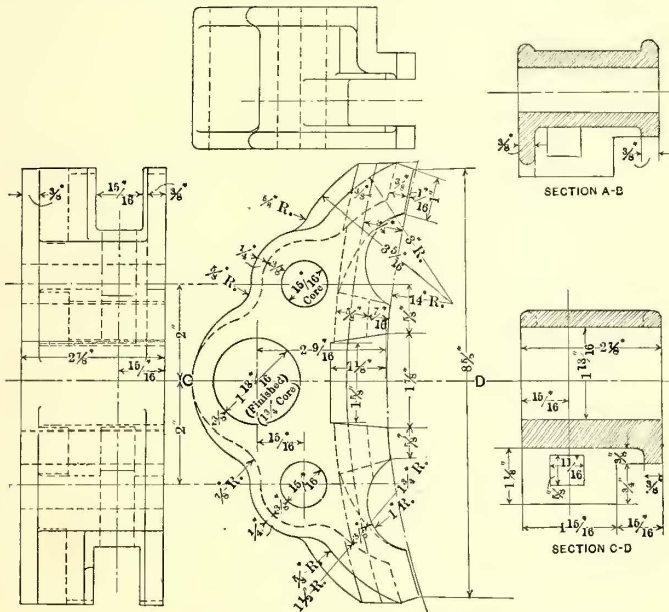


Fig. 2.—Brake-Shoe Head for Pony Wheels of Brill Maximum Traction Truck

patterns (including plows, sweepers, freight cars, etc.) have been reduced to 22 and the elevated patterns to 4.

The standard shoe for the 33-in. wheel is to be of the American Brake Shoe & Foundry Company's design M-512 for narrow treads, as approved by the standardization committee of the American Street & Interurban Railway Asso-

ciation, while the standard shoe for the pony wheel is to be of the same manufacturer's M-582 design except where a special B. R. T. pattern must be used on a few trucks with inside-hung brake rigging where it would be difficult to install a removable shoe. New heads have been designed throughout for these standard shoes. Fig. 1 shows the head for the drivers of a Brill maximum traction truck, and Fig. 2 the head designed for the accompanying pony wheels.

Of course, from the standpoint of practical economy these changes in brake-shoe heads will be made only as the old designs wear out and are scrapped. This is particularly true of the shoes with detachable heads, whereas the substitution of the combined head and shoe designs will effect a considerable saving in a very short time.

Fig. 3 is a curve of brake-shoe wear from January, 1907, to August, 1908, inclusive, and shows the following costs: On the elevated, a minimum of 0.024 cent per 100 ton-miles in November, 1907, a maximum of 0.051 cent in March, 1907, and a general average of 0.035 cent for the entire period; on the surface lines a minimum of 0.03 cent in August, 1908, a maximum of 0.077 cent in March, 1907, and a general average of 0.045 cent for the entire period. The novel feature of this curve is the fact that it is the first record of the kind ever worked out on the ton-mile basis by a

large surface railway.

In connection with the curves mentioned the accompanying table should be of interest, as it shows the comparative percentage of wear of the different brake-shoe designs now used on the majority of the cars. This table shows that the

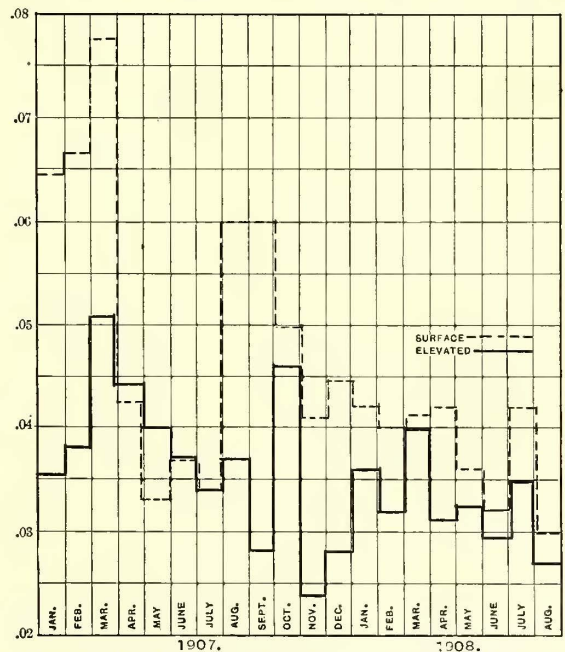


Fig. 3.—Brake-Shoe Cost Per 1000 Ton-Miles for Surface and Elevated Railway Equipment

best elevated equipment record is presented by pattern No. 5465, a "U" type steel back half-flanged shoe which gives 67.2 per cent wear on the 33-in. and 34-in. wheels of the standard motor trucks and then is used on trailer trucks, securing eventually 80 per cent wear. The best surface equipment record is offered by pattern No. 6415, a remov-

able shoe of the Lappin type, which gives 66.7 per cent wear on Peckham 14-D-5 trucks. In general, the percentage of wear is higher on the elevated equipment. The weights of worn shoes in both classes of service are made up from the average weight of a considerable number of shoes of each class as taken from the scrap pile. Blue prints of this percentage table are on hand at the different shops for the guidance of the foremen in determining the scrapping point

TABLE OF BRAKE SHOE WEAR ON SURFACE AND ELEVATOR PASSENGER EQUIPMENT.

Pat. No.	Description.	Truck.	ELEVATED.		
			Wt. of new shoe, lb.	Wt. of worn-out shoe, lb.	Per cent. of wear.
3,072.	"U" steel back, not fl., 36"...	Baldwin motor....	31	12	61.3
3,168.	"U" steel back, not fl., 30"...	Standard trail....	25	11	56.
5,465.	"U" steel back, half fl., 33"...	Standard motor....	55	18	67.2
SURFACE.					
3,208.	Shoe & all head, 1/2 fl., 33"...	Brill M. T. double.	30	17	43.3
5,056.	Full flanged, 33".....	Peck (No. 6) single	25 1/2	13	49.
5,055.	Shoe & all head, 1/2 fl., 20"...	Brill M. T. double.	20	11	45.
5,057.	3/4 flanged, 33".....	Dupont single.....	—	—	—
5,416.	Shoe & all head, full fl., 33"...	Peck 14 D5 double.	35	20	42.8
5,417.	Shoe & all head, full fl., 33"...	Peck 14 D5 double.	36	20	44.4
5,418.	Shoe & all head, full fl., 20"...	Peck 14 D5 double.	20	10	50.
5,419.	Shoe & all head, full fl., 20"...	Peck 14 D5 double.	20	10	50.
6,350.	Steel back, half flanged, 33"...	Peck 25 double....	37	13	65.
6,413.	Shoe & all head, full fl., 20"...	Peck 14 D5 double, B. O. Co. cars..	16	5 1/2	65.6
6,414.	Shoe & all head, full fl., 20"...	Peck 14 D5 double	—	—	—
6,415.	Shoe & all head, full fl., 33"...	Peck 14 D5 double B. O. Co. cars... B. O. Co. cars...	31 16	10 1/4 5 1/2	66.7 65.6

of the various kinds of shoes. Wherever possible the shopmen are expected to improve these records. Careful check of the wear is kept at the general office of the mechanical department to make sure that the standards prescribed are attained or even exceeded.

All of these changes in brake-shoe practice are being carried out under the direction of W. G. Gove, superintendent of equipment.

### HEARING ON PROPOSED JOINT FARES AND THROUGH ROUTES IN NEW YORK

The hearings before the New York Public Service Commission, First District, in reference to the order of the commission for a joint fare and through route between the Metropolitan Street Railway and the Central Park, North & East River Railroad, are still in progress.

Frank R. Ford, of Ford, Bacon & Davis, consulting engineers for the receivers of the Metropolitan Street Railway, of New York, testified on Oct. 14. Mr. Ford's testimony may be grouped under three headings. The first was a definition of a "through route." This is important in the New York situation, because the Public Service law gives the commission the power to establish "through routes," but not specifically the right to require the issue of transfers at different points. As the cost of installing the special work necessary to permit the operation of through cars on the lines in question would be prohibitive, it has been the contention of the company that the commission had the power only to order the operation of through cars. The second point of Mr. Ford's testimony related to a comparison of the flat and zone systems of charging for fares and the impracticability of mixing the two. Finally, Mr. Ford showed that the net earnings of all the large American city railway systems of the country are decreasing, owing partly to a decrease in average receipts per passenger and partly to the increase in operating expenses. The only way to

maintain the net revenues is to adopt some plan to increase the receipts per passenger.

#### THROUGH ROUTES

The question of what constitutes a "through route" was brought up, and Mr. Ford said that his definition of "through route" was "a through routing of car and passengers over a continuous line of transportation formed by switch or other track connections of two or more separately owned lines of track." This is distinguished from a "transfer route," which involves one or more physical transfers of passengers or change of cars before reaching destination. A "through route" was primarily a steam railroad term applied to passenger transportation by through service as distinguished from that by local service involving change of cars.

City street transportation, Mr. Ford said, was originally furnished by competing lines, which usually established through lines of transportation by compulsion only, such as by the 1000-ft. law applying to New York City. With the construction of electric interurban lines similar to steam railroads, they obtained their terminal rights to use the urban companies' street tracks to reach the center of the cities by contract, and this was practically the first use of the "through route" principle of steam railroad operation.

Apart from this, the "through route" had come into use in the street railway field in a number of special instances, such as that in Chicago, Mr. Ford said. The street railway and elevated railroad service in Chicago is divided into three parts, each operating practically exclusively in the north, west and south divisions of the city formed by the branches of the Chicago River. B. J. Arnold, the consulting engineer of the city of Chicago, in 1902 outlined a system of "through routes" and "universal transfers" which would give a one-fare service to the entire city. In 1905 and 1906, as consulting engineers of the Chicago City Railway, Mr. Ford's firm worked out with Mr. Arnold a plan of "through routes" for the entire city, its recommendations in this particular being presented to the committee on local transportation of the Chicago City Council by the Chicago City Railway on Oct. 6, 1905. These "through routes" were practically those which were finally embodied in the traction settlement ordinances of the Chicago City Railway and the Chicago Railways Company, passed by the City Council on Feb. 11, 1907.

These "through routes," of which there are 21, are established by the city directing the two companies to connect their lines and thereafter to operate a through line of cars over the two diversely owned lines of track. These "through routes" are distinguished from transfers in the ordinance.

Mr. Ford said that one of the reasons why Mr. Arnold and his firm recommended the establishment of these "through routes" (most of which pass through the central downtown delivery district) was to avoid the use of transfers in the downtown district, which would have been accompanied by great abuse. Perhaps the clearest understanding of what the term "through route" means could be obtained, Mr. Ford suggested, from reading under the heading "through routes," Section 13 of this ordinance.

More recently, in 1907-8, Mr. Ford's firm had worked out for the Northwestern Elevated Railroad, of Chicago, a plan of "through routing" trains from its tracks in the North division of Chicago to the tracks of the South Side Elevated Railroad in the South division of that city, so as to increase the terminal capacity of the Union Loop.

In this connection Mr. Ford pointed out that the trains of both the South Side and the Northwestern companies run to the central delivery district covered by the Union Loop, and there the cars of each company are looped back to its own line. The plan which was worked out (a modification of the one originally proposed by Mr. Arnold for the city as referring to the same companies) contemplated the installation of switch connections on each side of the Loop to permit the "through routing" of trains between the two companies.

One of the first contracts for a through line formed by an interurban line entering and running over the tracks of a city line with which Mr. Ford was familiar is a contract between the New Jersey & Hudson River Railway & Ferry Company and the Jersey City, Hoboken & Paterson Street Railway (now part of the Public Service Railway), under date of Dec. 20, 1901, to form a joint line or "through route" from Edgewater, N. J., on the Hudson River, via Hackensack to the Paterson city limits at Broadway Bridge, Passaic River, and thence into the business center of Paterson via the Broadway tracks of the Public Service company. In this contract the joint operation was referred to as a "through line," "through service" and "through cars," as distinguished from the service by "transfer" privileges from the "through line" of each company.

Similar contracts exist for interurban lines operating over the lines of the urban companies at Kansas City, Toledo, Cleveland, Indianapolis, etc.

#### FLAT RATE OF FARE

Mr. Ford, in the course of his testimony, entered into an extended discussion of the relative merits of the flat rate of fare and the zone system. He said that the flat rate of fare of a nickel adopted by practically all American street railways was based upon the assumption that the amount of service furnished for each nickel received (or revenue passenger) would cost less than 5 cents, leaving a margin of profit. In other words, the average cost for the service rendered per revenue passenger must be less than 5 cents in order to make the enterprise profitable. As the car service is properly dependent on the number of passengers carried and the length of the ride, it costs more to transport a passenger 6 miles than 1 mile; consequently, if the cost of transporting the average passenger 3 miles would return the cost of this service plus a reasonable profit, it followed that the passenger riding 6 miles represented a loss. This loss was counterbalanced by profit on the passenger riding 1 mile, and in many cases this profit on the short rider would make up the loss on the long rider, so that the average riding, or the average of the short haul and the long haul, would represent a cost per revenue passenger within the 5-cent piece, so as to allow a profit.

The proper unit by which to measure transportation receipts or rate of fare, Mr. Ford said, was the rate for each passenger per mile, which unit for convenience is called the passenger mile. All steam railroads charge rates of fare based on this unit of distance, as it is possible for them to do with their fixed station stops between which tickets are sold and accounts made up. This was not possible, however, upon the city street railway, where passengers were let on and off at each block, although it was attempted in the zone system of fares used almost exclusively by British and other European street railways. In order to simplify the collection, inspection and accounting of street railway fares, and due to the convenience of the 5-cent piece as a payment for the short rides on a city street railway system, this rate of fare had been adopted

In order to increase the business of these companies transferring of passengers from one line generally to an intersecting crosstown line was started early in the history of the electric equipment of these lines. Often this use of transfers was inaugurated in order to draw passengers from a competing line. With the gradual consolidation of these competing lines, there had been forced upon the consolidated systems, generally by governmental authority, the universal free transfer system. This involved the hauling of the 5-cent fare passengers a considerably longer distance without increase of fare, or in other words, involved a reduction in the rate of fare per passenger per mile. This reduction of receipts per revenue passenger mile when accompanied, as within the past few years, by a large increase in the cost of operation and taxes per passenger mile, had brought many of the large American street railway managements to realization of the fact that the increase of business caused by the universal free transfer system had wiped out the slender margin of profit in the nickel.

Mr. Ford said that his firm had applied the passenger mile unit to the receipts and operating expenses of several large systems by means of one or more days' count of the passengers on each system. This determined the average length of ride per revenue passenger (and also per total passengers including transfers) and correspondingly the receipts or gross earnings per passenger mile. This method was demonstrated to the Public Service Commission by Mr. Ford in the Coney Island 10-cent fare case last spring. If the car service was properly proportioned to the passengers carried, the operating expenses varying with the car miles operated or amount of service rendered depend directly on the number of passenger miles of business done, and this represented practically all of the operating expenses.

#### THE LONG HAUL AND THE SHORT HAUL

The entire cost of carrying a passenger on a street railway consists of the following items Mr. Ford testified:

1. Operating expenses.
2. Taxes.
3. Reserves.
4. Return on capital invested.

These costs were further divided by Mr. Ford into two general classes, namely, (a) fixed charges or service charges; these are, generally speaking, the return on capital invested, taxes, reserves and a small part of the operating expenses and for any given system will not vary with the amount of service rendered. In other words, these charges run along day after day whether the railroad is in operation or not. (b) Expenses dependent on amount of service rendered; these represent a large portion of the operating expenses.

Considering all of the costs of carrying of passengers, it would be observed that the fixed charges on track and permanent way are practically the same for the central portions of the city, where the traffic is dense, and the outlying sections of track where the traffic is sparse. Consequently, the cost per passenger mile of the passengers in the outlying districts, which constitute the great body of the long haul passengers, was larger, Mr. Ford said, than for the central districts or short haul passengers. In most large American street railway systems the total cost of carrying passengers on the outlying sections of the lines was larger than the receipts from these sections and this business was carried at a loss to be made up by the profit on the business in the central sections.

Mr. Ford summed up his testimony on this point by

stating that the long haul passenger is not only a loss to the company as compared with the passenger of average ride, but the cost of carrying this long haul passenger per mile (cost per passenger mile) was larger than the cost per passenger mile of carrying the short haul passenger. In general he would say that the entire cost of carrying a passenger had increased considerably in the past 8 or 10 years, due to the increased cost of operation per revenue passenger and the increased length of ride per revenue passenger. The latter was due to the expansion of American cities and the extension of track mileage and also to the large extension of the free transfer system, thus largely lengthening the revenue passenger's journey.

