Street Railway Journal

VOL. XXIX. NEW YORK, SATURDAY, MARCH 30, 1907 No. 13.

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

MAIN OFFICE:
NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:
Chicago: Monadnock Block.
Philadelphia: Real Estate Trust Building.
Cleveland: Schofield Building.
London: Hastings House, Norfolk Street, Strand.

Cable Address, "Stryjourn, New York"; "Stryjourn, London"—Lieber's Code used.

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Canada, Mexico and the Canal Zone

Street Railway Journal (52 issues).....$3.00 per annum
Single copies ..... 10 cents
Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—Feb., Aug. and Nov.).....$4.00 per annum
Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks. 31 francs.
Single copies ..... 20 cents
Remittances for foreign subscriptions may be made through our European office.

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Changes of advertising copy should reach this office by 10 a. m. Monday preceding the date of publication, except the first issue of the month, for which changes of copy should be received two weeks prior to publication date. New advertisements for any issue will be accepted up to noon of Tuesday for the paper dated the following Saturday.

Of this issue of the Street Railway Journal 8000 *copies are printed. Total circulation for* 1907 *to date* 106,150 *copies, an average of* 8165 *copies per week.*

Auxiliary Wiring on Pole Lines

On many electric roads little or no attention is paid to the maintenance of auxiliary wiring on pole lines until a breakdown occurs which ties up telephone, signal or lighting equipment and sends an emergency crew up and down the track at a feverish pace in the effort to get things going again. As a road develops, particularly in long-distance interurban service, there is a tendency for small wires for special purposes to multiply, and if care is not taken to install these auxiliary circuits according to the best standards of insulation and mechanical support, trouble is invited.

Crosses between telephone and signal wires, breakages of important leads for lighting or private communication, or in the event of a heavy storm or high wind, the tangling together of high and low-tension circuits are all most annoying from the operating standpoint. Sometimes it is these smaller troubles which cause the most exasperating delays to traffic. It is a simple matter to remedy bad conditions of this kind when they are discovered, and it needs but a little courageous inspection to locate weak spots. One of the truest mechanical axioms is that a sound job looks right; its proportions are acceptable to the eye. When telephone cables, signal circuits, lighting loads, pilot wires, feeders, trolley suspension and high-tension conductors are concentrated on a single pole, with the auxiliary lines running every which way according to no definite right angle or parallel scheme, the conditions are favorable for a tie-up that will cost the road more in lost earnings than would have been needed to properly maintain the auxiliary circuits for months.

The Public Utilities Bill

The general movement all over the country in favor of a closer supervision of public service corporations has found its outcome in national affairs in the enlarged powers of the Interstate Commerce Commission, and is represented in New York State by the public service or public utilities bill now before the Legislature. The abstracts which we have previously published of this very sweeping measure indicate that its sponsors contemplate a very radical change in the present methods of supervising and controlling the energies of the different public service corporations within the State. So far as the transportation interests of the State are concerned, it will be remembered that in the past the companies have been largely under the supervision of the State Board of Railroad Commissioners, a body which has existed for some twenty-five years. In New York City, however, there was the somewhat anomalous condition that while the surface and elevated railway companies reported directly to the Railroad Commission, the subway was built under the direction of an entirely independent board, the Rapid Transit Commission, and that to this latter body has been consigned the work of planning new rapid transit lines.

Under the proposed bill both of these existing boards will be legislated out of office and an entirely new body will exercise all of the privileges of both, as well as many not previously entrusted to either. It will have power, in some cases with the approval of the local authorities and in some cases without, to fix the fares and rates to be charged by the railway companies, to dispose of new franchises, to conduct investigations, to prescribe what the board considers

adequate service, to require changes in methods, and so on. Similar powers are given over the gas, electric and other public service corporations. For convenience in administering these functions two separate and independent commissions are to be appointed—one for New York City, the other for the rest of the State.

It will easily be seen that powers so extensive as those contemplated can be productive of a tremendous amount of good or evil to the communities served, depending upon the character and wisdom of the administrators. If a despotism was omniscient and impeccable it would be the best sort of government, and the same is true in regard to the powers of a commission. Street railway companies in the past have been the chief sufferers from a divided responsibility in matters of this kind, as it has often prevented them from introducing in their service improvements which were required by the needs of the community. The power to grant franchises and permit other necessary extensions in American municipalities is usually limited in so many ways that such concessions are difficult to obtain even when their necessity is generally recognized. This has been shown in Chicago, where the desirability of a working and business agreement under which the companies could make improvements has been apparent for a long time, but no body or individual in the municipal government has been able or willing to take the responsibility of settling the trouble. It has also been exemplified in connection with the East Side Bronx transportation situation, where, as shown in recent issues of this paper, there is a crying need for additional facilities. We have always believed that the chief danger to the transportation companies of to-day is their vulnerability to irresponsible attack by sensational newspapers or demagogues and in being held responsible for conditions which they would be glad to alleviate if they could. Any investigation of the New York City conditions by an impartial tribunal with power to apply remedial measures cannot but be beneficial to the transportation enterprises, because the need for transportation is so great that such examination must result in the grant of better facilities.

A despotism, however, has its dangers as well as its advantages. If the new commissioners administer their office in an intelligent, broad-minded way they can be of great service to the community. If, however, arbitrary power is accompanied by a tyrannical use of it, the interests of the city and State will suffer. For this reason we fear that the remarkable clause which seemingly aims to put the commission above the law by making its rulings binding until they are reversed by court procedure offers under possible conditions chances for a serious miscarriage of justice. Of course it would be unconstitutional to give binding force to the unreasonable regulations of any commission, but it is equally important to the entire community that quick redress should be granted for every wrong done. As the personnel of a commission of this kind must change from time to time we hope that this aspect of the situation will be considered by the Governor.

We are in a sense on the threshold of a new order of corporate administration. Whether rightly or wrongly, the sentiment seems to be that the public should take a closer interest and direction in the affairs of public service corporations. As a broad proposition we believe that the railway companies will benefit by such supervision if intelligently administered. The principal troubles in the past have come from being misjudged, and if the new era results in a better general knowledge of the policy and methods of the railway companies it cannot but be beneficial in setting them right in the eyes of the public.

Converting Apparatus

The discussion at the Institute meeting last Friday took up matters which are of direct interest to street railway men. The main subject under consideration was the relative desirability of the various converting methods, and, in addition, the practicability of winding large generators for pressures as great as 20,000 volts. The former subject was initiated by a paper from Mr. Lincoln favoring the synchronous converter, the latter by a discussion of the practical features of the problem from Mr. Behrend. The two topics are in a measure interconnected, since motor generators can be wound for the transmission voltage if not too high, and synchronous converters must work through a bank of transformers. In many cases, therefore, motor generators have an advantage in simplicity of plant and especially in the avoidance of switchboard complications. Year by year the relative cost of switchboards has increased until it has become a very serious amount, making switchboard economy almost as necessary a matter to consider as generator efficiency or first cost. The synchronous converter has become so thoroughly entrenched in American practice that it is pretty near to lèse majesté to criticise it, yet in view of the facts now available one must admit that its rule cannot much longer go unchallenged even if there is no open revolt.

To begin with, it must be admitted that railway work is the best hold of the synchronous converter. In such service practically all the energy generated is transformed to d. c. at present, and there is no need of precise voltage regulation upon the working circuits. Moreover, the service is fairly continuous and machines do not have to be frequently stopped and started. Mr. Lincoln's paper is not limited, however, to railway working, so that these favoring facts are lessened in importance. He lays great stress on two phases of the matter which are fairly open to debate, to wit: reliability and efficiency. On the former count he gives the synchronous converter a good record, estimating that if in a given period of service a synchronous converter would be out of service ten hours, an induction motor generator would be out fourteen hours and a synchronous motor generator about seventeen hours. This is important if true. Something must be assumed in such a case as to the existence or non-existence of transformer outfits with the latter machines. If these had no transformers but were wound for 6000 to 10,000 volts, as may well be the case, we should be inclined to think that the induction motor generator would make a better showing than the synchronous converter, and the synchronous motor generator one nearly or quite as good. A motor either synchronous or induction is a wonderfully reliable machine and a simple d. c. generator is so much less liable to trouble than a synchronous converter as to more than make up for the presence of the

added machine when one takes account also of the transformer bank and the added switchboard complications. Even admitting the use of transformers in all three cases, Mr. Lincoln's estimate seems unduly favorable to the synchronous converter even at 25 cycles.

In point of efficiency Mr. Lincoln's estimates run as follows for all-day efficiency at a load factor of about 75 per cent. Synchronous converter, 93 per cent; synchronous motor generator, 85 per cent; induction motor generator, 84 per cent, assuming units of about 500 kw. To get the first-named figure including the transformers would require the machine itself to have about 96 per cent efficiency at 75 per cent output. We know several railway men who would be glad to get machines on this sort of guaranty, but we fear they will have to wait a while. Taking out the transformers from the figure quoted the net efficiency would be about 90 per cent, which is quite as high as the facts would warrant. On the other hand, in 500 kw units 80 per cent is low for a motor generator properly designed for its work, and comparing the machines on the basis of high-voltage motors we think the difference here cited would be practically cut in two. On the same supposition the first costs of the equipments, including switchboards, would be nearly or quite on a parity. Parshall and Hobart in their recent book show in fact a balance in favor of the motor-generators when wound for high voltage. The extreme difficulty of getting accurate voltage regulation in a synchronous converter on account of the nearly complete interdependence of the a. c. and d. c. voltages is a practically fatal objection to this apparatus on lighting systems whatever its cost, so that this phase of the case may be dismissed. On railway systems, however, the case is different, since with suitable care in designing and operating the transmission system a fairly satisfactory regulation can be attained. The question then reduces itself to a comparison of efficiency, cost and general convenience, which is more favorable to the synchronous converter.

Mr. Behrend, whose opinion is entitled to much respect, holds that in modern turbo-generators of large capacity, say 10,000 kw and above, the armature can be successfully wound for as much as 20,000 volts, and has backed up his theory by building a 150-kw three-phase generator for 25,000 volts and working it successfully. It is notable that even in this small machine the loss of efficiency over one for 2300 volts is only about 3 per cent, no more than would be lost in raising transformers. In large units the loss in efficiency would be much less, and the problem of insulation much simpler. In most cases it would be feasible then to use high-voltage generators and motor generators if desirable. It seems to us, however, that, admitting the gain in simplicity in using motor generators, the loss of 4 or 5 per cent in actual efficiency is not compensated by the gain in regulation, especially since on long lines it is desirable to use not 20,000 volts but 40,000 to 60,000 or more, which would necessitate transformation in any case. It is of course doubtful whether d. c. will remain a necessity on systems having transmissions of this class, but assuming that it may, it seems to us that unless in enormously long transmissions the synchronous converter has rather the advantage. It has more to fear from the cascade converter and from the permutator than from ordinary motor generators. The permutator has an efficiency materially greater than any other equivalent device and is particularly good at light loads. If it can be built in large sizes it certainly must take an important place. The synchronous converter seems to us likely to be used less rather than more as time goes on, but for railway service it is excellently well suited. There may arise cases in underground distribution where the motor generator may be valuable for regulative purposes, and other special uses certainly exist in which it has advantages over the synchronous converter, yet for the rough-and-tumble conditions of electric railroading the latter machine is too effective to put aside without many another hearing.

Cars for Branch Line Service

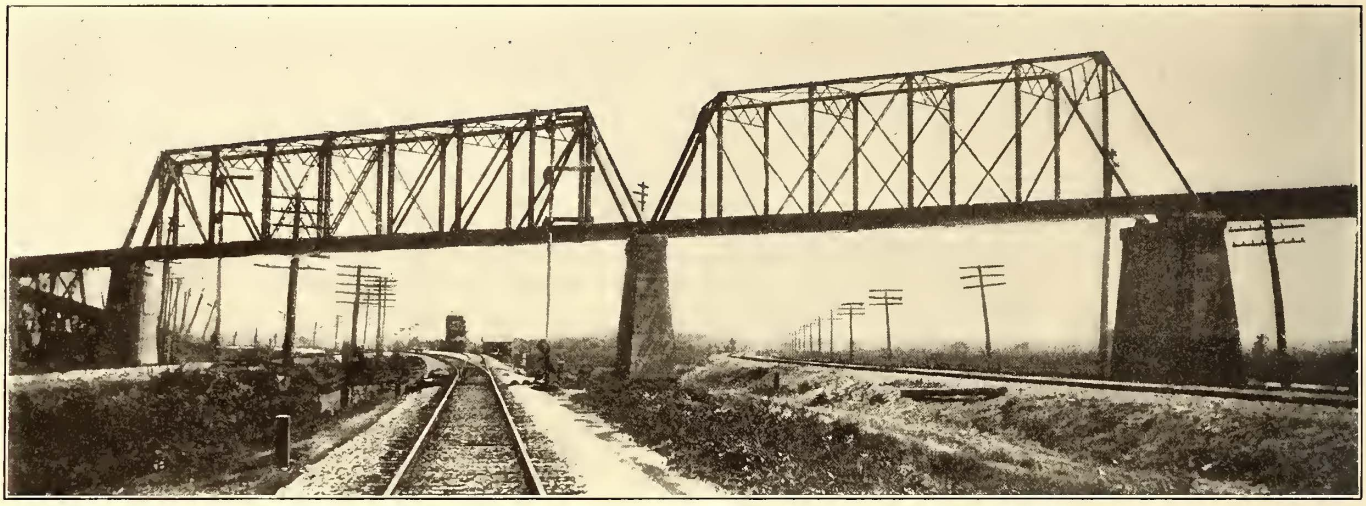
The type of car best suited to branch line service is a difficult problem to solve on many interurban roads. Of course, a great deal depends upon the character of the communities in which the branch lines operate, and upon the relative volume of the main line and branch traffic. On steam railways the well-nigh universal practice of relegating the older and partially worn-out equipment to the branch lines causes little comment from the public, but in electric service the standards are considerably higher. If competitive traffic is to be captured, the rolling stock must be reasonably comfortable and capable of running at maximum speeds of 30 or 35 m. p. h. if the branches are more than a mile or two long. The contrast between main line and branch service must not be too great if the public's opinions are to be held favorable.

There is no doubt that the reduced weight and lessened power requirements of single-truck cars, coupled with their lower first cost, incline many managers toward their use on lines where the traffic is light. But the rising standards of comfort demanded by the latest service favor the double-truck car for branch line work, though it may rightfully be designed from 10 ft. to 25 ft. shorter than the connecting rolling stock of the main line, and in most cases equipped with two motors instead of four. Multiple-unit control is a desirable specification for branch line cars, on account of the ease with which it enables heavy traffic peaks, excursions, etc., to be handled.

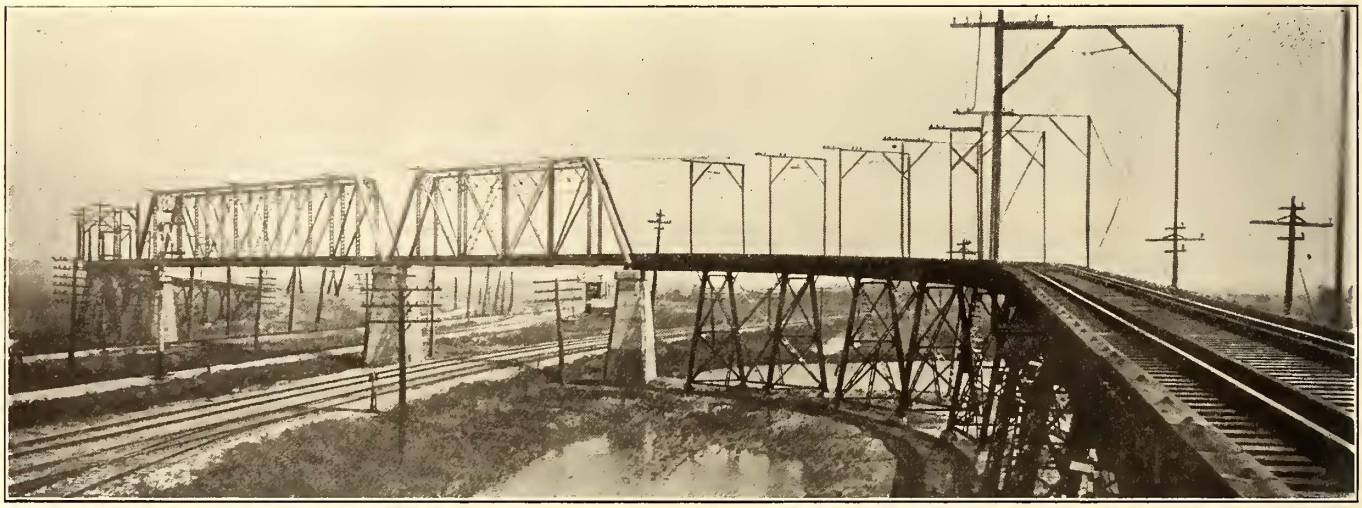
It is a question if it is not wiser to specify a certain class of double-truck car for branch service, buying these new and working them steadily during their life, than to operate superannuated main line cars on the branches. A multiplicity of car types on an interurban road makes the work of the shops more difficult, on account of the enormous number of spare parts which have to be kept in stock, but there is little disadvantage in operating three or four types on a road embracing say from 50 miles of track upward. Local conditions may modify the type best suited for a given road, but in general the same scheme of seating arrangement, smoking and baggage compartments can be followed with profit on both main line and branch rolling stock. The motors can usually be the same on both equipments, double or quadruple as the case may be. Uniformity in rolling stock is hard to attain in these days of changing car designs, but it is worth striving for in a broad way.

SOME CONSTRUCTION AND OPERATING FEATURES OF THE ALTON, GRANITE & ST. LOUIS RAILWAY

The Alton, Granite & St. Louis Railway, no doubt, has a greater number of overhead railway crossings and a greater total length of viaducts than any other Western interurban system of equal mileage. This road operates between East St. Louis, Alton and Edwardsville, Ill. It was built by the Alton, Granite & St. Louis Traction Company in 1904, with J. G. White & Company, of New York, as construction engineers. In the spring of 1906 it was acquired by the East St. Louis & Suburban Company and it is now under the management of the East St. Louis & Suburban Railway system, of which L. C. Haynes is vice-president and general manager and G. C. Pierce is general superintendent. It is operated as a division of this company with R. W. Bailey, former electrical superintendent at East St. Louis, as superintendent of the division. Mr. Bailey has his office at Alton.



VIEW SHOWING ANGULARITY OF CROSSING TRACKS ON MITCHELL VIADUCT



MITCHELL VIADUCT WITH CURVES ON BOTH APPROACHES

THE VIADUCTS

The tracks of the system form a "Y," the junction of the branches to Alton and to Edwardsville being at Mitchell. Between East St. Louis and Alton the tracks of ten different steam roads are crossed. Fortunately, however, some of the systems parallel one another and this lessened the number of separate crossings required. On the whole system, which includes 34 miles, there are seven separate railroad crossings, six of which are viaducts, having an aggregate length of 4440 ft. One has a maximum height of 60 ft. There is only one grade crossing with steam roads, and this is protected by an interlocking system.

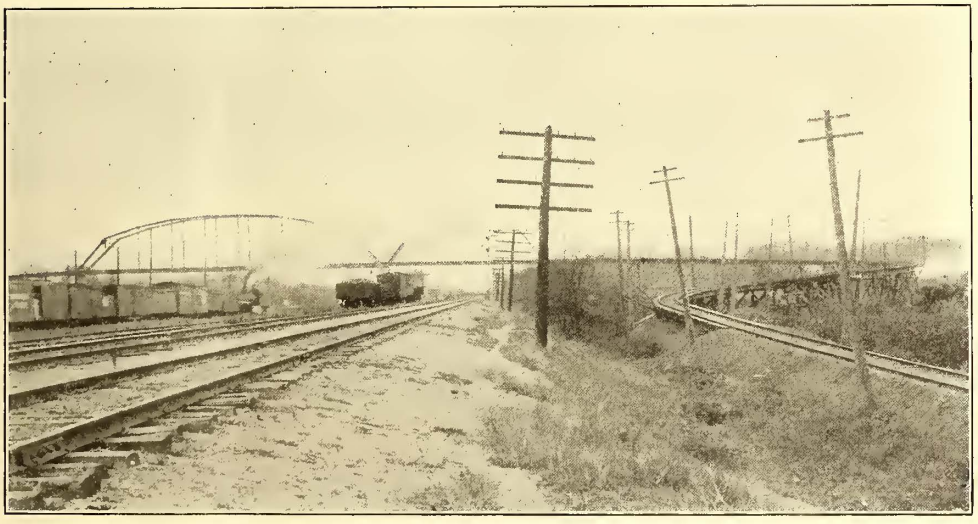
The longest of the viaducts over steam roads is that one near the terminal in East St. Louis. Immediately over the nine tracks which it crosses are two riveted steel spans, one 112 ft. 6 ins. long and the other, an incline top chord Pratt truss, 237 ft. 4½ ins. long. These spans rest on concrete piers at a height of about 25 ft. above the steam road tracks. The steel approaches are made at a 4 per cent grade and are 930 ft. long. The north approach is straight, but the one on the south, which is a temporary one, contains a reverse curve of 200 ft. radius. This approach will be changed shortly to run straight from the viaduct to the tracks of the East St. Louis city system and the curves will be eliminated. On the steel portion of the approaches to this viaduct, as well as the others, the trolley wires are carried on a steel framework. A short distance south of Madison are two viaducts, the southernmost of which crosses the tracks of the Troy & Eastern Railroad at a point where the steam road itself is on a high embankment. The dirt embankment of the electric line is carried up to the level of the steam road tracks and the additional elevation of the electric road tracks is obtained by means of pile trestle approaches.

The other viaduct in Madison, which has a total length of 1009 ft. and is 30 ft. high, consists of a central portion of three steel spans 195 ft. 6 ins., 237 ft. 9 ins. and 126 ft. long, respectively, and approaches which are each built on a 4 per cent grade and are 450 ft. long.

Immediately north of the junction at Mitchell, the Wabash, Big Four and the Chicago & Alton Railroads are crossed diagonally by a steel viaduct, both approaches of which contain curves. The total length of the steel portion is 1050 ft. It consists of two central spans 166 ft. long and approaches built on a 3 per cent grade. One approach contains a curve of 200 ft. radius and the other a 222-ft radius curve. The maximum height of this structure is 30 ft. The tracks of the Chicago & Alton Railroad are crossed by a viaduct about one mile east of the Alton terminus. This structure consists of a single bridge span resting on concrete piers, a steel girder approach on one side and an approach formed of a dirt embankment on the other.

The only viaduct on the Edwardsville branch is that one over the Chicago, Peoria & St. Louis Railroad at Edwardsville. The structure, however, was occasioned by the deep valley or ravine, which is crossed by the electric line, rather than by the presence of the steam road. The steam road tracks under the structure are on an embankment 31 ft. higher than the tops of the foundations of the steel structure, but the banks of the ravine are of such a height that the viaduct, although built with level approaches, crosses the steam road at a height of 23 ft. The steel structure, which is 1100 ft. long, consists of a middle bridge span 150 ft. in length and two approaches made up of fifteen 30-ft. and ten 50-ft. girder spans. The spans are supported on steel towers resting on concrete piers. The maximum height is 60 ft., while the average height is about 40 ft.

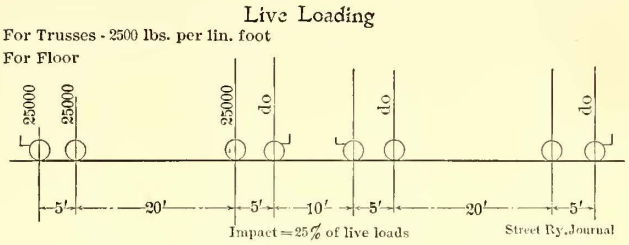
All of the longer viaducts were built by the American Bridge Company. The trusses are designed for a loading of 2500 lbs. per lineal foot, while the floors are designed for a train of two 50-ton cars. In addition to the viaducts mentioned, the only other important overhead construction work is the bridge over the Wood River near Alton. This consists of a single span 120 ft. long and was built by the Kenwood Bridge Company.



EAST ST. LOUIS VIADUCT, SHOWING REVERSE CURVE ON SOUTH APPROACH

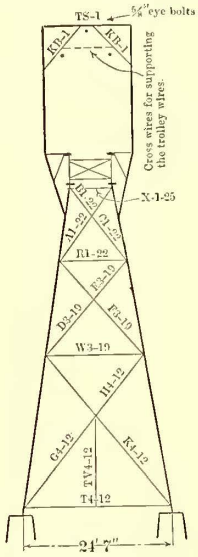
THE TRACK AND ROADWAY

With the exception of those on the approaches to the viaducts there are no grades on the line steeper than 1 per cent. With one or two exceptions all the curves outside of cities are of sufficient radius to permit the full-speed operation of cars around them. The right of way varies in width from 40 ft. to 60 ft. On the main line the track has been built on one side of the center of the right of way with a view of ultimately putting down a second track. Further provision has been made for two tracks by supporting the trolleys on span wires and placing the poles at a distance apart sufficient to accommodate the other track. Fills are 14 ft. wide at the top for single-track and 30 ft. for double track construction, while for single and double tracks cuts are respectively 26 ft. and 38 ft. wide.



LOADING DIAGRAM, EDWARDSVILLE SINGLE-TRACK VIADUCT

The main line is ballasted throughout with 8 ins. to 10 ins. of broken rock under the ties. A portion of the Edwardsville branch is ballasted with chatz. This material is finely crushed lime rock of a flint nature, and is the tailings from the zinc and lead mines in the mining district lying about 100 miles south of St. Louis. Rails 70 and 75 lbs. in weight and in 30-ft. and 33-ft. lengths are used. Some continuous rail joints are in service, but on the greater portion of the road standard angle-bars are employed. The joints are suspended and are laid broken. Turnouts, or sidings, are about 200 ft. long in the clear. They are all of the through type and are located at intervals of two or three miles. Elliot semaphore switch stands with oil lamps are used.



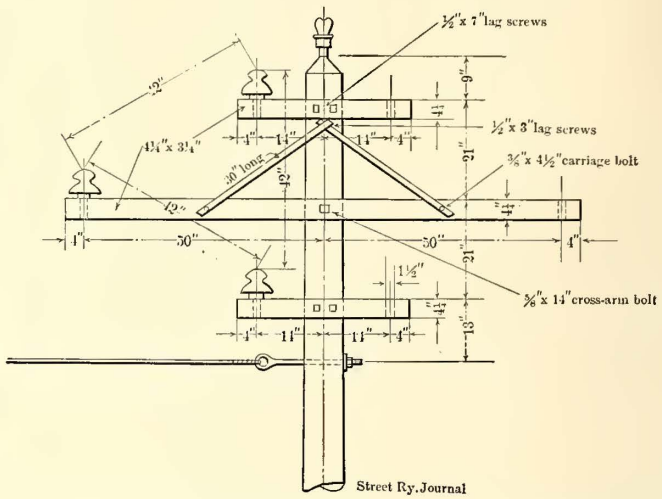
OVERHEAD CONSTRUCTION

Span wire trolley construction is used on the main line and bracket construction on the Edwardsville branch. The poles, which are placed 100 ft. apart, are extra heavy and are of Michigan white cedar. Double trolleys of 000 grooved wire are placed 18 ft. above the rail. Lightning arresters are located one-third of a mile apart, and in addition to having the usual earth ground are grounded to the rail.

Direct-current feeders are carried the full length of the line and consist mainly of 300,000 and 1,000,000-circ.-mil bare

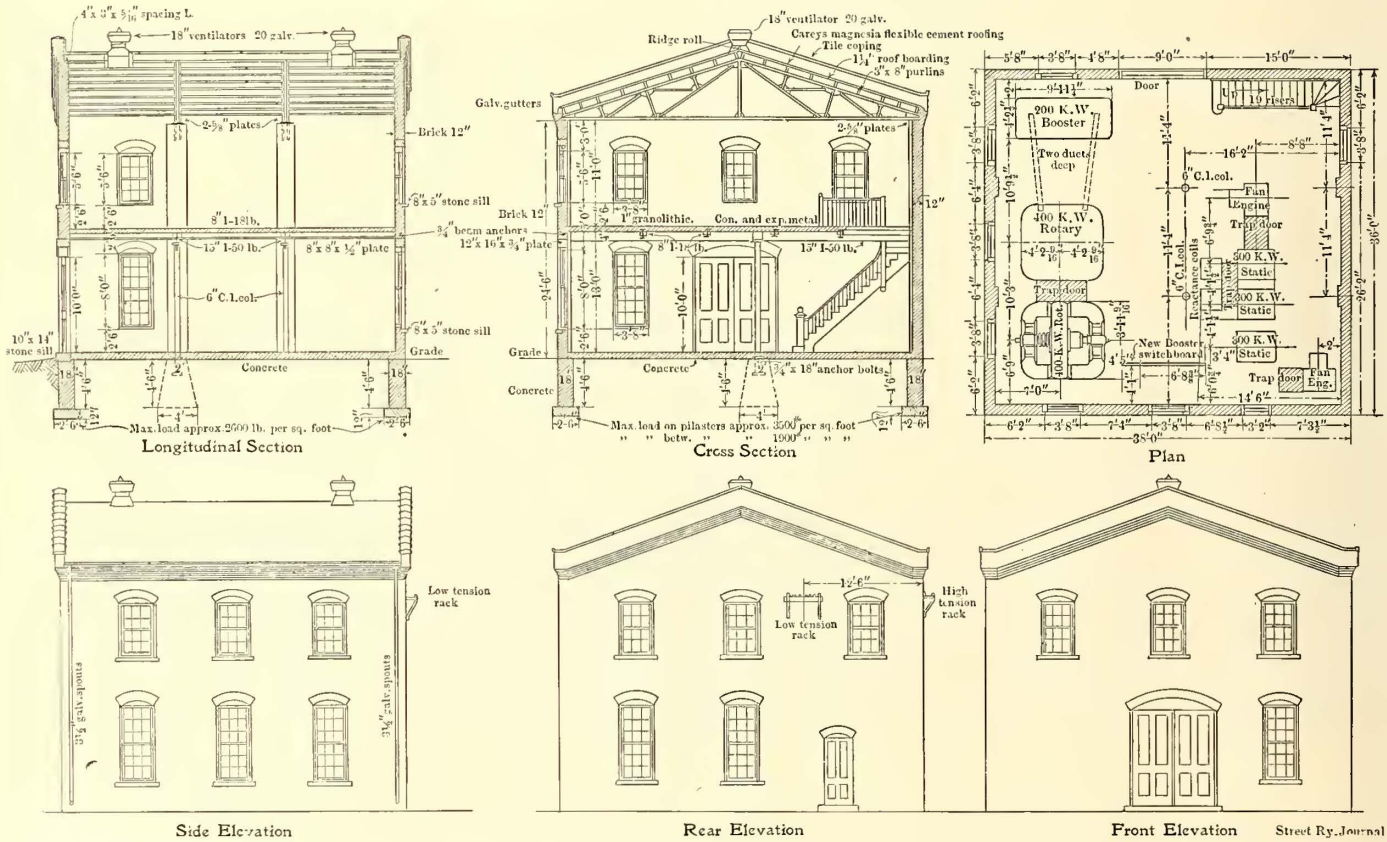
NORTH APPROACH OF THE EAST ST. LOUIS VIADUCT

200 volts to two sub-stations, one located at Granite City and the other a few miles south of Alton. The one high-tension line supplying these sub-stations consists of three No. 4 copper conductors supported on lock No. 18 glass insulators. The manner in which the high-tension wires



STANDARD POLE AND INSULATION LAYOUT FOR HIGH-TENSION WIRES

are carried on the poles is somewhat unusual. Three cross-arms, two of which are 3 ft. long and the third 9 ft. long, are employed. The arms are 25¼ ins. apart and one wire



PLAN AND ELEVATIONS OF THE TWO-STORY SUB-STATION OF THE ALTON, GRANITE & ST. LOUIS TRACTION COMPANY

aluminum cables. Taps to the trolleys are made at intervals of 1000 ft.

