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The Chicago Freight Tunnels

Those who attended the High Tension Transmission Meeting of the A. I. E. E. at Chicago recently were treated to a visit to the new tunnels which have been built at a depth of about 40 ft. below the business streets of Chicago, for the reception of telephone cables and for making possible a system of freight transportation to the large mercantile houses in the business district. This system of tunnels, being equipped by the Illinois Tunnel Company, as an experiment in freight transportation, will be watched by every large American city, as well as by the members of the electric railway industry. Underground freight transportation of this kind offers a possible new market for the apparatus and the brains which the electric railway business has to offer. The electric freight railways in this tunnel system will resemble electric-mine haulage rather than surface haulage, since the small size of the tunnels limits the cars to 24-in. gage. As an application of electricity to haulage pure and simple, without considering the transportation questions involved, this freight hauling system will be very simple. There are now, however, transportation and traffic questions which are of no small magnitude. The tunnels are mostly single track, and turn-outs will necessarily have to be provided at frequent intervals to serve the various mercantile houses along the street. The operation of a net-work of single-track tunnels of this kind with a large number of small freight trains will require a well-organized system to say the least, and involves many questions never before solved. The success of the Chicago venture may result in similar efforts in other large cities, and should result in lessening very materially the congestion of freight traffic on the street surface.

The Fender Problem

The general tendency toward quickening speeds brings the fender problem into greater and greater prominence. So long as cars ambled gently along they were easily stopped, and serious accidents were few. As we have many times pointed out, the speeds at present in vogue put an entirely different face on the situation. In front of a modern car there is a comparatively long, dangerous space, within which the car cannot be stopped with any brakes yet devised. There is, therefore, acute need of every safety appliance that can minimize the danger of personal injury. For a good many years there have been experiments with fenders, and through many failures there has come out of it all something material in the way of improvements. It is not putting the case too strong to say that there are now several types of car fender capable of very greatly reducing the danger to persons unlucky enough to be caught upon the track. Probably no fender will entirely obviate injuries, but, on the other hand, there are fenders which greatly reduce the danger. A bad fender, which either rides over and crushes the victim, or of itself inflicts serious injuries, is little, if at all, better than none. To be effective a fender must be reasonably yielding to lessen the danger of bruises, and, above all, must be capable of being brought into close contact with the track. In principle a fender striking very low should tip a person upon itself, but the instinctive effort to get away from it is liable to cause a fall in the other direction, with serious results. A fender should be able to scoop up anything that it is likely to encounter in order to fulfill its proper functions.

It has sometimes been said that the best fender is "a good motorman" or "a good brake." This, to a certain extent, is true, if the speaker means that a good brake or motorman can supplement the service of the fender. But even the best brake cannot stop the car instantaneously. As for the other proposition, there is little danger that reliance on fenders will tend to lack of proper care in the motormen. Their nerves are pretty

severely tried in running through crowded streets at best, and the possession of a really effective fender ought to steady them considerably and make them less likely to lose their heads in an emergency.

The Military Value of Electric Roads

The naval and military authorities seem just now particularly wideawake to the importance of modern methods of communication, as evidenced by their activity in wireless telegraphy and other directions, but we wonder whether they fully appreciate the importance of the electric railway networks from a military standpoint. These networks have grown up so swiftly and quickly that even those whose business it is to keep track of them can scarcely realize their actual magnitude. The railways of the country are more familiar, shown on every map, and with full time tables publicly accessible. The electric roads are seldom shown on maps, and if shown at all, are not kept up to date. Actually they form a system of coastwise transportation of great value in the mobilization and concentration of troops, for they run not only along immense stretches of coast, but connect the coast at numberless points with railway centers. We do not know in how far the general staff has taken cognizance of the facts, but it ought to be in possession of a set of complete maps kept rigorously up to date, and showing not only every available electric road, but the character of its track, the amount of its rolling stock, and even the capacity of its feeding system for handling large groups of cars. It should know particularly the gage and form of rail head, and to what extent freight and passenger cars of neighboring lines can be used over the track of each company.