#### ZONE SYSTEM

The zone system of fares generally used throughout Great Britain and Europe was described by Mr. Ford as involving the principle of making the rate vary in proportion to the length of the journey or practically establishing a series of rates per passenger mile varying with the distance ridden. In this case the passenger paid more closely for the amount of service received than in the flat rate system, which would therefore seem to make this method more logical and fair to the individual. At the same time, the complications of the tickets and large amount of inspection required by the zone system were urged against it from the company's standpoint, and from the standpoint of the public the flat rate was more conducive to the building up of the outlying districts of the municipality and was also more convenient as it did away with the use of pennies. Practically all suburban electric lines of from 3 to 5 miles in length and all interurban lines use the zone system in some form or other; in other words, it was generally recognized, said Mr. Ford, that the flat-rate system could not be extended over an indefinite area.

It is pointed out by Mr. Ford that Americans are wasteful people, due largely to the abundance and wealth of natural resources in a new country. With flat rates for water service probably more water is wasted per capita in the large cities of this country than is used per capita in many cities where water is metered. The same conditions largely apply to the lavish use and waste of timber and other products of the soil and mine. This subject is now receiving attention on all sides, due partly to the pinch of the late panic and also to the evolution of business conditions under which all expenses of operation are increasing. In the electric lighting business the original exclusive use of the flat rate had been almost entirely abandoned for metered rates.

It would seem necessary for large American street railway systems that steps be taken in the near future to raise the average return per passenger, but if the proposed partial zone system be injected into the present flat rate system in New York City, from the testimony the average return would be lessened rather than raised.

Mr. Ford agreed that as stated in Mr. Uebelacker's testimony [Further reference to this testimony will be published in a later issue.—Eds.] it was necessary for the New York City Railway system, in order to make its income match up with its outgo, to raise its average fare per passenger (passenger-mile). This was being done by the gradual abolition of free transfers, the other methods of raising this rate being the increase of fare per revenue passenger or a charge for transfers. Mr. Ford pointed out that the present street railway law of New York State does not seem to provide for either of the two last-mentioned methods; neither does it provide for the establishment of the

zone system within cities, which would involve a larger maximum charge than 5 cents.

Whether the flat rate or the zone system is adopted, the average rate per passenger or per passenger mile would have to be raised, Mr. Ford said, to equal the total cost of providing adequate service. Whichever method is adopted there will be required an extensive investigation of the subject by all parties interested, involving possibly changes in the statutory requirements. Apart from the impracticability of mixing the flat rate and the zone system which is here proposed, it would seem to be highly undesirable from all standpoints to begin the inauguration of the zone system, the witness thought, without a thorough study of the subject as applied to practical and financial conditions of the street railway system here, and also as applied to the social and economic differences between the American people and their municipal conditions and those of Europe.

In the opinion of Mr. Ford it would require approximately one year's time to make a thorough examination into the comparative results of the zone system, or flat rate, with or without transfers, for New York City fares with proper rates for each. This would require an examination into the business and operation of this system, requiring a large force of engineers, accountants and other experts. Similar reports in Chicago and other large cities with which he was familiar had required from a year to a year and a half of the time of a force of over 50 men.

A statement was submitted by Mr. Ford to show the growth of the amount of free transfers. The table gives the percentage of transfer passengers to revenue passengers by year from 1900 to 1907 for the four largest cities after New York, namely, Brooklyn, Chicago, Philadelphia and St. Louis, as follows:

#### INCREASE OF FREE TRANSFER BUSINESS. PER CENT OF TRANSFER PASSENGERS TO REVENUE PASSENGERS IN THE LARGEST AMERICAN CITIES OUTSIDE OF NEW YORK

Per cent.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Brooklyn	18.58	23.01	20.07	19.79	19.21	21.90	27.02	34.44
Chicago	40.05	41.09	42.26	50.98	61.03	64.74	65.69	63.40
Philadelphia	1.85	2.03	3.68	6.00	7.61	8.61	10.94	15.29
St. Louis	36.21	36.92	38.68	40.25	39.64	41.48	38.84	42.35

Note.—In Philadelphia the paid exchange tickets are not counted as transfers.

There was probably a point in the size or business of a street railway system where the use of free transfers may have been beneficial, Mr. Ford believed, but beyond that point they had proved detrimental.

#### INCREASE OF COST OF OPERATION OF AMERICAN STREET RAILWAYS

Another table, also submitted by Mr. Ford, shows the disposition of gross earnings for the years 1900 to 1907 of the five largest American cities outside of New York, namely, Chicago, Brooklyn, Philadelphia, St. Louis and Boston.

This table shows the disposition of the total gross earnings and similarly it shows the disposition of each nickel taken as fare; in other words, what proportion of the nickel is operating expenses, taxes, interest and rentals and remainder. For these five large cities the operating expenses and taxes have increased 5.63 per cent of the gross earnings during the seven years, whereas the interest and rentals and remainder, which really constitute the return on capital invested and reserves, have decreased the same 5.63 per cent of the gross earnings.

The tendency of these figures was plainly shown by a diagram. This statement and diagram showed the general condition of the street railway business better, Mr. Ford thought, than the per car-mile figures, because the

latter do not take into consideration the size and weight of car, etc.

PERCENTAGES OF OPERATING EXPENSES, RETURN ON CAPITAL AND RESERVES

(Average of five largest American cities outside New York—Chicago, Brooklyn, Philadelphia, St. Louis and Boston.)

1.—Cost of Operation.							
1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
63.24%	63.20%	65.32%	65.20%	66.15%	68.37%	68.07%	68.87%
2.—Return on Capital and Reserves.							
1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
36.76%	36.80%	34.68%	34.80%	33.85%	31.63%	31.93%	31.13%
Per cent of gross earnings, 100%.							

Mr. Ford estimated that the cost of platform labor, which is the large item in the expense of street railway operation, had increased about 25 per cent in the last seven years.

COMPARISON OF STREET RAILWAY RECEIPTS PER PASSENGER (IN FOUR LARGEST AMERICAN CITIES OUTSIDE NEW YORK).

	1900,	1901,	1902,	1903,	1904,	1905,	1906,	1907,
	cents.	cents.	cents.	cents.	cents.	cents.	cents.	cents.
Brooklyn	4.10	3.98	4.07	4.09	4.13	4.07	3.92	3.65
Chicago	3.51	3.53	3.50	3.30	3.10	3.02	3.00	3.06
Philadelphia	4.48	4.42	4.33	4.21	4.11	4.05	3.93	3.70
St. Louis	3.48	3.48	3.44	3.41	3.46	3.41	3.47	3.39
Average	4.02	3.92	3.88	3.78	3.69	3.63	3.56	3.45

Mr. Ford referred during his testimony to various articles which have appeared in the STREET RAILWAY JOURNAL as follows: An article by Mr. Ford, accompanied by maps, illustrating the extension of track of the street railway systems of Greater New York, published in the issue of Oct. 5, 1901; an article relating to the disapproval of transfers in Europe in the issues of Aug. 6, 1904, page 198,

DISPOSITION OF GROSS EARNINGS IN PERCENTAGES OF GROSS EARNINGS (AVERAGE OF FIVE LARGEST AMERICAN CITIES OUTSIDE OF NEW YORK, NAMELY CHICAGO, BROOKLYN, PHILADELPHIA, ST. LOUIS, BOSTON).

	1900,	1901,	1902,	1903,	1904,	1905,	1906,	1907,
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Operating expenses	57.21	56.72	58.98	59.16	60.64	62.85	62.65	62.29
Taxes	6.03	6.48	6.34	6.04	5.51	5.52	5.42	6.58
Total operating expenses and taxes	63.24	63.20	65.32	65.20	66.15	68.37	68.07	68.87
Interest and rentals	30.80	29.57	28.23	28.32	25.11	24.99	23.80	24.29
Remainder for dividends, reserves and surplus	5.96	7.23	6.45	6.48	8.74	6.64	8.13	6.84
Total gross earnings	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

NOTE.—In above figures fiscal years in some cases did not correspond with calendar years, and for year 1907 month of January is missing for Chicago City Railway Company.

The cost of materials, he thought, had increased fully as much.

AMERICAN STEAM RAILROAD PASSENGER RATES

A study of the tendency of American steam railroad rates Mr. Ford considered instructive as bearing upon the present condition of street railway rates. From reports of the Interstate Commerce Commission he had compiled the following table of steam railroad passenger statistics for the steam railroads in the United States reporting to that commission:

AMERICAN STEAM RAILROAD PASSENGER STATISTICS

	Revenue per passenger per mile, Cents.	Average journey per passenger, Miles.	Revenue per passenger, Cents.
1906	2.003	31.54	63.895
1905	1.962	32.21	63.985
1904	2.006	30.64	61.746
1903	2.006	30.10	60.720
1902	1.986	30.30	60.494
1901	2.013	28.58	57.941
1900	2.003	27.80	56.459
1899	1.978	27.89	55.816
1898	1.973	26.70	53.237
1897	2.022	25.04	51.163
1896	2.019	25.50	52.078

It will be noted that these steam railroad rates are based upon the revenue per passenger-mile, which rate has varied but very slightly above and below 2 cents for the past 10 years. On the other hand, the average journey per passenger has increased from 25.50 miles to 31.54 miles in this period and the average revenue per passenger from 52.078 cents to 63.895 cents.

In the case of the street railways, however, the revenue per passenger had been constantly decreasing and the average ride per passenger constantly increasing. The rate per passenger-mile, which is the revenue per passenger divided by the average ride per passenger, had consequently very largely decreased due to the increase of the denominator and the decrease of the numerator of this ratio.

The following table shows the revenue per passenger, including transfers, of the four largest cities outside of New York, from 1900 to 1907, during which period the average of these four cities decreased from 4.02 cents to 3.45 cents:

and of Aug. 9, 1902, page 206. He also submitted several opinions of the Massachusetts Railroad Commission approving the withdrawal of transfers.

MR. WOOD'S TESTIMONY

Frederic T. Wood, secretary to Oren Root, general manager for the receivers of the Metropolitan Street Railway, also testified at a recent hearing. He stated that for the purposes of operating convenience the surface car lines under the jurisdiction of the receivers are divided into two classes, one class known as the avenue or longitudinal lines, which are the trunk lines, running from the north to the south the length of Manhattan Island, the other class being the crosstown lines, running easterly and westerly, and serving as feeders to the trunk lines.

Mr. Wood explained the transfer system in force on the lines of the Metropolitan Street Railway, and submitted various maps illustrating in detail the transfer situation described by him. One map indicated that a passenger by transferring could ride for 18.7 miles upon the payment of a single fare.

Mr. Wood testified that it was impracticable, under the conditions incident to street car operation in New York City, to limit the period of validity of a transfer to less than one hour; that in many cases a two-hour limitation must be allowed because of the length of the journey which could be taken in good faith, and that the practical result of the decisions of the courts had been to render any time limitation valueless except as a moral restraint. He stated that the statutes of the State of New York pertaining to the transfer situation had been so interpreted that it was not only impracticable but impossible to limit the imposition on the transfer privilege. He described how a passenger living, for instance, on upper Amsterdam Avenue and desiring to shop in the downtown district might board a southbound Broadway and Amsterdam Avenue car, procure a transfer and alight at Thirty-fourth Street and Sixth Avenue; after transacting business at that point the passenger could then board a southbound Sixth Avenue car, exchanging her transfer for another, and alighting at

Twenty-third Street; after shopping there, she might use her transfer to ride across Twenty-third Street to Broadway, and thence south on Broadway to Fourteenth Street, having exchanged transfers with the Broadway conductor. After shopping in the vicinity of Fourteenth Street and Broadway, the passenger could then ride across Fourteenth Street to Sixth or Seventh Avenue, shop there, and transfer to a southbound car, alighting at Eighth Street, riding eastward on Eighth Street to Broadway, at which point further shopping could be done. Mr. Wood stated that the company had found that abuses of this character actually existed, and explained that one of the difficulties of the situation lay in the fact that a passenger may travel anywhere on the surface car lines, transferring as many times in a day as he pleases, providing he does not reverse his general northerly or southerly direction, and that at the end of his trip he will have a valid transfer in his possession, which he can exchange with some one else to the mutual profit of both. Furthermore, investigation had shown that transfer clearing houses, as they may be called, have been established throughout the city, and notably at the junctions of the longitudinal and crosstown lines, transfers being sold sometimes for a small consideration or given out as a gratuity for the sake of attracting trade. A number of violations of the law in this respect have been discovered and prosecutions have been instituted.

The witness stated as his recollection that during the last month there had been about 30 convictions of this character, but he said that the difficulty of securing incriminating evidence placed a great obstacle in the way of conviction, because the company must show not only a wrongful intention, but must actually prove that the transfer was used illegally; consequently the company endeavored to secure strong evidence before attempting to prosecute.

Mr. Wood added that the result of these prosecutions had been unsatisfactory. He continued: "The penalty sometimes is as low as 25 cents. It is my recollection that most of the penalties are approximately \$1.00, and in a few rare instances I think they have been \$10.00, but the penalty is always so entirely disproportionate to the offense, as viewed from our standpoint, that the moral effect of such a conviction does not assist us. The greatest number of offenders in this respect that we have been able to catch are minors, boys 13, 14, 15 years old, and sometimes girls. The fact that the defendant is a minor and that the parents appear in tears before the court and urge that this was the first offense and that the plaintiff is a corporation, makes it rather difficult for us to secure a heavy conviction. In one or two cases the managements of department stores have called our attention to the fact that trading in transfers was taking place in their establishments and have aided us in ferreting it out."

#### DECREASE IN AVERAGE FARE

As illustrating the extent to which this imposition was increasing, Mr. Wood testified that during the fiscal year ended June 30, 1907, the cash receipts were 4 per cent less and the transfer passengers carried were 9 per cent more than was the case during the preceding fiscal year; in other words, that there had been a decrease of \$750,000 in the receipts and an increase of 16,000,000 transfer passengers. He added that the average rate of fare per passenger during the 70 days prior to the discontinuance of the exchange of transfers with the Third Avenue system was 3.09 cents on the Metropolitan lines; for the six months ended Dec. 31, 1907, it was 3.16 cents on all surface lines; the average fare for the year ended June 30, 1907, was

3.29 cents, and for the fiscal year ended June 30, 1906, it was 3.43 cents, thus indicating that there has been a constant diminution in the average fare per passenger carried on the surface car lines of Manhattan Island.

The witness then outlined various routes over which a passenger could travel in riding from one section to another of the zone included between Thirty-fourth and 116th Streets, indicating where there was still an interchange of transfers between the lines of the Metropolitan Street Railway and those of the Third Avenue system as a result of the legal situation due to the fact that the two systems used common trackage. He stated he considered that a relatively small proportion of the passengers in the zone under consideration had been materially affected by the present independent operation of the Fifty-ninth Street crosstown line, between which and the Metropolitan lines the exchange of transfers had been discontinued. Inquiry brought out the fact that although on the lines of the Metropolitan system a person could ride for about 10 or 18 miles for 5 cents, other rides of 3 miles could not be taken for less than 10 cents, as these involved a change of direction from the north to the south, or vice versa. The witness stated that prior to the discontinuance of the exchange of transfers between the Fifty-ninth Street line and the Metropolitan lines a similar situation had prevailed, as the courts had decided that the company was not obliged to permit passengers to reverse the general northerly or southerly direction.

Taking up the question of the operation of through cars from each longitudinal line to each other longitudinal line via Fifty-ninth Street, Mr. Wood stated that to afford a service of this character, operated with sufficient frequency to amount to a convenience and involving the switching of cars from the longitudinal lines to the Fifty-ninth Street crosstown line and from the crosstown line to other longitudinal lines; would result in a practical disorganization of the entire service on all of the lines involved. He stated that the company had not sufficient equipment to operate any such special service without robbing the service in the remainder of the city; and further explained that the attempt to operate cars from one set of tracks around a corner to another set of tracks crossing the first set at right angles more than proportionately reduces the number of cars which may be operated over the intersection if the cars are sent straight across. In other words, the capacity of an intersection is more than correspondingly reduced whenever an attempt was made to operate around a corner. The attempt to operate through cars from one longitudinal line to another across Fifty-ninth Street, the witness stated, would affect the earnings of the roads disastrously, and not only would this special service on the through routes be unsatisfactory, but also the service on the trunk lines would deteriorate to such an extent that patrons would be repelled instead of attracted, and would go out of their way, even if additional expense were involved, to use some other more convenient way of reaching their destinations. Furthermore, the danger of accidents would be very great at such intersecting points, where the cars were moving in 12 different directions, constituting conditions most favorable for car collisions and collisions between cars and vehicles, as well as the knocking down of pedestrians, who would be likely to become confused at the unexpected direction in which the cars would turn. The initial and maintenance cost of the special work required would be enormous, Mr. Wood said.