HIGH-TENSION FEEDERS AND SUB-STATIONS

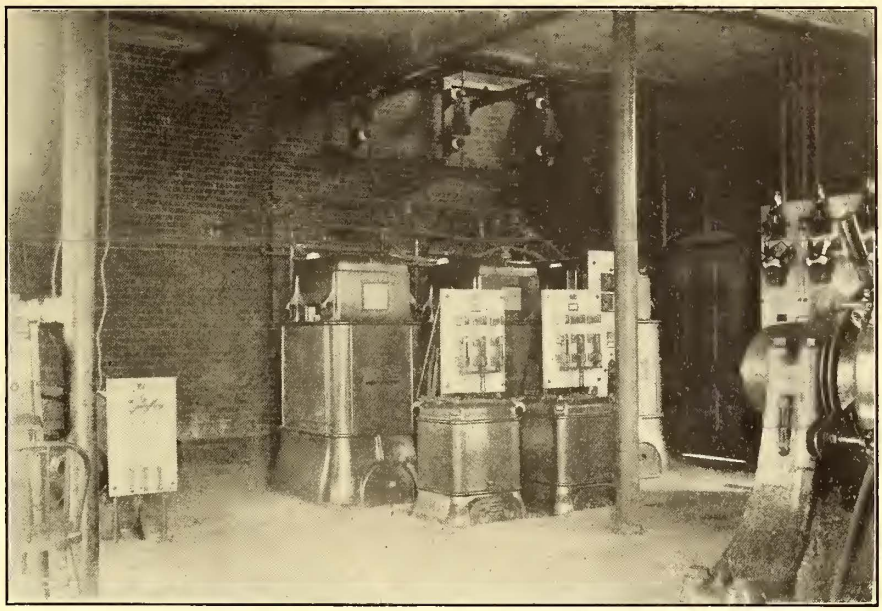
Current to operate the line is obtained from the power station of the East St. Louis & Suburban Company in East St. Louis. From this station current is transmitted at 13,-

is placed on the end of each cross-arm. This arrangement throws the three wires into a 42-in. triangle. The cross-arms are arranged for two circuits, but at present only one is installed. As a protection against lightning a No. 9 iron wire, which is grounded every 1000 ft., is carried on a ridge pin. At present this wire is run continuous, but it is

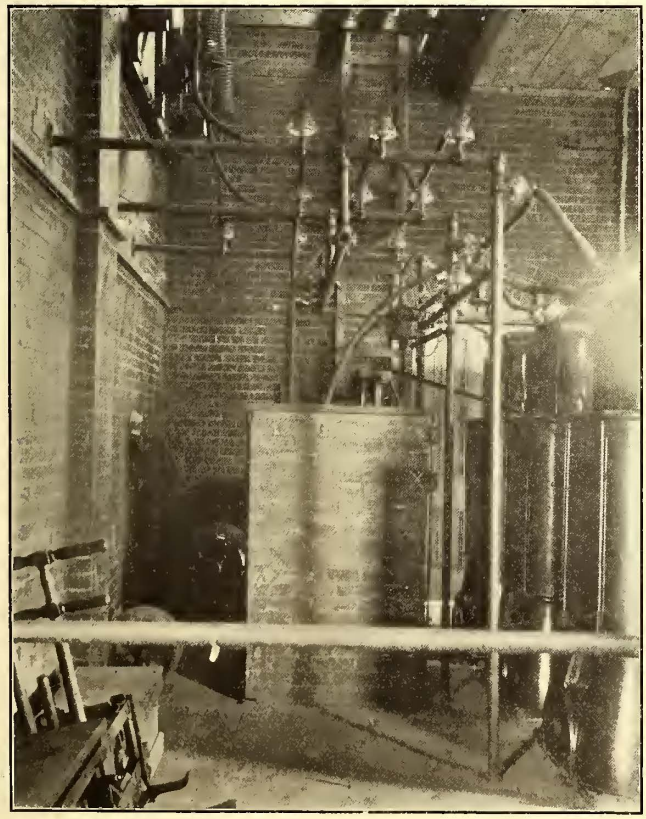
the intention to cut it in sections to prevent the generation of induced currents.

The two sub-station buildings are practically identical in construction with the exception of the fact that the one near Alton is only one story high while that one at Granite City has a second story. Both buildings have concrete foundations, pressed brick walls, concrete floors and steel roof trusses. In both stations the high-tension apparatus is grouped on one side of the building; the rotary converters are on the opposite side, and the switchboard is located near the rear wall so as to face the open spaces between the machines and the transformers. The high-tension apparatus, as well as the rotary converters, are of General Electric manufacture.

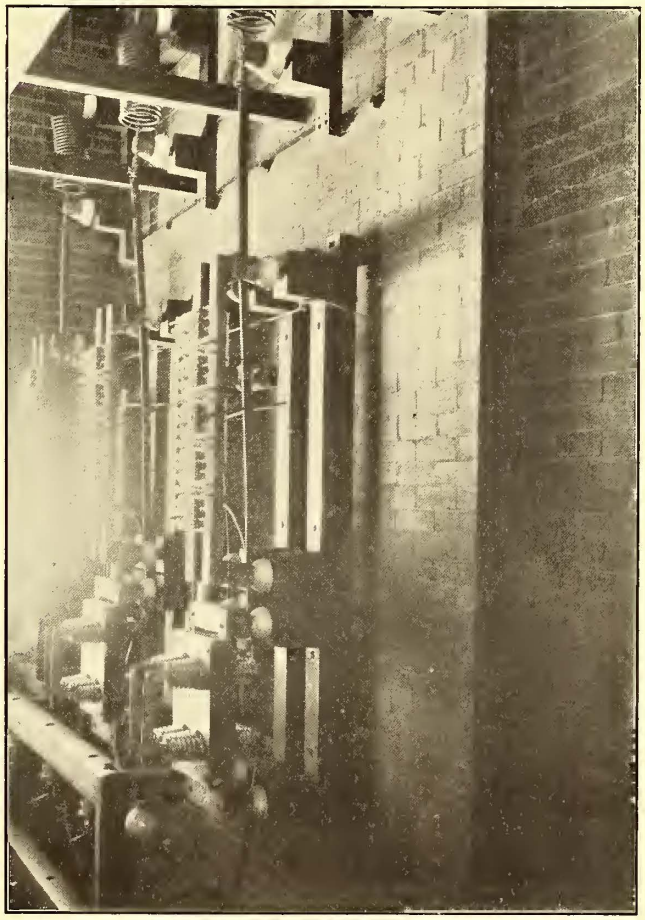
A somewhat unusual method was employed in bringing the high-tension wires into the building. Six or 8 ft. distant from the walls of the building, heavily insulated wires are substituted for the ones leading up to this point. The insulated wires are then carried into the building through porcelain tubes of practically the same diameter as the insulation on the wires. The relative location of all the high-tension apparatus in the stations is such as to permit the connecting leads between the lightning arresters, switches and tranformers to be exceedingly short, as is shown in an accompanying reproduction from a photograph. The transformers are air-cooled, two motor-driven fans being employed to supply the forced draft. The rotary converters are started from the a. c. side by means of double-throw switches through which current at 185 volts is supplied.



INTERIOR OF GRANITE CITY SUB-STATION, SHOWING TRANSFORMERS AND END OF THE SWITCHBOARD



HIGH-TENSION WIRING IN THE GRANITE CITY SUB-STATION



LIGHTNING ARRESTERS ON THE SECOND FLOOR OF THE GRANITE CITY SUB-STATION

The Granite City sub-station contains, in addition to two 400-kw rotary converters, a 200-amp. booster, which raises the voltage to 800 and is connected to a separate feeder, from which no taps are made until Mitchell junction is

reached. The other sub-station is equipped with two 300-kw rotary converters.

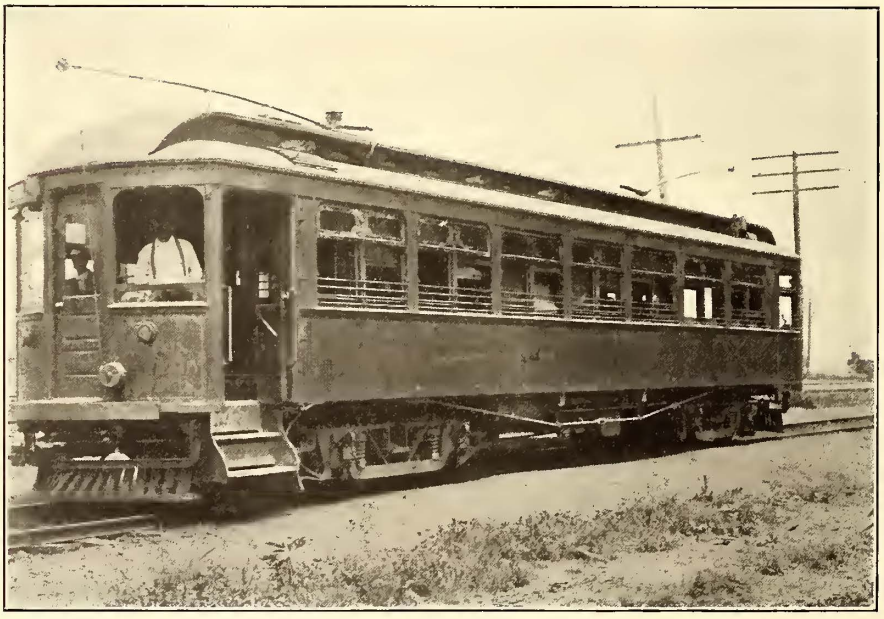
CARS

Eight interurban cars, all of the same type, are employed in the operation of the line. These cars are 52 ft. 9 ins. in length and 8 ft. 10 ins. in width over all. They are equipped with the GE-73 motors and GE multiple-unit systems of control. All are mounted on Peckham 40-A trucks, having

INTERURBAN STATION AT THE JUNCTION AT MITCHELL

38-in. steel-tire wheels. The gearing of the motors is such that a speed of 50 miles is frequently attained.

A car house at Alton is equipped with facilities for making light repairs, but all of the heavy work—such as turning wheels, changing gears and winding armatures—is done in the shops of the operating company in East St. Louis. A one-hour schedule is maintained over the whole line throughout the day. The cars are all in what is usually termed regular service; that is, they make all schedule stops.

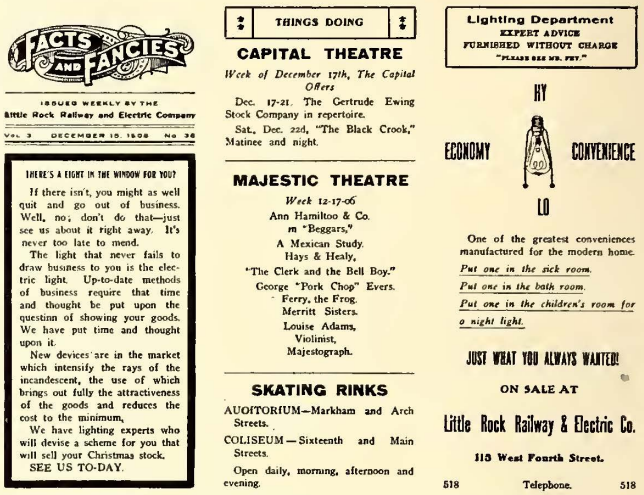


STANDARD PASSENGER CAR

No occasion has yet arisen for the inauguration of limited service. The regular cars, however, are operated at a speed approximately that of cars in limited service on many lines.

FACTS AND FANCIES AT LITTLE ROCK

All of the cars of the Little Rock Railway & Electric Company are provided with small cast-iron pockets on the side posts which are kept filled with the company's weekly publication, "Facts and Fancies." In the issues which are gotten up in the form of a folder, measuring about 2½ ins. x 6 ins., considerable space is devoted to the announcements of the theaters, of the skating rink, and of other places of amusement, while a portion is used by the lighting depart-


FACTS AND FANCIES

ISSUED WEEKLY BY THE Little Rock Railway and Electric Company

VOL. 3 DECEMBER 10, 1906 NO. 36

THERE'S A LIGHT IN THE WINDOW FOR YOU?

If there isn't, you might as well quit and go out of business. Well, no; don't do that—just see us about it right away. It's never too late to mend.

The light that never fails to draw business to you is the electric light. Up-to-date methods of business require that time and thought be put upon the questinn of showing your goods. We have put time and thought upon it.

New devices are in the market which intensify the rays of the incandescent, the use of which brings out fully the attractiveness of the goods and reduces the cost to the minimum.

We have lighting experts who will devise a scheme for you that will sell your Christmas stock.

SEE US TO-DAY.

THINGS DOING

CAPITAL THEATRE

Week of December 17th, The Capital Offers

Dec. 17-21. The Gertrude Ewing Stock Company in repertoire.

Sat., Dec. 22d, "The Black Crook," Matinee and night.

MAJESTIC THEATRE

Week 12-17-06

Ann Hamiltoo & Co. in "Beggars,"

A Mexican Study.

Hays & Healy,

"The Clerk and the Bell Boy."

George "Pork Chop" Evers.

Ferry, the Frog.

Merritt Sisters.

Louise Adams, Violinist,

Majestograph.

SKATING RINKS

AUDITORIUM—Markham and Arch Streets.

COLISEUM—Sixteenth and Main Streets.

Open daily, morning, afternoon and evening.

Lighting Department

EXPERT ADVICE FURNISHED WITHOUT CHARGE

"PLEASE SEE MR. PEY."

HY

ECONOMY CONVENIENCE

LO

One of the greatest conveniences manufactured for the modern home.

Put one in the sick room.

Put one in the bath room.

Put one in the children's room for a night light.

JUST WHAT YOU ALWAYS WANTED!

ON SALE AT

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113 West Fourth Street.

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OUTSIDE PAGES OF THE LITTLE ROCK RAILWAY & ELECTRIC COMPANY'S WEEKLY FOLDER

ment of the company in such a manner as to further its interests. All announcements in regard to schedules or changes in the railway service are given to the public through this medium.

ELECTRO-MAGNETIC BRAKING ON SEVERE GRADES

Some interesting work in electro-magnetic track braking has been carried out on an electric railway in Germany between Elberfeld and Cronenberg, on certain portions of which the grades are over 10 per cent. The first type of brake used required a set of racks placed between the rails with which a gear wheel on the car body would mesh. When the car attained too high a speed this gear wheel would release a counterweight which in turn actuated a band brake. The latter required such heavy maintenance expenses that it was removed after four years' service.

The company is now using an electro-magnetic track brake with the standard shoes of the Allgemeine Elektricitäts Gesellschaft. Instead of braking on the running rails, however, the two shoes are applied on a pair of flat rails laid in the center of the track about 2 ins. above the pavement. The center rails were preferred because they had already been installed in connection with the rack system, they permitted any desirable area on the magnetic shoes, and as the rails are not continuous can be placed in circuit in advance to apply automatically when a severe grade is reached. Hence, the motormen are instructed to switch on the brakes at the head of a grade.

When the electromagnets of the brakes are excited with a current of about 30 amps., each brake exerts a pull amounting to 1.9 tons, thus increasing the weight of the car available for adhesion by some 3.8 tons. The car itself weighs empty some 10 tons, and when all the seats and standing places are occupied the weight is 12.3 tons.

MAINTENANCE METHODS AND DETAILED COSTS OF CAR HOUSE FIRE PROTECTION IN CLEVELAND

One of the first electric railway companies to give especial attention to the protection of car houses and repair shops by the installation of automatic sprinkler systems was the Cleveland Electric Railway Company. An account of the sprinkler equipments installed in this company's car houses was published in the STREET RAILWAY JOURNAL for May 19, 1906, but some particulars of the method of maintaining these sprinkler systems, based upon experience extending over a year or more, should prove of interest. So far, there have been no fires of any moment to test their efficiency in practical use, but such is the care with which these protection systems are maintained that, without doubt, they would do the work perfectly when under trial.

Not only has the Cleveland Electric Railway Company installed a complete system of roof and aisle sprinklers, but in some of the largest houses division fire walls were built, some of them lengthwise of the houses and some crosswise, with automatic fire doors to allow the cars to have free passage through the buildings. In addition to this, the standpipes and hose lines, chemical extinguishers and yard hose reels that had been in use before were retained and may be used to extinguish fires that have not gained enough headway to open the sprinkler heads.

It might be supposed that, once the sprinkler system is installed, it will take care of itself, but this is not true. As in all other matters of equipment, the feature of maintenance and care asserts itself. All of this apparatus is carefully inspected and tested regularly, that the management may be certain it is in perfect working order at all times. Just as in all other departments of the company's business a system of reports has been adopted which show the actual condition of the system, the water pressure and everything else pertaining to it. The ways and means of taking care of the system were devised by T. Scullin, the capable master mechanic of the road. In the first place he put upon the foremen at the various car houses the responsibility of keeping their systems in proper order and everything in good shape. Then a general inspector was employed to keep a lookout on all the stations. He goes over the plants and checks up the reports of the foremen at least every two days. This man is an expert and of course is able to discover any trouble in making his inspection. A blank (Fig. 1) is used to record the water and air pressures each day in each installation. This blank is signed by the foreman who takes the readings and by the special inspector. It is then sent to Mr. Scullin. As the pressure always stands close around a certain figure at each of the stations, it is thus possible to see whether the systems are properly maintained and kept in shape for instant work. Since the special inspector may drop in at any time, he is a check on the foreman, who must take his readings correctly. The readings are generally taken between 9 and 10 o'clock in the forenoon.

FORM 160 3M-11-17-05

THE CLEVELAND ELECTRIC RY. CO.

Inspector's Report on SPRINKLING SYSTEM at _____ Station.

Week Ending _____ 190__

DATE	PRESSURES IN POUNDS AT VALVES																	
	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9		No. 10	
	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water	Air	Water

REMARKS

Correct _____ FOREMAN. Signed _____ INSPECTOR.

FIG. 1.—BLANK USED TO RECORD VALVE PRESSURES

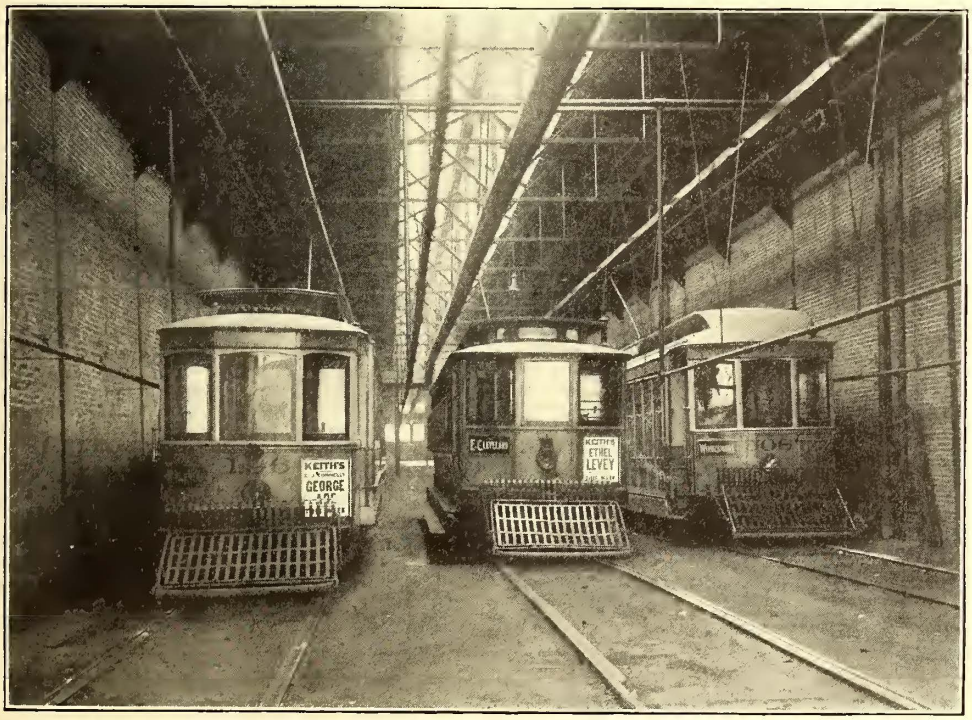


FIG. 2.—INTERIOR OF WINDERMERE CAR HOUSE, SHOWING SIDE LINES AND TROLLEY TROUGHS

All systems must, of course, have two sources of water supply, that is, either two large tanks or a tank with reliable city connection. During the winter careful attention is required to prevent the water in these tanks from freezing In stations where steam is used for other purposes, a coil is placed in the bottom of the tanks and steam is passed through it from three to five hours a day, depending upon the severity of the weather. The water is usually kept at about 65 degs. F. Five of the houses are provided with steam, but in the others gas hot water heaters are used. These gas heaters are similar to those used in heating houses

where gas is used as a fuel. They usually consist of an enclosed coil of copper or other pipe around which a blaze from a gas burner circulates freely. The blaze coming into close contact with the water heats the water very rapidly.

To ascertain the temperature of the water in the tanks, a ½-in. pipe extending 12 ft. through the water in the tank is carried down the side of the main water pipe to the inside of the tank riser house, where an ordinary hot

FIG. 3.—ENCLOSURE FOR VALVE WITH DOOR OPEN AND LAMPS INSIDE FOR HEATING. OUTSIDE ARE THE RISERS TO ROOF AND SIDE LINE SPRINKLER PIPES

water thermometer is attached to it. By drawing off a small amount of water, the thermometer will register the correct temperature. The readings have been compared often with the actual tank readings to ascertain their correctness. This plan has been found the most satisfactory of several that have been tried and requires less effort in getting the readings. No system of reports has been formulated to record these temperature readings, but they could be incorporated with the pressure readings, if found necessary.

Both the dry and wet pipe systems of sprinklers are used but the former is found in all the car houses on account of absence of heat and danger of freezing. In the shops the wet pipe system may be employed without danger. As is known, in the dry pipe system the pipes are filled with air kept at a sufficient pressure to counterbalance the water pressure at a double-seated valve which is always located close to the floor or at some other easily accessible point. When there is sufficient heat to open a valve, the air discharges and the water, having nothing to retard it, rushes in, This trips the main valve, allowing the water to flow into the pipes. At the same time an electric alarm sounds.

In houses where there is no heat and where the supply pipes come up from the ground these large valves and other apparatus containing water are enclosed and heated by passing current through five ordinary lamps such as are used for lighting cars. Car lamps that have been pretty well burned out and useless for lighting are utilized for this purpose. In addition oil lamps are kept in certain of the enclosures, and if the temperature gets low they are lighted. Steam heat or electric heaters are used elsewhere.

Each of these enclosures is furnished with a thermometer. so that the temperature may be ascertained at any time, and careful attention is paid to this point. During the summer and on warm days in winter these dry pipes are tested by letting the water into them, afterward thoroughly draining it off. Leaks and poor sprinkler heads are also found in this way when the temperature will permit. In some of the houses the enclosures for keeping the pipes and valves warm contain two valves and some only one. Where the sections of piping to be supplied could be conveniently arranged so that their valves could be placed in pairs, this was done, as the expense is reduced somewhat by this method. In the Rocky River car house it was found impossible to bring up the pipes in enclosures near the wall, as in the other cases. The valves were therefore placed in pits beneath the floor. These pits were built of concrete and are heated in the same way as the enclosures.

The valves for closing the roof sprinklers in the paint

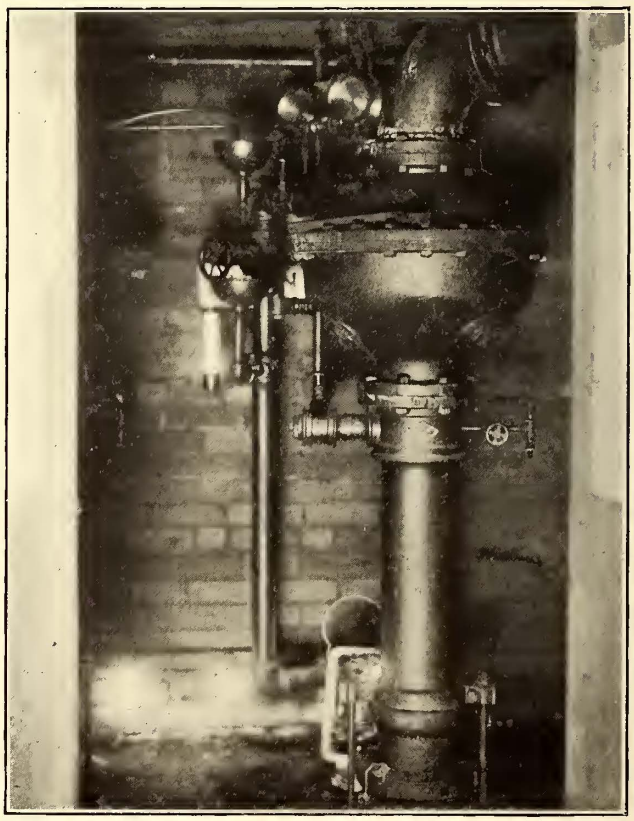


FIG. 4.—DRY PIPE VALVE IN ENCLOSURE BUILT ON OUTSIDE OF CAR HOUSE, SHOWING ELECTRIC AND OIL LAMPS FOR HEATING

shop and other sections of the Lake View plant, where the wet-pipe system is used, are 18 ft. or 20 ft. above the floor. The old plan of reaching them was by means of a ladder. Master Mechanic Scullin has arranged a sprocket wheel, in place of the usual valve wheel, with the chain dropping within easy reach of a man on the floor. This is not only more convenient, but requires less time to open or close the valve, and it can be done as effectually as in the old way. All car houses are also equipped with electric indicators.

For keeping up the air pressure in the pipes, standard compressors, such as are used on the cars, are employed. This is done because a stock of parts is always kept on hand. Usually the systems require pumping up about every three days. The city water pressures vary in different localities, so the air pressure is regulated to suit the water.

When it was decided to equip the houses it was found that the city had not provided pipes sufficiently large to supply enough water to many of them, and it was necessary for the company to put these in. As a charge is made for all connections, the expense thus incurred was charged back to the city, but at the same time the work took time and involved considerable trouble.

In all the houses the pipes are divided into sections and each is supplied with water from a separate pipe. As it is obvious that outside control is necessary in event of fire there are valves on the outside of the buildings, numbered the same as the sections, where the water may be turned off. There are also valves inside, where the water may be turned off, either from the roof lines or the transom lines or both.

The aisle sprinkler pipes are hung on adjustable hands 1½ ins. x ⅜ ins. In some cases single hangers are used, in other cases a double hanger is employed. In still other cases double lines were formed by placing the heads on inverted T's. This latter arrangement is followed only where the tracks were so far apart that one line of aisle sprinklers would not protect the cars on both tracks.

As a precaution against possible electrolysis, an insulating joint is used in the water pipe near the point where it enters the car house. As will be seen from Fig. 2, it consists of a hard maple washer boiled in parafine, held between the flanges of the water pipe by insulating bolts. These bolts are covered with rubber hose, and are provided with fiber and machine washers on the outside.

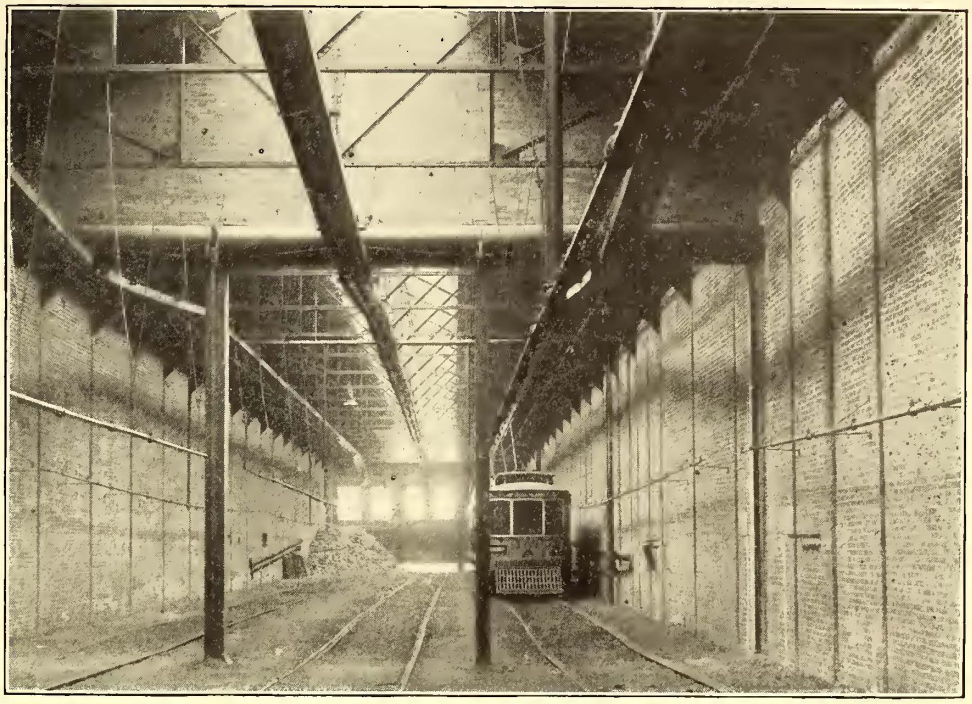


FIG. 5.—INTERIOR OF WINDERMERE CAR HOUSE, SHOWING ROLLER FIRE DOORS ROLLED UP

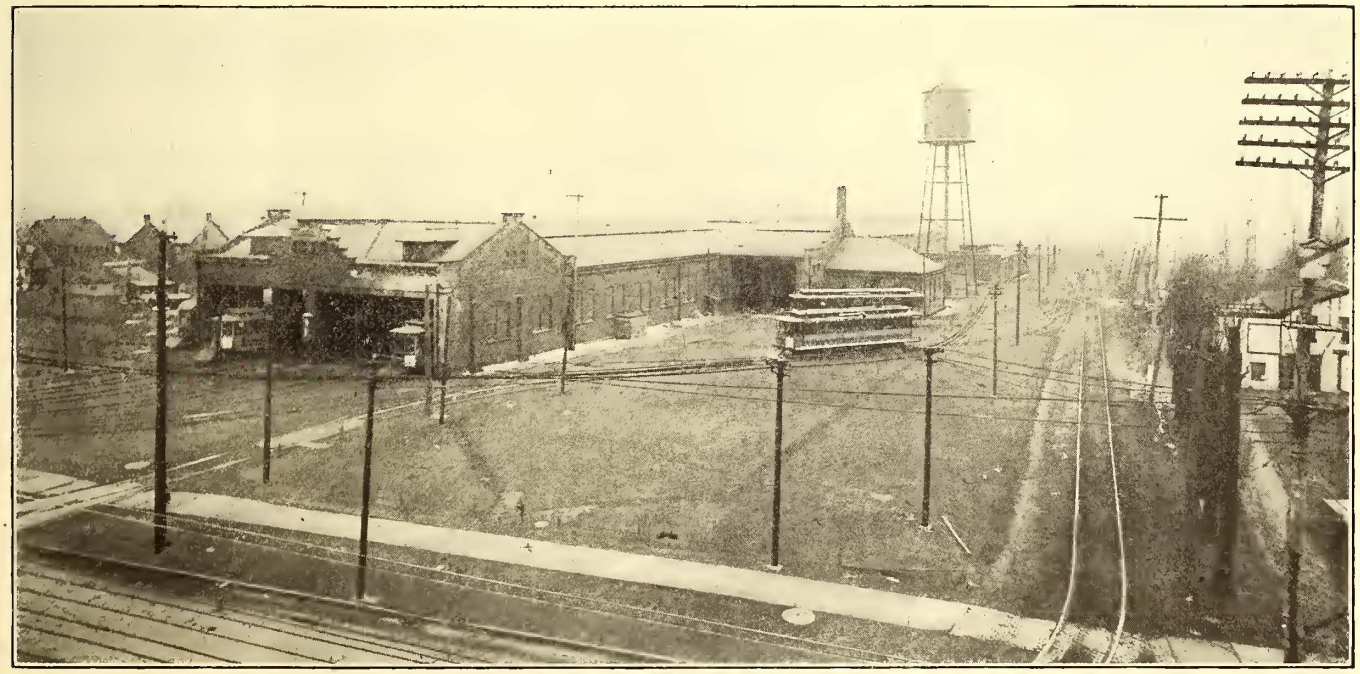


FIG. 6.—EXTERIOR OF WINDERMERE CAR HOUSE, SHOWING PRESSURE TANK

COST

The Grinnell system, furnished by the General Fire Extinguisher Company, is used throughout. The work was done on contract at a total expenditure of $128,428.56. Of this $121,823.09 was for the sprinkler systems alone and the remainder, $6,605.47, went for miscellaneous equipment and all articles that were required in addition to the work that was done by the contractors. The fire walls and automatic

fire doors entailed an expense of $13,908.08, making a total expense of $142,337.64.