In time of peace these precautions have only a secondary interest and value, but in time of war they are immediately necessary and there is no time in which to obtain them. In the Spanish war the transportation was a national disgrace. All accusations of pull and graft aside, it was the most stupidly organized and incompetently carried out attempt at mobilization that modern times has seen. The lack of full and exact knowledge of the railway facilities was at the bottom of the trouble. Some officer should have been able to drop in upon the manager of each railroad used with accurate previous knowledge of its entire capabilities upon which to base his plans. And for rapid concentration of troops this information must be extended to cover the electric roads as well as the steam roads. If it should be desirable to hurl a brigade suddenly upon some point upon the coast, some one should know not only what facilities can be secured to the nearest railroad station, but whether electric roads are available thence to the destination; how many cars can be concentrated at the given point ready for use, at what rate they can be dispatched without crippling the motive power, and at what speed the run can be made. If a dozen miles is to be covered it may make a vital difference in the result if electrics can be used. In a country well covered by electric roads infantry can be given almost the mobility of cavalry, if the roads can be utilized at short notice, but practical usefulness depends upon good previous knowledge of their exact capabilities.

For this reason we believe that the general staff would do exceedingly well to take up the practical study of the electric road situation and acquaint itself minutely with its condition. It should know the facts at first hand and not have to depend upon hurried examinations at the last moment. The information cannot be obtained off-hand, for to get it correctly requires a certain amount of exact military knowledge. For example, if the X., Y. & Z. line, which skirts the coast for twenty miles, reports certain capacity for carrying men in any emergency, good enough; but is the roadbed solid enough, the grades moderate enough, and the trestles strong enough to make patrol with an armored train practicable? Here is an investigation which well-trained militia officers could to great advantage make in their own territory, acting in co-operation with the general staff. And it would certainly be an excellent thing in the summer tours of duty of the various militia bodies to make practical trial of the facilities for mobilization offered by electric roads. They furnish good and cheap transportation, and practical knowledge of their capabilities could very quickly be obtained by utilizing them, not merely as a matter of convenience, but for a study in military methods. The available forces in this country are pitifully small at best—of admirable quality, but so meagre in numbers as to be inadequate for the sudden requirements of modern war. To a certain extent, they can make up in mobility what they lack in numbers and all means to this end ought to be familiar. We are not in the least alarmists, but the present struggle in the East gives a vivid idea of the consummate value of preparedness when the bitter necessity for war actually arises. In the Spanish war we were caught unready, and the result, had a first-class power been involved, is not pleasant to consider. Therefore, let the lesson be thankfully remembered.

The Penalties of Unsound Finance

The financial difficulties in which more than one electric railway finds itself struggling at the present time deserve to be carefully studied by every stockholder and executive official who is doing his best to preserve the prosperity of his own particular road. No one can follow the history of electric railway development without discovering a good many crippled or ruined properties scattered along the pathway of progress, and also finding out that the failure in almost every case was due to a neglect of the fundamental principles of sound finance.

It is a singular fact that a large portion of the general public has often failed to realize that the conditions which make for success or failure in ordinary business enterprises apply with exactly the same force to the business of transportation. No amount of mathematical juggling can overthrow the simple arithmetical relation which makes net earnings a function of gross receipts and operating expenses. If the original promoters of a line or system build it upon inflated capital, or operate it without regard to sound methods, approved by experience in the railway world at large, they may escape the impending disaster by selling out before the blow falls, but the crash is sure to come in time with accumulated intensity upon the late owners, and upon the public at large.

One great cause responsible for the condition of some of the non-dividend paying or insolvent roads is the lack of expert knowledge of the business of transportation. This lack is divided into the original sin of building roads through territory too sparsely settled, or too well supplied with other facilities to support them, and the similar fault of throwing money away by slipshod operation. With very few exceptions every railway manager knows that the more concessions he grants to the public the more the public demands. Consequently, there is much opposition on the part of communities to the slightest reduction in service—increase in fares being almost impossible, when the insufficient revenue of a poorly operated road, or one which has no economic justification for existing, requires a curtailment in the facilities provided. The moral of all