The witness stated that the overhang of the pay-as-you-

enter cars was considerably greater than that of the standard long or standard short cars, and that an attempt to operate the pay-as-you-enter cars on any such through routes as suggested would be attended by the greatest confusion and many accidents, demoralizing the street car service in the entire zone, and even beyond it.

#### SEGREGATION OF PASSENGERS NOT PRACTICABLE

With reference to the possibility of segregating passengers, Mr. Wood said that it would not be practicable to place partitions in a car and hold part of the car vacant until the transfer zone was reached; if people wanted to use that section of the car it would not be practicable to keep them out. When the traffic zone was reached it would be very difficult, if not impossible, to get people who had joint rate tickets to use the particular section reserved for such traffic. He said that it was absolutely impossible for any conductor to remember the faces of 20 or 30 passengers and the conditions under which they boarded the car, as well as the circumstances in connection with the payment of the fares by each individual. Without the physical segregation or the ability to distinguish the passengers who presented joint rate tickets entitling them to go, for example, to 116th Street only, the northern limit of the commission's proposed zone, it would be impossible for the conductor to make passengers get off at that point, and consequently zone passengers could ride to the end of the island.

Mr. Wood called attention to the fact that in collecting fares the conductors were obliged to depend upon their recollection. If the passenger claimed to have paid his fare, the decision in case of doubt must favor the passenger. The company would not dare to run the risk of lawsuit and the outcome thereof by instructing conductors to put passengers off the car under such conditions. Litigation of that character had resulted unfavorably to the company, and altercations on questions of this character had a tendency to delay the cars and upset schedules. Any attempt to run separate cars to provide for service from Fifty-ninth Street to 116th Street or from Fifty-ninth Street to Thirty-fourth Street would necessitate the operation during a large portion of the day of a number of cars which would not pay operating expenses, and would mean the procuring of considerable special track work, which would be extremely expensive to install and maintain. Such operation, with the resulting necessity of switching back cars at the zone limits, would seriously delay the through operation of cars running beyond the zone on either side.

Mr. Wood said that in his opinion it was to the interest of the public that conductors should devote all their attention to the operation of the car, and not be burdened with the additional duty of attempting to make odd change and of selling and receiving joint-rate tickets. He said it seemed to be a most difficult problem to devise any means of joint-rate operation which would be equitable and satisfactory from the standpoint of the public and of the companies involved. So far as he had been able to arrive at a conclusion, it appeared to him, in view of the fact that it was undesirable to have such joint-rate tickets sold by conductors, that it would be essential to have joint-rate ticket agents stationed at every intersection of an avenue line with the Fifty-ninth Street line, if joint fares were attempted. He would not like to be considered as presenting that as his final judgment of the question, but that was the best solution of the matter that he had been able to reach up to the present time.

#### ABUSE IN JOINT RATE SYSTEM

A system involving the sale of joint-rate tickets by conductors at the time when the passenger pays his fare would open the way to extensive imposition, the witness asserted, and both companies would suffer from the results. The witness further said that, as shown by the report of the receivers of the Metropolitan Street Railway, the business was now being transacted at a considerable loss, and this state of affairs pointed to the impracticability of extending further an unprofitable business by the establishment of additional transfer points or the adoption of a joint rate system which would tend to decrease the revenues.

The expense of establishing a system involving the use of agents at the transfer points along Fifty-ninth Street, Mr. Wood said, was estimated to be approximately \$92 per day, half of which would be needed to defray the expense of printing and distribution of joint-rate tickets, the redemption and accounting thereof, and an inspection service to minimize fraud, while the other \$46 would be required for the wages of the agents on the street.

The witness stated that during the six weeks prior to the discontinuance of the exchange of transfers between the lines of the receivers of the Metropolitan Street Railway and the Central Park, North & East River Railroad the average rate of fare on the lines of the receivers was about 3.26 cents per passenger, while during the six weeks subsequent to such discontinuance the average rate of fare had been approximately 3.35 cents per passenger; in other words, had the passengers transported on the lines of the receivers during the second period been carried at the rate prevailing during the first period, the revenues of the receivers of the Metropolitan company would have been about \$6,000 a week less than was actually the case. Mr. Wood pointed out that the adoption of any system which would tend to reduce the returns from the short haul traffic would be a vital matter, adversely affecting the revenues and the net returns. The operation of the lines at a loss, as shown by the report of the receivers, could not be continued indefinitely, and any measures which had the effect of reducing the returns would produce results of most serious import.

#### TESTING OILS FOR RAILWAY AIR COMPRESSORS

Some time ago a large Eastern electric railway system experienced trouble with the oil it was using for lubricating the motor compressors on its car equipments. As a result several manufacturers were requested to submit samples of compressor oils for tests in comparison with the original lubricant. These tests were conducted with such thoroughness and gave so good an insight into the requirements demanded that the methods followed and data secured merit considerable space. Trials were made of three grades of oil, which will be denoted hereafter as "A," "B" and "C."

##### COMPOSITION AND DETECTION OF ADULTERATION

The fluorescence or "bloom" of the oils was tried by bringing drops from each sample upon a black surface. The characteristic blue shade proved all samples to be of mineral origin or petroleum products. Passing chlorine through the oils gave a similar brown tinge in each, showing that animal oil had been added in accordance with the common practice for making lubricating oils for heavy work. The specific gravity tests, however, showed that this animal oil constituted only a small percentage.

Chemical reactions were secured to determine whether any adulterant had been added to increase the viscosity or for any other reasons. The tests for free acids showed

that none of the samples contained more than the negligible portion of .01 of 1 per cent. The tests also proved that no rubber, soap or "oil thickener" had been used, so on the whole, all of the samples fulfilled the most stringent requirements for purity.

MEASUREMENT OF DENSITY

The specific gravity of each oil was taken under like conditions of temperature and pressure with the results shown in the tabulated data.

DETERMINATION OF VISCOSITY

As the viscosity of an oil is widely held to be one of the most positive indications of its value as a lubricant, the tests to determine this feature were made with extreme care. The temperature range was selected to represent within close limits that actually obtained during the running of the compressors for which these oils were submitted. The viscosity of these oils is compared with that of distilled water. The accompanying table represents the average time of flow for 30 cu. cm. of each kind of oil and water through an opening 3/64 in. diameter under precisely similar conditions. Sufficient readings were taken at each point to minimize errors of observation.

It will be noted that the change in viscosity due to heat was greatest for oil "A," the rate of flow at 80 deg. C. being 240 per cent of that at 37.8 deg. C., while for "B" it was 167 per cent and for "C" 154 per cent. The effect of this feature is shown in the friction test, as except at high temperatures the oil is not sufficiently fluid to give the most satisfactory results.

DETECTION OF TENDENCY TO GUM

The relative tendency to gum was detected by allowing equal qualities of oil to flow down a glass plane inclined 3.5 per cent and measuring in inches the distance traveled by each sample at the end of 2 hours and 15 minutes. Sample oil "A" oxidized most rapidly as shown by its traveling the least distance.

DETERMINATION OF TEMPERATURES OF DECOMPOSITION, VAPORIZATION, IGNITION AND SOLIDIFICATION

Flash and "burning" tests were given each sample in an apparatus of the Tagliabue closed tested form. In this instrument a sand bath above an inside lamp is used to heat the oil. The thermometer gives the temperature of the oil, the flash point or vapor ignition being determined by applying a match at an orifice which at other times is closed by a valve. The cold test was made by solidifying each sample with a freezing mixture and taking the temperature of the chill point as the oil commenced to melt.

Oils "C" and "B" made the best showing in these tests, for while the temperature of ignition and decomposition of all three oils was well above the temperature met in service, the solidification temperature of oil "A" was far too high, as the winter temperature averages lower than the chill of this oil. The chill point of the other two oils was within the limits of railway needs.

A five-hour evaporation test was made under service temperatures, all samples being placed in a water bath to insure equal conditions. The loss in weight through the evaporation of volatile matter showed that in service oil "C" would have the fastest rate of decomposition and in that respect be the most expensive oil.

COEFFICIENT OF FRICTION TEST

The coefficient of friction was determined by a special apparatus similar to Thurston's railway lubricant testing machine, with runs of the same length using each oil as the lubricant. The speed was varied, but the averages

were the same for each oil. Temperature, pressure and friction indicator readings were taken to determine the coefficients of friction. As shown in the table, the best results in this case were obtained by using oils "B" or "C."

SUMMARY OF TESTS

The tests showed beyond question the inferiority of oil "A." Its coefficient of friction was very high, its viscosity low when compared with the others and its congealing point was at such a temperature as almost to prohibit its use during at least four months of the year. On the other hand, oils "B" and "C" were of practically equal merit. As to composition, density, ignition point and durability, all the oils give results consistent with the operating conditions.

The writer believes that only such a series of tests as the foregoing can give a true idea of the comparative merits of the oils tried, for in a service test local conditions may affect the data taken far more than the composition or efficiency of the oils under test.

TABULATED COMPARATIVE RESULTS

	A	B	C
Composition	Mineral and Animal	Mineral and Animal	Mineral and Animal
Adulterants	None	None	None
Free Acids	Negligible	Negligible	Negligible
Spec. gravity at 27.6 deg. C. ....	.892	.877	.876
Flashing point.....	210 deg. C.	180 deg. C.	190 deg. C.
Burning " ....	230 deg. C.	210 deg. C.	218 deg. C.
Chill " ....	-3 deg. C.	-20 deg. C.	-21 deg. C.
Loss at 80 deg. C. in five hours....	1.95%	.99%	1.67%

COMPARATIVE VISCOSITY AT SERVICE TEMPERATURES

Temp.	Water	A	B	C
37.8 deg. C.	9.5 sec.	37.7 sec.	21.2 sec.	20.8 sec.
48.9 deg. C.	9.5 sec.	27.0 sec.	17.7 sec.	17.6 sec.
80.0 deg. C.	9.5 sec.	15.7 sec.	12.7 sec.	13.5 sec.
Increase in rate of flow.	0 per cent	14 per cent	67 per cent	54 per cent
Average lubricating value.		64.2	100	99.4

GUMMING TEST

Time	Distance Flowed in Inches		
	A	B	C
2 hours 15 minutes.....	17 3/4	24 1/4	24 1/4

FRICTION TEST

	A	B	C
Coefficient of friction.....	.0490	.0400	.0416

CHICAGO CITY RAILWAY COMPANY'S REHABILITATION PROGRESS.

There has just been made public a statement of the progress to Oct. 1 of the rehabilitation of the Chicago City Railway property. This statement has been prepared by the railway company for the Commissioner of Public Works. It shows the railway company to be far ahead of the ordinance requirements in the matter of the percentage of work completed. On Oct. 1 the rehabilitation period was half over, whereas the company had, according to the Board of Supervising Engineers, completed 71 per cent of the rehabilitation work. In other words, the company was 21 per cent in advance of the ordinance requirements. The rehabilitation expenditures of the Chicago City Railway to Oct. 1, 1908, as shown by certificates of the Board of Supervising Engineers, Chicago Traction, aggregate \$10,827,745.42

A comparison of ordinance requirements for the 3 years rehabilitation period with work already done or under way, is given in the following recapitulation, expressed in per cent:



- (1) To remove from the street all (35 miles) cable tracks, etc.; 29.94 miles have been removed.... 86
- (2) To rebuild at least 60 miles electric (single) track; 42.29 miles have been reconstructed.... 74
- (3) To construct and equip system of distribution and substations:
  - a. Trolley wire—200 miles required; 95.36 miles constructed ..... 48
  - b. Conduit—2,225,000 duct feet required; 2,087,452 duct feet completed ..... 94
  - c. Underground feeders—145.3 miles of cable required; 75.53 miles of cable constructed..... 52
  - d. Auxiliary returns—79 miles of cable required; 49.79 miles of cable constructed..... 63
  - e. Substations—5 required, capacity 44,900 kw; 3 constructed, capacity 28,400 kw..... 63
- (4) To rebuild and re-equip its car houses, so as to enable it to properly clean and maintain its cars; 4 new car houses required—capacity 1051; 2 new car houses constructed—capacity 675..... 64  
 In addition, two (2) new car houses are under construction, of which the first, with a capacity of 191 cars, is 70 per cent completed, and the second, for 210 cars, is 35 per cent completed.
- (5) To increase to at least 800 such (double-truck) cars, 805 double-truck cars now in service..... 100.6  
 Average completion of work required in 3 years rehabilitation period now equals..... 71  
 Rehabilitation period expires 3 years after date of ordinance acceptance, or April, 1910; percentage of time expired to Oct. 1, 1908..... 50  
 This is exclusive of the large amount of uncompleted reconstruction work now under way.

The construction and equipment account follows:  
 Original valuation as per ordinance..... \$21,000,000.00  
 Additional property June, '06, to Feb., '07.. 1,816,853.19  
 \$22,816,853.19  
 Rehabilitation expenditures to Oct. 1, 1908, as per Board of Supervising Engineers' certificates ..... \$10,827,745.42

Total purchase price ..... \$33,644,598.61  
 The company now has in operation 370 pay-as-you-enter cars out of a total of 805 double-truck cars in service. It is the purpose of the company to remodel all double-truck

comfortable transit that it can no longer be regarded as an experiment. It is worthy of special mention that the pay-as-you-enter car, as operated on the lines of this company, has brought about a practical elimination of that class of accidents due to passengers boarding or leaving the front platform. Our records show that the pay-as-you-enter car is not only correct in principle, but efficacious in practice as a saver of life and limb. Furthermore, our latest comparative statistics indicate that the pay-as-you-enter cars have effected a reduction of 16.2 per cent in the number of fatal accidents."

The company has built in its own shops and now has in service 12 double-truck steel sprinkler cars, each equipped with four 40-hp motors and having a capacity of 4000 gal. These cars were described and illustrated in the ELECTRIC RAILWAY JOURNAL of Aug. 8, 1908, page 431.

**NEW CARS FOR THE MUNICIPAL TRACTION COMPANY, CLEVELAND**

In the Oct. 16 issue of the DAILY ELECTRIC RAILWAY JOURNAL a brief description was given of the car exhibited at the Atlantic City convention by the Cincinnati Car Company which was built for the Municipal Traction Company, Cleveland, Ohio. The accompanying illustration gives some idea of the appearance of this car, which embodies a number of interesting features, particularly the long front and rear platforms used and the novel method of supporting them with steel cantilevers or platform knees. The car body is 36 ft. long over corner posts and with the 8-ft. vestibules at each end, it has a total length of 52 ft. The underframe is entirely of wood with the exception of the steel platform knees which extend back under the side sills. The sides of the car body are trussed with single bottom truss rods bearing on king posts fastened under the needle beams and by top truss rods built in the side frames between the inner and outer sheathing. These top truss rods are bent down at the ends over truss posts carried up at



**New Pay-As-You-Enter Type Car for Municipal Traction Company, Cleveland**

cars to conform to the pay-as-you-enter method of fare collection as rapidly as they can be withdrawn from service for the purpose. In regard to satisfactory results brought about by the use of the pay-as-you-enter cars, the report states:

"The Chicago City Railway was the first company to introduce the pay-as-you-enter car in the United States. This type of construction and method of fare collection, which promised so much for the reduction of accidents, has so successfully met the requirements of safe, rapid and

the ends of the body bolsters and are anchored to the steel platform knees beyond the end of the car body as will be seen from the illustration. This provides a cantilever support for the platform knees and permits the use of the exceptionally long platforms. The car will seat 50 persons. The car body weight per passenger is 354 lb. and the total weight, including trucks, motors and electrical equipment, is 41,656 lb. The car is mounted on Standard Motor Truck Company's type O-50 trucks and is equipped with four Allis-Chalmers R-36, 40-hp motors with type S-1 control.

# News of Electric Railways

## Cleveland Traction Affairs

During the first week of campaigning on the referendum question a number of interesting matters came to light. One of the most important is the fact that the attorneys chosen by F. H. Goff to formulate a plan for trusteeing the stock of the Municipal Traction Company are not satisfied with the final arrangement, because the officers of the company rejected a number of the safeguards against abuse of power which the attorneys had recommended. This came out through the assertion of one of the newspapers friendly to the Mayor to the effect that the attorneys were thoroughly satisfied with all that had been done and now believed that the franchise should be supported.