On a basis of area the cost of equipping the houses with sprinklers was between 23 and 24 cents a square foot. This is exclusive of the cost of fire walls and miscellaneous expenses. But the work was done some time ago and since then the prices of materials, especially pipe, have advanced very materially. In all probability the cost at the present time would be very much larger than is given in the figures herewith. The reduction in insurance rates secured through the protection was such as to pay for the installation in six years.

DETAILS OF THE CONSTRUCTION AT EACH HOUSE

The Windermere car house, originally divided lengthwise by a solid brick wall, was furnished with a fire wall across the building, dividing it into four sections. Automatic closing fire doors with fusible links are used at each opening. This house has the dry pipe system and is protected by pipe lines carrying 1596 sprinkler heads. On the west side of the house are several tracks where cars are sometimes stored. To overcome this exposure all the windows on that side were bricked up. The enclosures for the dry valves are built on the outside of the side walls but open on the inside.

At Lake View 2029 heads are used, but for the most part the sprinkler system is installed in the shops, the cars being stored in an open yard. In the mill room and machine shop the sprinkler lines are located overhead, but in the erecting room, paint shop and motor department both the overhead and drop lines are used to take care of the cars that are constantly kept in these departments while repairs are being made. The wet pipe system is used here, because the buildings are always warm and there is no danger of the water freezing.

The Superior Avenue house has 637 heads, 444 on the lower and 193 on the upper lines. A row of open sprinklers has been arranged across the rear end of this house on the outside to form a water curtain for the protection of cars inside should fire occur in the yard, where many cars are stored. A fire wall was built lengthwise through the center of this building, dividing it into two parts. This was done at the suggestion of the railway company, as the insurance companies do not insist upon division walls in sprinkled car houses. The location of the lines is the same as in other houses and are cared for and maintained in the manner already described.

At the West Madison Avenue house 651 heads in all are used. This building has doors at the ends, which serve as a protection from air currents in case of fire. This is an important adjunct, but cannot be used in all houses, because of the arrangement of the tracks.

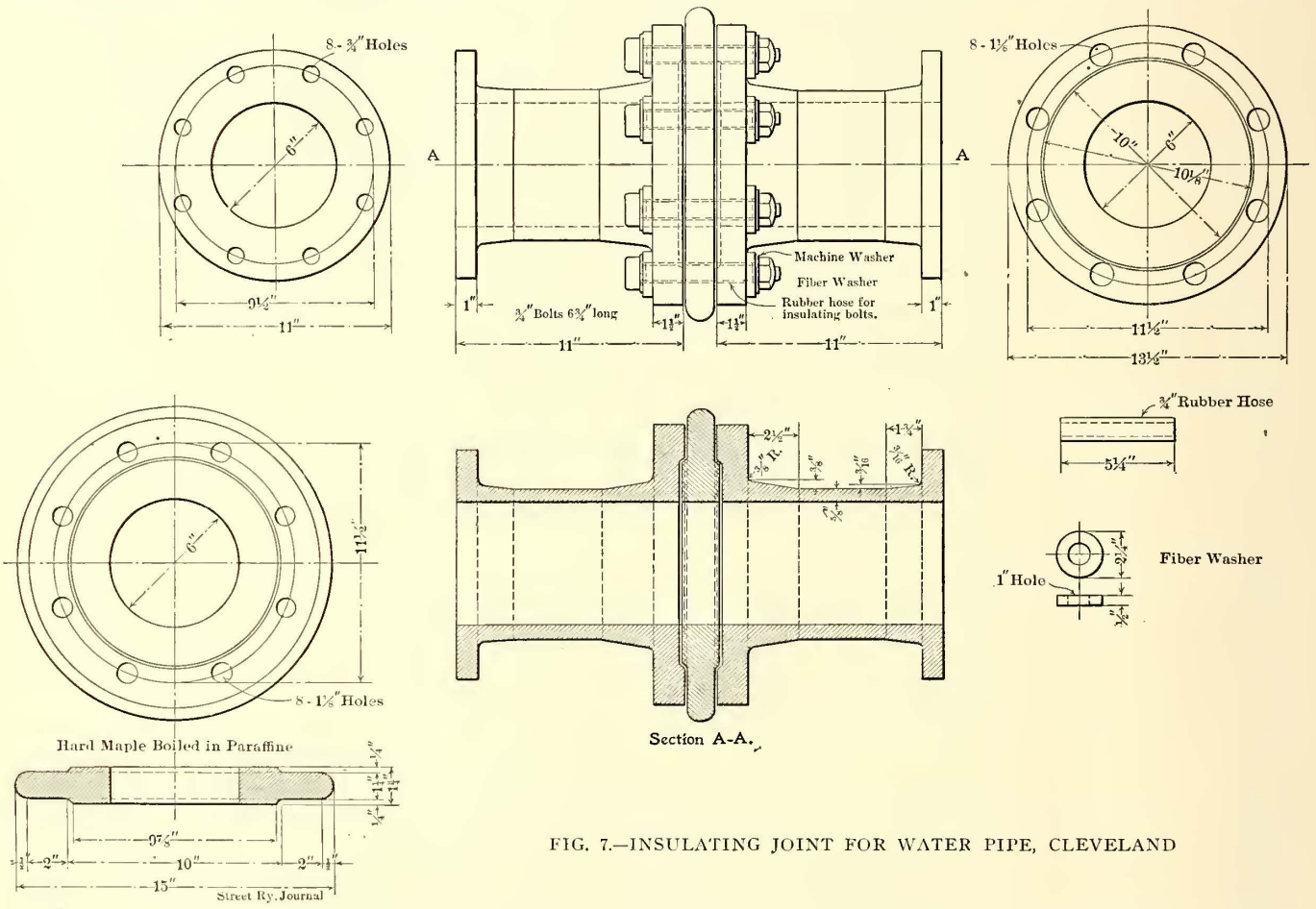


FIG. 7.—INSULATING JOINT FOR WATER PIPE, CLEVELAND

At Willson Avenue the car house was divided into three sections by walls which the company had built. This building is provided with 1130 sprinkler heads.

The windows were taken out of one side of the Lorain Avenue house and the side bricked up solid, where cars are stored. This house is provided with 1815 heads, arranged in the same way as in the other buildings.

At Miles Avenue, where many sprinkler tests took place, the large brick house is divided into two sections by a fire wall built across it, with automatic fire doors, as in the Windermere houses. The number of heads used in this building is 1567.

The South Brooklyn house has 785 heads.

At Rocky River the large brick car house is equipped with 1755 heads, while the Cedar Avenue house has 1668.

The St. Clair Avenue house is built of wood. It is

equipped the same as the others and has a water curtain at the rear, like the Superior Avenue building.

On Payne Avenue the company has a brick building which was equipped with 890 heads.

The cost of these improvements in detail is as follows:

	Sprinklers	Fire Walls
Cedar	$11,289.75	
West Madison	9,278.25	
Lake View	12,157.39	
Lorain	13,187.00	
Miles	12,366.50	$5,380.00
Payne	5,530.00	
Rocky River	11,483.70	
St. Clair	6,332.50	
South Brooklyn	7,741.00	
Superior	10,092.00	5,932.29
Willson	10,665.75	
Windermere	11,599.25	2,495.79

The miscellaneous expenditures were not gotten out in detail, but as they are only a small portion of the entire amount, it can be seen in about what proportion they might reasonably be distributed among the car houses.

At the Windermere house a hose house is maintained some distance from the main building, where a long hose is kept for the purpose of putting out fires in the cars on the outside of the building. The same plan is used at the Lake View, where cars are stored in large numbers in the yard. At Holmden Avenue, where there is no building, four hose reels are kept for this purpose. The hydrants are sealed by the city, after being used, in order that employees and others may not use them for any other than fire protection purposes.

Chief Engineer E. J. Cook had charge of the installation of the entire system for the company, and devised several plans for greater convenience and economy in the installation and maintenance of the system that had been provided for.

WESTERN SOCIETY OF ENGINEERS DISCUSSES STORAGE BATTERIES

"The Application of the Storage Battery for Lighting Power and Railway Service" was the subject of a paper presented by J. M. S. Waring, of the Electric Storage Battery Company, at the regular meeting of the Electrical Section of the Western Society of Engineers held in the Monadnock Block, Chicago, March 15. Mr. Waring separated battery installations into two classes, those for railway and power service and those for lighting service. Installations for railway and power service were further subdivided into power house and sub-station batteries and line batteries. Mr. Waring went at some length into the question of regulating batteries, and outlined by means of charts the different methods. The use of differential boosters, constant-current boosters and the carbon regulators was taken up. The differential booster, he said, had the advantage that when the load increased beyond that for which the series fields were designed it was necessary to shunt the fields and thereby impair the regulation. With the carbon regulator, however, increased loads could be cared for by simply substituting a larger solenoid.

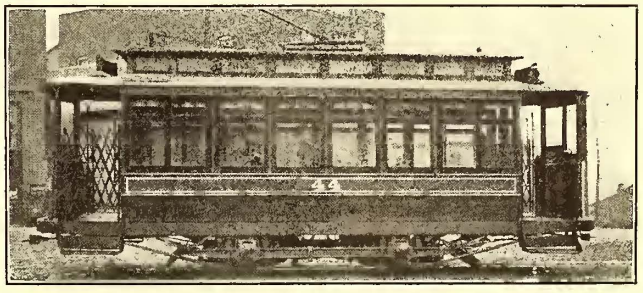
Mr. Waring said that when a battery was installed to keep the generators working at an efficient loading the losses due to conversion were almost negligible as compared with the increased economy of the plant. Later in the discussion he stated that batteries sometimes worked at an efficiency as high as 90 per cent. Line batteries, he said, frequently saved more than their cost in feed wire. In industrial railway work, where the locomotive is required to work continuously for several hours without opportunity for charging the batteries, he said the size and capacity of the battery installation often made the installation of batteries prohibitive. Where the service required of the locomotive was such as to permit charging at frequent intervals, however, batteries could often be used to a great advantage. He cited one instance where the locomotive was required to make a two-minute run and was then allowed to stand two minutes. In this case only a comparatively small battery installation would be required, as charging could be effected at the end of each run.

With regard to the life of battery plates the discussion brought out the statement that in the most severe railway service the positive plate would last about four years, while the negative plate had a greater life. In less severe work plates would last seven years or longer.

Reference was made to the batteries on the gasoline-electric car of the St. Joseph Valley Traction Company, operating out of Lagrange, Ind. This car, which was described in the Street Railway Journal, April 8, 1905, was burned a few months ago in a car house fire. The batteries, however, operated successfully for more than two years. As an evidence of this the company placed an order for a larger installation for a second car. The car made two trips per day over the line, and during the time it was in operation the batteries entailed no expense and the repairs on the car were trivial. The power consumption with the car hauling a 25-ton trailer was about 45 watts per ton-mile.

CONVERTING OPEN TO CLOSED CARS AT HOT SPRINGS, ARK.

During the past season several open cars have been converted to closed cars in a rather novel manner by Edward Harden, superintendent of the Hot Springs Street Railroad, Hot Springs, Ark. An accompanying reproduction from a photograph shows one of the converted cars. They were formerly provided with running boards and openings between the posts extending to the floor, and in fact were of



OPEN CAR CHANGED TO A CLOSED CAR

the customary open car type with the exception that they contained center aisles and central openings in the bulkheads. In converting them a belt rail and sash rail were mortised into the posts, and over these were placed sheets of No. 14 gage steel. These sheets are 30 ins. wide and extend the full distance between the side sill and the sash rail and one-half the length of the body of the car. They were secured in position by bolting them to the posts with stove bolts spaced 1½ ins. apart. Sashes were fitted between the posts in such a manner that they can be removed in summer.

THE REINFORCED CONCRETE VIADUCT OF THE RICHMOND & CHESAPEAKE BAY RAILWAY AT RICHMOND

An account was published on page 986 of the Street Railway Journal for June 23, 1906, of the plans of the Richmond & Chesapeake Bay Railway Company. This is a single-phase line of which Frank J. Gould, of New York, is president, and which is building a single-phase road 15 miles in length from Richmond to the Chesapeake Bay. It is to be supplied with a 6600-volt catenary trolley and the cars will be equipped with four G E A-603 single-phase motors on the multiple-unit system. All grades are less than 1 per cent., and long, easy curves are used in every instance, except on the viaduct entering Richmond. The company expects to do a mixed freight and passenger business.

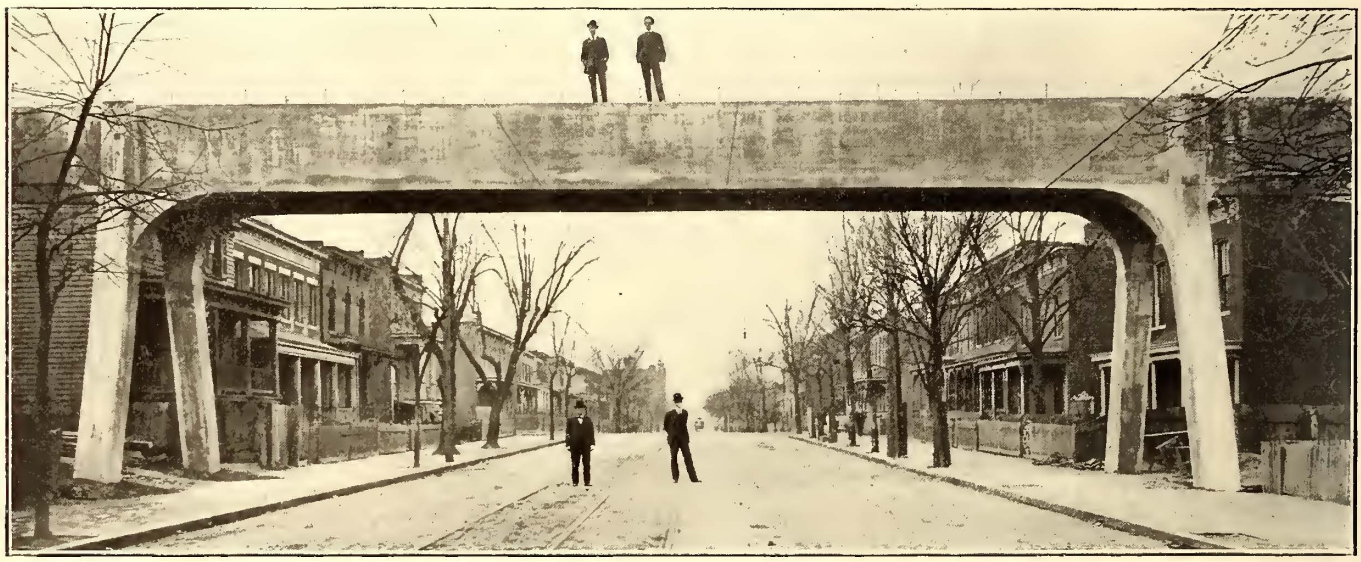
The road enters Richmond almost directly from the north, over an elevated structure 2800 ft. long and ranging in height from 18 ft. at either end to 70 ft. where it crosses a small stream known as Bacon Quarter Branch. A riveted girder viaduct was first considered, but was rejected on account of the present high first cost and cost of maintenance, as well as the difficulty of double-tracking such a structure, should this become necessary. A wooden trestle with steel girders spanning the streets only was then planned and carried so far as to have lumber ordered and partially delivered. The great danger of such a structure being destroyed by fire, as well as the necessarily temporary character of wood construction caused the officers of the company to turn to reinforced concrete as a modern, strong, permanent and handsome construction. The design accepted was submitted by the New York branch of the Trussed Concrete Steel Company, of which B. J. Greenhood is chief engineer. This company was to furnish all steel for construction under the Kahn system of reinforcing concrete, and John T. Wilson, of Richmond, Va., was the successful contractor to do the construction work.

The viaduct was designed to carry a train of cars each 54 ft. long over all and weighing 150,000 lbs. on four-wheeled trucks placed 33 ft. center to center. The wheels on each truck were 7 ft. on centers, and thus the nearest wheels of the adjoining cars were 14 ft. center to center.

The design consists essentially of a system of girders of rectangular cross-section supported by towers. Each tower is made with two vertical bents, each having two columns 6 ft. 9 in. apart on centers at top and battered 1 to 6. They are of square cross-section and reinforced with from four to nine steel bars, the steel being placed for transverse strains only and the concrete to take the compression. The longitudinal struts and transverse braces are all horizontal.

The girders follow the grade and are rectangular in cross-section, except at the span across Marshall Street, where the desired depth could not be used on account of the city limiting the company to a clear headway of 14 ft. These girders could not be made deep enough to take care of the bending movement, and as the railway company did not care to get any higher than was absolutely necessary, it became a problem of the designing engineer how best to span this street. It was found that with girders 6 ins. deep, the depth allowed here, that the beam would not contain enough concrete to take the compression stresses. A T-shaped beam was finally decided on.

The spans vary in length from 23 ft. 6 ins. to 67 ft. 5 ins. center to center bents, the longer spans being used at the crossings of the Seaboard Air Line Railway and streets which had to be crossed with a clear span. Expansion in the structure is taken care of by expansion joints placed at intervals of about 200 ft., consisting of a grooved steel plate on top of the bent, on which a planed steel plate on the bottom of the girder slides, while a sliding toggle near top of girder prevents any tendency to turn the girder. On account of unavoidable circumstances, it was necessary to put two seven-degree curves in the viaduct, both in the same direction. The grade is upward from the north end of the viaduct to about 200 ft. from the terminal, at which point it becomes level. The grade on the tangent is plus 1.10 per cent., and on curves plus 0.7763 per cent., there being a total difference in elevation of 25 ft. between the two ends of the structure.



CLAY STREET SPAN COMPLETED WITHOUT TRACK. SPAN 67 FT. 5 INS. CENTER TO CENTER

The concrete, of a 1:2:4 mixture, was figured for a compressive stress of 500 lbs. per sq. in. and shear of 50 lbs., while the steel used was given a tensile stress of 16,000 lbs.; compression, 60,000 lbs. and shear of 10,000 lbs. per sq. in. of cross-section. The modulus of elasticity of concrete to steel was taken as 1 : 12 and the percentage of steel to be less than 1.45 per cent.

Work on the viaduct was begun in the latter part of May,

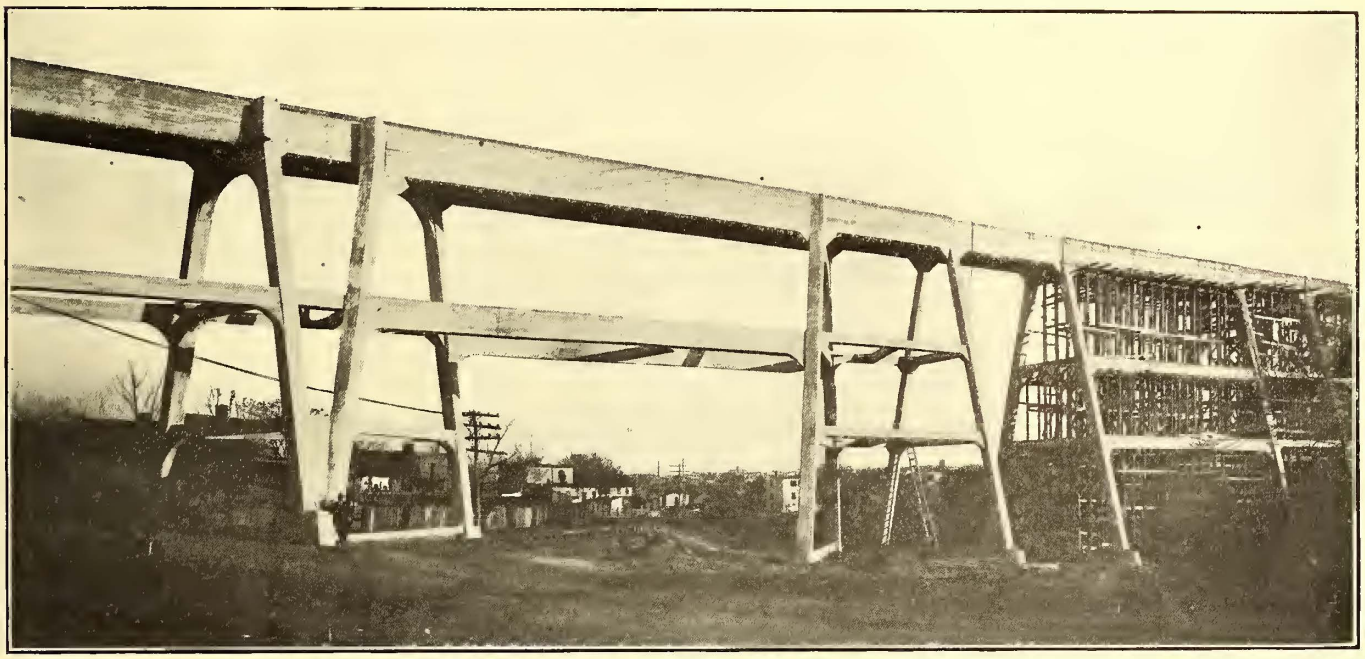
1906, and was quite slow until the contractor got a system of operations fully established. Work was started at two points, the northern end and about the middle, and both forces worked southward. The footings for the columns were first put in, having four ¾-in. rods projecting 4 ft., around which the column was built, and also a pocket left for the bottom of the column. The foundations were either hard clay or compact gravel, and were calculated for a pressure not to exceed 6000 lbs. per sq. ft. As the structure was designed so that it could be readily double-tracked when necessary, the footings were made twice as large as they would have been if designed simply for a single track, and a 4-ft. stump of a column was left on which the future double-track column will rest. When traffic justifies double tracking the viaduct, it will be easy to construct an additional girder with proper supports, on one side of the viaduct, shift the track so that it will be supported by the new girder and one of the original girders and carry the traffic on this track during the construction of the additional girder and new track on the other side. Cored holes are provided to take care of fastening new work to the old when double tracking is begun. The footings were carried down a uniform depth of 4 ft., unless extra depth was required to get suitable foundations.

The contractor supplied suitable equipment for two concrete gangs, consisting of two No. 2½ Smith concrete mixers, two hoisting engines, elevators, buckets, etc. But it was found that while one force was erecting forms the other was putting in concrete, and, therefore, one mixer was taken away to other work. After the erection of the forms the columns, up to the bottom of girders, and contiguous struts were poured at one continuous operation, so as to make them monolithic. Next the girders and floor were put in in the same manner. At first the attempt was made to pour columns from the top, but owing to the difficulty of properly ramming and working the concrete through the reinforcing Kahn bars, this method was abandoned. The column forms were then built in a U-shape and the fourth side built up in sections as the concrete was poured.

Dumping buckets holding 3 cu. ft. and built for this express purpose were used in dumping into column forms. These buckets were lifted by means of a traveling single boom derrick, seated on top of the viaduct, and a hoisting engine. The struts were poured from wheelbarrows from the top of the structure through a 10-in. hinged pipe of galvanized iron. Concrete for the girders and floor was hoisted on wheelbarrows by double cage towers to the top of the viaduct and wheeled to position on runways on the forms.

The forms were made of 2-in. lumber, dressed on one side, and as much of the lumber as possible was cleaned and used again after forms were pulled down. The forms on the sides of the girders were removed at the end of a week, but those on the columns and the supporting falsework of the girders were left in place thirty days longer if the lumber was not needed.

The smaller girder forms were supported by falsework, consisting of 4-in. x 4-in. pieces placed 3 ft. on centers along the viaduct and resting on planking placed on the ground, which had been leveled to firm bearing. Under the heavier girder forms, at street crossings, the falsework was made of 6-in. x 6-in. timbers and the struts were supported by 4-in. x 4-in. pieces, placed at distances to suit the weight carried Owing to the great height of the structure throughout a considerable part of its length, a prodigious amount of lumber was used in the forms and shoring. Approximately 456,000 ft. B.M. was used in the entire job, or about 16,500 ft. B.M. to each 100 cu. ft. of concrete. Of course, at street crossings, and especially at Clay Street, where a double-track street car line was crossed, and at the Seaboard Air Line Railway crossing, special provision had to be made to carry the great weight of girders. It is notable that in spite of the great weight of these girders, being considerably in excess of 50 tons each, the forms were erected and concrete put in place without delaying a train or street car. The cement used in the entire work was Atlas Portland. The stone was granite, crushed so that all would pass through a one-inch ring, and was thoroughly screened. The sand originally was obtained by dredging in the Appomatox River at Petersburg, and was of good quality. In the early stages of the work, comparative tests were made of mortar made from Petersburg sand and from screenings



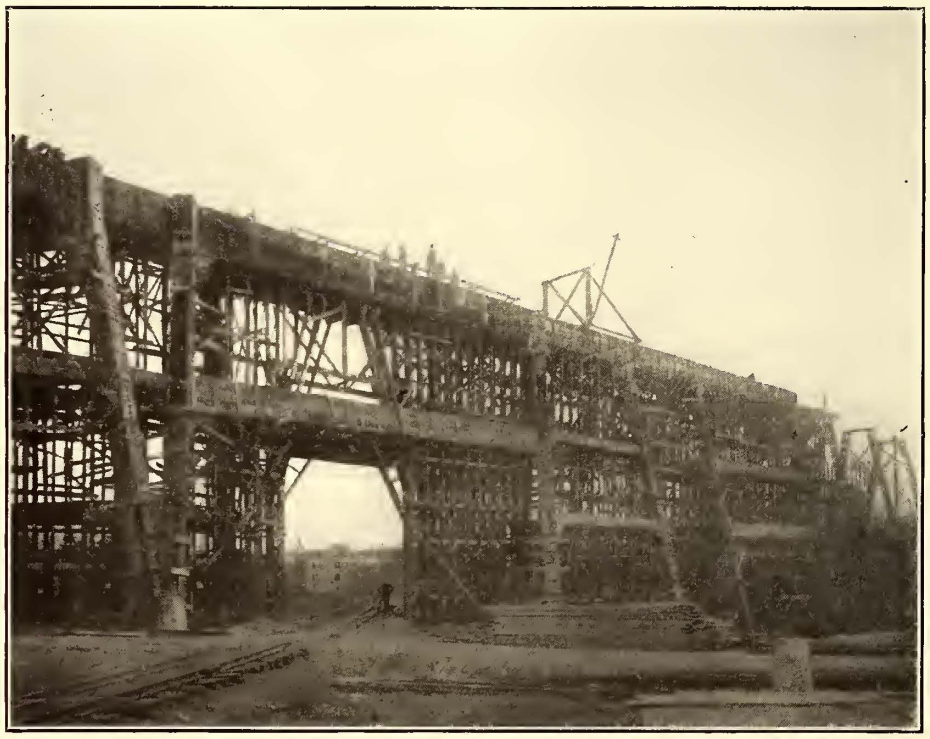
CROSSING OF SEABOARD AIR LINE RAILWAY AND OAK STREET AFTER THE FORMING WAS REMOVED

from the granite crushers at a neighboring quarry, and as the granite dust showed a superior tensile strength of from 20 to 50 per cent. over the sand, it was adopted and used in at least 80 per cent of the work.

The concrete in the footings was made of a mixture of one part cement, three of sand and six of stone, except that in wet pits near Bacon Quarter Branch, more cement was added. In all of the rest of the work a 1 : 2 : 4 mixture was used. This was made quite wet and the concrete was thoroughly worked into the reinforcement with spades and rammers. No concrete was allowed to go in that had stood as long as fifteen minutes.

After the forms were removed, porous places in the cement were plastered up with 1 : 2 mortar and a finish of sand and cement applied with a brush was required.

The track rests upon 6-in. x 12-in. heart pine stringers, placed over the girders on each side. The cross-ties are 8 ins. x 8 ins. x 9 ft., spaced 12 in. on centers, and are oak.



CROSSING OF THE SEABOARD AIR LINE RAILWAY AND AK STREET, SHOWING FALSE WORK

Every 5 ft. a ¾-in. bolt, imbedded 9 in. in concrete, goes up through the stringer and tie, while half-way between is a bolt through the stringer only. The holes in the stringers were 2 in. in diameter and afterwards were filled up with 1 : 3 mortar. This was to facilitate the placing of the stringers and also to prevent any tendency of the bolts to rust off where they come out of the girder. On the outside of curves a 12-in. x 12-in. stringer was used, thus giving the proper elevation of the rail, which was full at the beginning and end of curves and dropped off ⅛ in. to each foot.

The guard rail is of 8-in. x 10-in. pine, dropped 2 ins. between the ties. A walk-way is provided on the west side of the viaduct by using a 12½-ft. tie every 5 ft. and a neat hand rail of angle posts and pipe is added for safety. The supports for the trolley wire will rest on 8-in. x 14-in. x 16-ft. oak ties, placed every 60 ft. on tangents and 30 ft. on curves.

J. H. McLure, chief engineer of the railroad, who furnished these notes, has given much personal attention to the detail of both design and construction of the viaduct.

CORRESPONDENCE

NOTES ON SPEED-TIME CURVES

New York, March 25. 1907.

Editors Street Railway Journal:

I have read with interest Mr. Tracy W. Simpson's communication criticising and commenting upon my "Notes on Speed-Time Curves" published in the Street Railway Journal of March 2, 1907.

A few more "notes" from me seem to be "in order," under the circumstances.

The most interesting and significant statement in Mr. Simpson's communication is the admission, in the last paragraph, that he "*never tried the chart method.*" I was fully prepared for this information. Indeed it would have been very hard for me to believe that he could have tried the method. I felt sure that if he had had even a limited practical experience with it, the tenor and tone of his original "notes" would have been quite different. I might "rest my case" at this point but I am incited to go further by the rather confident manner in which Mr. Simpson proceeds to criticise a method admittedly untried by him, and the ease with which he shows it to be inferior to his own. His confidence and frankness are commendable. I regret that I cannot agree with him on many points; indeed, I must disagree more or less emphatically with him on certain points.

After reading Mr. Simpson's "notes" and his presentation of the "theory" of speed-time curve plotting, one can understand that his views regarding the burdening effect of "certain refinements in the theory and in the method of application" are natural enough to him; but, unfortunately, that does not make them true or make them acceptable, except, perhaps, to those who know nothing at all of the subject. The theory may be extremely simple; but that is no excuse for garbling or suppressing it altogether. There is a true and a fictitious simplicity; and we all know that nothing is so insidious, so misleading, so mischievous as the simplicity which is fictitious. A straight line may be the shortest distance between two points, geometrically, but it may also be the worst possible "route," practically, between these two points. The old adage that "fools rush in where angels fear to tread" was first invented decades ago, and it has been used ever since, with special reference to the poor unfortunates who allow themselves to mistake the "appearance" for the "reality" of simplicity. There happens to be, by the way, a very good specimen of this kind of simplicity in Mr. Simpson's own presentation of the theory. He describes V as an "arbitrary" interval of speed during which A is practically constant (see Street Railway Journal, p. 245). He further says: "V is best chosen at about 5 m p. h. for the low speeds and 2 or 1 m. p. h. as the maximum speed is approached." Not a word is said about any reason why V should not be taken at any constant value or why it

should vary with any conditions. After giving this simple "theory" he proceeds to discard it himself in the very next paragraph by taking V = 29.5 m. p. h. He makes no apologies or explanations for this discrepancy between his "theory" and his "practice." Those who happen to know the whole theory of the subject know, of course, that Mr. Simpson's practice of taking V = 29.5 m. p. h. is entirely warranted for that portion of the speed-time curve, and that portion only. They also know why They also know why and how much the value V must be reduced in all other portions of speed-time curve. They also know that even the lowest value (1 m. p. h.) given in Mr. Simpson's simple "theory" is still much too large for certain portions, in many cases. Any reader whose knowledge of the theory of this subject has been obtained wholly from Mr. Simpson's "notes" must be highly gifted if he can answer these questions intelligently. Moreover, if he can, with merely the instructions therein given, prepare interpolation charts such as shown in Figs. 2, 3, etc., or plot speed-time curves such as shown in Fig. 8 of Mr. Simpson's notes, without making serious errors, he must be something of a genius. The errors of 3 per cent or 5 per cent which Mr. Simpson so much dreads from uncertainties as to train-resistance values might perhaps be made to appear relatively small, in some cases.