this is that expert ability is none too expensive in the early determination of the economic feasibility of a proposed road, and that it is better to begin operation with hourly service and fares high enough to pay the cost of running the road with a reasonable return upon the invested capital than to start in with service and traffic adjusted with reference to the probable growth of traffic created by the new line. It should never be forgotten that the pressure upon fares by the public always tends to force them downward, and that they can be raised only in the most extreme and unusual cases. The municipal authorities having local jurisdiction over a proposed line are likely to attack almost any schedule of fares which may be submitted in the early negotiations by the promoters of the road, so that a margin for concessions often proves to be a valuable asset. Firmness in establishing just rates and a not-too-generous schedule at the beginning of a road's career is usually warranted by the laws of sound business. It is time enough to reduce fares when the road has been operated long enough to show up its earning capacity.

Failure to take sufficient account of maintenance and depreciation is another factor in the loss of dividends when the day of reckoning comes. A large number of electric railways in this country have now been operating long enough to feel the full force of the cost of replacing worn out and antiquated equipment, and those which have provided for this contingency in the years when everything was new and the road almost ran itself, are now in an enviable position. It has taken a long time for the non-technical stockholders of electric railways to appreciate that economical operation absolutely demands skilled engineering, and that money paid out in salaries to maintain a properly qualified technical staff is not thrown away. Even to-day there is a gross lack of realization of this fact in many operating companies.

The pioneer electric railway builders and operators had no opportunity to draw upon the experience of other systems, and it is not to be wondered at that mistakes were made in the early days of the trolley car. With the wealth of costly experience available to-day there is little reason to stray from the pathway of sound finance in carrying out electric railway undertakings.

High Tension Transmission Lines

President Bion J. Arnold, of the American Institute of Electrical Engineers, created considerable interest and started an animated discussion at the national high-tension transmission meeting of the American Institute of Electrical Engineers at Chicago June 21-22, when he made the statement that the Electric Traction Commission for the electrification of the New York Central Manhattan Terminal, after collecting evidence of the relative reliability and cost of overhead transmission lines as against underground transmission lines for high voltage, had decided unanimously in favor of overhead transmission. According to President Arnold's statement, the evidence as to reliability was so overwhelmingly in favor of overhead transmission that the commission of which he is a member was left no alternative but to select that in preference to an underground conduit line containing high-tension cable; to say nothing of the fact that the probable cost of the underground conduit transmission line would be seven or eight times that of the overhead line. Many of the engineers present at the convention, especially those identified with a certain large electric lighting company operating many miles of underground and overhead transmission lines, were much inclined to question the statement that overhead lines were more reliable. The matter is one of considerable interest to every company engaged in large electrical undertakings, where power must be transmitted at high voltages. It is altogether likely that the difference of opinion as to reliability of overhead as against underground transmission lines, which was expressed in Chicago, is due largely to the fact that those favoring the underground transmission lines had in mind an entirely different set of conditions from those favoring the overhead lines. It seemed to be agreed that for running through the streets of a large city there would be no question but that underground lines would be preferable on the score of reliability, even if they were not absolutely required. To take an extreme case in the other direction, none would probably have argued in favor of the underground lines for transmitting power any distance across an open country. The greater part of the New York Central transmission lines will be on a private right of way, where they will be comparatively free from disturbances, and therefore they will resemble cross-country transmission lines in this respect. If an underground conduit line was built, it would have to be blasted out of solid rock much of the distance. Furthermore, since only two three-phase lines are to be run, the cost per duct foot on a two or three-duct conduit would be excessively high. Mr. Arnold argued strongly in favor of the overhead line, because of the ease with which troubles can be located and the short time in which they can be repaired, as compared to underground cables, where it takes considerable time to find a fault and much more time to remedy it. The general plan of the New York Central transmission, as outlined by Mr. Arnold, is to maintain two 11,000-volt three-phase lines, either one of which could, in cases of emergency, keep the road in operation while the other was being repaired.