John G. White, one of the members of the commission, said that he and his associates had sought to minimize the danger of the possibility of the use of the control of the street railways and the traction employees for political purposes and that of the necessary freedom of purchase of the stock of the Cleveland Railway Company. Among the recommendations made was the selection of men of proved business ability on the board of trustees and board of directors of the company who had not been associated with Mayor Johnson in the street railway matter. Mr. White said the members of the commission felt that Mr. Johnson should have a majority of the directors, but at the same time others should have had a place there. In order that the street railways should be removed as far as possible, the president of the Cleveland Chamber of Commerce was recommended as a member of the board of trustees, his successor to succeed to the place.

The lease, Mr. White said, provides for three funds, any one of which at any time may be invested in the stock of the Cleveland Railway Company at the option of the Traction company. This stock may then be sold to any persons selected by the board of directors. The trustees can do nothing, even when the time arrives for the selection of new directors for the company, because the directors constitute the majority of the board of trustees. Mr. White says that it is an easy matter to forfeit the lease, through allowing an execution to be levied, failure to pay rent or anything of the kind which courts cannot prevent. The recommendation that no trustee should be the owner of Cleveland Railway stock was rejected by the Traction company. The recommendation that all trustees be electors of the city of Cleveland met the same fate, Mr. White said. Had all these recommendations been incorporated in the plan it would have been much more satisfactory to all concerned, Mr. White asserted.

Judge Robert W. Tayler and Attorney S. H. Tolles, the other men selected by Mr. Goff, have stated that they agree with Mr. White in the main. Mr. Tolles said that tried business men should have been placed upon the board of trustees. Judge Tayler added to the fact that he agreed with the criticisms made by Mr. White his opinion that none of the trustees should hold stock in the Cleveland Railway and that all should be residents of the community—not necessarily of the city, but of Cuyahoga County, if a boundary line be needed. He also said he would have been much better satisfied if a majority of the board had been representative business men.

Mr. Goff spoke before the Builders' Exchange on Oct. 15. He reviewed the history of the negotiations and placed the conditions before the builders in as plain a manner as possible. In regard to whether Mr. Johnson believes that 3-cent fares will be permanent, Mr. Goff quoted the Mayor as saying that he has faith in his plan and that it will work out all right at that rate. Mr. Goff stated that if he were in Mr. Johnson's place he would operate at a 5-cent fare until all the debts were paid and the company put into good financial condition. He said that Mr. Johnson should tell the people who buy the guaranteed stock just how much or how little there is to support the guarantee. Mr. Goff said that if the franchise is defeated the lease becomes void.

At one of his tent meetings Mr. Johnson made the assertion that all but two or three of the banks of Cleveland had combined to embarrass the Municipal Traction Company. This was said in answer to a question as to whether the banks would advance money on Cleveland Railway stock. At the same meeting Mayor Johnson said the Traction Company has available assets of \$1,250,000 which can be drawn upon at any time. At another time he said that the Payne Avenue line is showing an increase of from 15 per cent to 17 per cent in revenue since the adoption of pay-as-you-enter cars and that at this rate the company's earnings would increase \$750,000 a year.

Mr. Goff addressed one of Mr. Johnson's tent meetings Saturday evening. His talk was mainly a review of the history of the traction struggle and the settlement that was finally made. He said that the question now was mainly upon the honor of Mr. Johnson, who is responsible in a large degree for the proper operation of the lines. During the five months that he had been associated with the Mayor Mr. Goff said that he had never seen anything that would lead him to any other conclusion than that the Mayor is honest. However, he said that he was not there to vouch for Mr. Johnson or 3-cent fares, but that he believed that the people are now protected by the plan of trusteeing the stock of the Municipal Company, although the details had not been carried out just as he would have liked. Mr. Goff read letters from Messrs. Tayler, White and Tolles regarding their expressions of dissatisfaction with the manner in which their plan was finally put into force. Each of them said that the plan is as good as could be devised, but they would have been better satisfied had all their recommendations been embodied in it.

Mr. Goff said that he believed the Mayor was mistaken in his statement that the banks of Cleveland had combined against the Traction Company. He said he had never heard anything about such a combination and that he did not think it would be policy for the banks to take such action in view of the fact that it was understood that the Cleveland Railway Company was to carry the floating debt for two years after the settlement was made.

In the third issue of the *Public*, the paper published by the Traction Company, the plans for 1909 are stated as follows:

"1. To rebuild 350 cars of the most approved pattern, like these now in use on Payne, Bridge, Madison, Central and Denison Avenues.

"2. To purchase or construct 75 or 100 new cars.

"3. To erect double-decker cars for taking care of the rush-hour traffic.

"4. To equip other lines with trailers for the same purpose.

"5. To rebuild the tracks on a large number of streets. Superior, Payne, Scranton, Prospect and West Twenty-fifth will be rebuilt first.

"6. To lay a four-track line on Superior Avenue, so that passengers to the east of Sixty-sixth Street will be brought down to the center of the city in half the present time.

"7. To install a new type of heaters to distribute the heat and ventilate the cars.

"8. To provide for smoking conveniences on the double-decker and trailer cars.

"9. To test the new automatic street annunciators; if found successful, they will be adopted.

"10. Under the lease the company must spend nearly \$1,000,000 a year in upkeep. This of itself is sufficient to make the system the best in the United States in a few years' time. This is at least 40 per cent more than the street railways of America usually spend for that purpose. It would never be spent by a private company interested only in dividends."

## Expenses of New York Public Service Commission, First District

Travis H. Whitney, secretary of the New York Public Service Commission, First District, has made public a statement relating to the expenses of the Commission. Mr. Whitney says:

"The expenses of the Rapid Transit Commission (to which the Public Service Commission for the First District succeeded) estimated on its expenditures for its last six months (which ended in the middle of its fiscal year) were \$921,459.10.

"The expenses of the Railroad Commission, estimated on its expenditures for its last nine months (which ended before the end of the fiscal year), were \$101,578.20.

"The expenses of the Gas and Electric Commission, estimated on its expenditures for the last nine months (which ended before the end of its fiscal year), were \$60,171.80.

"The expenses of the State Inspector of Gas Meters, estimated on his expenditures for the last nine months (which ended before the end of his fiscal year), were \$23,440.67.

"Thus the total annual expenses of the various commissions to which the present Public Service Commission succeeded were \$1,106,649.77."

Compared with these annual expenses are the following expenses of the two Public Service Commissions for the year ended June 30, 1907:

"The expenses of the Public Service Commission for the First District upon rapid transit matters under the Rapid Transit act requiring an engineering force of about 300 employees, \$600,000.

"The expenses of the Public Service Commission for the First District to carry out its duties under the Public Service Commissions law and the Railroad law, \$366,861.32.

"The total expenses of the Public Service Commission for the Second District under the Public Service Commissions law and the Railroad law, \$234,282.09.

"Total expenses of the two Public Service Commissions under the Public Service Commissions laws, the Railroad law and the Rapid Transit act, \$1,201,143.41.

"It will thus be seen that the net increase in the expenses to the State and city for the two Public Service Commissions over the annual expenses of the officers whom they succeeded was only \$94,493.64."

In conclusion, Mr. Whitney writes:

"This increase is less than the average annual increase of the expenses of the commissions which were abolished, and shows that the two commissions have done not merely the work of the preceding commissions, but also all of the work involved in the duties imposed by the Public Service Commissions law, which had not heretofore been exercised by any State body.

"It is to be noted that the Public Service Commission for the First District did the rapid transit work under the provisions of the Rapid Transit act at an expense which is \$321,459.10 less than the expense of the Rapid Transit Commission for its last year, although the number of employees on rapid transit work was greater than that under the Rapid Transit Commission.

"Omitting the expenses of the rapid transit work done by the Public Service Commission for the First District, it will be seen that the total expenses for the efficient regulation of public service corporations afforded by the Public Service Commissions law are \$601,143.41."

### Wisconsin Electric Railway Organizes

The Wisconsin Electric Railway, successor to the Winnebago (Wis.) Traction Company, has organized as follows: Clement C. Smith, Milwaukee, president; J. B. Blake, Milwaukee, secretary; Miss May Rothermel, Oshkosh, assistant secretary; H. F. Whitcomb, Jr., Milwaukee, treasurer; R. T. Gunn, Fond du Lac, general manager; J. P. Pulliam, Oshkosh, general superintendent; W. J. Kelsh, Oshkosh, master mechanic. The officers of the Eastern Wisconsin Railway & Light Company are as follows: Clement C. Smith, Milwaukee, president; H. F. Whitcomb, Jr., Milwaukee, secretary; W. E. Cole, Fond du Lac, treasurer; R. T. Gunn, Fond du Lac, general manager; J. P. Pulliam, Oshkosh, general superintendent; W. J. Kelsh, Oshkosh, master mechanic.

The Eastern Wisconsin Railway & Light Company owns and operates the electric railway in Fond du Lac, the interurban railway to Oshkosh, and the gas plant and electric light plant at Fond du Lac. It has about 26 miles of electric railway and its gross earnings during the current year from all sources will be about \$240,000. The Wisconsin Electric Railway owns all of the electric railways in Oshkosh, the interurban railway to Neenah, the interurban railway to Omro, a total of about 40 miles, and White City Park, about 4 miles south of Oshkosh. The gross earnings of the Wisconsin Electric Railway for the current year will be about \$150,000.

R. T. Gunn is general manager and will be in charge of the operation of the companies' properties, having his headquarters at Fond du Lac. The railway department of both companies will be operated with Oshkosh as a center under the charge of J. P. Pulliam as general superintendent. The car repairs and maintenance of rolling stock of both companies will be in charge of W. J. Kelsh and will be handled from the shops at Oshkosh. For the past month interurban cars have been run through from Fond du Lac to Neenah, a distance of 33.75 miles, making the run in 1 hr. and 30 min. The run heretofore has been 1 hr. from Fond du Lac to Oshkosh, where the Eastern Wisconsin cars stopped, and 1 hr. from Oshkosh to Neenah. The Wisconsin Electric Railway will construct the extension from Omro to Berlin, 12 miles, within the next year or two, the distance from Oshkosh to Omro being about 11.17 miles.

### Illinois Central Terminal Electrification

A municipal commission has presented to the Mayor of Chicago a report on the electrification of the Illinois Central Railroad Company's suburban and through service within the suburban limits of Chicago. In contrast with the objections offered by the company the commission as-

serts that the electrification of through passenger and suburban and through freight service is entirely feasible. The principal reason put forth as to why the company should electrify the road is based on the so-called "smoke nuisance." The commission submitted to the Mayor alternative plans for electrification, with and without a central power house. Exclusive of the power station the commission estimates the cost for electrification as follows:

Rails, insulators, etc.....	\$580,574
Construction (road bed).....	426,435
Bracket construction.....	165,336
Span construction.....	255,360
Overhead work.....	36,650
Car equipments.....	450,000
Substations.....	480,000
Distributing station.....	120,000
Transmission line.....	100,203
Thirty-five locomotives at \$30,000 each.....	1,050,000
Change in signals, 30 miles, at \$1,000.....	30,000
Change in station platforms.....	20,000
Incidentals.....	2,373

Total.....\$3,806,931  
Credit thirty locomotives available for other parts of line..... 450,000

Net total cost of electrification.....\$3,356,931

The report also discusses in detail the present cost of operation and the estimated cost after electrification. The commission concludes that the company through electric operation would effect the following saving daily:

Locomotive maintenance saved on suburban trains.....	\$441
Locomotive maintenance saved on through trains.....	120
Repairs and renewals, passenger cars.....	22
Saving on water supply and repairs and renewals of buildings....	148
Saving on firemen's labor.....	150
Saving on coal and ash handling.....	350

Total a day.....\$1,212

For the year this saving in the gross would amount to \$442,467. From this showing the commission allows these deductions:

Upkeep of line equipment.....	\$32,500
Sinking fund on car equipments.....	27,000
Sinking fund on distributing station.....	6,000
Sinking fund for locomotives.....	52,500
Sinking fund for substations.....	19,200
Sinking fund for transmission line.....	7,600
Taxes, 1 per cent on \$3,356,981.....	33,570

Total debits.....\$178,370

This leaves a total net saving for a year \$264,097. "Even if no added traffic comes of the electrification," says the report, "this will pay 7.87 per cent on the investment, or 6.6 per cent on an investment of \$4,000,000 should a better construction be adopted."

No definite action has been taken by the City Council as yet, but mandatory ordinances have been proposed which would instruct the Commissioner of Public Works "to prepare specifications for the electrification of all that part of the trackage of all railroads other than street railways and elevated railroads that is within Chicago."

**Movement to Extend Authority of Ohio State Railroad Commission.**—It is said that an attempt will be made at the coming session of the Legislature of Ohio to extend the powers of the Railroad Commission of Ohio relating to steam railroads, to electric railways, electric light, telephone and other quasi public service corporations so that all complaints may be adjusted by it.

**Monorail Road for New York.**—The Monoroad Construction Company, New York, which has purchased the City Island Railroad from the Interborough Rapid Transit Company, New York, has applied to the Public Service Commission of the First District of New York for permission to reconstruct the City Island Railroad and convert it to a monorail line run by electricity. Among those interested in the Monoroad Construction Company are: C. C. Cuyler, of Cuyler, Morgan & Company; Robert H. McCarter, attorney-general of New Jersey; Charles Stewart Smith, former Rapid Transit Commissioner; Congressman Samuel McMillan, John H. Starin, former Rapid Transit Commissioner; Charles F. Holm, of the Hudson Trust Company, and Henry W. Williams, of Baltimore. Bion L. Burrows is president of the company.

**Fender Tests Continued at Pittsburg.**—The second series of fender tests conducted by the Public Service Commission of New York, First District, was begun at the works of the Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa., on Oct. 20. The testing track of the Westinghouse Company has been especially prepared to represent pavement conditions in New York City, and the tests are being conducted with the same dummies and under the same conditions as the first series of tests made at the works of the General Electric Company in Schenectady some weeks ago. The first device tested on Tuesday was the H. D. Gardy fender, entered by Hawthorne & Chadwick, Chester, Pa. This device was withdrawn after five tests with the 50-lb. dummy, as it was found that it

was not strong enough to stand up under the tests prescribed with heavier dummies. The tests were then continued with the Philipson wheel guard, which is an English invention entered by Philipson & Company, Bolton, Eng. This wheel guard has been in use on the cars of the Bolton Tramways for about five years. It was subjected to 30 of the 72 tests, and the remainder of the tests were continued on Wednesday. The wheel guard acted satisfactorily in all of the tests, picking up the dummies cleanly and carrying them to the end of the stop. About 100 visitors attended the first day's tests.

**Railway Legislation in San Francisco.**—The Board of Supervisors of San Francisco on Oct. 12 passed a bill regulating the street railways and prescribing "rules for the protection of the public from danger and inconvenience." William M. Abbott, attorney for the United Railroads, in opposing the bill, said he was convinced it was illegal and could not be enforced. He said that the statutes expressly provided that no executive officer of a railroad company, after having taken reasonable precautions in the employment of operatives, could be held criminally liable for the negligence of such operatives. Mr. Abbott's chief objection to the bill, however, is the section which places the transfer system on the same basis that it occupied on Sept. 1, and the further provision that gives to the Board of Supervisors the right at any time to change or regulate the transfer system of the company. He pointed out that the present franchises of the United Railroads were granted before the adoption of the present charter, and that those franchises had become contracts between the city and the grantees or their assigns, which the city had no right, through its Board of Supervisors, to abrogate. In support of his contention he cited the case of the Detroit United Railway, in which the United States Supreme Court had rendered a decision in favor of the company.

**Cost of Chicago Traction Board.**—In refutation of a resolution introduced before the Chicago City Council some time ago, the city comptroller has made a report with regard to the operating expenses of the Board of Supervising Engineers of Chicago Traction. The statement shows that during the period of rehabilitation of the surface railways \$18,198,484 has been expended and that the board has cost the city since its establishment in May, 1907, \$283,099. As, however, a part of the rehabilitation work was done before the board took charge, the actual cost of the board of supervising engineers has been, according to the report, 1.38 per cent of the cost of the work thus supervised and directed. The expenses of the board for the month of August, as reported by the daily press, were as follows: Board members and secretary, \$5,275; chief engineer and assistant chief engineer, \$2,583; track and roadway, engineers and inspectors, \$3,826; electrical power distribution, engineers and inspectors, \$1,192; power plants and substations, engineers and inspectors, \$1,354; cars and car routing, engineers and inspectors, \$670; tunnels, engineers and inspectors, \$153; drafting department, \$2,301; auditing and bookkeeping department, \$1,494; stenographic and general office services, \$1,163; office supplies and expenses, \$696; rent, light, street car tickets, telegrams, telephones, postage, and other general expenses, \$1,655; inspection by special engineers, not regularly employed, \$837; office fixtures and equipment, \$62; total, \$23,260.