It is already apparent that the extremely simple theory of Mr. Simpson is ridiculously incomplete. We shall see presently that it is, also, not quite as simple as it seems at first glance. In reality, this alleged theory amounts to a partial explanation of an incomplete formula, with a set of values for the quantity V which, so far as the theory given is concerned, are fixed empirically, although it is well known that these values do have a scientific, rational, mathematical explanation and determination. Mr. Simpson may possibly be able to present the complete theory without the notation or the methods of the calculus, but, certainly, he has not done it yet. His V and his t are "*increments*" with the "symbol" left off. They would both be recognized and understood much better if he retained the symbol of a "difference," infinitesimal or finite, and if he had written dV or ΔV. and dt or Δt. Any engineer who does not know at least that part of the "alphabet" of the calculus is, in my opinion, out of his sphere entirely in the art of plotting and using speed-time curves intelligently. The calculus method shows easily and clearly where and why and to what extent errors are introduced by making the velocity increments, ΔV (i. e. V according to Mr. Simpson's notation) finite instead of infinitesimally small. Mr. Simpson is not very explicit here, as we have found. Since he can presumably make such matters very clear without any "burden" of calculus, there is an excellent opportunity for him to distinguish himself right here.

Mr. Simpson is right in his contention that I neglected to give him due credit for using one more factor (besides 91.3), namely, the number of tons of train-weight per motor, in transforming the scale of ordinates of his "general speed-tractive-effort curves." The truth is that I did not attach so much importance to this innovation as he, apparently, does, and I did not wish to lengthen unduly my previous communication by a discussion of it.

I am very glad, however, to be reminded of my seeming neglect of this factor, because I see now that it does really make more difference than I had thought at first. It is much more objectionable and makes his method less practical than I had supposed. His alleged short-cut around the chart method is, in reality, a more devious and lengthy route than I had believed.

Mr. Simpson's categoric statement to the effect that, with the chart method, a new chart of coefficients must be plotted for each specific case, or "for each particular case of *weight per motor,* as well as gear-ratio," is of course due to and reveals his want of familiarity and experience with the chart method. It also reveals a certain lack of sagacity. The reference to "proportional dividers" in my previous communication should have served as a hint of possibilities which are damaging to his cocksure statement. Even if Mr. Simpson's statement were entirely true, however, his method would still be, both theoretically and practically, inferior to the chart method. We can see easily and clearly that the alleged great advantages of the "general curves" are not worth the price which has to be paid for them, precisely because the factor (tons per motor) of which Mr. Simpson is so proud enters into the scale of ordinates. The introduction of this factor complicates greatly the process of predetermining the time-interval values (t) whenever grades and track-curves have to be considered. In fact, the method is probably too cumbrous and tedious to be used for plotting speed-time curves directly. Its function is probably restricted, even by Mr. Simpson, to the preparation of interpolation charts by means of which the real work is done, by the interpolation method, devised and first published by me. Whenever a grade or curve has to be taken into account, Mr. Simpson's equation for t (given on p. 245) and also his slide-rule setting (see diagram on p. 244) lose their "extreme simplicity" because the term A in the denominator must now be increased for "down" grades and decreased for "up" grades, by an amount equal to

$$\frac{20\ G\ T}{M} \qquad \text{or } 20\ G\ w$$

where G = grade percentage,
T = total tons of train-weight,
M = number of motors per train,

$$w = \frac{T}{M} = \text{number of tons of train-weight per motor.}$$

Thus, as we see, the introduction of the prized factor (w) in the scale of ordinates of Mr. Simpson's Fig. 1 forces him to introduce it also in his equation every time that a grade has to be considered. Since, as is well known, the increased train-resistance due to track curvature can be and is most conveniently expressed in terms of an equivalent "up" grade, the occurrence of track-curves also necessitates the same procedure. It would seem, then, that Mr. Simpson's theory and method lose much, if not all, of their extreme simplicity the moment he has to leave a straight and level track, and has to reckon with curves and grades. Now, it is precisely in such a case that the chart of coefficients is valuable and practical. It enables grades and curves to be "reckoned with" as easily and as quickly as if the track were straight and level. This is because the equivalent acceleration values for grades can be represented on a chart of coefficients, by straight lines which are parallel with the axis of x (i. e., the axis of velocities) and whose distances from that axis are always the same. On Mr. Simpson's "general curves" the distance for any grade would vary with w, the tons per motor. The "grade-lines" can be located once for all on a chart of coefficients. They change, for the same grade, every time that w (tons per motor) changes, on Mr. Simpson's "general curves." On a chart of coefficients, grades and curves are automatically included in the computation by simply taking the proper

grade-line as a new axis of x. Thus, suppose we have a "down" grade of $-G = -1.57$ per cent, on a curve of 3 degs. (having an "equivalent" grade-effect of $+0.12$ per cent). The net "equivalent" grade will be

$$-1.57 + 0.12 = -1.45 \text{ per cent.}$$

If we assume the x-axis of the chart of coefficients to be displaced *downward* to the "grade-line" corresponding to $-G = -1.45$ per cent, then, clearly, every ordinate value of the "coefficient" curve, measured from this new axis, will be proportional to the sum of the accelerations due to the motor and to the grade. If the net equivalent grade were an "up" grade, the x-axis would be displaced *upward* to the $+1.45$ per cent grade-line and the ordinate value would then be equal to the difference between these accelerations. On deducting, from this sum or difference, the equivalent acceleration of train-resistance, we obtain the "actual" acceleration value, by reference to which the time-increment is calculated. This is all done by means of dividers; and it is found, practically, that grades and curves make but little difference, if any, in the time required. The operation takes no more time than is required by Mr. Simpson to obtain, from his Fig. 1, by dividers, the difference between the ordinates of his general tractive effort and train-resistance curves. In much less time than Mr. Simpson requires to "translate," as he must, his divider measurements into "pounds per motor," by the ordinate scale of his "general curves," the entire operation of obtaining the time-interval itself has been completed, by the chart method, by the simple process of transferring the dividers to the chart of reciprocals and reading off the time-value, according to a scale which is always large and therefore can be read to fractions of a second without hesitation or eye-strain. After he has translated his divider measurement, Mr. Simpson still has a slide-rule manipulation and reading to make, even when the track has no grades and curves; and, of course, he has considerable more than that to do, when grades and curves are involved. The writer has, many times, used the chart method for plotting directly the service-runs, for cases where it was not deemed worth while to prepare the sets of acceleration and retardation charts necessary for using the interpolation method. In some cases, the work of preparing interpolation charts would have been greater than that of thus plotting the service runs directly. I am quite sure that Mr. Simpson's confidence in the superiority and celerity of his method would receive a slight "jolt" if he had to use it for the direct plotting of service-runs in competition with the chart method, for a few days, even though the person using the chart method had to produce a new curve of coefficients two or three times a day, owing to changes of train-weight. As a matter of fact, while such additional charts of coefficients may be convenient and desirable in some cases, they are not by any means as indispensable as Mr. Simpson imagined. They are at all events so easily produced that they do not really constitute an appreciable item in the total time involved in the detailed study of an electric railway project by means of service-run diagrams. The new curves of coefficients required when a change is made in tons per motor (w) differ from the original curve only in the scale of ordinates. They can, therefore, be very quickly derived from the original curve by means of proportional dividers. This method is simple and expeditious enough for all practical purposes, where the charts are not too large. The curves can also be redrawn to other scales by means of an instrument called an "ordinate pantagraph," devised by the writer for enlarging and reducing the scales of all kinds of curves. With this instrument the curve can be quite accurately enlarged or reduced in any proportion from 1:2 to 1:10 or more, as quickly as the original curve can be followed by a tracing point. This method is available for both large and small charts.

The work of producing a curve of coefficients of different scale is not, after all, such a gigantic task. Still, even this task can be avoided; for it is actually possible to get along with one set of curves for all cases, i. e., for all values of tons per motor" (w). It so happens that the range of variation of the tons per motor is not infinitely great, as one might perhaps infer from Mr. Simpson's remarks. This is because small motors are not often used for heavy cars or trains, and large motors are not often used for light cars or trains. Hence, in practice, the "tons per motor" for a given motor and kind of service will vary between values which are not very many tons apart. In one case, for instance, I find the maximum and minimum values to be $w = 35$ tons and $w = 15$ tons, respectively. In another case, I find $w = 15$ tons and $w = 8.75$ tons, respectively.

In the first case the maximum value is 2.33 times the minimum value. In the second case, it is 1.71 times greater. This ratio might, possibly, in some cases, amount to 3; it is doubtful if it would ever exceed 4. Such ratios are well within the range of proportional dividers and proportional scales. They would still be, even if they were as high as 7 or 8. Of course, it is obvious that if the original curves of coefficients have been plotted with reference to an average value or a value approximately midway between the extreme values, for the tons per motor (w), the ratio by which its ordinates must be enlarged to give the curve coefficients for the lowest tons per motor and the ratio by which its ordinates must be reduced to give the curve of coefficients for the highest tons per motor, will be only half as large, and, therefore, almost always under 2. Suppose, for instance, that, in the first example, the original curves of coefficients on the chart of coefficients have been plotted with reference to the value $w = 25$ tons.

The factor giving the new ordinate values for the case $w = 35$ tons will be

$$\frac{25}{35} = 0.71;$$

and the factor giving the new ordinate values for the case $w = 15$ tons will be

$$\frac{25}{15} = 1.67.$$

A proportional scale for either or both of these factors can be made very readily. On a piece of squared paper lay off an ordinate scale of 100 units of any convenient length, and an abscissa scale of 71 units of the same length. Join the ends of the two scales by a straight line, thus forming the hypothenuse of a right-angled triangle.

With ordinary dividers take the ordinate value from the curve of coefficients for any desired speed value. Transfer this measurement to the proportional scale and find the point of the hypothenuse of the triangle whose ordinate is equal to that divider measurement. Then the distance from the base of this ordinate to the end of the abscissa scale is equal to 71 per cent of that ordinate. Therefore this distance, which can be easily taken off by resetting the dividers, represents the "corrected" or "transformed" ordinate value of the new curve of coefficients required (i. e. for $w = 35$ instead of $w = 25$). This value can now be transferred back to the chart of coefficients and the equivalent actual acceleration can be quickly obtained by subtracting, by the dividers, the

ordinate of the proper train-resistance curve and adding or subtracting the ordinate value corresponding to the proper net "equivalent grade." The time-interval value would then be obtained, in the usual way, from the chart of reciprocals.

The correction for rotational inertia, though more conveniently made by means of proportional dividers, may also be made by means of a similar proportional scale prepared for the proper "kinetic ratio" in the same way as that used for transforming the ordinates of the curve of coefficients. The whole operation is really simple and is performed in much less time than is required to describe it. It is expeditious because only one appliance, the dividers, has to be manipulated, and no "translation" of the divider measurements is required until the end of the operation, when the final result which is sought, namely, the time-value, is obtained. This method of procedure is entirely practical and it is doubtless more expeditious than Mr. Simpson's method, especially in computations involving grades or curves, which, as is well known, constitute the great bulk of the computations and determinations required in actual work.

I venture the opinion that the chart method, even under these circumstances, is still more expeditious than Mr. Simpson's method, for the preparation of interpolation charts. In view of the ease and facility with which the curves of coefficients can be enlarged or reduced to suit changes in the tons per motor (w), it is preferable, because it saves time, to prepare new curves of coefficients, when the chart method is to be used for direct plotting. The new charts of coefficients can be preserved and they may, indeed they generally do, prove useful on other occasions, so that the work does not necessarily have to be done every time that w changes.

It is now quite clear that the introduction of the additional scale-factor w, by Mr. Simpson, in his general curves (Fig. 1) does not, after all, change the nature of the diagram very radically or materially. We could still treat this diagram as if it were a chart of coefficients having a scale of acceleration values 91.3 times larger (since 1 m. p. h. corresponds to 91.3 lbs. of tractive effort). The curves would then be correct curves of coefficients for the case corresponding to w = one ton per motor. The actual case, according to Mr. Simpson's description, corresponds to single-car operation with a four-motor equipment, the total train-weight being 35 tons. Therefore, we have, actually

$$w = \frac{35}{4} = 8.75 \text{ tons.}$$

This figure shows that the scale of the curves of coefficients still need to be reduced by the factor

$$\frac{1}{8.75} = 0.114.$$

Of course, if these curves had been originally drawn especially for a chart of coefficients a more rational and more nearly average value would have been taken for w, say 10 tons or 15 tons instead of 1 ton. The factor would then be a more wieldy one. But, even with w = 1, it would still be possible to utilize Mr. Simpson's Fig. 1 as a chart of coefficients, in the manner explained hereinabove. When used in this manner, "grade-lines" could now be added, for "up" and "down" grades, and, with a chart of reciprocals, we could proceed to plot service-runs directly, for any conditions whatever of track grade and alignment, with greater ease and celerity than by any other method, including Mr. Simpson's.

The superiority of the chart method from the point of view of precision, as a method, remains unquestioned, even by Mr. Simpson. This precision, as we know, can be made as great as desired by increasing the number of determinations, i. e., by plotting more points. The writer has always found it possible to obtain, by the chart method, in a given time, the co-ordinates for more points than can be done by any other method. It is a mistake, however, to suppose that the method is only a method of precision. It lends itself to "rough work," of the roughest kind, at least as well as any other method. Indeed, it is precisely in the case of "rough work" that it proves exceptionally useful, often to the extent of rendering the interpolation method unnecessary.

Mr. Simpson's reference to the 200-mile road is not at all conclusive or convincing without detailed information regarding the number of "types" of service-runs and the total number of stops, i. e., how many different individual service-runs had to be plotted. It would also be interesting to know something of the "quality" of the work done, the way the runs are made, the scales of ordinates used, the degree of precision sought, etc. It does not seem impossible that the same work could be done by the chart method, at least as well (if Mr. Simpson's Fig. 8 may be taken as a fair sample of the "quality" of the work), in a time at least as brief. If the case were one in which several different kinds of train-units are to be used, including single-car trains, also two-car, three-car, and longer trains, for both express, local and freight service, the number of different sets of interpolation charts required would be multiplied until their preparation constituted a task of some magnitude. In such a case, Mr. Simpson would probably be glad to take the time to prepare a "chart of reciprocals" and to use the chart method for direct plotting, even at the risk and under the necessity of being obliged, occasionally, to drew new curves of coefficients for different values of w, the tons per motor.

I am grateful to Mr. Simpson for furnishing me the text and pretext for these "notes." The "moral" which they aim to illustrate is that: (1) all innovations, however original and meritorious, are not always necessarily improvements on existing ways and means; (2) theories, and other explanations, are not necessarily simplified by being curtailed, especially when the omission involves circumstances which affect the case quite materially. I have not been able to get over the feeling that it is at least as important to do the work well as to do it quickly, when this work, in the case of the technical study of a railway project, may influence large investments and their financial outcome. My feeling is that I prefer to entrust this kind of work to men who do know at least a little calculus, and who have sufficient application, industry, and perseverance to master the complete theory of the subject, instead of being content with a mere superficial smattering of it. I find that such men can be trusted to use their judgment, while the others usually require to be constantly watched and, often, to be "set straight." The frequent requests which I continue to receive for reprint copies of my original A. I. E. E. paper on speed-time curves, and the appreciative manner in which my lectures have been received by both students and teachers show that there is a demand for a presentation of the theory by calculus methods. It is to meet this demand that the preparation of a work on "Electric Train Movement" in two, possibly three, volumes has been undertaken by the writer. The first volume ("Kinematics and Dynamics of Train Motion") will appear during the present year.

C. O. Mailloux.

LECTURE ON SINGLE PHASE TRACTION

In a lecture by W. S. Murray before the Electrical Engineering Society of Columbia University on Wednesday, March 6, much interesting information was given concerning single-phase traction in general and the particular method employed by the New York, New Haven & Hartford Railroad in substituting electric for steam locomotives. It was shown that in changing over from steam to electricity during the early stage of transition it is desirable to employ as much of the old equipment as possible. Thus the old tracks can be used with the simple addition of proper bonds; and by using locomotives rather than motor cars neither the freight nor the passenger rolling stock need be altered. A determination of the exact type of locomotive will in general depend upon the service. For strictly local suburban work the low-voltage direct-current locomotive deserves careful consideration, but for long-distance service, high-tension alternating-current locomotives are preferable. One of the chief advantages of the single-phase equipment resides in its simplicity, because by selecting the proper voltage not only is there no need for rotary converters, but even both the step-up and step-down transformer equipments can be dispensed with. Eleven thousand volts being the potential adequately suited to the location of power centers, this voltage being common practice for transmission purposes and 25 cycles being as nearly standard frequency as the art to-day can dictate, this voltage and frequency were adopted.

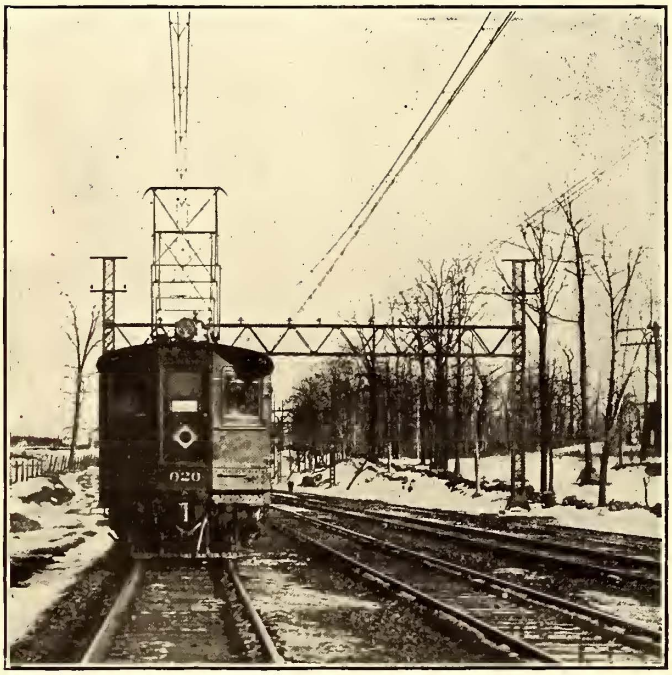


FIG. 1.—END VIEW OF ELECTRIC LOCOMOTIVE, SHOWING CATENARY CONSTRUCTION ON STRAIGHT TRACK

The simplicity of the single-phase equipment is well illustrated in the power house, where the major portion of the switchboard is designed for single-phase rather than polyphase work, although for convenience in interconnecting with other systems three-phase generators have been installed. The bus-bars are in duplicate throughout, for the purpose of maintaining immunity from breakdown.

Mr. Murray explained that the severest service to which the New Haven locomotives would be subjected would be in handling the local schedule. This service consists of the run between New York and New Haven, in which thirty-one stops are made. The average distance between stops is 2.2 miles, the average (or schedule) speed is 26 m. p. h., and the maximum speed does not exceed 45 m. p. h. The average trailing load of the New Haven trains is 210 tons, and while the locomotive will handle this tonnage in the above schedule with ease it will with equal facility handle a trailing load of 300 tons, in express service, within the zone of the present electrification.

In calculating the power required for hauling trains Mr. Murray assumed 40, 45 and 50 watt-hours per ton mile for express, express-local and local trains, respectively. By careful indication of steam locomotives in the above services he had found that these assumptions were well on the safe side, some trains, in express service, actually showing an energy consumption of only 31 watt-hours per ton-mile.

The locomotive is equipped with 62-in. drivers, which, together with the extra weight of the auxiliary devices and control mechanisms, give a center of gravity approximately 54 ins. above the rail. Although the motor is connected to the locomotive axle without gears, the whole motor equipment is spring suspended and the possibility of producing a hammer blow upon the track is practically eliminated. Electrically considered, each motor is provided with twelve poles. The field winding is of the compensated type in order to reduce the reactance of the armature. For the purpose of minimizing the sparking at the commutator, the armature is provided with a winding closed upon itself and connected to the commutator through resistance leads. Although some loss takes place in these leads, it is worthy of note that the loss is less when the leads are used than when they are omitted. The commutators of the motors on one of the locomotives which has traveled a total of 15,000 miles have never been sandpapered or trimmed down in any way, yet they appear to be in as good condition as when new. The motors are provided with forced ventilation supplied from electrically-driven blowers. The ventilation is so effective that the continuous rating of the equipment is nearly equal to the hour rating.

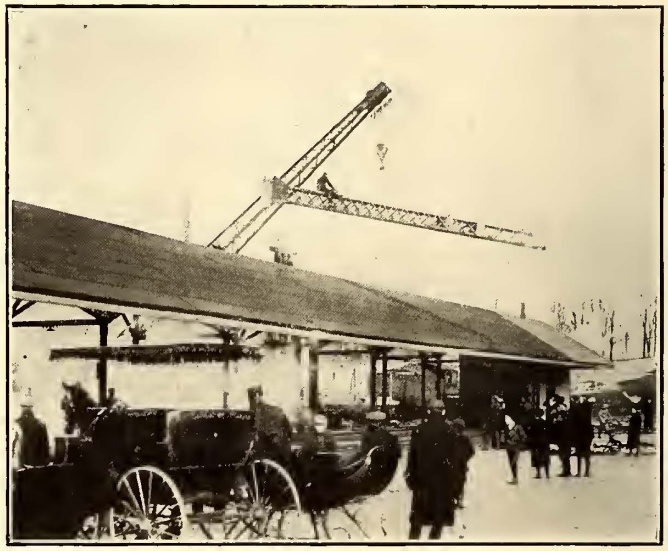


FIG. 3.—HOISTING POLE BY CRANE OVER SHED AT RYE WAITING STATION

The lecture was well illustrated, numerous views being shown of the locomotive and of the overhead work. The locomotive is designed for use over the tracks of the New York Central Railroad in the neighborhood of New York City where a third-rail equipment is used. Throughout the alternating-current zone of the New Haven road the loco-

motives will receive current from an everhead catenary structure. Fig. 1 gives an end view of a locomotive showing the third-rail contact shoes turned up at an angle of about 40 degs., which position gives the proper running clearance to the locomotive over the New York, New Haven & Hartford alignment. It will be noted that the pantagraph mechanism is extended so that the alternating-current contactor reaches the overhead construction.

The overhead wiring is supported at points 300 ft. apart by means of bridges made of steel lattice-work. At every two miles the overhead bridge is of special form and is used both to anchor the line work and to contain switches for the purpose of disconnecting the trolley circuits or interconecting them with feeders, as may be desired. A general view of the catenary construction is given in Fig. 2, which is from a photo taken looking east from the New Rochelle anchor bridge No. 72. Sectionalizing oil switches and trolley wooden section insulators are carried on the anchor bridges only and are not shown in the photographs. A 110-volt electro-pneumatic operating device is provided for controlling each sectionalizing switch. At each anchor bridge there is arranged a complete encircling bus to which can be connected the feeders, and to which each section of the overhead work is normally joined. When so desired the track switches may be opened at two adjacent anchor bridges, and thus any section of track may be rendered dead, while the bus allows the feeder circuit to form a shunt around the overhead work for furnishing continuity of transmission beyond the disconnected section. The 110-volt circuit is controlled from a panel in the regular signal tower (adjacent to the anchor bridge), thus it is possible for the signal operator to stop any train on any section when emergency may require. Thus, should a locomotive engineer disobey the operator's signal, by joint action with the adjacent tower, voltage is removed from the tracks of the offending engineer. This train would then come to a standstill.

No. 4-0 wire is used for the contact conductor; the feed-

FIG. 4.—SETTING POLE IN PLACE AT RYE

FIG. 2.—VIEW FROM THE NEW ROCHELLE ANCHOR BRIDGE NO. 72, LOOKING EAST

ers, however, are of No. 2-0 wire. The larger size was used for the contact conductor on account of the required mechanical strength and not because so great a conductivity was needed. A delta-formed catenary structure serves to support the contact conductor. The main support is provided by two 9-16-in. steel cables to which the copper con-

FIG. 5.—SETTING POLE IN PLACE AT RYE

tact conductor is joined at frequent intervals as shown in Fig. 2.

On account of the fact that some of the overhead bridges span as many as seven tracks, it will be appreciated that extraordinary means had to be employed in their erection. For the purpose of placing the side poles in position on their concrete foundations and for lifting the overhead bridges into place, use was made of the locomotive crane shown in operation in Figs. 3 to 6. The crane served for lifting the steel fabricated posts from the flat cars and carrying them over to the proper foundations. Figs. 3 to 5 indicate one of the most difficult pieces of erection at Rye station, where the side post is just being placed on its foundation. It will be noted that the beam of the locomotive crane does not even clear the station shed, yet the horizontal distance from the end of the crane to the foundation on which the pole is to rest is at least 25 ft. The lattice-work post was first balanced at its central point and lowered to the ground on the foundation side of the shed. By means of a sheave block and a hitch connected to a conveniently located tree in a yard adjacent to the station grounds the improvised telpher system allowed the mass to be drawn over to a point sufficient to permit the post to be swung towards the foundation in pendulum order, the last act in the performance being shown in the figure indicated.

After the side posts have been erected the truss is lifted from the flat cars, balanced in the air, raised above the ends of the posts and then lowered into position. The whole operation of lifting a cross-bridge from the cars and lowering it into position consumes about fifteen minutes. Fig. 6 shows an end view of the locomotive crane. The work of erecting the bridges has been accomplished by the McClintic Marshall Construction Company, under the immediate direction of G. W. Tracy.

The Rochester Railway Company has petitioned for a number of extensions. Some of these are for double-tracking present lines and others for new ones in outlying territory.

STEEL TOWER AS A PARK ATTRACTION.

A steel tower recently removed from the World's Fair grounds to Creve Cœur Lake has been equipped with an elevator by the Florissant Improvement Company, a subsidiary corporation of the United Railways Company, of St. Louis. It is desired to carry passengers to the top of the tower, which is 225 ft. high and 500 ft. above the surface of the lake. The United Railways Company also will make improvements on its ground upon the edge of the lake, sowing blue grass and making a park out of that portion of the lake. Driveways and stairways will also be constructed. In addition the company has sunk an artesian well 1300 ft. deep.

TRAIN DEPARTURE SIGNALS AT TOLEDO.

Interurban trains at the union passenger station at Toledo, Ohio, are now receiving signals for their departure through a gong placed on the outside of the building. This is manipulated by means of a button by a man who occupies a little room just above the waiting room. He also announces trains and looks after matters in general. All ticket sellers, baggage agents and other employees of the office are now under the supervision of J. S. McGee.

NEW OFFICERS OF THE HONOLULU COMPANY

At the recent annual meeting of the stockholders of the Honolulu Rapid Transit & Land Company the following officers and directors were elected: L. T. Peck, president; L. A. Thurston, first vice-president; J. B. Castle, second vice-president; Wm. Williamson, secretary; C. H. Atherton, treasurer; F. W. Klehbahn, auditor.

FIG. 6.—END VIEW OF CONSTRUCTION CRANE

THE STRAIN ON CURVE SPIKES

The subject of the strain placed on curve spikes is attracting a great deal of attention at present on account of the recent New York Central accident. Additional knowledge on this subject is given by some computations recently made by George F. Swain, professor of civil engineering at the Massachusetts Institute of Technology, who has been studying the subject. An abstract of Prof. Swain's report follows:

These computations are based upon a coefficient of friction between wheel and top of rail of .25, and the coefficient of friction between base of rail and tie-plate of the same. The action of the pony truck of the electric locomotive, which is transmitted to the rigid frame by means of the spring and pivot, has been taken account of in each case, but the friction on the sliding plate by which the vertical load is carried to the pony truck has been considered separately in order that it may be omitted, if it is thought that it ought not to be allowed for.

The second driving axle has a certain amount of play laterally, so that it would tend to work to the outside of the curve and make the pressure on the forward driver less than if the forward driver were the only one upon which the pressure were exerted. Whether the second driver will come into action in this manner depends upon its play laterally and upon the precise position which the locomotive assumes upon the track, as well as upon the perfection of the alignment of the track. This has been studied with various positions of the truck upon the track as follows:

(1) In which the rear driving axle is radial, with inside wheel close against the inside rail.

(2) In which the rear driving axle is pushed outward a little until outward wheel of rear pony is against rail but without compressing the spring.

(3) In which the rear driving axle is pushed outward still further until outer rear driver is in contact with the outer rail.

With the play of the second axle as given, it would be possible in each of these three cases for the second outer driver to be in contact with the outer rail, but the margin for possible inequalities in the track would be different in the three cases; for (1) it would be about 3-1000 in., for (2) it would be about ⅛ in., and for (3) it would be about ¼ in. In other words, it is more probable that the second driver would relieve the leading driver if the position were as assumed in case (2) than it would if the position were as assumed in case (1), and more probable still if the position were as assumed in case (3).

Table I. gives a summary of the conclusions arrived at.

Another point of some uncertainty in the problem is as to the distribution of the pressure of the forward driver upon the spikes. If this pressure is exerted directly over a tie, the outer spike on that tie will carry a greater portion of the pressure than any other spike, and if no yielding could occur either in tie or in spike, this spike would carry the whole of the load. Any yielding, however, no matter how slight, would distribute the load upon the two spikes on either side, these two carrying less than the first spike. In a similar manner, if the pressure were exerted midway between two ties, the two spikes on these ties would carry one-half the load, if no yielding could occur; but any yielding, however slight, would distribute the load upon other spikes on either side. It is impossible for anybody to tell just how much pressure would be carried upon the spike which is most stressed, but it would be the judgment of the writer that the pressure should be considered as distributed upon two spikes. It is possible to imagine cases in which nearly the whole load might be carried by one spike, but those would be cases where the track could not be said to be very perfect.

TABLE I.

	Speed—Miles Per Hour.				
	57.6	60	70	80	90
(1) Allowing for friction between base of rail and tie plate, but not for friction of sliding plate of pony truck or for pressure of second driver against outer rail, the pressure of leading driver against outer rail will not exceed	4,300	5,200	8,400	12,300	16,800
(2) If friction of sliding plate of pony truck is also allowed for pressure on leading driver against outer rail will not exceed	3,200	4,100	7,300	11,200	15,700
(3) If second driving axle slides laterally so as to bear against outer rail, pressure of leading driver will not exceed	2,100	3,000	6,200*	10,100†	14,000**
Friction on base of rail under outer leading driver	4,375	4,435	4,735	5,085	5,500
My belief is that on an approximately perfect track the pressure of the leading outer driver would not exceed the following	3,000	3,000	3,500	7,500 to 8,000	11,000

* And will probably not be over 3,000. † And will probably not be over 6,200
** And will probably not be over 11,000.

Another uncertain element in the problem is the question of impact. The pressure upon the spikes is not suddenly applied, but is applied very quickly, and with a good track it would not be applied with a shock; there would be a steady pressure of the outer wheel against the rail in passing around a curve. If the load were applied instantaneously to a spike the impact would be 100 per cent; if the load is applied gradually, as it is in fact, the impact will depend upon whether it is applied more quickly than the strain can follow it.

Another element, also, must be taken into account—namely, the fact that although the load is quickly applied it is removed just as quickly. If the quick application of a load is a disadvantage the quick removal of it is an advantage, like skating over thin ice. Everybody knows that if his speed is considerable a skater can skate over ice so thin that it would not bear his weight for an instant without breaking. The quick removal of a load, therefore, tends to offset any impact caused by its quick application.

As a result of the writer's study of this problem, he is convinced that with a good track it would not be possible for these engines running around a 3-deg. curve at a speed of from 60 to 70 m. p. h., or even higher, to shear the spikes on the outer rail. The ultimate strength of a spike, the writer is informed, has been found by tests to be 17,000 lbs. If the cross-section of the spike were reduced by wear by one-ninth, as has been stated to be the case, the breaking strength would be reduced to 15,100 lbs. The writer does not believe the pressure of the leading driver against the outer rail at a speed of 60 m. p. h. would be above 3000 lbs. (and it assuredly would not be above 5200 lbs.) or at a speed of 70 m. p. h. above 3500 lbs. (and it would assuredly not exceed 8400), so that there would be a considerable margin in either case. It must further be borne in mind that it will require a stress considerably above the elastic limit in order to break a piece of metal, even with

many thousands or millions of applications, the number of applications required being less as the ultimate strength under a single application is approached. For instance, reliable tests indicate that for steel in tension a stress of seven-tenths of the ultimate strength would have to be applied some 40,000,000 times in order to break a piece, and that a stress of about five-eighths of the ultimate strength would require 6,000,000 or 7,000,000 applications. Experiments, of course, vary with regard to the number of applications necessary. If there is any defect in the material at any point, the effect of repeated applications is to cause a failure at this point and with a less number of repetitions than if the material is perfect, but even with a defect, a stress of seven-tenths the ultimate is likely to require half a million more applications.