At the same meeting a great deal of discussion was given to transmission lines using steel towers for supporting the conductors instead of wooden poles, and using very long spans of several hundred feet between towers, thus cutting down the number of insulators, and the number of chances of insulator break-downs. While some engineers question the advisability of steel tower construction for transmission lines on the ground of high first cost, it seemed to be the consensus of opinion of a number of the best specialists in high-tension transmission that steel tower construction would be much more substantial than the present wooden pole construction, and that it would greatly reduce the number of some of the most common troubles: such as breaking of insulators, burning off of poles and the throwing of wire and sticks across the transmission conductors. Although the steel tower construction may offer a transmission line of considerably greater reliability than ordinary wooden pole construction, such lines are not likely to be extensively used in electric railway work, except where power is derived from a waterfall at some distance from the line of the road. The ordinary interurban electric railway must have its pole line along the track for the trolley and the low-tension feeders, and unless the work is of sufficient importance to justify an independent steel tower transmission line, in addition to the pole line for the low-tension conductors and trolley, there is not likely to be much variation from the standard practice of placing both the high and low-tension conductors on the same poles. If the third rail is to be used, the case is somewhat different, and steel tower construction may find some use. If, however, the single-phase alternating-current motor proves a success, the trolley wire will be retained indefinitely for long distance and high-speed work, and with it the necessity for a pole line.

REPAIR SHOP PRACTICE IN COLUMBUS, OHIO

The Columbus Railway & Light Company, of Columbus, Ohio, has a very complete repair shop, which takes care of practically all its own repair work, and it also engages in the manufacture of material and repair parts much more extensively than the majority of companies. The shops are located in a group of three buildings, adjoining the Rose Avenue car houses. An exterior view of the shop buildings and master mechanic's office is shown in Fig. 1. The pits and truck room are located in the front wing, which measures 55 ft. x 95 ft. The machine shop occupies the ground floor of a three-story building, formerly an old horse-car barn. The second floor of this building contains the armature and field coil rooms and a stock room, 65 ft. x 65 ft., while the third floor is used for storage. The carpenter shop is in a wing, 48 ft. x 100 ft., at the rear of the main building. The paint shop, foundry and blacksmith shop are in separate buildings, a short distance from the main buildings.

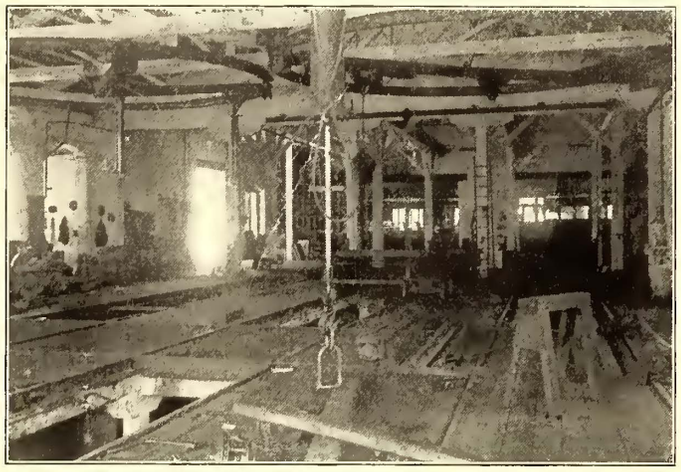


FIG. 2.—AIR HOISTS AND CIRCULAR CRANES

FIG. 3.—BRASS FOUNDRY

Air hoists are used extensively in the truck room. For hoisting cars there are eight 9-in. hoists, each capable of lifting 3 tons, covering three pit tracks. There are also two 6-in. air hoists on circular cranes in the rear of the shop and one 4-in. hoist in the armature room. A Christensen direct-connected compressor, supplying 150 ft. of air per minute, discharges into a 42-in. x 10-ft. reservoir, which supplies the hoists and is used for other purposes. The car hoists have stirrup-shaped attachments, and in hoisting a car a timber is placed under each end of the car and through the stirrups. It is possible to hoist a car in half a minute. The circular cranes are used in handling motors, armatures and trucks. Together they cover the entire width of the shop, the diameter of each circle being 24 ft. Each crane has two arms extending from the center to the circumference, these arms being pivoted at the center, with travelers at the outer ends. On the arms are also travelers from which the air hoists are suspended. The outfits were built in the company's own shop, and cost $240 each complete, including air hoist and connections. The circles were made from 8-in. I-beams, which were bent into proper shape on a wheel press. They were laid out with a templet, and steel-faced blocks were used in the wheel press. The I-beams were moved about 9 ins. at a time, and they went over the circle three times to insure accuracy. The outfit gives two cranes without any posts in the center of the room, and at a saving in cost of 200