**Chicago & Oak Park Elevated Railroad Improvements.**—It has been announced in Chicago that Clarence A. Knight, president of the Chicago & Oak Park Elevated Railroad, will soon present to the Chicago City Council plans for railway improvements which it is expected the city will ratify. The improvements which Mr. Knight will offer to make are said to be: Elevation of the tracks from Fifty-second Avenue west to the city limits. Rehabilitation of the main tracks with 80-lb. rails. Purchase of 50 new cars of the most improved pattern. Painting of the stations and structure to make them more sightly. Increasing the number of trains to meet the requirements of patrons. Adoption of the multiple-control system and the conversion of all trailers into motor cars. In consideration of these improvements and to give the company an opportunity to raise the necessary money to put them into effect, Mr. Knight will ask the city to: Extend the present franchise from Market Street to Fifty-second Avenue for 14 years, so that all the franchises held by the company may expire at the same time. Grant an ordinance to permit the building of an extension in the first alley west of Western Avenue from Lake Street to the alley between Division and Augusta Streets and thence west to the city limits. To restore the privileges of advertising on station platforms, which was abolished several years ago, and which netted the company \$10,000 a year. To grant the right to handle express matter when the extension to Elgin is built to connect with the Elgin & Belvidere Electric Railway.

## Financial and Corporate

### New York Stock and Money Markets

Oct. 20, 1908.

The course of the stock market during the past week has been erratic, sagging one day, advancing the next, and at all times dull. Trading has not averaged half a million shares a day and the greater part of this has been in the few special issues that have been the market favorites since the upward movement was started last spring. At the close to-day prices were about where they were a week ago and the variations during the week, except in a few special cases, had not been more than three or four points. Wall Street, as has been pointed out, is taking less interest in politics than ever before, but it nevertheless reflects the general business conditions of the country. It has now been just a year since the financial troubles culminated in disaster to big banking institutions. The volume of business in all lines is far below what it was at that time, but stocks are very much higher. There is hardly any important issue that does not record a substantial advance. Thus we see the beneficial results of a professional management in the hands of men who know the game and have the money to play it. Just at present there is no disturbing element in the market. The amount of available stock in the market is small and even a small buying tendency easily sustains prices. The principal feature of the financial market, however, is the strength of bonds. There is a constant and healthy demand for every good issue and prices are well advanced. The ease with which the new \$14,500,000 issue of the Southern Pacific was absorbed is a case in point. While there is a hesitancy about going into stocks, the public can always find plenty of money for a good investment bond. Money, while slightly higher than last week, is still plentiful. Loans are made somewhat more freely, but the surplus reserve in the banks continues to be oppressive. Rates to-day were: Call, 1¼@1¾; 90 days and four months, 3½@3¾.

### Other Markets

Philadelphia Rapid Transit and Union Traction continue to be the leading features of interest in the Philadelphia market. The general opinion that the opposition to the new financial plan will not prove effective is responsible for the strength in these issues. Rapid Transit has advanced to 23¾ and Union Traction is selling at 51½@51¾. The movement in these stocks has awakened some interest in other tractions and strengthened the entire market.

In the Boston market there is little interest in traction securities. Only odd lots are traded in and these at practically the same prices that have prevailed for the past two months. Boston Suburban preferred sells at 56, Massachusetts Electric at 51 and West End at 89.

Trading in Chicago Railways bonds furnishes the principal traction interest in the Chicago market. Series "B" sold Oct. 21 at 83¾, while series "C" closed at 83. In the stock certificates series 1 sold up to 108½ and series 2 sold at 44. Kansas City Railway & Light was traded in at 36.

United Railways bonds were, as heretofore, the main traction features in the Baltimore market. The income bonds are still fairly active and are selling at 52; the funding 5s are not in so great a demand, but small parcels change hands at about 79.

Quotations for various traction securities as compared with last week follow:

	Oct. 15.	Oct. 20.
American Railways Company, Philadelphia.....	43¾	44¾
Boston Elevated Railway.....	134	133
Brooklyn Rapid Transit Company.....	48½	48¾
Chicago City Railway.....	a180	a175
Cleveland Railway.....	—	90
Consolidated Traction Company of New Jersey.....	a68	a68½
Consolidated Traction Company of New Jersey, 5 per cent bonds.....	a103½	a104
Detroit United Railway.....	*38½	*38½
Interborough-Metropolitan Company.....	10½	10
Interborough-Metropolitan Company (preferred).....	31¾	30
Manhattan Railway.....	-135½	137
Massachusetts Electric Companies (common).....	9½	a10
Massachusetts Electric Companies (preferred).....	51	a51
Metropolitan West Side Elevated Railway, Chicago (common).....	a13	a13
Metropolitan West Side Elevated Railway, Chicago (preferred).....	a42¾	a43
Metropolitan Street Railway.....	*28	*28
North American Company.....	63¾	65¼
Philadelphia Company, Pittsburg (common).....	38¾	38¼
Philadelphia Company, Pittsburg (preferred).....	40¼	39¾
Philadelphia Rapid Transit Company.....	24¾	23¾
Philadelphia Traction Company.....	90	90
Public Service Corporation, 5 per cent collateral notes..	—	a97
Public Service Corporation, certificates.....	—	a67½
Twin City Rapid Transit Company, Minneapolis (common)	89	90
Union Traction Company, Philadelphia.....	52	51¾

\* Asked.  
\* Last sale.

### Court to Order Sale of Richmond Properties

Passing upon the various questions affecting the companies in the Virginia Passenger & Power Company litigation, Judge Edmund Waddill, Jr., of the United States District Court, handed down an opinion on Oct. 13 ordering that final arrangements for the sale be made on Oct. 20, when attorneys for the several interests were to meet and enter the decree. It is said that the sale price has been agreed upon, but that the actual sale will not be made before Jan. 1, 1909.

In his opinion affecting the properties, in advance of the determination of many matters arising in the litigation, Judge Waddill decided against the objection of the trustees in the following important respects: (1) To allow to be filed the plan of reorganization of the property for certain purposes only; (2) to allow the intervening bondholders in the Central Trust Company mortgage on the Virginia Passenger & Power Company property to intervene to contest certain questions in the future, against the protest of their trustees, and (3) that with proper reservations as to the many questions arising upon the master's report, affecting the liens upon the property, and the order of their priority, that he could at once decree a sale upon first having settled the amount due under the Metropolitan Trust Company mortgage, subordinate to that of the Central Trust Company, which could be quickly determined.

In conclusion, Judge Waddill said: "In reaching this conclusion that the property ought now to be sold, the court is not unmindful of the many objections there are to a sale in advance of the ascertainment of and settlement of the parties' rights; but these are outweighed by other considerations which should control. The litigation has already been quite extended, and the impossibility of an earlier settlement is manifest to all. The property is of a public nature, and of the kind that ought not to be kept longer than necessary under the control of the court. The receivership has been a most successful one, so far as the up-building, maintenance and operation of the property are concerned, yet it has not been able to keep up the interest on the entire indebtedness secured, and at the same time make desired improvements, and comply with demands for increased and extended service, made necessary by the rapidly increasing growth of the several communities through which the various lines are operated. While large sums have been expended in the payment of interest on the underlying mortgages, on those sought to be foreclosed but little has been paid, and those speaking for parties most largely interested are urgently for pressing a sale, to the end that the property may be bought in by them, or sold to others and they awarded what is due to them. Believing that the reasons presented are sufficiently cogent to call for the sale of the property at the earliest practicable moment, the same will be ordered as herein indicated."

### Second Avenue Railroad, New York

Judge Lacombe, of the United States Circuit Court, has denied the application of the Guaranty Trust Company for the appointment of George W. Linch, as independent receiver of the Second Avenue Railroad. He says that the receivers of the Metropolitan Street Railway, New York, are ready to turn the property over to the stockholders and that the application for a receivership can be renewed in the State courts. The receivers of the Metropolitan Street Railway have been running the Second Avenue Railroad at a yearly loss of \$200,000, and \$800,000 is required to put the property in good condition.

Judge Lacombe says: "Several questions are presented by the application, some of which concededly can only be answered after a hearing before a special master, who can take testimony and ascertain the facts. They will be now considered and disposed of so far as may be practicable at this stage of the case. The roads, buildings and fixtures, with all such personal property as can be identified as belonging to the lessor, should be returned to its representative—that is, the receiver—subject to and without disturbance of any existing liens. This may be done promptly, but the interests of the public require reasonable notice of the change of operation; the time of return is therefore fixed for one week subsequent to the entry of the order to be entered hereon."

The question of compensation for the substituted motors put on the Second Avenue Railroad is referred to a special master, but the 275 cars themselves are ordered turned over to the company. The question of insurance on the car barns at Ninety-sixth Street and Second Avenue and the contents is also referred to the special master. As regards the horses, harness, tools, machinery, equipment, etc., delivered by the Second Avenue Railroad when posses-

sion was taken under the lease to the Metropolitan Company, Judge Lacombe says:

"In this connection it should be noted that what is now presented for consideration is not a claim against the lessee company for property converted or allowed to go to waste and destruction. It is a demand that the receivers turn over certain specific things now in their custody—and it cannot be complied with by them if no such specific things have in fact come in their possession. The horses are long since dead, and the road being now electric, presumably the harness and stable equipments have also disappeared without replacement. The receivers offer to turn over all items that can be identified, and proof may be taken before the master as to any other items which petitioner thinks should come to him.

"It is contended that the receivers of the Metropolitan Street Railway should pay over to the petitioner a sum of money equal to the amount of cash delivered by the Second Avenue Railroad to the Metropolitan at the time it took possession. The lease expressly provides that if the lessor shall resume possession of the demised property on account of any default of the lessee, then the money so received shall be deemed to have been a loan and shall be returned by the lessee. Petitioner may have a provable claim against lessee and sub-lessee for the whole or any part of this sum, but certainly it never came into the possession of the receivers and no obligation rests upon them by which they shall repay it.

"For several years past no franchise taxes have been paid on this property, the amount being in litigation with the city authorities. Petitioner may have a perfectly good claim against lessee and sub-lessee for failure to protect the property against the lien of these unpaid taxes, but he certainly is not entitled to demand that these receivers save harmless and indemnify the Second Avenue Railroad against any claim or claims of the City of New York on account of such taxes."

Concerning the contract for the electrification of the Second Avenue line by the Metropolitan Street Railway, in which the latter promised to supply the former with electric power at actual cost, Judge Lacombe says:

"It does not appear that receivers have ever adopted this contract, and it is difficult to understand upon what theory it is contended that they are bound by it. If petitioner wishes seriously to press such a claim he may present evidence and argument before the special master. The receivers of the Metropolitan Street Railway, however, may make a contract similar to that in the case of the Belt line for furnishing power for operation of the Second and First Avenue lines on reasonable terms."

The question of the acceptance or rejection of the lease by the receivers and the accounting for receipts from the operation of the road are to be referred to the special master. The claim of the receivers for moneys expended by them in putting the First Avenue line between Fifty-ninth Street and 125th Street is also referred to the special master.

Judge Lacombe also handed down an opinion on the question of the return of property to the Belt line by the receivers of the Metropolitan Street Railway pursuant to the contract of lease under date of Oct. 14, 1892, and also the payment of accrued rental aggregating approximately \$96,000, and also money amounting to \$108,618, which was turned over in cash by the Belt line at the time of making the lease.

As to the claim for \$108,618, Judge Lacombe says:

"It seems entirely clear that under the covenant the lessor has a claim against the lessee for the money loaned, but neither the original \$108,618 nor any like sum earmarked as the lessor's property has ever come into the possession of receivers and the application to instruct them to pay such sum to petitioner is denied."

**Camden & Trenton Railway, Camden, N. J.**—Chancellor Pitney, on Oct. 13, continued the receivership of the Camden & Trenton Railway, with Wilbur F. Sadler as receiver, until Dec. 29, that the bondholders' committee might confer further, looking toward a reorganization of the company. Receiver Sadler had asked whether or not he should continue the operation of the road, and, if so, whether it should be under an agreement with the bondholders as to the cost of such operation. He asked also whether or not he should sell the property and franchises subject to the first and second mortgages; also whether or not the mortgagees should be authorized to foreclose the mortgages.

**Hudson Companies, New York.**—The response of the preferred stockholders of the Hudson Companies to the plan to offer \$5,000,000 of three-year 6 per cent notes has been satisfactory and the success of the plan is assured. The estimated income of the company from real estate holdings, from the operation of the tunnels and from other sources

is set forth in this summary of the estimates of engineers and others:

77,000,000 passengers per annum (estimate of Charles M. Jacobs, chief engineer, and Hugh Hazelton, electrical engineer) at 5 cents per passenger .....	\$3,850,000
Cost of operation and taxes, at 40 per cent (estimate of Hugh Hazelton, electrical engineer) ..	1,540,000

Net earnings from passenger traffic.....	\$2,310,000
Net income from Terminal Buildings.....	1,200,000
Estimated income from baggage, advertising in cars and stations, news-stands and other privileges, per annum .....	300,000
Total per annum.....	\$3,810,000

#### DEDUCTIONS FROM INCOME

Interest on \$53,500,000 Hudson & Manhattan first-mortgage 4½s and \$5,000,000 New York & Jersey Railroad 5s.....	2,657,500
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Surplus .....	\$1,152,500
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The schedule for the company's buildings fully rented is \$1,811,000, or over \$600,000 in excess of the net revenue from the buildings figured in this estimate of the company's total income.

**Lehigh Valley Transit Company, Allentown, Pa.**—The voting trust agreement expires on Nov. 3, 1908, and the management, with the approval of large interests in the company, is asking the certificate holders to send their assent to a three-year extension of the agreement to the Lehigh Valley Trust & Safe Deposit Company, Allentown, Pa., by Nov. 3. The following voting trustees, who have served up to this time, will act for the extended period: George H. Frazier, of Brown Brothers & Company, Philadelphia; Edward B. Smith, of Edward B. Smith & Company, Philadelphia; William F. Harrity, Philadelphia; Arthur E. Newbold, of Drexel & Company, Philadelphia; Harry C. Trexler, president of Lehigh Portland Cement Company, Allentown; Tom L. Johnson, mayor of Cleveland, Ohio; George O. Albright, manufacturer and banker, Allentown.

**Nahant & Lynn Street Railway, Lynn, Mass.**—This company has filed a petition with the Railroad Commission asking approval of the issuance of bonds to the amount of \$25,000. The money is to be used to fund floating indebtedness incurred in construction work and equipment purchases.

**Oneonta & Mohawk Valley Railroad, Oneonta, N. Y.**—The property of the Oneonta, Cooperstown & Richfield Springs Railroad, now known as the Oneonta & Mohawk Valley Railroad, was resold at Cooperstown on Oct. 9 under the mortgage foreclosure brought by the Knickerbocker Trust Company, New York, as trustee. The sale was made to Joseph A. Starratt, of New York, for \$200,000, subject to a prior judgment of \$320,000 and subject to alleged claims the amount of which cannot be estimated. On the sale in the same action, two years ago, the purchase price was \$960,000, but the purchaser failed to complete his bid.

**Philadelphia, Bristol & Trenton Street Railway, Philadelphia, Pa.**—Refusing to interfere with the Bucks County Court in the receivership proceedings brought by the Interstate Railway Company and the United Power & Transportation against the Philadelphia, Bristol & Trenton Street Railway, Judge Holland in the United States Circuit Court has filed a decision revoking the appointment of temporary receivers. The action was originally instituted in the State Court at Doylestown, where it is still pending final decision. Despite this, a similar action was later filed in Philadelphia, and temporary receivers appointed. Judge Holland holds that where one court has acquired jurisdiction over the property of a defendant it will be its right to hear and determine all controversies relating thereto, without interference.

**Pennsylvania & Maryland Street Railway, Elk Lick, Pa.**—This company has just placed on record a mortgage covering its property to the amount of \$1,000,000 in favor of the Farmers' Loan & Trust Company, New York. It is the intention of the railway company to build an extension to its system from Garrett to Johnstown, Pa.

**Seattle-Tacoma Short Line, Seattle, Wash.**—Thomas B. McMahon, representing clients who have claims against the Seattle-Tacoma Short Line aggregating \$1,458, has applied for a receiver for the company.

**Washington, Arlington & Falls Church Railway, Washington, D. C.**—This company has placed on record a mortgage on all its property to secure an issue of \$1,000,000 5 per cent bonds. The Girard Trust Company, Philadelphia, is trustee under the mortgage.