TEST OF SPIKES

Robert W. Hunt & Company, engineers, have also made some tests on the shearing of spikes which are of interest. They are contained in a report made March 14, 1907, which is given in abstract below:

We made tests of six spikes in double shear, using the shearing blocks as shown on accompanying sketch, Fig. 1. These shearing blocks do not give a knife edge shear, but in our opinion approach very closely the actual shearing, bending and tension stresses obtaining in actual service where a spike is sheared off by flange of rail. The elastic

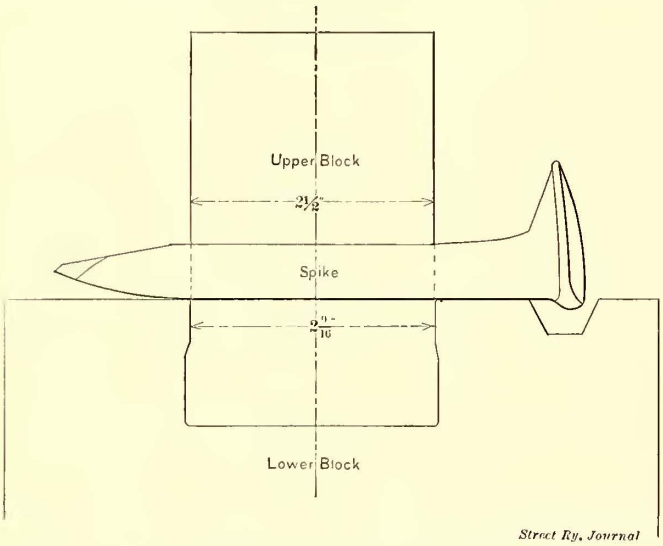


FIG. 1.—ROUND-CORNERED BLOCKS, APPROXIMATING BASE OF RAIL FOR SHEARING SPIKES

limit, or rather the yield point, was obtained as closely as possible from the action of the beam of the testing machine and also from a close observation of the spike itself. We believe that the approximate elastic limit obtained under the given conditions does not vary more than 2½ per cent from the actual. There was practically no bending of the spike until the elastic limit was reached. The results are published in Table II.

TABLE II.—RESULTS OF TESTS WITH SPIKES WITH ROUND-CORNERED BLOCKS

Test No.	Width of Spike.	Height of Spike.	Approximate Elastic Limit.	Maximum Load.
	Inch.	Inch.	Lbs.	Lbs.
1	.624	.622	9,500	37,880
2	.591	.608	10,500	40,460
3	.631	.592	10,500	38,640
4	.630	.597	12,000	38,820
5	.626	.601	10,900	40,930
6	.634	.609	10,000	40,160
Average	.6226	.6048	10,566	39,481

Average approximate elastic limit or yield point in either double or single shear, pounds actual = 10,566; average single shearing load of spike, pounds, actual, 19,740.5; average single shearing load of spike, pounds, per square inch, 52,420.

These results were obtained in the straight portion of the spike. While the spike in service would fail nearer the head where the area would be greater, the area of the spike where tested was .3765 sq. in., and the area of the spike at the base of rail where the shear would probably take place in about .4225 sq. in.; therefore, the approximate elastic limit and the shearing load at the latter point would be in the proportion of .4225 to .3765, when compared with those actually obtained in the straight portion of the spike. The approximate elastic limit and the shearing load of the spike at the base of rail would therefore be 11,855 lbs. and 22,145 lbs., respectively.

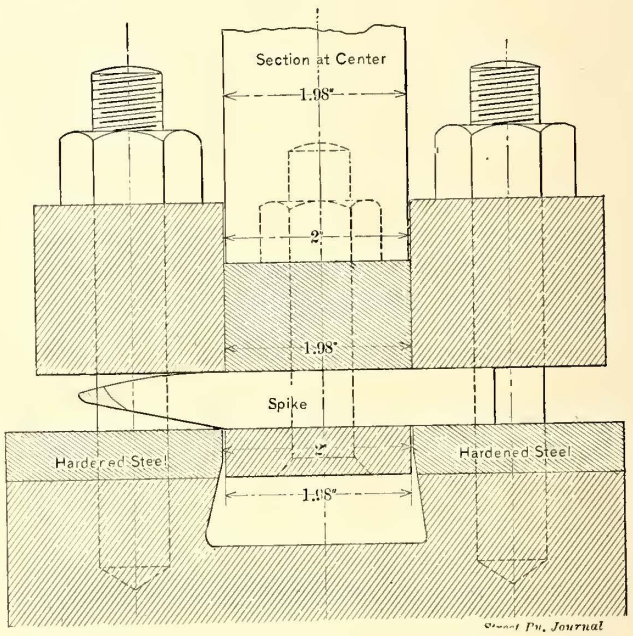


FIG. 2.—KNIFE-EDGED BLOCKS FOR SHEARING SPIKES

We also made some tests with blocks which would give a knife-edge shear (see Fig. 2). In these testing blocks the entire spike is rigidly clamped and there cannot be any bending of the portion of the spike corresponding to the head and a short length of the shank as would probably be the case in service. We had the heads cut off of four spikes and tested in this device, with the results given below. As will be noted, the approximate elastic limit or yield point is raised when tested under these conditions, and the maximum shearing load is lowered as shown in Table III.

TABLE III.—RESULTS OF TESTS WITH SPIKES WITH KNIFE-EDGE SHEAR

Test No.	Width of Spike.	Height of Spike.	Approximate Elastic Limit.	Maximum Load.
	Inch.	Inch.	Lbs.	Lbs.
8	.624	.608	13,000	36,550
9	.627	.593	14,000	38,790
10	.625	.592	12,000	37,810
11	.627	.608	11,500	36,880
Average	.6257	.601	12,625	37,507

Average approximate elastic limit of yield point in either double or single shear, pounds, actual, 12,625; average single-shearing load of spike, pounds, actual, 18,753; average single-shearing load of spike pounds per square inch, 49,807. The approximate elastic limit or yield point and the shearing

load of the spike at the base of the rail would, therefore, be 14,165 lbs. and 21,062 lbs., respectively.

Spike No. 2 was not sheared entirely in two, the testing machine being stopped after the maximum load was reached. This was done in order to indicate the shape of spike just before shearing took place.

In connection with Prof. Swain's letter and in view of the many conclusions that have been reached regarding the comparative effect on curves of steam and electric locomotives because of the different assumptions made by those investigating the matter, it seems wise to summarize all the results to see what the comparative shear on spikes will be under various conditions for an electric locomotive of the New York Central type and a steam locomotive of the Atlantic type, on a 3-deg. curve elevated for 46½ m. p. h. and with a train-speed of 70 m. p. h. These results would therefore show the effect on the spikes at the outer rail at a speed 23½ m. p. h. in excess of that for which the curve would be elevated.

The alternative elemental assumptions are:

(1) Shall the calculations be made on the basis of the front driver only bearing against the outer rail or both the first and the second drivers bearing against the outer rail? Prof. Swain's calculations, as explained in his report, are on the basis of the first two drivers bearing, but the counter-claim is made that under certain conditions only the bearing of the first driver should be considered.

(2) Shall full allowance be made for the friction between the rail and the tie-plate, based on a coefficient of, say, .25; or, as many claim, shall no allowance be made for friction between the rail base and the tie-plate due to the possibility of a thin layer of ice in cold weather that would practically eliminate this feature?

The accompanying tables (IV. to VI.) have been prepared summarizing the results of the calculations that have recently appeared in the technical press and which have been testified to before public investigating bodies, showing four sets of comparisons. From these it appears that at 70 m. p. h. (see Table IV.) in one instance, with the first driver only bearing against the outer rail and full allowance made for friction between the rail base and the tie-plate, the electric locomotive exerts 50 per cent greater shearing stress on the spikes than the steam locomotive. The stress per spike, however, shows a factor of safety of 4. In the other three cases the greatest shearing stress is caused by the steam locomotive, with factors of safety ranging from 2½ where the first driver only bears against the outer rail and with no allowance for friction between the rail base and the tie plate to a factor of safety of 8 where both drivers are assumed to bear against the outer rail and full allowance made for friction between the rail base and the tie-plate.

It will, of course, be borne in mind that these results are based upon a very much higher speed around the curve than that for which it is elevated.

It appears, therefore, that for most of the assumptions the steam locomotive shows greater stress on the outer rail than the electric locomotive, and that in all instances, even at 70 m. p. h. on a curve elevated for 46½ m. p. h., the shear on the spikes is well within the limits of safety.

TABLE IV.—COMPARATIVE SHEAR ON SPIKES FOR ELECTRIC AND STEAM LOCOMOTIVES ON THREE-DEGREE CURVE ELEVATED FOR 46½ MILES PER HOUR, TRAIN SPEED 70 M. P. H., *i.e.*, 23½ M. P. H. IN EXCESS OF EQUILIBRIUM SPEED.

Assumption of Driver Bearing on Outer Rail.	Full Allowance for Friction Between Rail and Tie Plate.						No Allowance for Friction Between Rail and Tie Plate.					
	Electric.	Steam.	Difference.		Spike Shear.*		Electric.	Steam.	Difference.		Spike Shear.*	
			Per Cent Greater.	Greatest Shear on.	Lbs. Per Spike.	Factor Safety.			Per Cent Greater.	Greatest Shear on.	Lbs. Per Spike.	Factor Safety.
First driver only against outer rail	D 9,130	D 5,970	50%	Electric.	4,565	4+	D 14,130	D 15,390	9%	Steam.	7,695	2.5+
First and second driver against outer rail	T 3,020	T 4,840	60%	Steam.	2,420	8+	D 7,460	T 8,170	10%	Steam.	4,085	5.—

D = Driver wheel. T = Truck wheel. * Spike shear data based on average result of full size tests of spikes, showing ultimate shear 19,740 lbs., two spikes assumed to carry the load with 100-lb. rail.

Table IV. gives an analysis of the results shown in Tables V. and VI.

TABLE V.—COMPARISON OF PRESSURE AGAINST OUTER RAIL. ELECTRIC LOCOMOTIVE AND STEAM LOCOMOTIVE ATLANTIC TYPE.

Miles per Hour.	Front Driver Pressure Against Outer Rail.				Guiding Truck Pressure Against Outer Rail.	
	Supposing 2d Axle Not Thrusting Against Rail.		Supposing 2d Axle Thrusting Against Rail.			
	Electric.	Steam.	Electric.	Steam.	Electric.	Steam.
40	4,740	6,120	3,860	6,260	6,410	7,830
50	7,400	7,450	4,120	6,220	6,600	7,950
60	10,470	11,230	4,480	5,460	6,830	8,130
70	14,130	15,390	7,460	7,570	7,100	8,170
80	18,360	21,160	11,000	13,020	7,400	8,200

TABLE VI.—COMPARATIVE SHEAR ON SPIKES AT LEADING TRUCK WHEEL AND AT DRIVER WHEELS FOR ELECTRIC LOCOMOTIVES AND CENTRAL-ATLANTIC TYPE STEAM LOCOMOTIVES, ON THREE-DEGREE CURVE, SUPER-ELEVATION—4½ INCHES.

Electric Locomotive.

Miles Per Hour.	Rail Thrust Leading Truck Wheel.	Friction Bet. Rail and Tieplate Leading Truck Wheel.	Shear on Spikes by Leading Truck Wheel.	Rail Thrust Leading Driver, Second Driver Not Against Rail.	Rail Thrust Leading Driver, Second Driver Against Rail.	Friction Bet. Rail and Tieplate Leading Driver.	Shear on Spikes by Leading Driver, Second Driver Not Against Rail.	Shear on Spikes by Leading Driver, Second Driver Against Rail.
40	6,410	4,000	2,410	4,740	3,860	4,180	560	.....
50	6,600	4,030	2,570	7,400	4,120	4,360	3,040	.....
60	6,830	4,050	2,780	10,470	4,480	4,650	5,820	.....
70	7,100	4,080	3,020	14,130	7,460	5,000	9,130	2,460
80	7,400	4,100	3,300	18,360	11,000	5,360	13,000	5,640

Steam Locomotive (Atlantic).

40	7,830	3,200	4,630	6,120	6,260	6,280	.....	.....
50	7,950	3,210	4,740	7,450	6,220	6,720	730	.....
60	8,130	3,240	4,890	11,230	5,460	8,170	3,060	.....
70	8,170	3,330	4,840	15,390	7,570	9,420	5,970	.....
80	8,200	3,430	4,770	21,160	13,020	11,250	9,910	1,820

Table V. shows the pressure against outer rail, ignoring the friction between the rail base and tie-plate.

Table VI. gives the comparative shear on spikes on the basis of the first driver and also of the first and second drivers against outer rail, making allowance for friction between the rail base and tie-plate.

STREET RAILWAY LEGISLATION IN PENNSYLVANIA

Several articles in recent issues of this paper have referred to important legislation which is being proposed in Pennsylvania in favor of the electric railway companies, but a general review of the situation at this time may be of interest. The law regulating the construction of lines in Pennsylvania presents an anomalous condition. Under the existing statutes permission to construct lines on highways within the State is contingent upon the railway company securing the permission of every abutting property owner. A single individual owning even 10 ft. along the highway on which the road is to be constructed can block the construction of the entire line. Where the title of the property rests with an infant, lunatic or other person legally incapable of giving consent, an insurmountable obstacle is encountered. The conditions for constructing lines over a private right of way are equally onerous and are practically prohibitive. The existing law gives no right of eminent domain to companies organized under the street railway act, and any property owner over whose land the line is projected can block its construction by refusing to sell or else offering to sell only at a prohibitive price. In some cases electric railway companies have been able to construct their lines by consenting to be held up for large payments at the whim or avarice of individuals along their lines of route, but the effect upon interurban railway construction in Pennsylvania has been and could not be anything else but disastrous. It has been suspected that the powerful steam railroad interests in the State were largely instrumental in retaining this oppressive law on the statute books, through fear of trolley competition for local business. Whether that is so or not, there seems to be at present a revolution of feeling throughout the State at the present state of affairs. The farmers are becoming cognizant of the fact that they lack the transportation facilities by trolley enjoyed by the residents of other States, as well as the ability to send their produce to market and receive their supplies in the same way.

The result has been a general agitation on the subject in the State of Pennsylvania which has culminated in the organization, early in the year, of what is being called for the present the Temporary Street Railway Association of the State of Pennsylvania. This association has elected Walter E. Harrington, president of the Pottsville Union Traction Company, as chairman, and now includes among its membership seventy-two of the electric railway companies of the State. Practically all of the companies outside of those in the larger cities, with whom the matter is not so important, have joined the association. An executive committee of fourteen has been elected, consisting of the following members: W. E. Harrington, Pottsville, chairman; T. A. H. Hay, Easton, vice-chairman; Murray A. Verner, Pittsburg; Hon. W. F. Bay Stewart, York; R. H. Koch, Pottsville; M. H. Kulp, Shamokin; H. E. Ahrens, Reading; A. M. Taylor, Philadelphia; C. L. S. Tingley, Scranton; H. J. Crowley, Altoona; H. C. Reynolds, Dalton; J. E. Rigg, Reading; F. B. Musser, Harrisburg, and David Young, Allentown.

From this executive committee two sub-committees have been appointed, one on legislation and the other on law. These committees are composed of the following gentlemen: Committee on legislation, F. B. Musser, Harrisburg, chairman; T. A. H. Hay, Easton; M. H. Kulp, Shamokin. Committee on law, R. H. Koch, Pottsville, chairman; A. Merritt Taylor, Philadelphia; John E. Rigg, Reading.

The principal object of the association at present is to present arguments before the Legislature showing the advantages to the commonwealth of granting street railway companies the right of eminent domain and the privilege to carry light freight. With this object in view, two bills were presented in the Legislature on March 4. That permitting the carriage of light freight was advanced to its second reading on March 21 with no change in the wording. The second, granting the right of eminent domain, was slightly amended March 19, on the motion of Mr. Moyer, of Lebanon. It was then recommitted, but was reported upon favorably on March 20 by the committee on electric railways of the House. As an investigation disclosed that there was nothing in the law giving street railways operating on the street the unquestioned right to depart from the highway to a private right of way, a third bill covering this point has been introduced in the House by Mr. Moyer.

The hearings on the bills before the committee on electric railways of the House of Representatives have been extremely instructive. Addresses on the subject were made, among others, by Hon. H. L. Carson and H. C. Reynolds. These speeches have since been reprinted by the association and have just been sent to all of the electric railway companies of the State. Copies have also been mailed to many of the Granger associations which have manifested their desire to co-operate in the proposed reforms as well as to others whose interests are affected by the bills under consideration. The principal argument was made by Mr. Carson. In urging the passage of the freight bill the speaker referred to the fact that every State immediately adjoining Pennsylvania permitted the haulage of light freight, and that it had been of great service in developing the resources of the rural districts. The effect of such means of communication were described by Mr. Carson in the following words:

> Every man likes to get into a community where there is life. This is an active age, and the whole theory of transportation is to get human business and those things which they need for their personal comfort or convenience transported as speedily as possible. Yet there are certain remote districts which at present are suffering from a lack of this very ease of transportation, even as far as passengers are concerned, because the population is so sparse as not to justify the building of a trolley road for passenger service alone. The expense of doing so and the returns would be so inadequate that no capitalist is willing to undertake the experiment. If, however, there were added the right to carry light freight which those passengers would require in that community, there would then be a temptation to build the road, and incidentally the communities would develop and benefit by the incidental advantages which are none the less incidental social intercourse. A community which lives by itself is like an individual living by himself, nothing more than the hermit with no interchange of thought or contact with the outside world, but when a community is brought into closer contact with its neighbors it can enjoy those advantages; people are happier, and although it may seem like dwelling upon the sentimental side, yet at the same time much of that which is valuable depends upon sentiment. In addition, there is an economical question involved, and nothing can be more concise than this resolution adopted by one of the State organizations of the farmers. I will give you its exact language: "The farmers have done more than their share in their liberal grants of rights of way to electric railways, which should not only be permitted but should be required to serve the public to the full extent of their facilities; to this immediate portion of the community, both the Legislature and the railways owe an immediate and important duty—their need for additional, frequent and quick service is urgent. They should no longer be deprived of it."

In connection with the proposal to grant the companies the right of eminent domain, Mr. Carson discussed each clause seriatim, and pointed out that under the bill it was

still necessary to secure the consent of 51 per cent of the abutting property owners as well as that of the local authorities.

Mr. Reynolds referred in his speech to the fact that he was constructing a short electric line in a community which was served at present by but one freight train in every twenty-four hours; 640 cans of milk were carried on this road per day during December, but owing to delays the milk frequently reached the city in such condition that much of it was spoiled. While securing the right of way for this electric line, the company had to pay for farm property in one instance at the rate of $43,000 an acre. He cited another case in which an electric railway company had expended about $5,000 for surveys for a projected line. The road was desired by the community but its construction was prevented by the refusal to grant its consent of a large corporation owning real estate along the line.

In furtherance of its policy of education, the temporary association has sent a letter to those whom it thought would be interested in the reform measures. Some abstracts from this letter follow.

Pottsville, Pa., March 19, 1907.

In response to a widely prevailing popular sentiment, voiced by the pledges of all political parties in Pennsylvania, there have been introduced into the General Assembly, bills conferring upon street railway companies the right to carry light freight and to exercise such powers of eminent domain as are essential to secure their rights of way and efficient operation. All these bills having been duly considered by the interests affected, two have been favorably reported to the House, viz.: the so-called "Homsher Bills."

The Temporary Street Railway Asociation of Pennsylvania, composed of seventy electric railway companies, formed for the purpose of advocating the legislation which is much needed by the electric railways in this State, in order that they may serve the public to the fullest extent of their ability, and respectfully submits for your consideration the following suggestions as to the merits of the pending measures:

AS TO THE EMINENT-DOMAIN BILL

As submitted by John G. Homsher and amended by Gabriel H. Moyer.

Most of the States have conferred upon their electric railways the right of eminent domain.

The right of eminent domain is exercised in Pennsylvania by railroad, telegraph, telephone, electric light, gas, water and oil pipe line companies.

We do not ask that the full and unrestricted right of eminent domain be extended to electric railways as it has heretofore been extended to railroad companies

The Constitution of this State provides, in Article XVII., Sec. 9, that "No street passenger railway shall be constructed within the limit of any city, borough or township without the consent of its local authorities." Therefore, in conferring upon electric railways the right of eminent domain, such right is only conferred subject to this constitutional provision. In applying to the local municipal authorities for permission it is necessary for the electric railway company to describe the proposed route in detail; it is, therefore, within the power of the municipal authorities to prescribe any changes in the location of the route, as a condition precedent to the passage of an ordinance. These restrictions will effectively prevent the use of the right of eminent domain except where it should be exercised in the interest of the entire community.

An additional safeguard has been provided by stipulating in the bill that the right of eminent domain shall not be exercised upon highways until consent of the owners of at least 51 per cent of the foot frontage of the entire distance to be traversed on such highways has been obtained. Then, having also obtained municipal consent, the rights of the owners of a minority of the foot frontage may be condemned. Under the law as it stands to-day, an electric railway company has to obtain consent for the construction of its lines from every abutting property owner on a highway and from the owner of every property through which it is proposed to operate upon a private right of way. The result is as follows:

Many communities are devoid of transportation facilities by reason of inability on the part of the electric railways to obtain the necessary consent from property owners to enable them to reach such communities.

At present it is in the power of any one large property owner to deny an entire community in this State much needed electric railway facilities.

It is also in the power of one property owner to predicate his consent upon the location of the railway upon his property in such manner as to entail steep grades and dangerous curves, which are a constant menace to the safety of the traveling public.

One small property owner may require an electric railway to go around his property, thereby placing awkward and dangerous curves in the tracks and increasing the distance and consequently the running time between terminal points to the disadvantage of the traveling public.

At present where it is necessary to establish an additional turnout or lay a second track to give a more frequent schedule, it is frequently impossible to give the public these added facilities on account of the excessive demands of property owners or their unwillingness to meet public requirements.

At present where a property is owned by a lunatic, by minor children or by others incapable of giving title or consent, it is impossible for an electric railway to operate over such property or along the highway in front of it under any conditions. The public is thereby denied necessary facilities or the railway company is compelled to locate its line around such property.

Almost monthly there is a serious accident in this State, caused by motormen losing control of cars on steep grades which have sharp curves at their base: a construction which has been made necessary by the cupidity of property owners and the inability of the electric railway companies to secure the necessary rights of way to eliminate these grades and curves. Such danger places, of which there are many in this State, cannot be eliminated unless the right of eminent domain is conferred.

Great corporations in the central and northern part of this State, owning vast tracts of land, are holding up many legitimate railway extensions against the protests of large communities. Where the whole people require the construction of an electric railway and show their desire by granting, through their local authorities, municipal consent to the construction of such lines, the State should certainly intervene by lending the electric railway companies the right of eminent domain where these corporate or individual property owners, through mercenary or other ulterior motives, withhold their consent.

Power houses are frequently located at points remote from railway lines so as to be near running water and railroad sidings upon which fuel is received. It is, therefore, important that the railway companies should be able to secure the necessary strips of land upon which to erect the feed wires from their power houses to their railway tracks.

The passage of the eminent domain bill will greatly stimulate electric railway building in Pennsylvania, and many new lines for passenger and other traffic will thereby be opened up to the advantage of the people of this State. The bill which has been reported has had the consideration of eminent counsel, who approve and affirm its constitutionality.

AS TO THE FREIGHT BILL

Every State bounding the State of Pennsylvania, and most of the other States of the Union, have granted to electric railways the right to carry freight. Every rural community in Pennsylvania recognizes the very great importance of the passage of this bill.

Rural communities which are remote from steam railroad stations, but are near electric lines, are now denied the right to ship and receive farm products and necessities by the most convenient routes, and the residents of these towns are compelled to drive long distances over heavy roads, regardless of weather conditions, to the steam railroad stations. In such communities it is impossible to raise perishable garden vegetables, fruit and other perishable products, which are very profitable, on account of the long, unnecessary and expensive hauls to the steam railroad stations. Such communities cannot produce and ship milk economically to the cities on account of the expense of the long haul and exposure to the hot sun inseparable from these conditions.

The handling of farm products by electric railways will result in a large increase in the value of farm lands along the lines and also in greatly added convenience to the residents of the rural districts, who will be able to order their supplies by telephone and receive them conveniently and quickly.

There are many sparsely settled districts in this State through which it would be unprofitable to extend electric railways for passenger business only, but with the added revenue which will be produced by the carrying of freight, electric railways can be extended through sparsely settled districts which are in great need of transportation facilities.

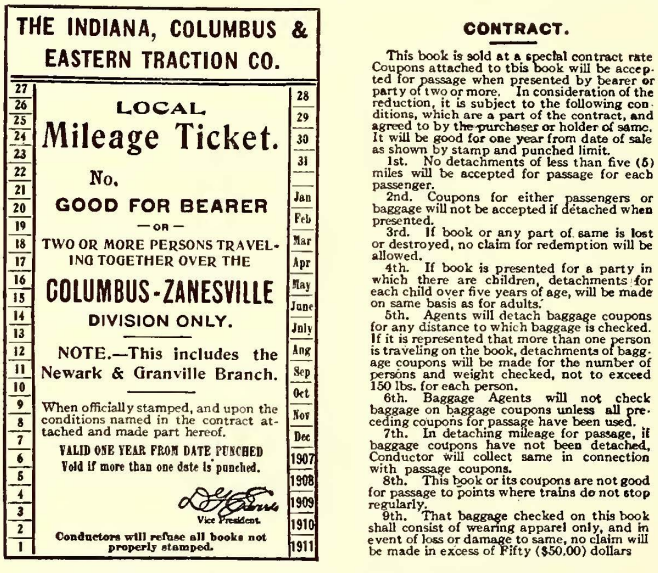
Under existing conditions, traveling men and others are compelled to take long roundabout routes to get from one point to another in order to have their baggage carried, where an electric railway connects such points by a direct route, but cannot extend the facilities for the carrying of baggage. The passage of the freight law will open up a new and efficient channel for commerce, and the electric railway will become a strong contributor to the welfare and comfort of the public at large. It will thus open up new channels of trade, with the resultant increase in consumption of manufactured articles and give great added convenience to the public.

We ask the right to carry farm produce, etc., and other light freight, and this only under and subject to the consent of the authorities of communities through which our lines operate.

Very respectfully,
W. E. Harrington, Chairman.

MILEAGE BOOKS ON INDIANA, COLUMBUS & EASTERN

The Indiana, Columbus & Eastern Traction Company placed on sale on three of its divisions, last week, a new form of mileage book, and it is expected that within the next few weeks similar books, good only on the divisions.


THE INDIANA, COLUMBUS & EASTERN TRACTION CO.

LOCAL
Mileage Ticket.
No.
GOOD FOR BEARER
—OR—
TWO OR MORE PERSONS TRAVELING TOGETHER OVER THE
COLUMBUS-ZANESVILLE
DIVISION ONLY.
NOTE.—This includes the Newark & Granville Branch.
When officially stamped, and upon the conditions named in the contract attached and made part hereof.
VALID ONE YEAR FROM DATE PUNCHED
Void if more than one date is punched.
Vice President.
Conductors will refuse all books not properly stamped.

27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
28 29 30 31 Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec 1907 1908 1909 1910 1911

CONTRACT.

This book is sold at a special contract rate Coupons attached to this book will be accepted for passage when presented by bearer or party of two or more. In consideration of the reduction, it is subject to the following conditions, which are a part of the contract, and agreed to by the purchaser or holder of same. It will be good for one year from date of sale as shown by stamp and punched limit.

1st. No detachments of less than five (5) miles will be accepted for passage for each passenger.

2nd. Coupons for either passengers or baggage will not be accepted if detached when presented.

3rd. If book or any part of same is lost or destroyed, no claim for redemption will be allowed.

4th. If book is presented for a party in which there are children, detachments for each child over five years of age, will be made on same basis as for adults.

5th. Agents will detach baggage coupons for any distance to which baggage is checked. If it is represented that more than one person is traveling on the book, detachments of baggage coupons will be made for the number of persons and weight checked, not to exceed 150 lbs. for each person.

6th. Baggage Agents will not check baggage on baggage coupons unless all preceding coupons for passage have been used.

7th. In detaching mileage for passage, if baggage coupons have not been detached, Conductor will collect same in connection with passage coupons.

8th. This book or its coupons are not good for passage to points where trains do not stop regularly.

9th. That baggage checked on this book shall consist of wearing apparel only, and in event of loss or damage to same, no claim will be made in excess of Fifty ($50.00) dollars

COVER AND CONTRACT FOR MILEAGE BOOK

will be sold on all of the divisions. The first divisions to get the books are the Columbus & Zanesville, the Dayton & Union and the Dayton & Richmond.

The books contain coupons for 350 miles and are sold for $5. This makes the rate 1 3-7 cents a mile. They also contain coupons for the checking of baggage. The accompanying illustration shows the cover of the book and the contract that the purchaser enters into with the company.

The baggage rules and regulations which the traffic department of the Schoepf traction lines has been working on for several months, and which were to have gone into effect Feb. 20, have just been completed and were put into effect March 20. The rules will probably be copied by a number of independent traction lines that are contemplating dropping the usual charge of 25 cents for each piece of baggage checked.

The rules are now in force on the lines of the following companies: Indiana, Columbus & Eastern Traction Company, Cincinnati Northern Traction Company, Lima & Toledo Traction Company, Indianapolis & Western Railway Company, Richmond Street & Interurban Railway Company, Indianapolis Coal Traction Company, Indianapolis & Eastern Railway Company, Indianapolis & Martinsville Rapid Transit Company, Indianapolis & Northwestern Traction Company, and Indiana Union Traction Company. They are, briefly, that no single piece of baggage must weigh over 250 lbs., that baggage must consist of wearing apparel or personal effects for the use of passengers and must be in trunks, valises or boxes with handles. Baggage not exceeding 150 lbs. in weight is checked free on one full ticket, and 70 lbs. on one half ticket. Where the fare is less than 25 cents excess baggage rates are charged, the excess rates varying from 15 cents to 40 cents per 100 lbs., depending on the fare up to a fare of $2. Bicycles, baby carriages, etc., are always considered excess baggage and a fee of 25 cents is made for them. There are storage charges if the baggage remains in any inbound or outbound station for more than twenty-four hours. Dogs when accompanied by the owner and properly tagged and provided with a collar and chain will be transported in baggage cars at the owner's risk. Transfer charges of from 10 cents to 25 cents are made between stations in Dayton.