FIG. 1.—EXTERIOR OF REPAIR SHOPS, COLUMBUS RAILWAY & LIGHT COMPANY

per cent over the ordinary type of crane. The cranes were of great advantage this spring when the company changed motors on nearly 100 pairs of trucks used under box cars and placed them on trucks used under summer cars, and it was possible to change from six to seven cars per day with seven men in the shop. The Columbus system is broad gage (5 ft. 2½ ins.), and the company uses maximum traction trucks with a 20-in. pony wheel on the box cars and an 18-in. wheel on the summer cars. The closed cars have seventeen-tooth pinion and sixty-seven-tooth gear, while the summer cars have nineteen-tooth pinion and sixty-nine tooth gear, hence separate trucks were required.

For car lubrication the company uses Galena car oil. On motor bearings wick-feed armature cups are employed, of the type recently illustrated in the STREET RAILWAY JOURNAL as having been originated by this company. The journal boxes are packed with Perfection packing waste, the same as a freight car. The cost of lubrication on this system does not exceed 12 cents per 1000 miles.

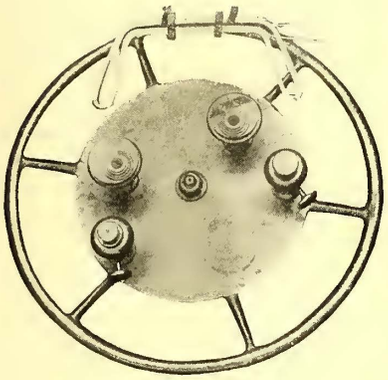


FIG. 6.—FORM FOR WINDING G. E.-800 ARMATURE COILS

FIG. 7.—INTERIOR OF STOCK ROOM

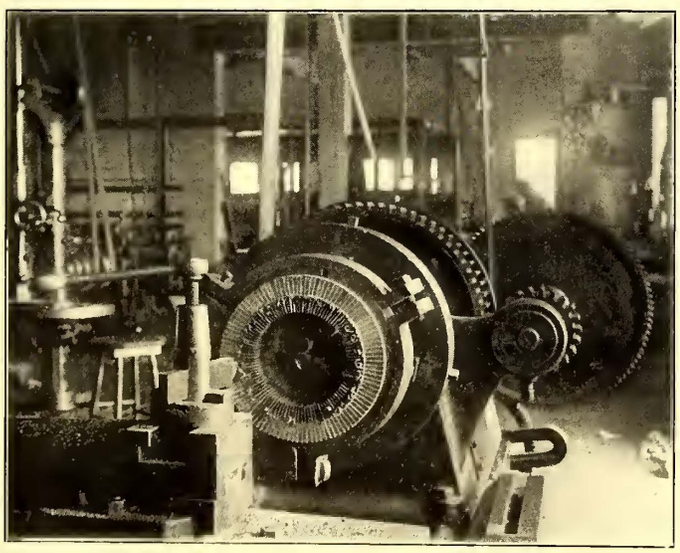


FIG. 4.—TURNING COMMUTATORS

The G. E. 67 motor is used as standard, and besides doing all its own armature work, the company builds all its own commutators.

Billings & Spencer drop-forged commutator bars are employed, with Chicago Mica Company's mica bars as segments. These bars are assembled in a three-part clamp, as shown in Fig. 5, and faced and slotted in a lathe, as shown in Fig. 4. The commutator is held in place while being turned and banded on the outside by a core, which is cast in two sections and drawn together by a large bolt and nut, as shown in Fig. 5, with a commutator segment inserted. The men have slotted, set up and turned commutators ready to go into armatures in 1½ hours, and the average time is less than 2 hours.