## Traffic and Transportation

### Public Service Commission Dismisses Complaint Regarding Fares

The New York Public Service Commission, Second District, has dismissed the complaint of the citizens of Watervliet against the United Traction Company, of Albany, as to rate of fare. The opinion in the matter, written by Commissioner Olmsted and concurred in by all the Commissioners, is given in full:

"The petitioners ask for a five-cent rate of fare, either direction, from any point on Broadway in the city of Watervliet to State Street in the city of Albany. They contend that the present rate of 10 cents between these two points is 'unjust, unreasonable, discriminatory and unduly preferential as against the citizens of Watervliet,' and base their contention on the ground that the distance traveled is less than other distances traversed by the cars of the respondent for which it charges only five cents fare. They state that the time required to ride from State Street in the city of Albany to the Watervliet United States Arsenal in the city of Watervliet is 25 minutes. The distance is about 4¼ miles. The fare charged is 10 cents. Whereas the time required for one continuous ride on the respondent's line from the western terminus of the Troy & New England Railroad at Albany through Greater Troy to Twelfth Street, in the county of Rensselaer; thence across the Hudson River by bridge to Van Schaick's Island, and through the city of Cohoes in the county of Albany to the waiting room of respondent in the city of Cohoes, is more than one hour. The distance traveled is about 6 miles. The fare charged is five cents. Several instances similar to the above are set out in the complaint as tending to show discrimination.

"On the hearing the petitioners contented themselves with argument on the admitted facts, namely, that the distances and rates of fare charged therefor were substantially as stated in the complaint. No witnesses were sworn.

"It is the general practice of street railway companies to fix their rates of fare on a zone basis instead of a mileage basis. These zones are large or small, as local conditions may determine. Density of population—difficulty of operation—the presence within the zone of localities frequently visited, such as amusement parks, etc., are large governing factors. Outside of limitations laid down in particular statutes or franchises, it may be said that the law has set no limit on these rates further than to inhibit generally a charge greater than five cents for one continuous ride within the boundaries of any incorporated city or village, except the general regulation that they must be just and reasonable.

"Acting on the practice above set forth, the respondent has established two zone limits within which a five-cent fare is charged. They are clearly shown on a map submitted by it. The first, which may be called the Albany zone, includes all of the city of Albany and a section of the town of Colonie, lying to the north of the city of Albany and extending as far north as Schuylers Bridge, which is the south boundary of the city of Watervliet. The second, which may be called the Troy zone, includes the city of Troy, the city of Watervliet, the village of Green Island, the city of Lansingburg and some parts of Cohoes and Waterford, besides some outlying district, and also includes the same portion of the town of Colonie that is embraced in the Albany zone above described. It will be noted that the two zones overlap each other, and within the section of common ground (so to speak) thus formed are situated a ball ground, a cemetery, Altro Park, as well as several other resorts much frequented by the inhabitants of both zones.

"By this arrangement the people of Troy, Watervliet and the other localities embraced in Zone No. 2, as well as those living within the boundaries of Zone No. 1, can reach all the points within the boundaries of the (so-called) common ground at a single fare of five cents, but any passenger from either zone passing beyond the boundaries of the common ground and into the other zone must pay an additional fare of five cents; this additional fare, however, not entitling him to universal transfers in the zone into which he last enters.

"It was further shown by respondent's schedule and map that a passenger from any point in Zone No. 1 (the Albany zone) can be carried to any point in Watervliet, to any point in Green Island south of Albany Avenue (as a matter of fact, although not so shown on the map submitted, he can be carried to any part of Green Island), and to certain points in the city of Troy, known as the shopping district, for a fare of 10 cents; while if he boards the car at State Street and Broadway in the city of Albany he can be carried to any point in Zone No. 2 (the Troy zone) for 10 cents,

and vice versa, passengers from any point in Zone No. 2 can reach State Street and Broadway in the city of Albany for the same fare of 10 cents. Passengers also taking the car at any point in Watervliet or Green Island and that part of Troy above referred to as the 'Shopping District' can reach any point in the city of Albany for a fare of 10 cents. Passengers from the northern or eastern section of Zone No. 2, whose destination is any point in Albany beyond State and Broadway, are charged 15 cents.

"If these rates of fare as above established are 'discriminatory or unduly preferential' it will be seen that they are so not against the citizens of Watervliet, who are the complainants here, but rather in their favor. The people in Watervliet can ride anywhere in Zone No. 2 for five cents, which the people of Albany cannot do. They also have the privilege (in common with the citizens of Green Island and a part of Troy) of a 10-cent fare to any point in the city of Albany; a privilege which is denied to all the other residents of Zone No. 2, viz., those living in Cohoes, Waterford, Albia and those sections of Troy not included in the portions last above referred to.

"It remains, therefore, to be decided whether the rate complained of is 'unjust and unreasonable.' It is not to be disputed that the respondent has the right and is within the ordinary practice of street railway companies in fixing its rates according to the Zone System. The question simply is: Is it just and reasonable that the boundary of Zone No. 1 should stop at Schuylers Bridge, or should it be extended farther northward to take in any part of the city of Watervliet?

"In determining the answer, distance between points is but a factor merely and is by no means controlling. In a territory in which communities are as closely related as are those of Albany, Troy, Watervliet, Waterford and Cohoes, the arrangement of the entire system is to be taken into the account, so far as it concerns the convenience and economy of all the patrons served. Within the two zones the rates charged are 10 and five cents. How the territory shall be divided up within the zones on the basis of five-cent and 10-cent fares (the only question to be decided here) is a matter of opinion, and, basing its judgment on the privilege of transfer above set forth, the density as well as the distances of travel, the local situation and all the facts in the case as disclosed in the hearing, the opinion of the Commission is that the 10-cent rate complained of is neither unreasonable nor unjust.

"The complaint should be dismissed."

**Record of Accidents in New York City for September**

The report of the Public Service Commission for the First District of New York covering accidents on street railways in September, 1908, has been made public. Compared with the same month for 1907 it shows as follows:

	Sept., 1908.	Sept., 1907.
Car collisions.....	155	218
Persons and vehicles struck by cars.....	889	972
Boarding .....	588	512
Alighting .....	1068	931
Contact electricity .....	39	—
Other accidents .....	2284	2569
Totals .....	5023	5202
INJURED		
Passengers .....	2098	—
Not passengers .....	586	—
Employees .....	526	—
Total .....	3210	—
SERIOUSLY INJURED, INCLUDED IN ABOVE		
Killed .....	34	63
Fractured skulls .....	9	11
Amputated limbs .....	6	6
Broken limbs .....	36	39
Other serious .....	225	95
Totals .....	310	216

**Philadelphia Rapid Transit Company Replies to Suit to Prevent Transfer Curtailment**

The Philadelphia Rapid Transit Company filed in Common Pleas Court last week its answer to the equity suit begun by the city last June to test the corporation's right to change its transfer system.

First, the company maintains that the "rates of fare" spoken of in the partnership contract with the city have no reference to the rates of fare then in use, but mean simply the five-cent cash fare. The exchange and six-for-a-quarter tickets, it is contended, are commutation rates.

Second, figures presented demonstrate that the change in the transfer system made on May 18 has resulted in raising the average rate of fare three-tenths of a cent. This increases the earnings on the traffic in July \$117,111, at a rate of \$1,405,000 per annum.

Third, it appears that the additional cost of the free transfer, now issued only on a cash fare, has decreased the number of passengers carried. Comparing July with April, the company's answer shows a decrease of 2,765,037 in the latter month.

Of this number, 2,280,800 is in transfer passengers, leaving a decrease of 484,237 in the number of those who paid fares. This number, figured at 3.82 cents, the average fare for the month, produced a revenue loss of \$18,498. Deducting this loss from the increased earnings of \$117,111 resulting from the three-tenths of a cent advance in the average fare, a net gain remains of \$98,613. Thus, on the basis of the July traffic, the company would profit about \$1,000,000 under the new transfer arrangement.

It was admitted that transfers were given by the company in order to develop its business and accommodate the public, but it is asserted that it was never the intention to grant transfers, except to passengers who paid cash fares, nor to allow four rides for 8 cents, or two rides for 4 1/6 cents.

**Proposed Exchange of Transfers Between New York City Lines**

Frederick W. Whitridge, receiver of the Third Avenue Railroad of New York, has written to the directors of the Central Park, North & East River Railroad, offering to exchange transfers for a period of six months between the Fifty-ninth Street line of the latter company and the Third Avenue lines, which connect with the Fifty-ninth Street Crosstown line at Broadway and at Third Avenue. Mr. Whitridge says in his letter:

"This means that each company will keep the fares paid to it, and will honor the transfers issued on the payment of such cash fares for use on the other line.

"This offer will give us an opportunity to ascertain whether the arrangement is reasonably profitable.

"I assume the purpose of the commission in seeking the arrangement is to serve the convenience of the public, and is not intended to be a step toward the restoration of universal transfers, but only to provide an alternative to the proposed transfers with the Metropolitan. This offer is, therefore, conditioned upon the abandonment or other disposition of the proceedings before the Public Service Commission to compel you to transfer with the Metropolitan, before any extension or renewal of the agreement herein proposed shall be made."

Mr. Whitridge wrote a letter in reply to the order of the Commission requiring the establishment of joint fares and through routes, in which he said:

"Some months ago I made a proposition to the Fifty-ninth Street Crosstown Road respecting this matter, which it declined, and I have been informed by its officers that they do not wish to exchange transfers with anybody. I have, however, to-day addressed to them a letter, of which I herewith enclose to you a copy, and if you can, by the use of your good offices or otherwise, induce them to accept that offer, I shall be very much obliged to you. The conditions, I think, speak for themselves; I hope you will consider them reasonable. The main thing to be considered in any such arrangement is whether it is commercially possible. I think nobody, except possibly your own experts, would dare to say exactly what the effect of such an arrangement would be, and because I am anxious to find out and think that it will probably be for the benefit of the Third Avenue road, I am willing to make an experimental arrangement.

"In this connection, I should be glad if you would assist me to clear the minds of people who discuss this subject of all the cant about over-capitalization, inflated securities, water, etc., because the companies of which I am receiver are not paying any rentals to anybody; they pay no interest upon the \$36,000,000 of Third Avenue bonds, or any of the stocks, and it is therefore quite immaterial how many of such bonds or stock are outstanding. All of the receipts from the Third Avenue properties, and \$2,000,000 besides, are being expended upon them.

"The second condition I suppose to be equally plain, and is made because I cannot imagine that it is the purpose of the commission to endeavor to compel separately owned, distinct, rival railroads in this city to enter into any sort of partnership, or that you have in mind the making of any precedent which would enable you hereafter, by a series of orders upon the application of citizens of the West Side, or any other point of the compass, to establish 'through routes' which would be tantamount to a restoration of universal transfers.

"If, with these conditions as I have stated, you can induce the Fifty-ninth Street people to accept my proposition, I shall be very much obliged to you. If you cannot, and you undertake to establish a 'joint rate' and 'through

routes' for passengers, as you propose, I am bound to say that I deny your right to do anything of the sort. The attempt to translate the nomenclature, conditions and theories in respect to interstate commerce to the street railways of the city of New York, was not, I think, intended by the Legislature, and does not appeal to my common sense, and I shall deem it my duty, in the protection of the interests of the property holders committed to my care, to challenge your right to do what you propose.

"This, I beg you to believe, is no diminution of the respect which I owe to the Public Service Commission, but because I think it will in such case be proceeding on an erroneous theory which may be damaging, if not destructive, to the interests I am set here to guard."

**Rochester & Sodus Bay Railway Withdraws New Passenger Tariff.**—The Public Service Commission of the Second District of New York has granted permission to the Rochester & Sodus Bay Railway Company to withdraw the tariffs calling for increase of rates. By order of the Commission a new tariff raising the rates on the interurban lines several cents on each ticket was to have gone into effect on Oct. 24.

**Interchange of Traffic Insisted Upon in Michigan.**—The Railroad Commission of Michigan has filed an answer in the case brought by the Grand Trunk Railway to test the law requiring steam and electric roads to connect their lines and exchange freight when ordered. The Grand Trunk Railway and the Detroit United Railway were ordered to connect at South Flint and are opposing the order. The commission denies all the excuses made by the Grand Trunk Railway for not obeying the order and sets up that the connection is a public necessity.

**Brooklyn Conductors Announce Denominations of Coins Offered for Fare.**—The Brooklyn Rapid Transit Company, over the signature of William Siebert, superintendent of surface lines, last week issued the following order to conductors on surface cars: "Effective October 15—and continuing until further notice—conductors will announce in a sufficiently loud tone to be heard by passengers the denomination of the coins or bills tendered for fare. This is intended to eliminate controversies between passengers and employees."

**Massachusetts Company Seeks to Reduce Service.**—The Lexington & Boston Street Railway is planning to petition the Waltham Board of Aldermen for a release of that portion of the company's franchise which specifies that cars shall be run upon a 30-minute schedule between Lexington and Waltham, such release to continue from November to April, inclusive. This proposed action is to be taken because the road has paid no dividend since 1903. The receipts for the year ending Sept. 30, 1908, show a deficit of about \$8,000. The franchise requires a half-hourly service between 6 a. m. and 9 p. m., but the company feels that during certain hours of the day hourly service will accommodate the travel.

**Seats for Boston Motormen.**—Each of the cars of the Boston (Mass.) Elevated Railway will be equipped with a seat for the motorman within the next few months. This change has been decided upon in the interest of the comfort of the motormen. At present the elevated cars of the company are equipped with seats, also a few of the closed surface cars running from the Lenox Street and Grove Hall stations. The semi-convertible cars on the Ipswich Street line, the East Boston cars and most of those running from the Sullivan Square line are likewise practically unequipped with seats for the motormen. While the summer open cars are in storage this winter, they will be fitted with seats.

The Nebraska Traction & Power Company, Omaha, Neb., has begun the construction of its projected standard gage electric railway, which is to extend from Omaha to South Omaha, Ralston and Papillion, Neb., a distance of 6½ miles. The company proposes to install overhead catenary construction and will build its power station and repair shops at Ralston, Neb. Power for lighting and manufacturing purposes will be furnished to towns along the route. The contract for the construction of the entire property, including a telephone plant in Ralston, has been let to the General Construction Company, Omaha. Capital stock, \$2,500,000, of which \$257,800 has been issued. Bonds authorized, \$1,660,000; issued, \$230,000. Headquarters, Omaha. Officers: Mel Uhl, president; C. M. Wilhelm, vice-president; J. F. Emmert, secretary; F. J. Moriarity, treasurer; William D. Crist, general manager and purchasing agent; R. H. Oliver, superintendent and chief engineer.

## Personal Mention

**Mr. Charles A. Wickersham** has been elected president and general manager of the Selma (Ala.) Street & Suburban Railway, to succeed the late Col. F. M. Abbott.

**Mr. A. Gordon** has been appointed park manager of the Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., to succeed Mr. M. E. Caper.

**Mr. A. Norman** has been appointed superintendent and purchasing agent of the DeKalb-Sycamore & Interurban Traction Company, DeKalb, Ill., to succeed Mr. D. Thomson, formerly general manager, superintendent and purchasing agent of the company.

**Mr. Albert E. Eastman** has been appointed general passenger and express agent of the Utica & Mohawk Valley, the Oncida Railway and the Syracuse Rapid Transit Railway. He was formerly general express agent in charge of express traffic, but with his new title he will now also take over the passenger department, having charge of tickets, etc.

**Mr. Henry C. Morris**, for the last five years assistant general manager of the Bay City Traction & Electric Company, Bay City, Mich., has been appointed assistant to Mr. J. F. Collins, general manager and superintendent of the Saginaw-Bay City Railway & Light Company, controlling the railway and lighting properties in Bay City and Saginaw, and Mr. J. A. Cunningham, who has been assistant general superintendent of the lighting properties of the Bay City Traction & Electric Company in Bay City, has been appointed to succeed Mr. Morris as assistant general manager of the Bay City Traction & Electric Company.

**Mr. Martin J. Binkley**, who, as previously announced in the *ELECTRIC RAILWAY JOURNAL*, was recently appointed general auditor of the Buffalo & Lake Erie Traction Company, Jamestown, N. Y., Chautauqua & Lake Erie Railway and the Chautauqua Steamboat Company, was formerly connected with the accounting department of the International Traction Company, Buffalo. Mr. Binkley entered the employ of the International Company in 1901 and served in various capacities, finally becoming assistant to Mr. D. M. Deininger, auditor of the company. Before entering the railway field, Mr. Binkley was with a mercantile house.

**Mr. Lawrence Manning**, who recently resigned as general superintendent of the Choctaw Railway & Lighting Company, McAlester, Okla., has opened an office as a consulting engineer in Charlotte, N. C. After leaving the Virginia Polytechnic Institute, Mr. Manning went with the Camden Water, Light & Ice Company, Camden, S. C., remaining about two years. In January, 1900, he entered the testing department of the General Electric Company, at Schenectady, N. Y., and later the drafting and construction departments. In April, 1904, he became general manager and purchasing agent of the Owosso & Corunna Electric Company, a railway, light and power property at Owosso, Mich. In March, 1908, he accepted the position with the Oklahoma property, from which he recently resigned because of ill-health.