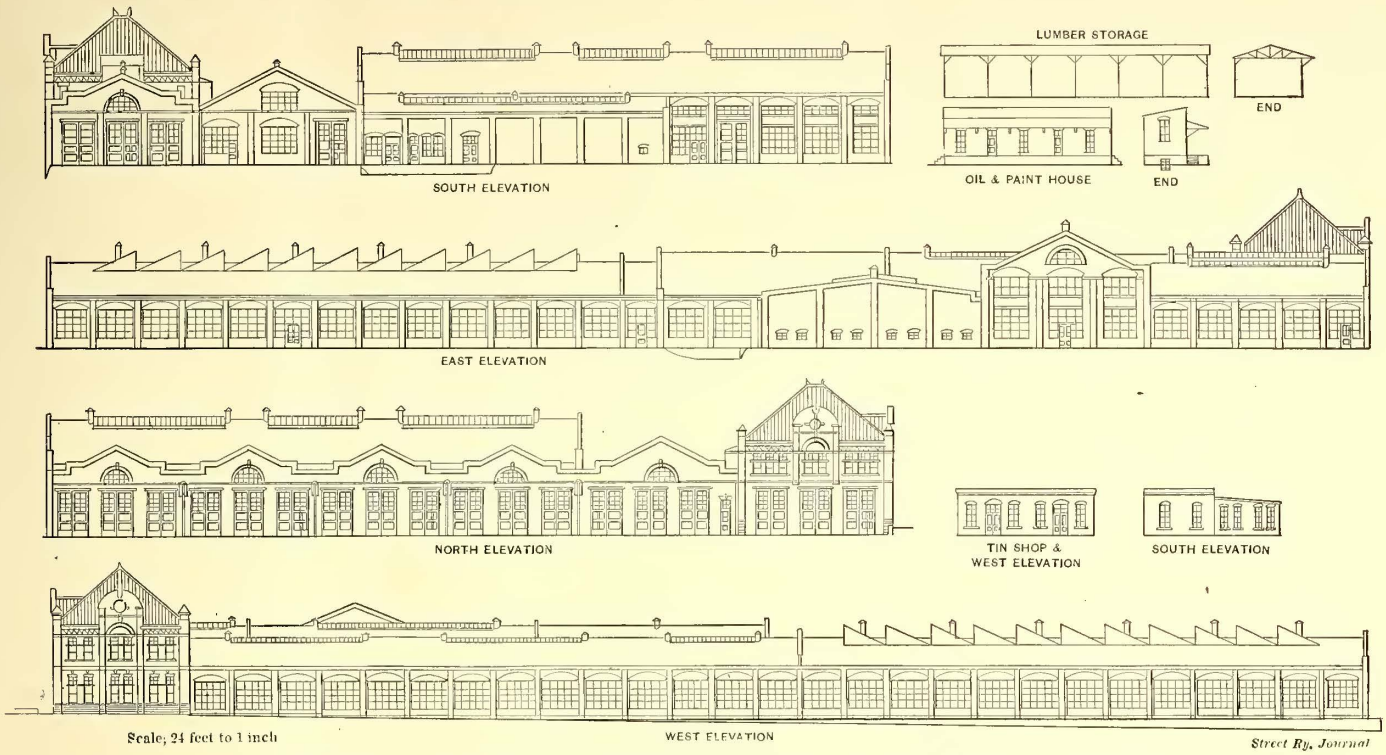
MEETING OF A. S. R. A. CONVENTION COMMITTEE

As announced in the Street Railway Journal for Feb. 2, the selection of the city for the convention of the American Street and Interurban Railway Association next fall was left to a joint committee of the American Street and Interurban Railway Association and the American Street and Interurban Railway Manufacturers' Association. This committee was instructed to investigate the facilities for holding the convention at Norfolk, Atlantic City and any other places which they might consider desirable, and were authorized by their respective associations to make a decision on the subject. In conformity with this resolution, the following gentlemen met at Norfolk on the morning of March 25: Messrs. Beggs, Tingley and Swenson, representing the American Street and Interurban Railway Association, and Messrs. McGraw, Wilson, Martin, Gale and Keegan, representing the American Street and Interurban Railway Manufacturers' Association. Mr. Gale attended in the place of Mr. Pierce, of the Manufacturers' committee.

At Norfolk the committee was met by representatives of the Board of Trade of Norfolk and of the Jamestown Exposition. In the morning they made a tour of the city and investigated the facilities there for the convention. In the afternoon they visited the Jamestown Exposition grounds, where they made a similar tour of inspection. They left Norfolk in the evening and went by the Cape Charles route to Philadelphia and thence to Atlantic City, arriving in Atlantic City Tuesday morning. They were met there by representatives of the Board of Trade of that city, and inspected the various piers where the exhibits could be displayed in case that city was selected. They returned to New York Wednesday morning. Wednesday evening part of the committee went to Boston to attend the annual dinner of the New England Street Railway Club. In Boston another meeting will be held, at which Messrs. Shaw and Peirce, who were unable to be present at Norfolk and Atlantic City, will be consulted. Due notice of the decision will be issued by the secretary and published in this paper.

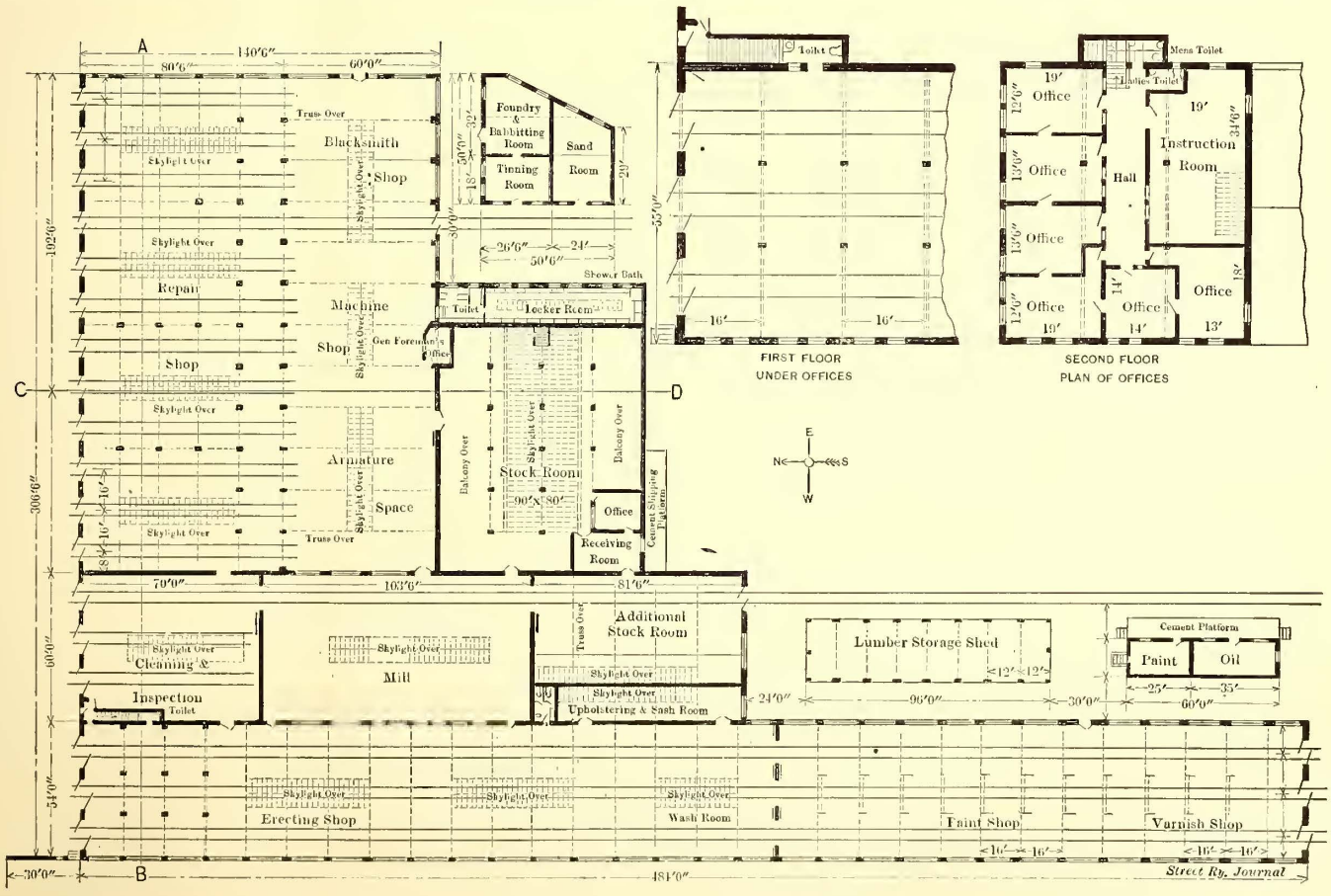
PLANS FOR THE NEW SHOPS OF THE INDIANA UNION TRACTION COMPANY

Construction work on the new shows of the Indiana Union Traction Company is progressing as rapidly as weather conditions will permit. The west wall, having a frontage of 481 ft., is practically completed and the foundations for other portions are in. The shops are being located south of the power house at Anderson, and the site includes that of the present shops. The main building of the new shops will in fact be built so as to include the buildings of the present shops.



ELEVATIONS OF NEW SHOP OF INDIANA UNION TRACTION COMPANY AT ANDERSON

This building will be L-shaped, 481 ft. long and 306 ft. 6 ins. deep. The westernmost bay, containing three tracks,



PLAN OF NEW SHOP OF INDIANA UNION TRACTION COMPANY AT ANDERSON

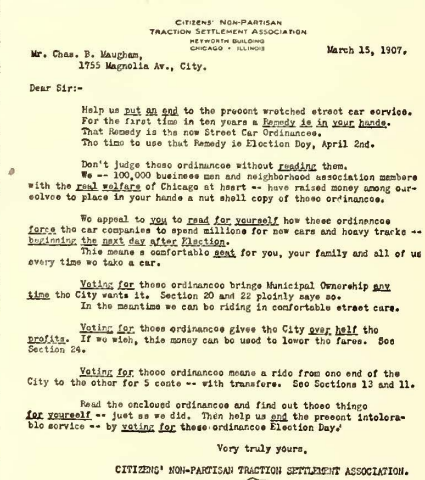
will constitute a paint shop and varnish room and an erecting shop. The present shop buildings just north of this will be remodeled to serve as a cleaning and inspection shop and storeroom. The repair shops proper will occupy the easternmost portion of the building. The twelve tracks in this portion will each hold one interurban car. The armature room, machine shop and blacksmith shop will be located at the head of the repair tracks so as to necessitate carrying armatures and other heavy repair parts as short distances as possible. An overhead system of car hoists will be employed which will permit cars over any tracks to be raised.

Locker and toilet rooms for the shop men will be located just east of the stock room, and additional toilet rooms will be located adjacent to the erecting shop. A detached building south of the blacksmith shop will contain a brass foundry, tin shop, sand room and facilities for babbitting bearings. Paints and oils will be kept in a detached building near the south end of the paint shop. A lumber storage shed will also be constructed east of the paint shop. The shop offices will be located in the only two-story portion of the shop at the northwest corner of the main building. In addition to several offices, this second-story portion will contain a trainmen's instruction room, which will be provided with apparatus to assist in instructing the men with regard to the car equipment.

In design of the shop particular attention has been given to the question of light. The side walls are made up almost entirely of windows. The pain shop will be supplied with a saw-tooth roof and skylights will be built in the roofs over other portions of the main building.

THE CITIZENS' NON-PARTISAN TRACTION SETTLEMENT ASSOCIATION OF CHICAGO

Although the Chicago Mayoralty campaign, of which the traction question is the chief issue, has been at its height for the last few weeks, nothing new in the traction situation has developed. The campaign is being given more attention by the voters than ever before, as is indicated by the registration, which is the highest in the city's history, and by the attendance at the political meetings. Practically all of these are limited to a discussion of the traction ordinances. Walter M. Fisher, who drew up the ordinances, is the chief spokesman of the Republican party at the meetings throughout the city and at the downtown noon meetings held in various theaters. Test ballots taken by newspapers indicate that Mayor Dunne will be defeated and that the traction ordinances will be recommended. Sunday, March 24, the vote taken by the Chicago "Daily News" showed the following votes: Busse, 8939; Dunne, 2695. For the ordinances, 9916; against the ordinances, 2092.



CITIZENS' NON-PARTISAN
TRACTION SETTLEMENT ASSOCIATION
HEYWORTH BUILDING
CHICAGO - ILLINOIS

Mr. Chas. B. Maughan, March 15, 1907.
1755 Magnolia Av., City.

Dear Sir:-

Help us put an end to the present wretched street car service.
For the first time in ten years a Remedy is in your hands.
That Remedy is the new Street Car Ordinances.
The time to use that Remedy is Election Day, April 2nd.

Don't judge these ordinances without reading them.
We -- 100,000 business men and neighborhood association members with the real welfare of Chicago at heart -- have raised money among ourselves to place in your hands a full shell copy of these ordinances.

We appeal to you to read for yourself how these ordinances force the car companies to spend millions for new cars and heavy tracks -- beginning the next day after Election.
This means a comfortable seat for you, your family and all of us every time we take a car.

Voting for these ordinances brings Municipal Ownership any time the City wants it. Section 20 and 22 plainly says so.
In the meantime we can be riding in comfortable street cars.

Voting for these ordinances gives the City over half the profits. If we wish, this money can be used to lower the fares. See Section 24.

Voting for these ordinances means a ride from one end of the City to the other for 5 cents -- with transfers. See Sections 13 and 11.

Read the enclosed ordinances and find out these things for yourself -- just as we did. Then help us end the present intolerable service -- by voting for these ordinances Election Day.

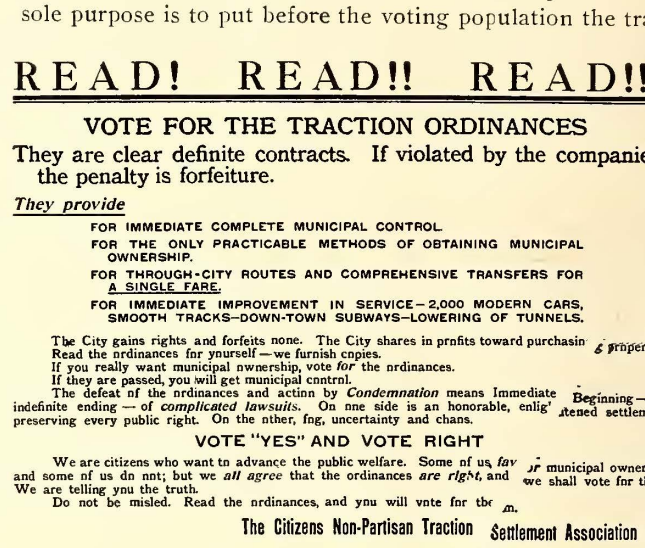
Very truly yours,

CITIZENS' NON-PARTISAN TRACTION SETTLEMENT ASSOCIATION.

Frederick Body Pres.

LETTER ADDRESSED TO VOTERS

The traction question in Chicago has resulted in a peculiar body known as the Citizens' Non-Partisan Traction Settlement Association, organized to further the interests of the traction ordinances. The association, as its name implies, is non-partisan, being allied with neither political party, and it is in no way connected with the traction companies. Its sole purpose is to put before the voting population the traction ordinances in their true light and encourage the passage of these ordinances at the election on April 2.



READ! READ!! READ!!!

VOTE FOR THE TRACTION ORDINANCES

They are clear definite contracts. If violated by the companies the penalty is forfeiture.

They provide

FOR IMMEDIATE COMPLETE MUNICIPAL CONTROL.

FOR THE ONLY PRACTICABLE METHODS OF OBTAINING MUNICIPAL OWNERSHIP.

FOR THROUGH-CITY ROUTES AND COMPREHENSIVE TRANSFERS FOR A SINGLE FARE.

FOR IMMEDIATE IMPROVEMENT IN SERVICE—2,000 MODERN CARS, SMOOTH TRACKS—DOWN-TOWN SUBWAYS—LOWERING OF TUNNELS.

The City gains rights and forfeits none. The City shares in profits toward purchasing properties.
Read the ordinances for yourself—we furnish copies.
If you really want municipal ownership, vote *for* the ordinances.
If they are passed, you will get municipal control.
The defeat of the ordinances and action by *Condemnation* means Immediate Beginning—but indefinite ending—of *complicated lawsuits*. On one side is an honorable, enlightened settlement, preserving every public right. On the other, long, uncertainty and chaos.

VOTE "YES" AND VOTE RIGHT

We are citizens who want to advance the public welfare. Some of us *favor* municipal ownership and some of us do not; but we *all agree* that the ordinances *are right*, and we shall vote for them. We are telling you the truth.
Do not be misled. Read the ordinances, and you will vote for them.

The Citizens Non-Partisan Traction Settlement Association

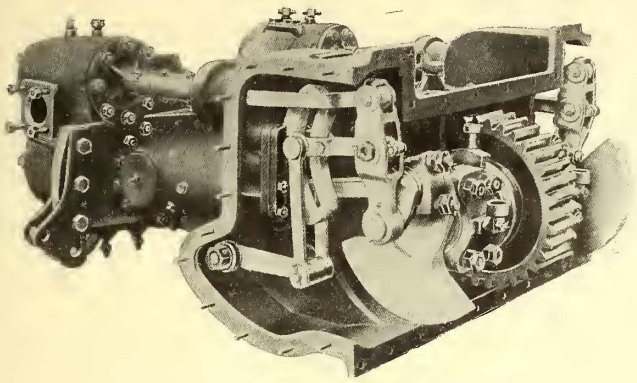
PLACARD POSTED IN WINDOWS

The association had its conception in the simultaneous passage of resolutions by the Chicago Real Estate Board and the Chicago Commercial Association, commending the course of the City Council in passing the traction ordinances over Mayor Dunne's veto. Committees of these two organizations held a joint meeting and decided on a broader organization such as has been effected. All non-partisan clubs favoring the traction ordinances were invited to send representatives to a joint meeting to organize an association. Thirty-one clubs responded and the present organization was effected. Permanent headquarters were engaged and the active work of disseminating information and creating enthusiasm with regard to the ordinances was begun. At the present time there are seventy-seven organizations identified with the association. An idea of the non-partisan character of these clubs may be gathered from the fact that the Architects' Business Association, the Chicago Butter and Egg Board, Chicago Grocers and Butchers' Association and the Chicago Women's Club are included among them. The various clubs include a membership of from 75,000 to 100,000 voters. The meetings of the association are attended by representatives of the various clubs, who later report to their individual clubs the actions taken.

Since its organization, Feb. 26, the association has been active in distributing literature concerning the traction ordinances, and badges urging voters for them. In all, about 400,000 badges have been distributed, 60,000 hangers printed on heavy cardboard have been sent out, and the association is now sending out a series of four appeals to every voter in the shape of folders. One of these urged registration on March 12 in order to vote on the ordinances. Another, entitled the "Traction Ordinances in a Nutshell," contained a copy of the ordinances stripped of legal verbiage. Enclosed in it is an article, "What Happens if We Reject These Ordinances," in which it is stated that in the event of the ordinances not being adopted traction facilities during the coming four or five years while condemnation proceedings are being effected will be worse than at present.

STEAM MOTOR CAR FOR THE ROCK ISLAND

The Chicago, Rock Island & Pacific Railway Company will soon receive a self-propelled steam motor car from the Railway Auto Car Company, of New York, the American company which controls the patents and manufacturing data for the Ganz system. From the general plan and elevation of this car shown herewith it will be seen that the total length over end sills is 54 ft. 10¾ ins. The car has seats



STEAM MOTOR WITH PARTS EXPOSED

for fifty-two passengers, including sixteen in the smoking compartment. The baggage room is 7 ft. 1¾ ins. long, and the motorman's compartment at the forward end of the car, which contains the generator and accessories, is but 6 ft. 4¾ ins. long over all. The coal bunker is supported over the front end sill and the coal is removed through a small sliding door opening into the motorman's compartment. The coal bunkers carry sufficient fuel for a continuous run of 50 miles.

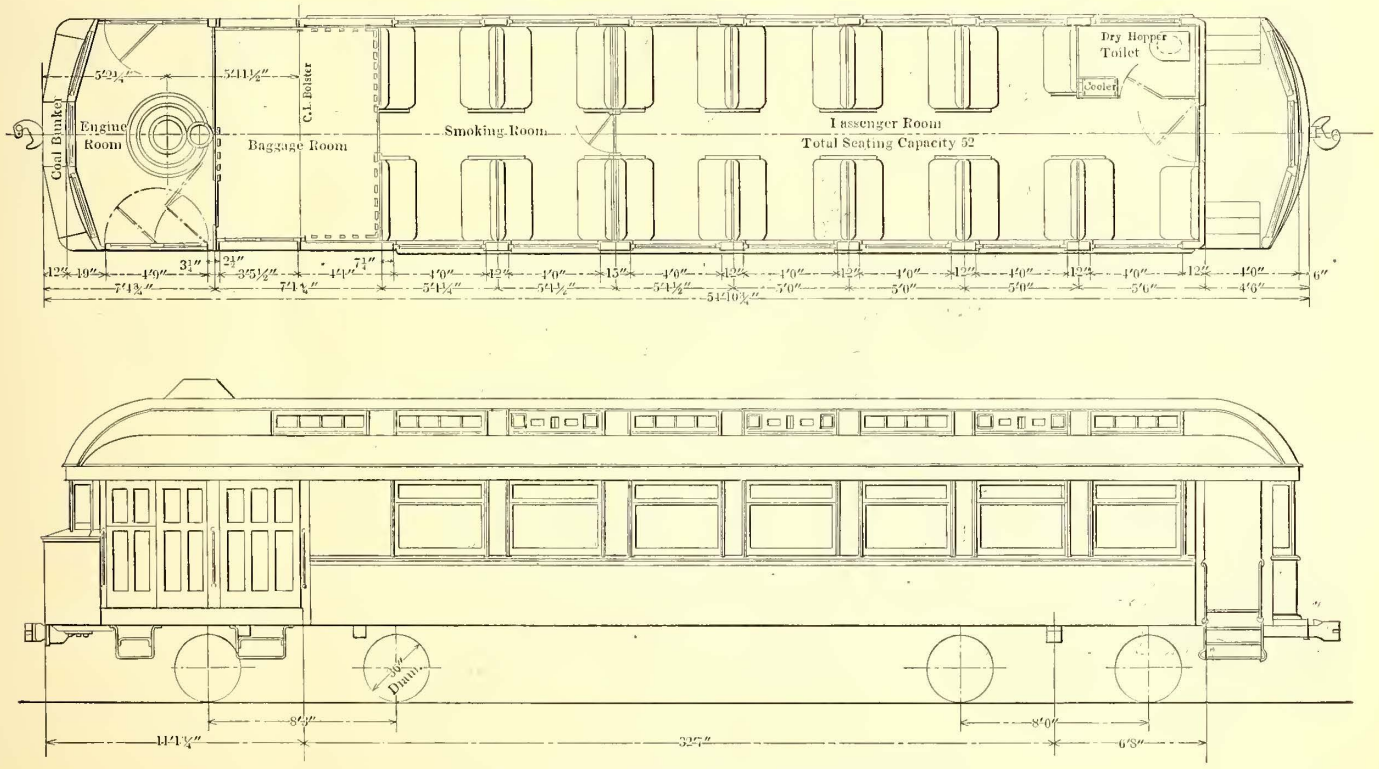
The feed water for the steam generator is carried in two longitudinal steel tanks suspended from the underframe of the car. These have a total capacity of 600 gals., or sufficient for a continuous run of about 60 miles. The steam generator is of the standard Ganz type and 42 ins. in outside diameter. It is capable of developing a maximum of 120 hp in conjunction with the compound steam motor mounted in the forward truck and which drives on the rear axle thereof.

The half-tone view shows the steam motor with the cover enclosing the gears and link motion removed. This motor is compound and steam-jacketed and is entirely enclosed. The gear case is partly filled with oil so that all moving parts receive a continuous and thorough lubrication. The normal speed of this motor is 600 r. p. m., although it can be operated satisfactorily up to a speed of 900 r. p. m. The working pressure is 270 lbs. per square inch, and the steam is superheated. The motor is controlled absolutely from levers conveniently located at the right-hand side of the motorman's compartment.

The car body is of all-steel construction with interior finished in quartered oak. Its design is in accordance with what is now considered to be the most advanced practice in passenger cars, that is, the vertical load of the car is cared for by the sides of the car, which form deep girders, while the buffer strains are taken care of by relatively light longitudinal center sills. The total weight of this car in working order fully loaded is 36 tons. It is equipped with Westinghouse automatic brakes with the axle-driven air compressor mounted on the trailer truck.

The car is designed to maintain 35 m. p. h. on a level track, 24 m. p. h. on a 1 per cent grade, and 15 m. p. h. on a 1 per cent grade. The car is also capable of hauling a trailer at 30 m. p. h. on a level track, and 15 m. p. h. on a 1 per cent grade. The fuel is to be coke and the consumption is not to exceed 16½ lbs. per mile.

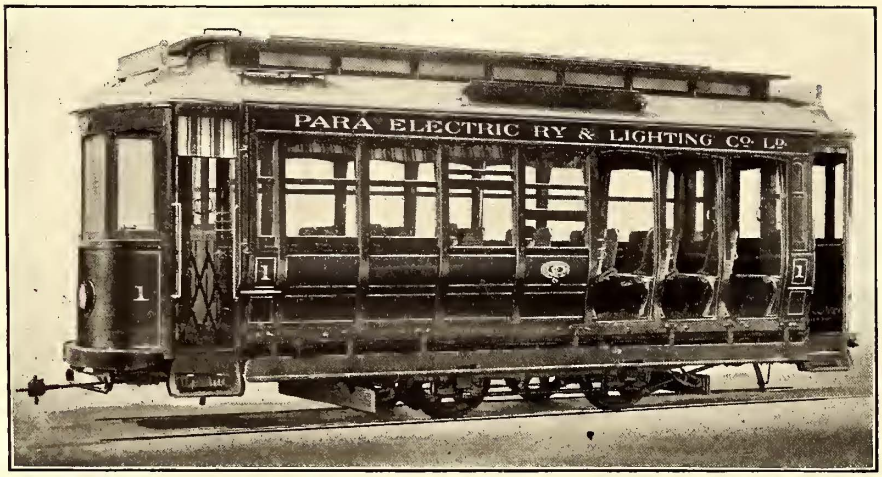
This is the first standard car of the Railway Auto Car Company which will be built and delivered in this country, although orders for other cars of this general type are now being executed.



PLAN AND ELEVATION OF STEAM MOTOR CAR

FULL CONVERTIBLE CAR FOR PARA, BRAZIL

Three years ago, residents of Para, Brazil, had to depend solely on mule tramways, which ran through Para, connecting it with the suburbs. Since the advent of the Para Electric Railway & Lighting Company, under the management of J. G. White & Company, the 50,000 inhabitants have at their disposal an electric railway system that is



EXTERIOR OF CAR FOR PARA

modern in every way. Para is situated in the northern part of Brazil, 62 miles from the ocean, on the River Para. It is a port of considerable importance and maintains a regular coasting service with Rio de Janeiro, Manoas and other Brazilian ports, and in addition has steamer communication with New York, Galveston and European ports. For some time the local authorities have been improving the city to the extent of widening, straightening and beautifying the streets, which in the new part of Para present a very modern appearance with their wide thoroughfares lined with palms and other tropical trees. The climate is exceedingly moist, and care had to be exercised in selecting wood for the cars suited to the climatic conditions as well as being insect-proof. Teak was found to contain all the necessary qualities and all cars are made of this wood throughout, which includes, in the case of the full-convertible Brill car illustrated, the slat seats, hand poles and other accessories. The curtains were made mildew-proof, and the ceilings of aluminum. There is a gutter along the side of the roof which connects with a ¾-in. pipe down the corner post. The short platforms, 3 ft. 2 ins. in length with 22-in. step openings, would indicate that not often will the loading and unloading of the car be suddenly taxed. The width of the car over the sills, including panels, is 6 ft. 8¼ ins.; over posts at belt, 7 ft. 3 ins., figures which permit seats for two passengers abreast on one side of the aisle only, the other seats accommodating one passenger each. The truck shown under the car in the picture is the No. 21-E with a 6-ft. wheel base; the motors used are of 40-hp capacity each. Included among the specialties on the car of the builders' own make are angle-iron bumpers, gongs and signal bells, radial drawbars, etc. The dimensions not already given are as follows: Length over end panels, 20 ft. 1 in.; over bumpers, 27 ft. 6 ins.; sweep of posts, 3½ ins.; centers of posts, 2 ft. 7 ins.; size of side sills, 4¾ ins. x 7 ins.; reinforced with Z-iron; end sills, 4¼ ins. x 7 ins.; thickness of corner posts, 3¾ ins.; side posts, 3⅜ ins.

INTERIOR OF CAR FOR PARA

PROPOSED EXTENSION TO TITUSVILLE SYSTEM.

William J. Smith, general manager of Titusville Electric Traction Company, of Titusville, has recently returned from a conference in New York City with Charles Pfizer, Charles Hart and W. R. Brown, directors of the company, concerning the work of the coming season with regard to extensions and improvements. Two or three things are considered necessary. The road must be extended to the westward. Cambridge Springs is now being considered as the most available opening in that direction, making connections with the main line of the Erie Railroad and with trolley lines for Erie and Meadville. The company owns Mystic Park, which Manager Smith believes should be improved. A line southward to Oil City has also been the subject of considerable discussion. Two routes have been surveyed, one over the old railroad grade southward from Pleasantville and the other directly from Titusville through Cherrytree to Rouseville. Such an extension of street railway service would open to local trade and local interest at Titusville a large section of country to the south and west and would bring the city in closer touch with a number of towns and hamlets and a large farming community. It has been suggested that the Titusville Chamber of Commerce meet the directors of the company upon their visit to the city and take up with them the general subject of extensions and improvements.

FINANCIAL INTELLIGENCE

Wall Street, March 27, 1907.

The Money Market

The developments in the local money market during the past week have been of a favorable character, and at the close the situation was more encouraging than for some weeks past. Early in the week the heavy liquidation in the securities markets, and the active calling of loans on the part of the larger financial institutions, together with the disturbance in the foreign financial markets, caused an advance in the call loan rate to 14 per cent, while in the time loan branch of the market there was an advance in the rate for accommodations for the short periods. Thirty and sixty-day contracts commanded a premium, bringing the total charge to the borrower up to 6½ and 7 per cent, while for the longer periods 6 per cent was bid with practically no offerings. Toward the end of the week, however, there was a sharp reaction in demand money to 4 per cent, but the asking charges for fixed periods remained practically unchanged. The improvement was directly due to the action of the Treasury Department in authorizing the deposit of about $15,000,000 custom receipts in the national banks in this city, and also the anticipation of the payment of the April 1 interest on the public debt. It is estimated that this action will make available about $18,000,000 for market purposes, and there is assurance from Washington that further relief measures will be adopted should market conditions necessitate such action. In addition to this, there has been a decided change in the attitude of local bankers in the matter of gold withdrawals from the other side. For some time past our bankers have been reluctant to draw gold from London, notwithstanding the large balance in our favor, and the low rates prevailing for sterling exchange, which would have made imports of the yellow metal profitable, but some improvement in the foreign situation led to the engagement of $1,650,000 gold for shipment to this side, while further engagements are regarded as highly probable, although these will depend largely upon the amount of new gold laid down in the London market. A substantial amount of the metal is due to arrive from the Cape early next week, and doubtless New York bankers will be active, bidding for all or part of it. The disturbing rumors regarding the monetary situation abroad proved to have been grossly exaggerated, and the settlements at London and Berlin passed over without any serious disturbance. The utterance by a prominent foreign banker made it clear that there is no danger of the money markets abroad being seriously disturbed, as the scarcity of money the world over is due to the phenomenal activity in all lines of industry, and not to any excessive speculative activity. The fact that the demand for funds is not a speculative one means continued firmness in rates, but the banking interests appear to have the situation well in hand, and they assert that there is no reason whatever for any apprehension. The preparations for the April interest and dividend disbursements which will be made this week will doubtless cause a temporary flurry in the local money rates, but this should be followed by a return to easier conditions within a short time, as the money thus paid out promptly finds its way back to the banks. Corporate borrowings have practically ceased, and are not likely to be resumed on a liberal scale, owing to the policy of retrenchment adopted by many of the leading railroads and the cancellation of large orders for materials, etc.

The bank statement of last Saturday was somewhat better than had been expected. Loans decreased $3,487,000, due almost entirely to liquidation in the stock market. Deposits decreased $1,829,000, and cash increased $1,218,900. The legal reserve was $457,450 less than in the preceding week and which, added to the increases in cash, augmented the surplus reserve by $1,676,350. The surplus now stands at $4,709,450, as compared with $6,363,775 in the corresponding week of last year; $6,479,325 in 1905, $27,468,875 in 1904, $6,280,900 in 1903, $6,965,575 in 1902, $10,272,425 in 1901 and $5,817,300 in 1900.