For winding G. E. 800-armature coils the company uses a specially designed form, which consists of a large brass hand wheel provided with spools having ridges suitably arranged for this particular coil (see Fig. 6). Two of the spools have release plugs which slip out for removing the coil. All armature and field coil winding is done by one girl in a winding room, which is located on the second floor. Taping is done by hand, as it is claimed it can be done more accurately than by machine. Coils are first taped with white braid, and then dipped in armalac, and the portions which fit into the armature slots are taped with Star friction tape. The coil is then taped the second time with linen tape, and then dipped in Massachusetts Chemical Company's armalac insulating varnish.

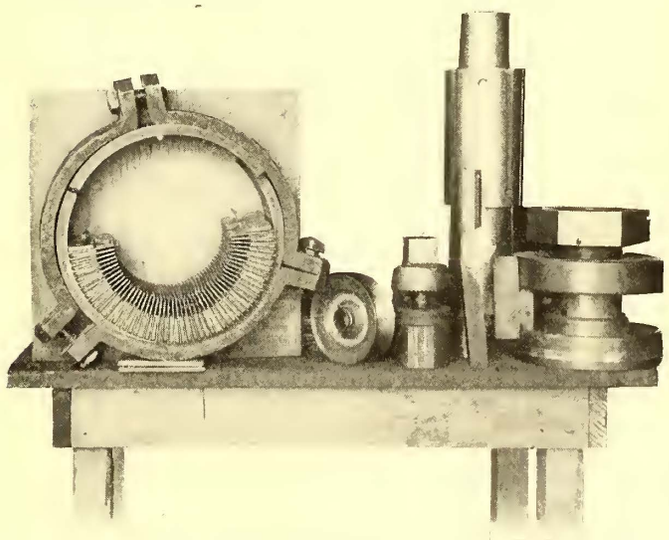


FIG. 5.—CLAMP AND COMMUTATOR SEGMENTS, ARBOR FOR TROLLEY WHEEL, TOOL FOR TURNING TROLLEY WHEEL, EXPANDING MANDREL AND COMMUTATOR CORE

A small but well equipped brass foundry takes care of a remarkably large amount of work. One man, at $2.50 per day, does all the work in this department, including making of cores and babbitting. The company produces practically all the brass castings required in the operation of the system, in-

cluding rail-bonds, line ears, trolley wheels, controller parts, journal bearings, etc. As an example of the intricate work produced it might be stated that the company recently turned out a set of switchboard equalizing bars with sixteen double connections. The furnaces were home-made, and consist of two old boiler shells, which were lined with firebrick and provided with suitable castings at top and bottom. Natural draft

S 42—2-24-03-2000

THE COLUMBUS RAILWAY COMPANY.

Truck No. Car No. 190

	MOTOR No. 1.		MOTOR No. 2.	
Type.				
Arm. out.				
Arm. in.				
P. Brasses.	Out	In	Out	In
C. Brasses.	Out	In	Out	In
Axle Brasses.	Out	In	Out	In
Truck Brasses.	Out	In	Out	In
Pinion.	Off	On	Off	On
Gear.	Off	On	Off	On
Wheels.	Off	On	Off	On
Wheels.	Off	On	Off	On
Field Coils—Top.	Out	In	Out	In
Field Coils—Bottom.	Out	In	Out	In

Miscellaneous Repairs.

Remarks:

Truck in Service Car No.

FIG. 8.—TRUCK-ROOM REPORT ON CARS TURNED IN TO MASTER MECHANIC WHEN WORK IS COMPLETE

is used with a good grade of coke for fuel. But one furnace is used at a time, giving each one heat per day. The composition used in trolley wheels is nine parts of copper and one of tin.

S 27—2-03-500

THE COLUMBUS RAILWAY COMPANY.

CAR REPAIRS.