**Mr. L. E. Fischer**, whose resignation as general manager of the Illinois Traction System will become effective in January, as noted recently in the *ELECTRIC RAILWAY JOURNAL*, will manage the public utilities at Cairo, Ill., including the property of the Cairo Electric & Traction Company, and will develop an interurban railway system for Saline County, in southern Illinois. Mr. Fischer expects later to offer his services as an independent expert in the management of utility properties. Mr. Fischer was born at O'Fallon, Ill., in 1876. He graduated from the Manual Training School at St. Louis in 1893, and entered the University of Illinois in the School of Municipal and Sanitary Engineering, from which he graduated in 1898. He was immediately appointed assistant city engineer at Kendallville, Ill. In 1899 and 1900 he acted as assistant city engineer at Paris, Ill. Mr. Fischer's connection with the Illinois Traction System began in 1901, when he was made superintendent of the power house of the company at Danville, Ill. In 1902 he became manager of the company's property at Danville, and after three years' service was appointed general manager of the entire system, which at present includes about 500 miles of interurban railway and the public utilities at Danville, Urbana, Champaign, Decatur, Bloomington, Peoria, Springfield, Edwardsville and other cities.

### OBITUARY

**Dr. Frederic A. C. Perrine**, well known as an electrical engineer, died on October 20 at his home in Plainfield, N. J., at the age of 46. Dr. Perrine was born at Freehold, N. J., and was graduated from Princeton. Later he became professor in electrical engineering at the Leland Stanford University, California, and still later president of the Stanley Electrical Manufacturing Company at Pittsfield, Mass.



## NEW PUBLICATIONS

**How to Build Up Furnace Efficiency.** By Jos. W. Hays, combustion engineer, Chicago. Pamphlet, 3½ in. x 6¼ in.; 48 pages. Price, 50 cents, postpaid.

The author treats of a new subject in this booklet, which is offered as a means for posting the operating engineer in the methods of improving furnace efficiency. He discusses in careful detail the approved methods for analyzing furnace gases. Examples are presented and comparative values as found by the author are given for the different methods of gas analysis. The instruments on the market for analyzing furnace gases are discussed in detail and prices presented in a comparative way. The latter half of the book takes up the practical points of furnace analysis and efficiency. There are discussed here such subjects as regulating dampers, firing, wet and dry coal, thick and thin firing, determining the heat value of coal, grate surface and many other of those little refinements which, if properly practised in a power station, will contribute largely to an improvement in its efficiency.

**The Street Railway System of Metropolitan Boston,** by A. E. Pinanski, New York, McGraw Publishing Company, 1908. 58 pages. Price, \$1.

This essay won the 1908 William H. Baldwin prize offered by the National Municipal League for the best essay "on the relation to the municipality to the transportation service" and discusses the development, finances and present condition of the system operated by the Boston Elevated Railway Company. The author, who graduated from Harvard University this year, considers the metropolitan district of Boston, with its population of 1,200,000 persons, as the nearest approximation which has been reached, on this continent at least, of the metropolis of the future. That is, "a city closely built, and during the daytime densely populated, this surrounded by a semi-rural district, in which are the homes of those who work in the city, but who pass their nights, and whose families pass their lives, under the purer and healthier influences of the country." In the early part of the essay the author describes the early horse railway lines in Boston which led up to the organization of the Metropolitan Railway Company, the Cambridge Street Railway Company and others until all were united in 1887 in the West End Street Railway Company. Experiments in electricity followed soon after this consolidation and proved so successful that electric power was adopted for the entire system. In spite of the introduction of the improved power, and possibly on account of the additional traffic thereby attracted, the congestion of street cars in the heart of Boston soon became intolerable and resulted in the authorization in 1892-1894 by the Legislature of the construction of a subway under a portion of Tremont and Boylston Streets.

The successful introduction of electric traction and its rapid spread brought into existence an entirely new set of problems in the way of regulations of the issue of stock and of franchises. A Board of Railroad Commissioners had been established in 1871, but its authority was greatly increased in 1894 and again in 1898 by awarding it supervision of both franchises and capitalization. Mr. Pinanski while stating that the law that street railway companies must obtain the sanction of the board for any new issue of stock and bonds and that such an issue should be made a price fixed by the board, but not less than par, has been a distinct advantage in some particulars; it has certain disadvantages to the conduct of honestly managed enterprises. Control by the board of franchises by which the companies possess "terminable—perpetual" franchises has proved more satisfactory, although theoretically most illogical. "It recognizes an ownership under limitations, and the holder of the franchise works with an incentive of gain." Such a plan the author considers much superior to direct municipalization which he says has not been worked out yet in any city to logical results nor can it be so worked out for at least a score of years to come. Applied to the local situation, such a system would be very difficult since the West End Street Railway holds franchises of no less than 11 different towns and cities. The physical features of the Boston Elevated Railway system are considered but briefly, although statistics are given of the elevated and subway systems and of the tunnel under the harbor. Under the present management of the Boston Elevated Railway Company the author considers the City of Boston has very little cause for complaint. He continues: "The company pays 11 per cent of its net earnings to the city in taxes and other assessments, a better dividend to the municipality than that of any of the municipally owned roads in Europe. The road gives good service, has no water in its stock, pays dividends to its stockholders and pays the city (which has none of the expense or trouble of management) for the privilege of doing business, a million and a half dollars a year."

## Construction News

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

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

## FRANCHISES

**\*Heber, Ark.**—The City Council has given a franchise to C. F. Crosby to build and operate a street railway system in Heber. Mr. Crosby was granted one year in which to begin work on the line.

**\*San Rafael, Cal.**—An application has been made to the Board of Supervisors by Charles Murphy, of San Francisco, for an electric railroad franchise to include practically all the towns of Southern Marin. He plans to run one line from Sausalito to Mill Valley, another from Mill Valley junction across the marshes to Belvedere and Tiburon, and a third from Alto station to Corte Madera, Larkspur, Kentfield, Ross, San Anselmo and San Rafael.

**Santa Barbara, Cal.**—The City Council has granted the Santa Barbara Consolidated Railroad a franchise for an electric railway from the intersection of Bath and Second Streets, thence along Bath Street to the intersection of Bath Street and Fourth Avenue, thence along Fourth Avenue to Castillo Street.

**Battle Creek, Mich.**—The Michigan United Railways has asked the City Council for a franchise that the company refused more than a year ago. The new franchise gives the company a 30-year lease of life and supersedes one that has yet 14 years to run. The new franchise grants the city a number of concessions, including the extension of 4 miles.

**Akron, Ohio.**—The County Commissioners have granted a 25-year franchise to the Turkeyfoot Traction Company, which gives it rights on South Main Street, from the city limits to Schwartz's Corners, where the proposed line leaves the public road and continues to the lake district over private right of way. Thomas L. Childs is the promoter of this road. [E. R. J., Sept. 19, '08.]

**Youngstown, Ohio.**—It is stated that within a few weeks the Lake Erie & Youngstown Railroad will make an application to the City Council for a franchise for the Youngstown terminal of its line, which will run from Conneaut, Ohio, to Youngstown. The company proposes operating gasoline driving cars on its road. The line has a private right of way between Youngstown and Conneaut, closely paralleling the Lake Shore road. John H. Ruhlman, president.

**Hamilton, Ont.**—The Railway Commission has granted the application of the Brantford & Hamilton Electric Railway for an order granting it permission to operate its cars over the crossings of the tracks of the Tilsonburg branch of the Grand Trunk Railway pending the installation of an intersection and derailing plant, which has to be put on this crossing.

**Boswell, Pa.**—The Pennsylvania & Maryland Street Railway has presented an application to the City Council for a franchise through Boswell. Boswell will be on the route of the connecting line between Meyersdale and Johnstown, the line traversing the principal thoroughfares of this place and connecting with the system of the Johnstown company at Paint Creek.

**Chattanooga, Tenn.**—The County Court has granted to D. J. Duncan a franchise for a trackless trolley line up Lookout Mountain and Walden's Ridge. Mr. Duncan was given one year in which to complete the line and get it in operation. A franchise was also given to S. W. Devine for a similar line, from Chattanooga to Coulterville, a distance of about 30 miles.

**Norfolk, Va.**—The Norfolk & Portsmouth Traction Company has presented to the Common Council an application for a franchise, in the form of an ordinance, which includes a reduction of the trackage in Portsmouth. It is stated that if a reduction of trackage were allowed it would enable the company to give a 12-minute schedule.

**\*Snohomish, Wash.**—An application has been made to the City Council by J. M. Shawhan and J. D. Brown for a franchise to build a street railway system in Snohomish.

## RECENT INCORPORATIONS

**San Joaquin Valley Electric Railway, Stockton, Cal.**—Incorporated in California to build a standard gage electric railway from Stockton to Modesto, a distance of about 35 miles. Capital stock, \$1,000,000. Directors: M. L. Brackett and H. E. Teter, of Stockton, and John G. Weir, E. T. Zook and J. E. Weaver, all of San Francisco. [E. R. J., Oct. 10, '08.]

**\*St. Louis & St. Liborg Railway, Belleville, Ill.**—This

company has been incorporated in Illinois to construct a line from East St. Louis through St. Clair County to St. Liborg. Incorporators: Edward L. Thomas, John T. Taylor, David O. Thomas, C. A. Heinzelman and Gustave A. Becker, all of Belleville.

#### TRACK AND ROADWAY

**Red Deer (Alta.) Railway.**—J. C. Moore advises the *ELECTRIC RAILWAY JOURNAL* that construction work will probably be started on this road early next spring. The line as proposed will be a standard gage one, 40 miles in length, and will connect Red Deer and Nevis. The overhead trolley system will be adopted. Power will be rented from the Western General Electric Company, of Red Deer, but it is the ultimate intention of the company to construct two stations, one at Red Deer and the other at Coalbanks. Mr. Moore states that the most revenue is expected from the hauling of coal and freight. Capital stock, \$100,000. Provisional directors: Geo. W. Smith, John J. Gaetz, F. W. Galbraith, Wm. A. Moore, J. Carlyle Moore, all of Red Deer. [E. R. J. Sept. 26, '08.]

**\*San Luis Obispo, Cal.**—Surveys on the electric railway, which is to run between Cambric, Santa Maria and San Luis Obispo, have been begun under the direction of A. T. Patton.

**Denver (Col.) City Tramway.**—The engineers of this company are said to be preparing plans for extending its present street railway system to Valverde, Overland Park and Fort Logan districts. These lines were provided for in a franchise voted by the taxpayers of the city in 1906.

**Connecticut Company, Middletown, Conn.**—George Butterick, who is in charge of the extension of this company's line now in course of construction from Middletown to Hartford, is said to have announced that the line will be in operation by Jan. 1, 1909. The Valley road is bonded to Cromwell and tracks have been laid as far as the Valley Hotel in Rocky Hill.

**Elgin, Woodstock & Lake Geneva Railroad, Elgin, Ill.**—The directors of this company have selected a definite route for the proposed line in Elgin. Right of way has been secured along North Liberty and Park Streets, and application for franchise will be made within a short time to the City Council. J. A. Kirkland, Elgin, is interested in this project. [E. R. J., Oct. 10, '08.]

**Murphysboro (Ill.) Street Railway.**—This company has awarded a contract to Jenkins & Hill, Murphysboro, for the construction of about one mile of new track in connection with street paving.

**Taylorville (Ill.) Street Railway.**—The contract for the construction of the street railway and overhead equipment of the plant of this company has been let to a construction company in Chicago on a bid of \$61,800. Work on the track will commence shortly and the company expects to have its road in operation within 60 days. The company's power station, located in the southern part of the city, is under course of construction and will be completed within 20 days. The contract for the machinery to be installed and for the cars will be let within a week. The railway will run from the paper mill in the extreme northeast part of the city to the mine of the Christian County Coal Company in the extreme southwest part of the city, a distance of 4 miles. It traverses the north and west sides of the public square, and goes through the most thickly settled portion of the city. At the southwest terminus of the road the company has purchased 40 acres of ground to be converted into a park and turned over to the city. W. B. Adams, president. [E. R. J., Oct. 3, '08.]

**Logansport, Frankfort & Indianapolis Traction Company, Logansport, Ind.**—Washington and Carrollton townships, Carroll County, have voted a subsidy of \$20,000 in aid of the construction of this company's line. The conditions call for the erection of stock pens at several towns, and that no portion of the tax shall be paid to the company until after the road is completed and in operation. Frederick Cook, Indianapolis, and S. H. Blakeslee, Cleveland, are interested in this road.

**Albia (Ia.) Interurban Railway.**—The *ELECTRIC RAILWAY JOURNAL* is informed that 3 miles of grading have been completed on the extension of this company's system to Hiteman. This new branch when completed will be 6 miles in length. The Engineering Construction & Securities Company, Chicago, is financing and constructing the extension. The contract made with the railway also includes the purchase of the Albia Electric Light & Power Company's property and the remodeling of the same.

**St. Tammany & New Orleans Railway & Ferry Company, Covington, La.**—It is announced that this company has purchased from Frank Davies, of New Orleans, 1000 tons of rails, with suitable switches, etc., to be used in the construc-

tion of its electric railway between Covington and Mandeville, the latter point to connect with ferry for New Orleans. It is expected to have the road in operation by Jan. 1, 1909. A press dispatch says that the company has completed its bridge 1000 ft. long over the Bogue Falaya River, and it is now ready for track. Officers: Clay Riggs, president; C. Z. Williams, Covington, La., vice-president; John Birg, Franklin, La., secretary and treasurer, and Preston Herndon, Covington, La., chief engineer. [E. R. J., Aug. 29, '08.]

**Boston & Northern Street Railway, Boston, Mass.**—The metropolitan park commission has granted this company a two-track location in the Middlesex Fells, beginning at the Medford-Stoneham line near Porter's Cove, in Spot Pond, and running northerly to the boundary line of the reservation at Main and South Streets in Stoneham.

**Boston, Mass.**—According to present indications the Washington Street tunnel in Boston will be opened for traffic about Dec. 1. The tunnel is now nearly complete, with the exception of platform changes at Haymarket Square, and alterations in the approaching tracks at the northern entrance to the new route. Six-car trains will be operated at first in the tunnel, as it has been found that the various elevated station platforms cannot all be extended simultaneously for this length of train without interruption of service. The platform changes will be made in due course after the opening of the new route. In connection with the restoration of surface cars in the through tracks of the Tremont Street subway the present wooden platforms will be removed, in order to bring all tracks at about the same level in each station. At present the platforms are designed to be used by passengers to and from trains, with platforms at a lower grade for surface car use. It has practically been decided not to use the present Pleasant Street station as the terminus of an inter-station shuttle service from the North Union station to the South station via Atlantic Avenue. The present structure between Pleasant Street and Mott Street will probably be retained, however, in case further use of it becomes desirable. The Forest Hills extension will probably not be operated before spring.

**Detroit, Flint & Saginaw Railway, Saginaw, Mich.**—This company has filed for approval with the Railroad Commission a map of the extension of its system from Frankenthum to Flint. The extension will run through Burton, Genesee, Mt. Morris and Vienna Townships, Genesee County, and Birch Run, Frankenthum and Bridgeport Townships, Saginaw County.

**St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo.**—This company has just completed and placed in operation an extension of its street railway system from Krug Park to the property of the Industrial Development Company, about 1½ miles north.

**Binghamton (N. Y.) Railway.**—This company is working on an extension of the Leroy Street line down Beethoven Street to Main Street. It is planned to lay a track from Leroy Street north past the entrance to the park.

**Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company, Seneca Falls, N. Y.**—This company has a force of men reconstructing the track in Seneca Falls, beginning at Clinton Street and extending toward Waterloo, to which place the work will be continued, to connect with the improvements from Geneva. Oak ties will replace those now in use, and 70-lb. rails will be used in the place of those now down. The trestle will be filled and improvements made in the track bed in the vicinity of this fill.

**New York, N. Y.**—E. J. Duggan has been awarded the contract for furnishing and installing the electrical equipment for the overhead trolley system of the Blackwell's Island Bridge, his bid being the lowest, namely, \$95,845.

**\*Winston-Salem, N. C.**—It is stated that H. P. McKnight, lessee of Vade Mecum Springs, about 32 miles from Winston, will within 30 days start a force of men to work on building an electric railway from Winston-Salem to the Springs. Later, he declares, he will continue the line to Spray and Leaksville, provided the rights of way can be secured. Surveyors are already on the right of way which has been obtained.