The Stock Market

The stock market has passed through another period of liquidation and demoralization which culminated in a very serious decline in prices in the middle of the week, although the downward movement was not attended with the same degree of excitement which characterized the break in values in the earlier part of the month. The selling movement was stimulated by active calling of loans by the banks and a sharp advance in the call loan rate, and by some very disquieting rumors regarding financial and speculative conditions in Berlin and London. This received attention more for the reason of the heavy selling for foreign account than through any confirmation of reports, which were sufficiently serious to call forth denial from one of the most prominent British financiers. Prices for many stocks made new low levels, and the execution of stop orders was responsible for rather large declines in certain quarters of the list. It would be difficult, however, to ascribe any specific reason for the continued liquidation. The engagement of $1,650,000 gold for import, together with the action of the Secretary of the Treasury in anticipating payment of the April interest on the public debt, and in depositing customs receipts with the national banks in New York City was received favorably as practical assistance to the money market, and was in a large measure responsible for the sharp recovery in prices which was in progress at the close. The larger financial interests appear to have at last come to the support of the market, and further serious drives are more unlikely with this fact now generally known. The copper stocks suffered severely, with heavy selling of Amalgamated, influenced by the rather sensational break in the copper metal price in London, and a corresponding decline in the price of the metal in New York, which appeared to indicate that the statistical position of the metal was less strong than had been the belief. The cancellation of contracts for improvements by the railroads, owing to the inability to raise fresh capital will have an important influence upon the iron, steel and metal industries, although, according to officials of the United States Steel Corporation, there is as yet no indication of any material falling off in the volume of business in the iron and steel trade. General conditions remain practically unchanged. The activity in trade is sufficient to absorb all the available capital, and this naturally acts against speculative activity in the stock market of the inauguration of any important sustained upward movement. Crop possibilities are now coming in for consideration, and these will later on prove an important speculative influence.

The local traction stocks followed the course of the general list, although quite a little selling was caused by the various and conflicting reports from Albany regarding the passage of the Public Utilities bill which would circumscribe the powers of these companies.

Philadelphia

Although the dealings in the traction shares were considerably smaller than in the preceding week, they were accompanied by a general decline in values, and in many instances prices made new low records for the present downward movement. Philadelphia Rapid Transit was again the center of interest. During the first half of the week the stock moved within narrow limits, but toward the close there was fresh selling which brought the price down to 15⅛. About 14,000 shares were traded in. Philadelphia Traction sold at 91 and 92, and American Railways ran off from 49½ to 49. Philadelphia Company common, after selling at 44, declined to 42⅞, while the preferred stock brought 45½. Union Traction sold to the extent of about 1500 shares at 54 and 53½, and Consolidated Traction of New Jersey sold at 70. Rochester Railway & Light preferred changed hands at 91, and Union Traction preferred of Pittsburg brought 50.

Baltimore

The local traction issues were extremely quiet and weak during the past week. About the only activity was in United Rail-

ways preferred, more than $50,000 of which sold at prices ranging fram 87¼ to 85¾. The income bonds were unusually dull, a few odd lots changing hands at 52 to 51¼. United Railway free stock brought 11, and the certificates representing pooled stock changed hands at the same figure. Other sales included Baltimore City Passenger 5s at 102½ and Washington City & Suburban 5s at 101.

Other Traction Securities

The feature of the Boston market was the break of several points in Massachusetts Electric preferred. Opening around 65, it broke to 55½ and later recovered to 57; upwards of 2500 shares were traded in. The common stock declined from 17 to 14½ and then recovered to 15⅞. Boston Elevated was steady at 145. West End common sold as low as 90 and the preferred at 106½ and 106. The Chicago market has continued quiet. Metropolitan Elevated preferred sold at 65. West Chicago brought 27, and Chicago City Railway brought 150 for a small lot. Union sold at 5.

Considerable activity was shown in the various traction securities on the Cleveland Stock Exchange the past week. Blocks of the Aurora, Elgin & Chicago, Cleveland Electric, Forest City and Northern Ohio Traction changed hands. In one day 250 shares of the Forest City was sold. This is the largest transaction in this stock for one day that has ever been reported. Cleveland Electric stood about 60 bid for several days, but on Tuesday it fluctuated widely, owing to the report of a disagreement on the leasing plan having been reported to the City Council on Monday evening. Forest City stood about where it has been for some time, with 98 asked and 94½ bid.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with last week:

	Mch. 20	Mch. 27
American Railways	49	49
Boston Elevated	145	a143½
Brooklyn Rapid Transit	54	49⅜
Chicago City	150	150
Chicago Union Traction (common)	4¾	4⅝
Chicago Union Traction (preferred)	13	13¼
Cleveland Electric	—	54
Consolidated Traction of New Jersey	71	70
Detroit United	69	68
Interborough-Metropolitan	24	23⅝
Interborough-Metropolitan (preferred)	58½	56
International Traction (common)	54	45
International Traction (preferred), 4s	79	72½
Manhattan Railway	135	130½
Massachusetts Elec. Cos. (common)	16½	15
Massachusetts Electric Cos. (preferred)	63	56
Metropolitan Elevated, Chicago (common)	23	25
Metropolitan Elevated, Chicago (preferred)	64	a65
Metropolitan Street	—	a93
North American	73⅞	72⅜
North Jersey Street Railway	40	40
Philadelphia Company (common)	43	43½
Philadelphia Rapid Transit	16¾	15¾
Philadelphia Traction	92	91
Public Service Corporation certificates	65	66
Public Service Corporation 5 per cent notes	94	94
South Side Elevated (Chicago)	80	80
Third Avenue	106	105
Twin City, Minneapolis (common)	94½	93
Union Traction (Philadelphia)	54	53½

a Asked.

Metals

The "Iron Age" says: "So far as the current movement in crude and finished iron products is concerned, the situation is practically unaffected by the recent events in Wall Street and the numerous announcements of a proposed cessation of railroad work. It is idle to deny, however, that unless there is a resumption of that work during the next few months, consumption of iron and steel must be affected and values must be influenced. It has already had the effect of making buyers of crude iron and steel more cautious as to commitments for the last half of the year. In the Central West the scarcity of steel continues. Quite a large tonnage of structural material is in sight. Copper metal has ruled easier, in sympathy with the fall in the price of the metal in London. Quotations are: Lake, 24¾c. to 25¼c; electrolytic, 24¼c. to 25c.; castings, 23¾c. to 24¼c."

MEETING OF THE OKLAHOMA ELECTRIC LIGHT, RAILWAY & GAS ASSOCIATION

The first meeting of the Oklahoma Electric Light, Railway and Gas Association, notice of the organization of which appeared in a recent issue of the Street Railway Journal, will be held April 22 and 23 at Oklahoma City, Okla. Ter.

TO OPEN UP BERKSHIRE REGION

The plans of the New York, New Haven & Hartford Railroad Company are definitely announced for the building of electric railway lines from Great Barrington to South Egremont, in Massachusetts, and to Canaan, Conn., the junction point of the Central New England and Housatonic steam railroad lines. The line from Great Barrington to Canaan will closely parallel the Housatonic Railroad. The immediate plans in the Berkshire region also include the building of a cog road to the top of Mount Greylock, the other terminal of which has not yet been definitely decided upon. None of these projects will be affected by the curtailment policy of the New Haven company regarding extensions. They form part of a large scheme of opening up the Berkshire region as a great summer resort.

IMPROVEMENTS AT PORTLAND

The budget of the Portland Railway, Light & Power Company, 1907, amounts to a trifle over $2,000,000. The items are not alone for new work on the railway and power systems, but include such incidentals as paving in connection with the improvements of thoroughfares over which the corporation operates its rolling stock.

Lump sums are given the Oregon Water Power Company and the original Portland Railway systems, each securing $600,000. The Oregon Water Power Company's lines cover about 90 miles, while the city system is approximately 115 miles long. It is the intention to do more city work this year than on the suburban and interurban runs.

This amount does not include the $1,000,000 terminal station on First and Pine Streets, which came up after the budget was compiled. Orders placed for 100 new cars, fifty of which are to be shipped next month, consumed considerable of the available cash. Nearly a mile of 72-pound rail has been laid on Dawson Street, where street improvements are being made. On Union Avenue, north of Weidler Street, about 2½ miles of 72-pound rails are to be put down in place of the 40-pound steel now used.

Two miles of new road will be built from East Twenty-Eighth and East Burnside Streets to Rose City Park, a new addition being laid out. That line will later be connected with the East Burnside Street branch at East Sixteenth Street. It has been reported several times the company intended to double track the line to Ivanhoe, but while it will ultimately be brought about, no provision has been made for such improvement this year.

Three new trailers, each the length of the regular sized motor car, have been turned out of the Oregon Water Power shops for the Mount Scott run, and three others are being completed. More cars have been added to the rolling stock on the Mount Scott division, and with the arrival of the open rolling stock, increased service will be given on various lines.

MR. ANDREWS AND MR. DU PONT DISAGREE ON CLEVELAND VALUATIONS

Horace E. Andrews, president of the Cleveland Electric Railway Company, and A. B. Du Pont, president of the Municipal Traction Company, who have spent two months in an endeavor to place a satisfactory leasing value on the property and franchises of the Cleveland Electric, reported to the City Council, Monday evening, March 25, that they had disagreed. Each made a report, and submitted figures widely divergent; Mr. Andrews stating that, under the plans laid down at the suggestion of Mr. Du Pont in the beginning, the value of the physical property and franchises is $33,888,888.88, while the best figures Mr. Du Pont could offer were $19,898,126.93. The first would give a stock value of 105, and the latter 45.10, with a possibility of reaching 49.61. Mr. Andrews stated that he had followed the plan of making the estimates that he and Mr. Du Pont had fixed upon right through and arrived at the conclusions given. This is what is known as the Chicago plan, under which a committee appointed by the city worked in fixing valuations on the street railways in that city.

Mr. Du Pont, so far as known, followed the same plan in making his estimates, but digressed by omitting contractors' profits, interest during construction, charges for management, brokerage, commissions and all consideration of franchises in Gleville, Collinwood, East Cleveland, Cleveland Heights, Newburg, Newburg Heights, South Brooklyn and Lakewood. This, of course, would make a big difference in the valuations. The money put into the first-named items is considerable, while the franchises in the thriving towns named are valuable.

The two gentlemen had progressed well until almost the middle of this month, when Mr. Andrews requested Mr. Du Pont to ascertain from Mayor Johnson a statement as to whether he was satisfied as to the methods used in arriving at the valuations. The answer was that he was not. Two or three days later a proposition was made by Mr. Du Pont to the effect that the negotiations be conducted without considerations of the long-time grants in the towns outside the limits of Cleveland, and that the estimates should not include certain items of expense that are always made a part of the cost of railways. This was refused by Mr. Andrews, who felt that the rules governing the work of fixing valuations were being departed from.

Since that time no conferences have been held, Mr. Andrews feeling that the time had come when further talk on the matter would merely be time wasted. Mr. Andrews and the officers of the Cleveland Electric Railway Company have refused to make any statements regarding the matter. The reports of Messrs. Andrews and Du Pont follow:

To the Council of the City of Cleveland:

Gentlemen—Under your resolution of Jan. 14, Mr. Andrews and I have met almost daily for two months in an effort to determine the value of the physical property and unexpired franchises of the Cleveland Electric Railway Company. We have been unable to agree, and I therefore report for your information my opinion, based upon a careful study of all phases of the problem.

Upon the valuation of many items of the physical property, the dates of expiration for most of the grants and the method of valuing physical property, we were able substantially to agree. The conclusion here expressed, of course, includes such agreed values, but neither Mr. Andrews nor his company are bound by the conclusions as a whole, nor the details entering into it.

The total value of the physical property and unexpired franchises of the company is $17,908,314.24. Adding to this one-ninth, we have $19,898,126.93, which makes for the outstanding stock a value of $45.10 per share, redeemable on the suggested plan at $49.61.

The value here given includes $1,533,566.84 as the value of the street paving done by the company, though I am informed that this paving is now the property of the city.

Nothing is included for contractors' profits, brokerage, commissions or interest during the construction, for two reasons; first, such items are not properly a part of the physical property; and second, if these items are not adequately covered by the bonus of 21 per cent, which is the basis of the suggested plan for determining the redemption value of the stock, any extra allowance on that account should be made by the Council.

The value of the physical property has been determined independently of the length of the franchises, and no deduction has been made from the amount so determined by reason of unprofitable grants. To all franchises I have assigned full value. Where, however, lines are composed of portions having different dates of expiration, the later in date being remote from the center of the city, and through unprofitable territory, I have assigned no value to the outlying portion after the expiration of the inlying connection. Such grants are operated even now at a loss, and are, in fact, a burden upon the inside lines, and, of course, are not susceptible of profitable operation after the expiration of the inside connection.

The conclusions here stated with detailed figures and reasons were submitted to Mr. Andrews on March 13, with a request that we discuss them in detail and that he suggest any revision that he thought just, with his reasons. I submitted also a schedule of disputed items now allowed, with my estimate of their value in dollars to the company as a basis for further discussion if reasons for allowing them could be advanced, professing myself entirely willing to consider such reasons. I have had no summary of the conclusions reached by Mr. Andrews, nor of the aggregate of his claims, and to my report to him I have had no reply except a verbal comment that we were apparently too far apart to make further conferences useful. Respectfully submitted,

Monday, March 25, 1907. A. B. DU PONT.

To the Honorable City Council of the City of Cleveland:

Gentlemen—Pursuant to the Council resolution of Jan. 14, A. B. Du Pont and I, together with the assistance of a large corps of engineers and accountants, have made a thorough examination of the property of the Cleveland Electric Railway Company.

In making this examination, the plan laid down by the commission appointed by the city of Chicago, consisting of Bion J. Arnold, Professor M. E. Cooley and A. B. Du Pont was followed, and the same method of valuing physical property and unexpired grants from the city of Cleveland and the municipalities surrounding Cleveland served by the Cleveland Electric Railway Company, was adopted.

In preparing the preliminary estimates of the value of the physical property, only the cost of labor and material was included, less depreciation, with the intention of adding later the customary percentages for administration, engineering, carrying charges, etc., aggregating, as an average, in the case of the Chicago valuation, 20 per cent of the cost of the material and labor.

The value of the unexpired grants was arrived at in accordance with a plan dictated by Mr. Du Pont following the method used in Chicago.

The result for the physical and franchise value thus obtained aggregated approximately $20,500,000, to which, under the proposal of the Municipal Traction Company, one-ninth should be added, making a total of $33,888,888.88; from this sum, the funded and unfunded debt of the company, as of Jan. 1, 1907, should be deducted, leaving a net result of $24,547,888.88, which, divided by the number of shares of stock of the Cleveland Electric Railway Company, outstanding, would show a present value approximately of $105 per share.

During the last week of the negotiations I suggested that Mr. Dupont confer with Mayor Johnson with a view of learning whether the method of valuation adopted met with his approval, and was informed that it did not. Whereupon, a day or two later a surprising proposition was submitted in writing by Mr. Du Pont, providing that no valuation should be given long-time grants in Glenville, Collinwood, East Cleveland, Cleveland Heights, Newburg, Newburg Heights, South Brooklyn or Lakewood, nor to certain grants in the city of Cleveland. The proposition also contained an estimate of the physical value which did not include all of the various items making up that value, and particularly excluded any consideration for any charges for management, superintendence, engineering, interest on cost during construction, contractors' profits, and other items which were included in the Chicago estimate and in the Detroit estimate prepared by Professor Bemis and others, and which are usual charges in the construction of any railway, and are necessary to and as much a part of the cost of construction as the cost of rail or any part of its track equipment is.

We are perfectly willing to abide by an arbitration based upon such methods of valuation as were adopted in Chicago by an impartial commission, of which Mr. Du Pont was one, but can not consider any offer by the Municipal Traction Company for a lease based upon a value which does not include proper charges for the items of cost enumerated above in making up physical value, and can consider no adjustment which does not contemplate the value of the property operated as a whole, as was the assumption in Chicago. Respectfully submitted,

H. E. ANDREWS.

Business men who know Mr. Andrews and the board of directors of the Cleveland Electric Railway Company have felt all along that they would not submit to leasing their property upon a valuation below what it should be. The company has made an offer eminently fair, and with a rate that is very low for a city of the size, and the general opinion seems to be that the offer of seven tickets for a quarter should have been accepted. It is further believed that, if put to a vote, there would be an almost unanimous decision in favor of the acceptance of the offer.

The City Council is in something of a quandary just now, it would seem, as there was little said regarding the reports Monday evening. A resolution was passed calling for a mass meeting Wednesday morning to discuss the matter, and another asking that the Cleveland Electric report the business done on the Central and Quincy Avenue lines since Jan. 10, when the company agreed to operate them on the 3-cent-fare basis, and, if an agreement was not reached, to submit reports to the city and pay everything above the expense of operating the lines.

There seems to be nothing left but arbitration, and it is believed that the Cleveland Electric will not submit to such a form of settlement, unless certain definite lines are laid down upon which to base a settlement. It is possible that the company might yield a little from the valuation fixed by Mr. Andrews, but at the same time there is small chance that any great concessions will be made.

This action breaks the truce in the legal battle that has existed between the Cleveland Electric Railway Company and the Municipal Traction Company. It is said that the attorneys for both sides have arranged with the courts to take up arms as soon as the word is given. However, it is not known how soon this will be. It is probable that the first move will have to be made by the Cleveland Electric in forcing the Municipal Traction cars from operating over its tracks on Superior Avenue. Since the truce was declared these cars have been running regularly to the Public Square and turning on the loop. An injunction against this exists and it only remains to ask the court to put it in force again. Then there are a number of suits that will have to be fought out, one of them being against the Forest City Railway Company, on the ground that Mayor Johnson is financially interested in it.

EARNINGS OF THE UNITED RAILWAYS OF ST. LOUIS

For the first time since the World's Fair period the United Railways Company reports a deficit in its net income account in the February statement of earnings. The two months of 1907 show a net income of only $1,802, as compared with nearly $77,000 for the same period last year. These two months cover the operation of the suburban system since it was taken over on Jan. 1. The gross earnings of last month show the comfortable increase of $51,000, as compared with February, 1906, but this is more than wiped out by increase in expenses and depreciation, amounting to $85,000. The official statement issued by the auditor is as follows:

February—	1907	1906
Gross earnings and other income	$764,680	$713,664
Expenses, taxes and depreciation	548,479	463,041
Net earnings	$216,201	$250,623
Charges	231,324	231,991
Net income	$15,123	$18,632
Jan. 1 to Feb. 28—		
Gross earnings and other income	$1,591,017	$1,495,453
Expenses, taxes and depreciation	1,126,349	954,409
Net earnings	$464,668	$541,044
Charges	462,866	464,046
Net income	$1,802	$76,998

Details of the earnings and expenditures of the United Railways Company during 1906 are presented in a report issued last week by President John I. Beggs. More than 183,000,000 passengers, not counting those who rode on transfers, paid into the treasury of the company $8,997,240. The rest of the company's income is derived from advertising privileges in cars, carrying United States mail, express business, rental of electric power, interest on deposits and securities and miscellaneous sources. Taking the figures given as a basis, the company received for each revenue passenger 4.91 cents per ride. Included in both the revenue and transfer service the average paid by the total number of passengers was 3.40 cents per ride. A summary of the business of the company follows:

Year's traffic of United Railways—	
Cash fares	183,237,886
Transfers	81,183,324
Total	264,421,210
Percentage of transfer	41.81
Gross earnings and income	$9,146,348
Net income	1,201,459
Dividends on preferred stock	649,160
Surplus	552,299
Assets	108,204,746
Value of property and plant	102,608,623

Length of track since consolidation 456.14 miles—350.09 in city and 106.05 in county.

NEW POWER PLANT FOR DELAWARE AND HUDSON INTERESTS

The Hudson Valley Construction Company, of Troy, has secured the contract for constructing a steam turbine power plant at Mechanicsville, N. Y., for generating electric power for the Hudson Valley Railway Company and the United Traction Company, of Albany and Troy. Spurs from the main line of the Delaware & Hudson Railroad will run to the property from both north and south, and, according to the plans prepared by J. G. White & Company, of New York City, the engineers, the power station will be erected about 1000 ft. north of the dam of the Hudson River Electric Power Company. The engineers of the Hudson Valley Construction Company have made measurements at the property and will begin excavating at once for the intake canal from the river through the site of the power station. This canal will be 480 ft. long and 12 ft. wide, and will furnish water for the condensing plant. The engine room to be constructed will be about 180 ft. x 70 ft., and the boiler room about 180 ft. x 75 ft. The plant proper will be 165 ft. long by 155 ft. wide. The Delaware & Hudson Company will spend between $500,000 and $600,000 in the construction of the plant. It is expected to have a part of it ready for operation in August of this year.

ANNUAL REPORT OF HAVANA ELECTRIC RAILWAY

The Havana Electric Railway Company's report for the year ended Dec. 31, 1906, shows a deficit of $67,000 comparing with a surplus of $370,000 in the previous year, as follows:

Income account—	1906.	1905.
Gross receipts	$1,621,209	$1,504,837
Expenses, taxes, etc	1,031,373	776,052
Net earnings	$589,836	$728,785
Other income	40,863	38,033
Total income	$630,699	$766,818
Charges	498,313	395,897
Surplus	$132,386	$370,921
Preferred dividends	200,000	.....
Deficit	$67,614	*$370,921
Previous surplus	509,073	138,152
Profit and loss surplus	$441,459	$509,073

* Surplus.

The general balance sheet as of Dec. 31, 1906, compares as follows:

Assets.		
Properties	$20,502,940	$20,102,101
Stage lines	225,000	225,000
Insular railway	280,646	230,982
Cash	33,264	359,545
Accounts receivable	75,085	4,305
Materials on hand	569,690	174,632
Fuel on hand	15,567	3,541
Insurance prepaid	17,267	11,054
Taxes prepaid	2,025	1,819
Deposits made as securities	12,700	2,300
Treasury bonds	168,630	89,113
Treasury stock	36,040	36,040
Total	$21,938,854	$21,237,433
Liabilities.		
Common stock	$7,500,000	$7,500,000
Preferred stock	5,000,000	5,000,000
Funded debt	8,311,561	8,031,037
Accrued interest	171,958	166,835
Interest on sinking fund bonds	.....	.....
Outstanding coupons	6,422	5,216
Employees' deposits	18,400	10,101
Unclaimed wages	.....	2,396
Dividends	50,000	.....
Balance due on first mortgage bonds	.....	.....
Spec. loan on stage property	.....	.....
Accounts and wages payable	189,055	12,775
Profit and loss account	441,458	509,073
Total	$21,938,854	$21,237,433

INTERBOROUGH REPORT FOR YEAR

The report of the Interborough Rapid Transit Company, of New York, for the year ended Dec. 31, shows an increase in the number of passengers carried of 54,127,910, as compared with the preceding year, and a gain in gross earnings of $2,697,881. Net earnings were large, increasing $2,149,398. After the payment of the 7 per cent guaranteed dividend on Manhattan stock there was a surplus of $3,545,192, compared with a surplus in 1905 of $2,504,142. Detailed figures follow:

	1906.	1905.
Gross earnings	$20,916,147	$18,218,266
Operating expenses	8,793,486	8,245,004
Net earnings	$12,122,660	$9,973,261
Other income	673,598	701,660
Gross income	$12,796,259	$10,674,922
Interest on bonds	3,961,991	3,018,166
Taxes	1,341,074	1,288,613
Total	$5,303,066	$4,306,780
Net income	7,493,192	6,368,142
Seven per cent on Manhattan Railway Company stock	3,948,000	3,864,000
Surplus	$3,545,192	$2,504,142
Operating per cent	42.04	45.26
Passengers carried	420,302,389	366,174,479

FROM LANCASTER TO PHILADELPHIA BY TROLLEY

By Jan. 1 there will be through trolley connection between Lancaster and Philadelphia. The Lancaster & Eastern Street Railway Company now has in operation a line from Lancaster to Christiana, 20 miles east of Lancaster, and the engineers of the company started work last week surveying for a line to connect Christiana with Coatesville, 12 miles further east, to which point there are trolley lines from Philadelphia. These lines will give through connection between Lancaster and Philadelphia.

ENGINEER RICE THINKS THE BROOKLYN SUBWAY WILL BE READY FOR USE TO CITY HALL STATION BY JUNE 1

George S. Rice, engineer for the New York Rapid Transit Commission, addressed the department of engineering of the Brooklyn Institute Thursday evening, March 21, on "The Subways of Greater New York and Their Engineering Problems." After a rapid survey of the planning and carrying out of the subway work already finished, Mr. Rice spoke of the fact that it is but a week ago Wednesday since permission was given to take up further work, and the Commission, which had its contracts ready in advance, is now advertising for bids. "There is so much comment on the Rapid Transit Commission," said Mr. Rice, "that I would like to have this department appreciate this. Three or four hearings are to be held next month, but I suspect there will be few bidders in Manhattan, because, by the provisions of the Elsberg bill, twenty years is the limit of any franchise. I am afraid capital will be chary about going into these subway contracts." Because of other public works the city can have but about $30,000,000 to spend on necessary immediate work, and Mr. Rice thought that would not go very far toward meeting the demand of the traveling public. Computations made earlier in the lecture showed that, at the present rate of increase, in 1910 there will be a population of 4,720,000 in this city, who will pay 1,500,000,000 single fares. The population is doubling in an average of twenty-five years, but the amount of travel is doubling in an average of ten to eleven years. Mr. Rice expressed the opinion that the Brooklyn subway, as far as the Borough Hall station, would be ready for use in June, and to the Long Island Railroad station, Flatbush Avenue, in September. He said that the work on Fulton Street, when all the conditions are considered—one of the most crowded streets in the world, from the Borough Hall to above Flatbush Avenue, the surface and elevated tracks and the late decision to four-track the tunnel, is the quickest piece of subway work ever done.

INDIANA TRACTION MERGER

The Terre Haute, Indianapolis & Eastern Traction Company, with an authorized issue of $25,000,000 worth of stock and $10,000,000 worth of bonds, filed articles of incorporation with the Secretary of State, at Indianapolis, Ind., Saturday, March 23. This is the holding company toward which the plans of the Philadelphia syndicate, represented in Indianapolis by Hugh J. McGowan, have been shaping for nearly two years.

The Terre Haute, Indianapolis & Eastern, as previously stated in the Street Railway Journal, will acquire by purchase or lease all the Indiana syndicate lines. These include the Indianapolis & Northwestern, the Indianapolis & Western, the Indianapolis Coal Traction Company (Plainfield line), the Indianapolis & Martinsville, the Indianapolis & Eastern, and the Richmond Street & Interurban Companies. The holding company will not acquire the lines of the Indianapolis Union Traction Company, the Ft. Wayne & Wabash Valley Traction Company, nor the Evansville & South Bend properties, which have recently come under syndicate control.

It is practically assured that the new company will acquire the lines owned by the Terre Haute Traction & Light Company, including the city lines in Terre Haute and interurbans to Clinton, Brazil and Sullivan. It is understood that a proposition will be made at once by the new company to the Stone & Webster syndicate for the lease for a period of ninety-nine years of the Terre Haute properties. The terms of the proposed lease have not been made known. The new company will control 363 miles of traction line in operation.

The Terre Haute, Indianapolis & Eastern, as a holding company for the syndicate lines in Indiana, corresponds to the recently incorporated Indiana, Columbus & Eastern Railway Company, which is a holding company for the lines in Ohio owned by the same interests as the syndicate lines in Indiana. The two holding companies will operate in close relation and establish through service over their roads.

PROGRESS ON THE PENNSYLVANIA TUNNELS IN NEW YORK

Now that a period of favorable weather conditions has begun work on the Pennsylvania Railroad's New York terminal and tunnels is going forward with great rapidity. A considerable section of the tunneling is actually completed. There has been another "meeting" of tunnels—this time in Long Island City. The southernmost of the four tubes being driven from East Avenue under the Long Island Railroad passenger terminal toward the East River has reached the river shaft, and is now connected with the tubes that go out under the water. A few days ago the "headings," bound in opposite directions under Thirty-Second Street, Manhattan, came together nearly under Third Avenue, so that there are continuous passages from the East River to Fifth Avenue under both Thirty-Second and Thirty-Third Streets.

Under the East River the tubes have gone about 500 yards. Those going east from Manhattan, having started a full year earlier, are more advanced. The three to the south, known as B, C and D, are now piercing through the rock of Blackwell's Island reef. The tubes bound from the Long Island City side toward Manhattan are about 350 ft. out under the water. The meeting of the eastbound and westbound tubes will take place considerably to the east of the middle of the river.

About 85 per cent of the excavation work in the area bounded by Seventh and Ninth Avenues and Thirty-First and Thirty-Second Streets is done. Between Seventh and Eighth Avenues practically all the excavation is completed. The greater part of the steel work which is to support Eighth Avenue over the underground tracks is in place. The foundations for the station columns are being laid.

Between Harrison, on the present main line of the Pennsylvania, and the Bergen Hill tunnels several bridges have been constructed. The one over the Hackensack River is nearly finished. Under Bergen Hill itself, through the hard Palisades rock, the tunnelers are making more rapid progress than at any previous time. They are now at work in four sets of "headings"—west from the Wechawken shaft, east from the Hackensack portal on the edge of the Meadows, and east and west from the central shaft, 220 ft. beneath the crest of the hill.

COMMITTEES OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

President H. A. Nicholl, of the Central Electric Railway Association, has announced the appointment of the following standard committees:

Subject Committee.—E. C. Spring, West Milton; J. L. Adams, Dayton; J. C. Rothery, East Liverpool; Thos. Elliott, Cincinnati; C. F. Smith, Findlay.

Insurance Committee.—H. N. Staats, Cleveland; H. J. Davies, Cleveland; Harry P. Clegg, Dayton.

Finance Committee.—C. N. Wilcoxon, Kamms; Geo. Whysall, Marion; Thos. McReynolds, Kokomo; W. B. Wright, Rushville; H. E. Vordemark, Ft. Wayne.

Standardization Committee.—R. C. Taylor, Anderson; W. H. Evans, Indianapolis; F. Heckler, Fremont; M. E. Baxter, Wapakoneta; W. A. Gibbs, Newark.

Publicity Committee.—F. D. Norveil, Indianapolis; George Davis, "Traction Weekly," Cleveland; Cale Gough, Street Railway Journal, Chicago; L. E. Gould, "Electric Railway Review"; Mr. Grimes, Ohmer Fare Register Company, Dayton.

Transportation Committee.—F. J. J. Sloat, Hamilton; F. T. Hepburn, Lima; F. J. Stout, Norwalk; Chas. G. Lohman, South Bend; F. S. Davis, Columbus.

Committee to Report on Lighting Car for Interurban Service.—R. C. Taylor, Anderson, Ind.; W. H. Evans, Indianapolis, Ind.; Mr. Tracy, master mechanic Cleveland & S. W., Kamms, Ohio; W. P. Jackson, Columbus, Ohio.

Committee on Express Companies' Contracts with Interurban Railways.—A. A. Anderson, Columbus, Ind.; Geo. Whysall, Marion, Ohio; F. D. Carpenter, Lima, Ohio.

PLANS PERFECTED FOR BUILDING LONG ISLAND SYSTEM

At a meeting held in New York, Friday, March 22, the organization was perfected of the company with which Cleveland interests formerly identified with the New York & Long Island Traction Company are connected, and which has for its object the construction of a system of interurban lines on Long Island with a connection for New York. The officers of the company elected on Friday are as follows: George A. Stanley, of Cleveland, president; C. S. Thrasher, of Cleveland, vice-president; Joseph Nutt, of Cleveland, treasurer; J. A. MacElhinney, 120 Broadway, New York, secretary; G. A. Stanley, of Cleveland; C. S. Thrasher, of Cleveland; Joseph Nutt, of Cleveland; William Christy, of Akron; B. F. Hamilton, of New York; B. R. Duff, of New York; J. A. MacElhinney, of New York; F. B. Jordan, of New York, and T. Kerrigan, of Sea Cliff, directors.

The company's plan is to build first to connect Mineola, Rosyln and Port Washington. Later from Roslyn a line will be built to Manhassett and Great Neck, and eventually to the New York City line at Little Neck. All the franchises have been secured, and there are on deposit a bond for $5,000 and $5,000 in cash to insure the construction of the line. The contract for building has been placed with the Cleveland Construction Company and work will be begun at once. The plan is to rush construction, and it is hoped to have the Mineola, Roslyn and Port Washington line, some 10 miles long, completed and in operation by Sept. 1. At Mineola connection will be made with the New York & Long Island Traction Company's system, which connects Mineola, Hempstead and Freeport, and affords a connection with the lines of the Brooklyn Rapid Transit Company through the medium of the Long Island Electric Railway, which operates between Jamaica and Queens. The company has arranged with the Nassau Electric Light & Power Company for securing power from that company's plant at Glen Cove. The Nassau Power Company had its beginning in the desire of wealthy residents of Long Island to light their grounds and buildings by electricity, and from a private enterprise has grown into a company operating generally throughout the part of the island proposed to be traversed by the new railroad.