**Cleveland & Indianapolis Interurban Railway, Norwalk, Ohio.**—It is officially announced that this road has been financed, so far as the branch from Norwalk to Bluffton is concerned. It is said that construction work will be started within a short time. The road will be built from Norwalk to Van Wert, thence to Decatur, Ind., and from there to Bluffton. J. Y. Todd, Toledo, Ohio, president.

**\*Belleville, Ont.**—It is said that application will be made at the next session of Parliament for the incorporation of the Belleville Radial Railway, a company to have power to construct and operate an electric railway in the city of Belleville.

**\*Altoona, Pa.**—It is stated that McDonough & Gavey, of New York, have undertaken to construct an electric railway from Altoona to Bedford Springs by way of Morrisons Cove and partly finance the scheme. Property owners along the proposed line or contiguous thereto have agreed to take one-fourth of the stock, and Altoona and Bedford capitalists will subscribe largely. The road will be 50 miles in length. Leaving Altoona the American Railways Company's line will be used to El Dorado. From that point the new line will pass through Duncansville, Hollidaysburg, Roaring Springs, Martinsburg, New Enterprise, Woodbury and other prosperous towns on the direct line to Bedford Springs. The estimated cost of the construction of the road, power plants and rolling stock is \$1,500,000.

**Chambersburg, Greencastle & Waynesboro Street Railway, Waynesboro, Pa.**—It is stated that the projected extension of this company's line from Greencastle to Mercersburg is being revived, and that the construction of the branch, either by the present company or an allied corporation, is being seriously considered. J. E. Wayne, general manager.

**\*Grove City, Pa.**—J. A. Jolliffe, of Charleston, W. Va., and J. H. Pizor, of Slippery Rock, are said to be interested in the construction of an electric railway from Butler to Slippery Rock, Grove City and Mercer. Cleveland capitalists are reported to be back of the project. The route has been surveyed a good part of the way.

**Southern Cambria Railway, Johnstown, Pa.**—It is stated that this company, together with the Pennsylvania Railroad and the County Commissioners, are to unite in the construction of a \$30,000 bridge at South Fork.

**Interstate Consolidated Street Railway, Pawtucket, R. I.**—This company has asked the approval of the Railroad Commission of a location in Newport Avenue and West Street, in the town of Attleborough, Mass.

**Houston (Tex.) Electric Company.**—This company has just completed and opened to traffic its extension to Harrisburg. The estimated cost of this new line is said to be \$90,000.

**Dallas, Tex.**—The Dallas Electrical Construction Company, 328 Commerce Street, Dallas, is reported to be in the market for 3 miles of relaying rails, 40 or 60 lb., also overhead material, etc.

#### POWER HOUSES AND SUBSTATIONS

**Denver (Col.) City Tramway.**—John Evans, chief engineer, writes that this company will build a new substation, which will necessitate the purchase of two 500-kw rotaries, transformers, etc.

**New York, N. Y.**—The Public Service Commission has approved designs for a substation at the west pier of the new Blackwell's Island Bridge, to cost \$10,000; a subway entrance in the small parkway in Delancey Street, on the loop, to cost \$12,000, and five markees, or covered ways, to subway entrances through private property at the Bowery and Canal Street stations on the loop, to cost \$1,900 each.

**Scioto Valley Traction Company, Columbus, Ohio.**—The ELECTRIC RAILWAY JOURNAL is advised that this company is in the market for a steam pump. R. Fullerton, purchasing agent.

**Seattle, Renton & Southern Railway, Seattle, Wash.**—It is stated that within 30 days the company will begin the construction of a power station at Columbia City, which will enable the company to increase the car service in the district lying between Columbia City and Renton. The new station will furnish 600 hp in addition to the current already obtained.

**Washington Water Power Company, Spokane, Wash.**—This company has recently awarded a contract to the I. P. Morris Company, Philadelphia, for the installation of four water wheels, each having a capacity of 9000 hp, with a head of water of 68 ft. The plant will be built on the Spokane River, 15 miles west of Spokane, to furnish electric light and power for towns in the vicinity of Spokane.

#### SHOPS AND BUILDINGS

**Dayton (Ohio) Street Railway.**—The Board of Public Service at Dayton has granted this company permission to erect its new car house at the corner of Lorain Avenue and Pritz Street. The structure will be of brick and one story in height. Work will be begun at once.

**Scioto Valley Traction Company, Columbus, Ohio.**—This company expects to award a contract during the next six weeks for the erection of a passenger station at Circleville. R. Fullerton, purchasing agent.

**Hanover & McSherrystown Street Railway, Hanover, Pa.**—This company is building a brick car house, 200 ft. x 45 ft. Three tracks will be used for storage and paint shop.

## Manufactures & Supplies

### ROLLING STOCK

**Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis.,** is in the market for 20 pairs of fenders.

**Dallas Electrical Construction Company, 338 Commerce Street,** is said to be in the market for two or four single-truck, single motor cars, double control.

**West Chester, Kennett & Wilmington Electric Railway, Kennett Square, Pa.,** has recently purchased from the Burnham-Williams Company, Philadelphia, one pair of heavy arch bar freight trucks.

**Sarnia (Ont.) Street Railway** has purchased one double-truck car body from the Ottawa Car Company. The equipment, consisting of four motors, was furnished by the Westinghouse Electric & Manufacturing Company, Hamilton. The trucks were purchased from the Taylor Electric Truck Company, Troy, N. Y., and the overhead appliances from the General Electric Company, Toronto, Ont.

### TRADE NOTES

**Pennsylvania Steel Company, Steelton, Pa.,** has secured the contract for the new 8000-ton bridge for the Illinois Traction System over the Mississippi River at St. Louis.

**H. S. Bradfield** has been appointed general sales agent of the New York Car Wheel Company, with offices at 2 Rector Street, New York City.

**Edward B. Smith & Company, Philadelphia, Pa.,** announce the removal of their offices to the northeast corner of Broad and Chestnut Streets, Philadelphia.

**Cleveland Crane & Car Company, Wickliffe, Ohio,** having discontinued the manufacture of cars for many years past, and realizing the importance of a more descriptive firm name, will hereafter be known and operate as the Cleveland Crane & Engineering Company. Under this title its production will be confined to the manufacture of cranes of every description, including traveling, gantrys, mono-rail and grab-bucket handling equipment of various types.

**Elmer P. Morris Company, New York, N. Y.,** suffered a loss by fire in its offices at 72 Trinity Place, New York. Mr. Morris reports that many of his files were lost. He will commence immediately the rehabilitation of his office and announces that he has secured quarters at 90 West Street, room 1215. The fire will not delay in any way the shipment of orders pending, as the work at the company's factory is in no way affected by the conflagration. Neither will it affect the execution of new orders.

**R. W. Marshall & Company, New York, N. Y.,** have issued under date of Oct. 10 a list of cars, trucks, motors, controllers, armatures, engines, boilers, etc., which they have for sale. The rolling stock listed includes 16 22-ft. closed cars, 31 18-ft. closed cars, 5 combination cars, 29 semi-interurban cars, 4 combination baggage and passenger cars, 4 new car bodies, 26 Brill semi-convertible cars, 8 new interurban cars, a Ruggles rotary snow plow, etc.

**C. N. Wood, Wilson Trolley Catcher Company, Boston, Mass.,** states that the orders for over 1400 Wilson catchers, mentioned on page 1163 of the DAILY ELECTRIC RAILWAY JOURNAL for Oct. 16, were for the Chicago Railways Company and not for the Chicago City Railway. The Wilson Trolley Catcher Company has also received an order for 2500 catchers from the Boston Elevated Railway and one for 235 from the United Railways, St. Louis.

**Raymond Concrete Pile Company, New York and Chicago,** through Chas. F. Uebelacker, chief engineer of the Metropolitan Street Railway, New York, has been awarded a contract for placing Raymond concrete piles in the foundations of the new car houses that are to be erected by the Metropolitan Street Railway at Fifty-fourth Street and Ninth Avenue, New York. The Philadelphia office of the Raymond Concrete Pile Company has been moved from the Arcade Building to Suite 1330, Land Title Building.

**Peter Smith Heater Company, Detroit, Mich.,** announces the consolidation of the Peter Smith Heater Company and the Franklin Car Heating Company, of Syracuse, N. Y. The plant of the latter company at Syracuse will be abandoned and all manufacturing will be done at the rebuilt plant of the Peter Smith Heater Company in Detroit. Daniel W. Smith and Elmer J. Smith will have charge of sales in the Western territory, with offices at Detroit, and K. D. Hequembourg will act as Eastern representative, with offices in New York. The consolidation of these companies, with the increased facilities, will, it is expected, materially improve the product and insure promptness and dispatch in the filling of orders.

## ADVERTISING LITERATURE

**Western Electric Company, Chicago, Ill.**—This company has issued Bulletin No. 5910-8, which has for its subject Electrical Equipment for Mines.

**C. F. Massey Company, Chicago, Ill.**—A catalog by this company describes its anhydric water-proof concrete products, including battery wells, battery chutes, pipe carrier and other foundations. The company's battery wells are reinforced according to a patented system designed to give a maximum of strength or rigidity and a minimum of weight of material.

**Sterling-Meaker Company, Newark, N. J.**—The Giant brake and the Sterling patent roller bearing trolley bases are described and illustrated in publications issued by this company. The company says that so far as the parts and dimensions of the Giant brake were borrowed, they were taken from the Sterling safety brake, which it owns, and that such parts were chosen because many years of service had proved them to be best adapted for their respective purposes. The description of the trolley base is very thorough and covers the contacts, tension pivoting, bearings, lubrication, etc. Detail drawings of the base are also presented.

**Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.**—This company has issued Bulletin B, which has for its subject Westinghouse Nernst multiple glower lamps. The bulletin says that the new Westinghouse Nernst lamp offers, in addition to the four single glower units described in Bulletin A, namely, 66, 88, 110 and 132 watts, multiple glower units representing the same notable improvements and differing from the small units only in the necessary details of construction. The glowers in the new units, however, are identical in construction with the glowers used in single glower units. The connection, ballast, holder, glowers, globe holder and reflectors are all described, and a distribution curve is presented of the four-glower lamps. The different lamps are all listed together with the prices.

**J. G. Brill Company, Philadelphia, Pa.**—*Brill's Magazine* for October, dated Oct. 15, is a special issue in honor of the convention of the American Street & Interurban Railway Association at Atlantic City. The feature of the issue is a description of the interurban system and cars of the Lewistown, Augusta & Waterville Street Railway. The rolling stock of this company includes some exceptionally fine cars with observation platform, designed with the idea of making them attractive to tourists. A double-page illustration in the center of the magazine shows Young's pier at Atlantic City at night with the Brill convention exhibit in the foreground. A description of the exhibit accompanies the picture. "Rebuilding Cars to the Pay-as-You-Enter System" is the title of an article in which are described the methods employed by the G. C. Kuhlman Car Company in converting 94 cars of various types for the Municipal Traction Company, Cleveland. The company announces that it has just mailed to the technical schools and colleges throughout the United States an announcement of an offer of three prizes for these on the subject "Design of an Electric Car for City Service." The prizes are, respectively, \$250, \$150 and \$100, and it is hoped that senior students will choose the subject in connection with their regular senior thesis work.

## ELECTRIC RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED OCT. 13, 1908.

**Hose Bridge, 900,690;** Moses T. Andrick, Terre Haute, Ind. App. filed April 12, 1908. A permanent concrete conduit built under the rails in the roadbed and having suitable hinged covers.

**Circuit Controller, 900,699;** Alexander Bevan, Providence, R. I. App. filed Sept. 16, 1907. A circuit controller of the type for operating electric street railway signals. Is designed to be used to control a single circuit or two separate circuits. Has separate circuit controlling levers on each side actuated by a single handle movable to three positions.

**Arm-Rest, 900,702;** Edward G. Budd, Philadelphia, Pa. App. filed Sept. 6, 1906. An arm-rest consisting of two sheet-metal parts secured together at their edges and pressed to provide on each part a body portion and a flange extending entirely around the same and turned at an angle thereto and to form an integral projection on the bottom of the arm-rest adapted to coact with the upper end of a seat-end to secure the arm-rest in position.

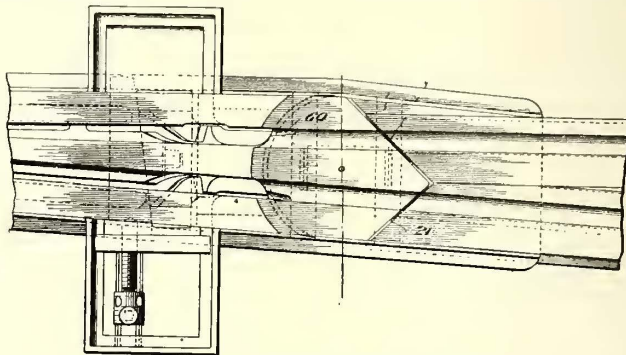
**Arm-Rest, 900,703;** Edward G. Budd, Philadelphia, Pa. App. filed Sept. 6, 1906. Consists of two sheet-metal parts having abutting edges, each of said parts being pressed into form to provide a body portion and an integral inwardly turned flange about said body portion, a metallic strip un-

derlying the abutting edges of said parts and means securing said edges to said strip.

**Arm-Rest, 900,704;** Edward G. Budd, Philadelphia, Pa. App. filed Sept. 25, 1906. Comprises an upper part formed of non-metallic material and a lower part made of metal, said upper part having a tongue on the bottom thereof entering within the lower part, and the side walls of said lower part having ribs therein with which the end of said top is adapted to coact.

**Amusement Device, 900,749;** William B. Leonard, Chicago, Ill. App. filed Feb. 8, 1908. A plurality of cars pivotally suspended from an endless carrier and means for so adjusting the supports for the carrier that the course may be varied.

**Tie-Tamper, 900,721;** Frank L. Gilroy, Buffalo, N. Y. App. filed Nov. 26, 1907. A tie-tamper adapted to be slid along the rails and clamped thereto at any desired point, the tamping devices being operated by fluid under pressure and supported from the rails upon a transverse member upon which they may slide.



Railway Switch—Pat. No. 901,254

**Controlling Means for Air Brakes, 900,752;** George Macloskie, Schenectady, N. Y. App. filed March 5, 1908. An arrangement whereby both valve and contacts may be operated from a single handle without producing any unnecessary wear on the valve. The connections between the handle or operating member and the valve are so arranged as to permit movement of said handle or member to operate the switch contacts without movement of the valve.

**Car-Replacer, 900,838;** Samuel N. Ellenwood, Jones, Okla. App. filed April 20, 1908. Details of construction.

**Safety Appliance for Electric Railways, 900,958;** Robert K. Richardson, Brooklyn, N. Y. App. filed Sept. 21, 1907. A means for protecting third-rails consisting of a plurality of hinged shields adapted to close over the rail, said shields being separated by the passage of the collector shoe and thereafter closed by spring means.

**Wear Plate for Railway Ties, 900,982;** Simon Clary, Carnegie, Pa. App. filed Jan. 11, 1908. The wear plate has spike apertures extending therethrough and a plurality of ribs on its under surface which extend continuously across the plate transverse to the grain of the tie.

**Combined Rail Joint and Anti-Rail-Spreader, 901,026;** Alfred H. Newpher, Chicago, Ill. App. filed June 22, 1907. The fish-plates have depending flanges which are secured in a rod or plate extending under both rails.

**Safety Guard for Trolley Wheels, 901,027;** Frank J. Nolan, Buffalo, N. Y. App. filed Sept. 13, 1907. A pair of depending inclined plates are positioned alongside the trolley conductor so as to guide the wheel thereon in passing hangers.

**Rail Fastener, 901,128;** David H. Turnbaugh, Altoona, Pa. App. filed Sept. 11, 1907. Means for securing railway rails to metallic ties.

**Bumping Post, 901,196;** August E. Schultz, Chicago, Ill. App. filed May 28, 1908. The bumper is supported at the vertex of a pyramidal construction formed by four ordinary traction rails.

**Cab Signal System, 901,250;** Daniel J. McCarthy, Wilkesburg, Pa. App. filed May 19, 1908. A cab signaling system adapted to be used independently of or in conjunction with an automatic block signaling system, and which, when used in conjunction with such systems, will give an indication within the cab of a locomotive in advance, and also in the block in which a train is located.

**Railway Switch, 901,254;** Henry B. Nichols, Philadelphia, Pa. App. filed Sept. 12, 1906. The switch has a pinless tongue seated on the body portion and having a centering bearing at its extreme rear end and rigid means forward of said bearing and intermediate the ends of the tongue for holding the tongue back against the bearing.