The Chicago City Railway notified its employees Thursday, March 28, that wages will be increased from 1 to 4 cents per hour if the traction ordinances are successful next Tuesday.

MEETING OF MUNICIPAL OWNERSHIP AND PUBLIC RELATIONS COMMITTEES

A joint meeting of the committees on municipal ownership and public relations of the American Street and Interurban Railway Association was held in New York, March 22, 1907. A conference was held later with similar committees representing the electric light, gas and telephone interests. Among those present were: C. D. Wyman, W. Caryl Ely, H. A. Robinson, B. F. Swenson, Walton Clark, J. B. McCall, C. L. Edgar, Arthur Williams, W. H. Gardner, H. L. Doherty, E. W. Burdett. The meeting was devoted to a general discussion of the relations of corporations to the public and to the State, and concluded in the evening with a dinner at the Waldorf-Astoria.

Both of the committees of the American Association will probably issue within the next few weeks a series of questions to be answered by the street railway companies of the country. The data obtained in this way will be used as a basis for the reports which will be presented by the committees at the 1907 convention.

NO REDUCED RATE OVER STEAM LINES FOR VETERANS

The Central Passenger Association has refused to grant the members of the Grand Army of the Republic reduced rates over the steam lines to Ft. Wayne, where their annual encampment is to be held in May. Heretofore they have granted a 1-cent rate to the veterans. In reply to the request the president of the association said: "The Indiana Legislature having fixed a rate of 2 cents a mile the transportation lines consider that they may not reasonably be asked further to deplete their revenues by conceding reductions from this probable unprofitable basis."

AMERICAN MUSEUM OF SAFETY DEVICES

With the purpose of arranging the preliminary plans connected with the establishment of a permanent museum of safety devices in America, a dinner conference was held by Dr. Josiah Strong as president, and Dr. W. H. Tolman as director, of the American Institute of Social Service, at the Aldine Club, New York City, on Friday evening, March 22, at which a number of the leading editors and publicists of New York City were in attendance The business portion of the evening was devoted to a discussion of the facts which render desirable the establishment in this country of such a museum. It was stated that even in New York City alone, taking the statistics for certain years, an average of from nine to thirteen persons meet with violent death per day. Most of the accidents to which these deaths can be attributed are preventable by the use of proper safety devices.

It is the intention to establish in New York City a museum in which approved safety devices can be permanently located and to which the public will have free access at all times. During the evening lantern slides were shown of a considerable number of the great museums already established abroad, notably those at Amsterdam, Berlin, Paris, Madrid and Milan.

It will be recalled that an exposition of safety appliances and industrial hygiene was held at the American Museum of Natural History from Jan. 29 to Feb. 12, 1907. At this exposition marked interest was aroused in the general movement, and it is believed that the time is now ripe for making the exposition permanent. Present estimates seem to indicate that about $25,000 will be needed as an initial fund. About $1,500 has already been raised for this purpose, $1,000 of which has been pledged by the Non-Explosive Safety Naphtha Container Company, of New York. Subscriptions will be solicited from those who will profit from the application of safety devices as well as from those who are interested in the movement from the humanitarian aspect. The "Scientific American" announced its intention of presenting annually a gold medal to be awarded for the invention of the best safety device, with the single suggestion that the medal in successive years should be given for inventions in widely differing lines. A pronounced step was taken in the organization by the appointment of an advisory committee consisting of the editors of a number of the technical and trade journals.

AMERICAN RAILWAY INSURANCE COMPANY TO BEGIN BUSINESS IN APRIL

The American Railway Insurance Company, of Cleveland, organized by the traction interests to carry their risks, will not begin business until some time next month, as its $500,000 of capital and surplus is not to be fully paid until April 1. In the meantime Henry N. Staats, its manager, has been placing with stock companies the entire business of any traction companies which wish to turn over their business to the new organization, returning to them the commissions paid. Mr. Staats also has arranged with these companies to reinsure any excess lines after the American Railway Insurance Company begins business. Much interest is taken as to the identity of these companies.

Mr. Staats reports pledges from twenty-eight traction companies to place their insurance with the new concern, and negotiations pending with sixteen more. The activity with which the new organization will be pushed will depend upon the rates made by the stock companies in competition. If these are at a figure so low that no profit can be seen by the new company, as is claimed to be the case at Cleveland, where the sprinklered risks of the Cleveland Electric Railway Company are being carried at 15 cents, it will decline to compete, holding that it has achieved its purpose.

PROGRAM OF IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION

The program of papers just announced to be presented at the meeting of the Iowa Street and Interurban Railway Association at Clinton, Ia., April 19 and 20, includes the following: "The Steam Motor Car—Its Value for Interurban Service," by W. G. Wagenhals; "Amusements—How Should This Feature be Handled by Operating Companies," by H. W. Garner; "Freight Handling by Electric Lines," by H. H. Polk; "Joint Operation of City and Interurban Cars Over City Tracks," by Isaac B. Smith; "Effective Methods of Handling Peak, or Rush-Hour Traffic on City Lines," by E. L. Kirk; "Modern Train Dispatching Methods on Electric Railways," by P. P. Crafts.

This program is one which will be of great interest and value, not only to the members of the Iowa association, but to the street railway fraternity at large. Mr. Wagenhals, who has the paper on the "Steam Motor Car," is the inventor of the car, which he will describe in connection with his paper. He has given years of attention to the application of the steam motor in interurban service, and his latest type of car has excited much favorable comment. Mr. Garner, who handles the park or amusement feature, will embody in his paper the best practice and idea of the companies operating in this section of the country. Mr. Polk, who handles the paper on "Freight Handling by Electric Lines," is the president of the companies which are conspicuous for the success they have met with in the freight field. Mr. Smith, of Cedar Rapids, is expected to produce an interesting paper on prevailing practice, which covers the "Joint Operation of City and Interurban Cars Over City Trackage."

Mr. Kirk is general manager of the Sioux City systems, and has for years handled an enormous summer business, the pleasure resorts of Sioux City being admirably located from a street railway point of view. Mr. Crafts, the general manager of the I. & I. Railway at Clinton, is giving much attention to "Train Dispatching Methods," through the fact that he is operating an electric railway maintaining a schedule of 35 m. p. h., a service which has been successful in competing with parallel steam lines.

There will be ample entertainment features provided by the local committee of Clinton, which consists of P. P. Crafts, general manager of the I. & I. Railway Company; R. M. Howard, general manager of the Clinton Street Railway Company, and Thos. Crawford, superintendent of the Clinton Gas, Light & Coke Company. As stated in the STREET RAILWAY JOURNAL last week, managers desiring to exhibit will be cared for, ample arrangements having been made for space for exhibitors. For this space there is no charge. The Clinton Gas, Light & Coke Company will furnish service and connections complimentary to those who make exhibits.

FAREWELL DINNER TO MR. STANLEY

Albert H. Stanley, who has just resigned his position as general manager of the railway lines of the Public Service Corporation of New Jersey to accept that of general manager of the Underground Electric Railway Company, Ltd., of London, was the guest of honor at a banquet held at the Waldorf-Astoria Hotel, in New York, on Friday evening, March 22. Mr. Stanley expects to leave for London about April 1, as has already been announced in this paper. The dinner, which was held in the Astor Galleries at the Waldorf, was an elaborate one in all its details. It was characterized by great cordiality, and the desire of all those present to express the high esteem in which they held the guest of the evening and bear tribute to his high ability and strong personality. The tables were arranged in the form of a large circle and were banked with flowers. About one hundred were present, including many of Mr. Stanley's former associates on the Public Service Corporation, representatives from the transportation companies of New York City, Central New York State, Buffalo, Cleveland and elsewhere, together with others prominent in the electric railway industry.

ALBERT H. STANLEY

C. Loomis Allen, vice-president and general manager of the Oneida Railway Company, the operating company of the New York Central's trolley lines in Central New York State, acted as toastmaster in the unavoidable absence of Thos. N. McCarter, president of the Public Service Corporation. Mr. Allen portrayed the great regard and affection with which Mr. Stanley is held by all the railway men who have become acquainted with him, sketched the services which he has accomplished both for the companies with which he has been connected and the industry at large, and extented to him the most cordial wishes of all his friends for success in the new and important work in which he is so soon to become engaged. The remarks of Mr. Allen formed a most graceful tribute to the guest of the evening to whom they were addressed, and were most enthusiastically received. At their close the speaker, in behalf of those present, presented Mr. Stanley a handsome fob and Jurgensen watch as a perpetual reminder of his friends and experience in America. Colonel Sterling, of the Public Service Corporation, followed Mr. Allen. He referred to the unavoidable absence of President McCarter, but said that he voiced the sentiment of the latter, as well as all of Mr. Stanley's other associates on the Public Service Corporation, in the high tribute which he paid to him as a man and to his ability as a manager.

The committee had arranged for no formal speeches at the banquet, and the menu card bore no names of speakers, nevertheless, at the close of Colonel Sterling's remarks, Mr. Allen called upon a few among those present to say a few words. Among those who spoke were Frank Bergen and Howard MacSherry, of the legal department of the Public Service Corporation, who represented Mr. Stanley's late associates in the operating department of that company; James H. McGraw, of the STREET RAILWAY JOURNAL, who spoke as the representative of the technical press, and Charles G. Castle and Daniel M. Brady, who represented the manufacturers. Mr. Stanley was the last speaker of the evening. He was greeted with great applause and responded to the many wishes for his success in an acceptable and graceful manner.

The occasion was one of the most delightful in all its appointments of any of the kind which has been held in New York and was a striking evidence of the worth and regard in which the late railway manager of the Public Service Corporation is held by his fellow railway men. The committee in charge of the banquet were: Col. E. W. Hine, assistant to president Public Service Corporation of New Jersey; C. Loomis Allen, vice-president and general manager, Utica & Mohawk Valley Railway Company; J. N. Shannahan, general superintendent, Fonda, Johnstown & Gloversville Railroad; Frederick V. Green, Westinghouse Air Brake Company, and Charles G. Castle, vice-president, Hildreth Varnish Company.

NEW PUBLICATIONS

"Electrie Railway Engineering." By H. F. Parshall and H. M. Hobart. New York: D. Van Nostrand & Company, 1907. 475 pages. Illustrated. Price, $10,00.

This is the most voluminous book published on the subjeet of electrie railway engineering, and like others written by the same authors is in royal octavo form and a fine speeimen of typography. The extent to which eleetrieity is being applied to heavy electric traetion is given as one reason for the publieation of the work at this time, but in this eonnection the authors sound a note of warning that "except in the ease of exeeedingly dense and heavy traffie the cost of working by eleetricity will apparently for a long time to come be greater than that of working by steam." This may perhaps be based upon the opinions of the authors in regard to the eommereial possibility of the alternating-eurrent motor, because on this point they say:

> In our judgment, the limitation of the alternating-current motor is fixed, in its relation of energy output to weight, by the inherent properties of single-phase commutator apparatus, and the limitation of the continuous-current motor will be determined by the maximum safe voltage at which a commutating machine can be worked. While the development of each class of machine has advanced beyond the point that could reasonably have been foreseen, and while, in our judgment, it is impossible at the present time to predict where the limitations will be reached, we are satisfied that a careful comparison of the two types at the present time is decidedly to the advantage of the high-tension, continuous-current motor.

The primary mechanieal advantage of electrification over steam is considered "the ability to apply power to as many axles as may be neeessary to secure the best mechanieal results."

The work as a whole is divided into three parts, viz.: (1) The Mechanies of Electric Traetion. (2) The Generation and Transmission of the Eleetrical Energy. (3) The Rolling Stock. Part I. considers traetive resistance, acceleration, motor eharacteristics, etc. In the first ehapter all of the well-known formulæ on train resistanee are quoted. That of Mr. Aspinall seems to be the one the authors prefer, although they consider there is a lack of reliable data upon the subject. Some interesting figures are given as to the traetive resistanee in tube railways, and from the Central London Railway the authors have obtained results represented by the formula:

$$\text{Resistanee in pounds per ton} = 6 + 0.5\,\frac{V^2}{W},$$

where V is the speed in miles per hour and W is the weight of the train in metrie tons. As will be seen the length of the train is immaterial. For some plotted results of a 130-ton Central London train on the surfaee, as compared with operation in tubes, the additional resistance, due to the tube, varies from 3 lbs. per ton at 8 m. p. h. to 2 lbs. per ton at 30 m. p. h. These figures are based on level traek, but on the Central London the use of aceelerating grades at starting and of retarding grades at stopping contributes, aeording to the authors, as much as one-fourth of the energy supplied to the train.

The ehapter on acceleration opens with the "useful rule," discovered by the authors, that on a level track a tractive force of 100 lbs. per metric ton, in addition to the force required to overcome the traetive resistance, imparts to a train an acceleration of 1 m. p. h. per seeond. This does not make allowance for the rotational energy of the wheels and armatures, which is from 3 to 7 per cent of the whole kinetie energy of the train, so that praetically the rule is equally adapted to the ordinary ton. As the metric ton (which is taken as 2200 lbs.) is used frequently throughout the book, with all the other dimensions in the English system, we assume that the authors favor its use in some instances as a compromise between American and English methods. They then take up, in a clear manner, the theory of acceleration with its application to different schedule speeds, and diseuss the various forms of curves previously considered by Messrs. Armstrong, Gotshall, Carter and others. An acceleration and retardation of 2 m. p. h. per second is usually assumed, although the authors give eurves obtained in practice in which as high an acceleration as 3 m. p. h. per second was obtained. In their general treatment of the subjeet of tractive force they offer an interesting endorsement of the regenerative control system when used on a relatively high sehedule speed with frequent stops; more so in fact than for commercial systems of regeneration, for after referring to the "brief periods of notoriety whieh these systems enjoy, prior to disappearing from the scene," they remark that "their inventors, or rather the exploiters and their technieal staff, have not themselves yet arrived at a elear understanding of the matter."

The effieiency of different control systems and the relation of number of station stops to a maximum and average speed under different maximum and average rates of acceleration are considered in detail. In eonneetion with the latter subjeet the authors have suceeeded by plotting as abseissæ (schedule speed in miles per hour) × (stops per mile), and as ordinates (kilowatts per ton) × (stops per mile)^2 in redueing Mr. Armstrong's well-known curves on the effeet of frequent stops in high-speed railroading (see Street Railway Journal for Jan. 19, 1904, page 70) to a single curve. The authors warn the reader, however, that their treatment of the subject is based on d. c. motor performance, and the greater weight, lower effieieney and presumably poorer commutation performance of the single-phase motor without rapid aeceleration would affeet the result so far as that type of machine is coneerned. This matter is eonsidered important in suburban work, where the use of aecelerating rates of 2 m. p. h. per second or so are desirable.

The seeond part of the book, or that relating to the generation and transmission of electrieal energy, is divided into four ehapters, viz.: the high-tension transmission system, the sub-stations and the distributing system. In the first the general prineiples of station construction are reviewed, diagrams are given of typical installations and the eost of operation of various stations is eompared. The transmission ehapter is devoted prineipally to eity distribution, as the referenee to aerial lines is slight, and the recommendation of restriction of the voltage to 11,000 would indicate. The chapter on sub-stations opens with a very interesting diseussion of the relative cost of motor generators and rotaries, in which the authors favor the former from economical grounds exeept where the transmission is short and the voltage drop small. Further on storage batteries and sub-station layouts are considered. In the chapter on the distribution system the third rail, overhead system and track return are in turn discussed, the former with espeeial completeness.

The part of the book on rolling stoek is devoted almost entirely to heavy eleetrie traetion. After a deseription of the different well-known forms of geared and gearless loeomotives the authors diseuss the relative weights and costs of different types of equipments. This leads up to a eomparison of types in which the authors refer to the high-voltage d. e. system as greatly neglected. Upon this point they say:

> High-tension continuous-current railway motors are already on the market, and it is the writer's belief that half the sum spent in developing the single-phase commutator motor to its present condition (in which it still remains less efficient, more bulky, and less satisfactory in several respects than the 600-volt continuous-current motor) will result in the development of thoroughly satisfactory high-tension continuous-current motors. These motors will be as efficient and as light for a given temperature rating and a given speed as the present standard 600-volt motors. The commutation will be better. As traction motors increased in size they were designed successively with five, four, three, two, and finally one turn per segment. Beyond that point, the commutation difficulties with increasing capacity can only be met with reversing poles, or their equivalent. Going up to 1500 volts and higher it will again be practicable in motors of large capacity to improve the commutation in virtue of the decreased current, and, when, in addition to this, reversing poles are employed (in the cases where they are suitable), there need be no apprehension that commutation will present any difficulties. Indeed, the commutator of a 1500-volt, continuous-current motor will be much shorter than that of a 600-volt, continuous-current motor, since the current to be collected is so much less. The total brush surface will be correspondingly reduced. Thus a greater space between wheels may be devoted to armature and winding, and motors of larger capacity will be practicable for a given driving-wheel diameter and gear ratio. In other words, the limiting areas will become larger. The very slightly increased space necessary for high-voltage slot insulation will be an almost negligible factor as affecting the bulk of the motor for a given rated capacity when this rated capacity is a matter of 100 hp and upward. If, on the other hand, we turn our attention to the single-phase commutator motor, we find it in possession of over twice as large a commutator (as this is for 250 volts) as its 600-volt, continuous-current equivalent. This alone takes away valuable space between wheels, and leaves a less available width for the armature. As, however, the latter also is large for its rated output (for equal rated speeds), the areas are, for single-phase commutator motors, very restricted, indeed. There will be a tendency to keep down the dimensions by employing a higher rated speed and ratio of gearing. This means, in motors of high rated capacity, serious losses in gearing and rapid deterioration of gearing. It is also unfavorable for commutator and brushes. There thus appears good reason to anticipate better results from high-voltage, continuous-current traction than from single-phase traction with commutator motors.

This opinion does not prevent a full description of the different types of single-phase and polyphase motors in use. Subsequently a comparison of construction and operating cost is worked out on the 1300-volt d. e. and 20,000-volt single-phase system. The example selected is that used by Mr. Lincoln in his Canadian Engineers' paper (STREET RAILWAY JOURNAL, Dec. 12, 1903), and a very satisfactory economy for high-voltage d. c. construction is the result. These quotations from Messrs. Parshall and Hobart's book of high-voltage d. c. and a. c. motors, are not given because they form a prominent portion of the volume or because they interfere with a full treatment of all of the different systems. They do neither. But they are given on account of the extent to which the same subject has recently been debated in this country. A chapter on trucks completes the volume.

The volume is certainly a very important addition to the literature upon the subject and reflects great credit on both authors and publishers.

"Report of the Third Annual Convention of the Iowa Street and Interurban Railway Association." Published by the Association. 123 pages.

Although the Iowa Association is one of the youngest of the State associations, being organized in 1904, the report of its Des Moines meeting in April, 1905, indicates an enthusiasm and readiness for work worthy of emulation. Six papers in all were presented at the convention, and the resulting discussion was extremely instructive. The association is to be congratulated both on the meeting and the report.

"Long Distance Electric Power Transmission." By Rollin W. Hutchinson, Jr. New York: D. Van Nostrand & Company. 345 pages. Illustrated. Price, $3.00.

The importance in the commercial world which the construction of long distance electric power transmission plants has assumed has brought forth a wealth of literature on this subject. The author of the present volume has gathered together the principal facts in connection with both the hydraulic and electrical features of the problem and has put them in concise and readable form. Examples are given of the methods of making the main determinations necessary, and each chapter concludes with a bibliography of the subject treated.

WORK ON THE DENVER & INTERURBAN SYSTEM

The Denver & Interurban Railroad Company, which was incorporated to build an electric line in Northern Colorado, at present is constructing a line from Denver to Boulder, the entire length of which is 44 miles. Sixteen miles of this is a new line, on private right of way, and entirely independent of the steam lines. At Louisville Junction, however, 16 miles from Denver, the electric line is connected with the company's present steam line, operated under the title of the Colorado & Southern Railway, and runs over the same track to Boulder, and from Boulder, by way of the loop, back to Louisville Junction.

The company is not constructing its own power house, but will purchase power from the Northern Colorado Power Company, located at Louisville, which is about half way between Denver and Boulder.

The line will be overhead construction, poles on one side, with brackets and suspended catenary construction. The trolley line will be alternating current, 11,000 volts.

At Denver city limits, this line connects with the Denver Tramway Company's tracks, and from the city limits into the heart of the city will run over the tramway tracks, transferring passengers to all parts of the city, the tramway being overhead construction, direct current. The company expects to install its service about Dec. 1, of this year, and will purchase ten motor cars and six trailers, cars to run in multiple. Plans for these cars are not yet perfected, but they will be 56 ft. in length, 9 ft. in width, seating capacity of sixty, except the combination cars, which will carry baggage compartments. Cars will be equipped with four 125-hp a. c. motors and Baldwin trucks.

In addition to this line, the company also is constructing a street railway in the city of Fort Collins, building this year about 7 miles of line. The power will be furnished by the Northern Colorado Power Company, delivered to the company's street-car house in Fort Collins at 60,000 volts and there converted. Contracts have been placed in Denver for four motor cars, and two additional motor cars and four trailers will be purchased in the East.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED MARCH 19, 1907

847,304. Toboggan Slide; Orcenith F. Allen, Temple, Tex. App. filed July 2, 1906. A pleasure railway or toboggan slide formed of a plurality of sections detachably secured together, whereby the slide may be quickly set up for use and readily knocked down and compactly assembled for transportation.

847,337. Electrical Rail Bond; Alonzo F. Hooton, Greenfield, Ind. App. filed May 24, 1906. A sheet metal plate is cut and bent so as to closely fit upon the adjoining rails beneath the fish-plates which connect them.

847,400. Rail Joint; Sterling H. Campbell, Detroit, Mich. App. filed Nov. 8, 1905. A combined fish-plate and chair-plate and a wedge-plate adapted to be interposed between the chair-plate and the rail base, the chair-plate and wedge-plate being adapted to extend across the rail base from side to side thereof.

847,437. Car Fender; William Pickett, Lynn, Mass. App. filed Feb. 8, 1906. A car fender having a main supporting strip with downwardly extending arms integral therewith, in combination with a pivotally secured frame, one extremity of which is provided with an upwardly extending arm adapted to engage with a latch held normally in position by a spring.

847,453. Ice Remover; Gerald P. Ayers, Chicago, Ill. App. filed April 30, 1906. A power-operated hammer carried by the car truck directly above the third rail and means for operating said hammer to force it downwardly into close contact with the top of the rail.

847,559. Binding for Car Trap Doors; Oliver M. Edwards, Syracuse, N. Y. App. filed March 5, 1904. A binding for the trap doors of car platforms to preclude wedging in damp weather, said binding tapering in thickness from one edge toward the other and adapted to be applied with the lessening thickness extending toward the under side of the platform.

847,642. Rail Tie; William E. Boyles, Grafton, W. Va. App. filed July 11, 1906. Means for fastening the rail to a metal tie of peculiar construction.

847,701. Trolley and Crossover; Fredrich Schmunk and Paul B. Schmunk, Beaver Falls, Pa. App. filed July 10, 1906. The harp has upwardly projecting arms with rounded shoes closing over the trolley wire at their extremities. These separate by their resiliency in passing hangers, etc. An arch-shaped frame supports conductors crossing at right angles.

847,711. Fluid Pressure Brake; Henry H. Westinghouse, Pittsburg, Pa. App. filed April 1, 1903. Provides means for maintaining the train-pipe pressure substantially constant at whatever point it may be intentionally reduced at the engineer's brake-valve for applying the brakes.

847,732. Car Replacer; William Cook, Hoboken, N. J. App. filed Jan. 14, 1907. Consists of a block adapted to be applied to the side of the rail and presenting an inclined face extending upwardly from the inner edge of the rail-head and having shoulders projecting upwardly from said face near the ends of said body, said shoulders being adapted to deflect a wheel off of said inclined face onto the rail-head, and means for guiding a wheel onto said block.

847,743. Current Controller; Richard Duckworth, Preston, England. App. filed Jan. 3, 1906. A form of mechanically actuated switch for sectionally energizing the third rail of an electric railway while the train is passing. A tappet adjacent the track is mechanically depressed by the wheel flanges of the train.

847,745. Metallic Railway Tie; Alexander Durand, Toledo, Ohio. App. filed Dec. 24, 1906. The tie is of inverted U-shape in cross section and recesses are provided in the top of greater width than a rail base, said recesses each having like walls thereof grooved to engage like flanges of different rails, and a clamp secured in each recess and co-operating with the groove to retain a rail in its seat in the recess.

847,780. Railroad Tie; Joseph H. Jennings, Middleway, W. Va. App. filed June 5, 1906. A tie comprising a top plate having oppositely disposed depending side walls at its ends, and inwardly extending overlapped flaps carried by the walls, said overlapping flaps being punched one into the other to prevent separation thereof.

847,783. Railway Tie; Henry S. Kilbourne, Nashville, Tenn. App. filed April 5, 1906. A reinforced concrete tie embodying means for effectually insulating the rails.

847,808. Fare Register and Recorder; Wilfred I. Ohmer, Albert J. Kirchner, Dayton, Ohio, and John W. Hill, Providence, R. I. App. filed Dec. 16, 1905. Details of construction.

847,905. Electric Signal System; Eugenio Chouteau, Jr., St. Louis, Mo. App. filed Oct. 24, 1906. A trolley wire is mounted upon the web of the rail and is adapted to be engaged by a specially constructed trolley wheel or shoe depending from an arm on the train. The purpose is to complete signal circuits within the locomotive cab. Has resistance bonds at intervals along the track.

847,931. Switch; Oscar S. Gage, Tecumseh, Okla. Ter. App. filed Feb. 23, 1907. A tappet at the end of the switch point is engaged by a shoe on the car platform to throw the switch.

847,936. Air Brake Mechanism; Alva L. Goodknight, Council Bluffs, Ia. App. filed Nov. 21, 1906. One of the objects of this invention is to secure a graduated release of the brakes throughout the entire length of the train and to provide means whereby when full release pressure is turned on by the engineer's brake-valve the brake on the rearmost car of the train will be fully released while the brake on the head car will be only partly released.

847,937. Insulated Rail Joint; George L. Hall, New York, N. Y. App. filed Oct. 22, 1906. The fish-plates have sections dovetailed together and sheets of insulating material are clamped between the sections. Bolts with insulating bushings are used for clamping the plates on the rails.

847,989. Trolley Wire Crossing; James N. Hayes, St. Louis, Mo. App. filed Jan. 29, 1906. A trolley wire crossing employing two castings mortised together with depending rails which guide the trolley wheel in passing. Has a pyramidal stud at the center which guides the wheel in passing across the usual gap thereat.

PERSONAL MENTION

MR. A. V. SCHROEDER has resigned as division superintendent of the Illinois Traction System at Decatur, Ill., to become general manager of the La Crosse Water & Power Company, of La Crosse, Wis., which is building a line between La Crosse, Wis., and Winona, Minn.

MR. S. L. VAUGHAN, of the Grand Rapids, Grand Haven & Muskegon Interurban Railway has been appointed traffic manager of that line. Mr. Vaughan, for the past year, has been auditor of the road, and prior to that was traffic manager of the Barry line of steamers plying between Muskegon, Grand Haven and Chicago. He was for a number of years connected with the Pere Marquette Railroad.

MR. C. M. BAYNE, who was with the Detroit & Ypsilanti Electric Railroad Company for some time, has been appointed master mechanic and superintendent of motive power at the power house of the Northern Ohio Traction & Light Company, in Canton. He succeeds William E. Ralston, who resigned some time ago to accept a similar position with the Buffalo & Erie Traction Company, at Fredonia, N. Y.

MR. M. INOUYE, manager of the Kwansai Railway Company, Japan, is on a visit to the United States to look into the subject of electrification of steam railroads. He is accompanied while in this country by Prof. Ogura, of the University of Kgoto. Mr. Inouye will return to Japan by way of the United States after visiting Europe. The Kwansai line is at present equipped with steam locomotives, but the matter of changing to electric traction is now under consideration.

Mr. ALEXANDER K. CUTHBERT has been appointed agent of the express department of the United Traction Company by Traffic Manager Charles H. Armatage. This is the position which Mr. Armatage held before his appointment as traffic manager. Mr. Cuthbert has been connected with the express department of the Traction Company as cashier for about thirteen years. Previous to that he was with the General Electric Works, at Schenectady, and the Edison Electric & Illuminating Company, in New York, for ten years.

MR. JOHN C. REILLY, a director of the Pittsburg Railway Company, is dead. Mr. Reilly was born in Pittsburg in 1844, and was connected with transit development in that city from the time of the inception of the first horse-car line. In fact, it was while he was a member of the livery firm of Burns & Reilly that the omnibus line was established by that firm from which later developed the street railway system. Mr. Reilly, Mr. Bigelow and James D. Callery, the present president of the Pittsburg Railways Company, all were associated in the building of this line.

MR. I. R. NELSON, the retiring general foreman of the Public Service Corporation of New Jersey, was tendered a farewell dinner in Newark, Tuesday evening, March 26, by the shop foremen of districts Nos. 2 and 3 of the company and business associates and personal friends. Mr. J. R. Case was chairman, and Mr. Thomas Kelly, Mr. John Amberg, Mr. H. W. Wightman, Mr. J. Nichols and Mr. John Murphy were the committee in charge. Mr. Case, who is foreman of the South Orange Avenue shops, was the toastmaster, and Mr. J. G. Buehler, president of the Columbia Machine Works, of Brooklyn, acted as speechmaker in presenting Mr. Nelson with a silver set as a present from all of the shopmen in the districts mentioned. Mr. Nelson responded, thanking the men for the honor they had bestowed upon him and the help they gave him in making the mechanical department a success. Mr. Nelson, it is announced, will go into business for himself as a contractor, and in this capacity has already accepted from the Westinghouse Company a contract for equipping all of the cars turned out from the works of the John Stephenson Company for which Westinghouse apparatus is specified.

MR. THEODORE P. SHONTS, president of the Interborough Rapid Transit Company, of New York, was given a dinner by the Phi Kappa Psi fraternity at the Hotel Knickerbocker, Friday evening, March 23. Mr. Walter L. McCorkle was the toastmaster, and Mr. Guy Morrison Walker, of New York, formerly associated with the Everett-Moore syndicate, made the address of welcome. Mr. Walker welcomed the guest of honor to New York as "the man who can." He analyzed from the point of view of an expert the importance of transportation in the development of modern society. Mr. Shonts responded briefly, taking as his theme "Team Work." He told of his early days in the fraternity and its influence upon him. He drew a comparison between the good results obtained by a fraternity and the work of a large corporation. Mr. Shonts emphasized the fact that large corporations could be handled successfully only by the application of one of the first principles of fraternal organizations, namely, the thorough co-operation of persons in authority. Both, he said, called for the continual training of men fitted to assume high responsibilities and the willingness of those men to work with or under others as the cause might determine.

MR. R. E. DANFORTH, vice-president and general manager of the Rochester Railway Company, of Rochester, N. Y., has been appointed general manager of the Public Service Corporation to succeed Mr. Albert H. Stanley who, as noted elsewhere in this issue, sails for Europe April 1 to assume the management of the Underground United Railway Company, Ltd., of London. Mr. Danforth has been identified with traction interests since 1891, when he graduated from Cornell University. His first work was in the mechanical department of one of the constituents of what is now the International Traction Company. He continued with this company until 1901, serving for part of the time during this connection as superintendent of the system. In 1901 he was appointed to the position of general manager of the Lake Shore Electric Railway Company, a consolidation of the Lorain & Cleveland, the Sandusky & Interurban Railway and the Sandusky, Norwalk & Southern Railway Company. Mr. Danforth, however, was greatly handicapped in his work with the Lake Shore Company by lack of funds to place the road in a paying condition, and when the property was placed in the hands of a receiver at the time of the Everett-Moore embarrassment, his authority was curtailed considerably, so that his resignation followed on April 1, 1902, at which time he accepted the position of general manager of the Rochester Railway. Mr. Danforth expects to assume his new duties May 1. During the interval between Mr. Stanley's leaving and Mr. Danforth's taking up of his duties the responsibility for the management of the property will devolve upon Mr. George J. Roberts, the representative in the Public Service Corporation of the interests of the United Gas Improvement Company, of Philadelphia.