Car No. 190

	HOURS.	COST.
Panel in		
Sash,		
Glass,		
Posts,		
Seats repaired,		
Floors repaired,		
Sills,		
New Vestibules,		
Vestibules repaired,		
" Sash,		
" Posts,		
" Arms,		
" Floors,		
" Roofs,		
" Fronts,		
" Panels,		
Dashes,		
Miscellaneous Repairs.		
Total,		

FIG. 9.—CARPENTER SHOP REPORT ON CAR REPAIRS

It is claimed that in preparing the metal it should be melted and run into pigs and then melted the second time. When put into the lathe it should cut very tough and free from grit, and the shavings should turn a red color. In turning wheels a single tool is used, which is provided with ears, which trims the sides as well as turning the center, and they are able to finish forty wheels an hour by this method. The tool and arbor used are shown in Fig. 5. G. E. graphite bushings are used, and the wheel has a reservoir which is filled with oil. The 4-in. wheels cost 42 cents, and they have averaged 6567 miles over a period of several years. The company makes all its own babbitt and bearing material. The babbitt used is a composition of 83 1-3 per cent tin, 8 1-3 per cent copper, and 8 1-3 per cent antimony. In making rail-bonds the company uses scrap wire of 9-gage, 10-gage or 11-gage. Seven strands are usually employed. A tin clamp holds them in place and a pure copper lug is cast on. As shown in view of the foundry, Fig. 3, the rail-bond molds are designed to produce five bonds at a time. The lugs are then turned and expanded on a lathe.

C E Form 2 10-23-02-2500

The Columbus Railway Company.

CAR TROUBLE REPORT.

TO C. E. HOTT:

Car House, 190

Name of Conductor, *Motorman,*

No. of Car, *Time,* *Where occurred,*

Give detail description of trouble and damage resulting:

Motor Inspector.

NOTE.—This report must be made out promptly by Motor Inspector, reporting any trouble which may cause car to be removed from service or any damage car may receive

FIG. 10.—REPORT OF CAR TROUBLES MADE BY BARN FOREMAN TO MASTER MECHANIC

S No. 17—12-17-03-5000

The Columbus Railway & Light Company.

MR. HOTT: 190

The following repairs are needed on Car No. Division,

Foreman.

FIG. 11.—REQUISITION ON MASTER MECHANIC BY CAR HOUSE FOREMAN

The Columbus Railway & Light Company.

To Date 190

CREDIT for material returned from

QUANTITY	ARTICLE.	COST.

FIG. 12.—FORM FOR CREDITING RETURNED MATERIAL

Bonds are produced at the rate of 120 per day, and they cost about 16 cents, figuring material, labor and all foundry expenses. Trolley ears, 14 ins. long, cost 16½ cents each. Armature bearings have a composition of 80 per cent copper, 15 per cent lead and 5 per cent pig tin, and have shown a life of 58,000 miles and over. Controller cylinder segments are cast in rings and turned out, using an expanding mandrel to get inside. The company has a complete line of expanding mandrels, which were made in the shops. The company is also making its own register fittings, and hangs the register pulleys from the hand-strap pole, using eighteen on a car. For the corner pulley a 4-in. wheel with wide groove is employed. A

5-16 round leather belt is used, and practically all trouble from breaking of register cord has been eliminated. In fact, there has been only one replacement during a year after cars were equipped. Span-wire insulators are made from steel strips, cut into suitable lengths, using porcelain knobs and bolts.

The stock room, measuring 65 ft. x 65 ft., is located on the second floor of the main building, and is reached by dumb waiters and speaking tubes from the various departments below. The master mechanic has a photograph album, containing photographs of every piece of material produced in the shop

S. 26—2-24-03-3000

The Columbus Railway Company.

ELECTRICAL REPAIRS.

Rose Ave. Shops. _____ 190__

TYPE		NUMBER
Open	Fuse	#318

			HOURS.
Note	7/16	1 Insulation repaired	

Repaired by _____

FIG. 13.—SPECIMEN OF DAILY REPORT FROM ELECTRICAL DEPARTMENT

and carried in stock. These have numbers corresponding to the pattern numbers, and the work of ordering material is greatly facilitated by this method.

The use of pumice stone and sand-paper in rubbing down and finishing woodwork and car bodies has been entirely dispensed with. Instead, the company uses a fine silica sand, which is rubbed on wet with a sponge or cloth. This material

Form 42—4-23-04-10,000

The Columbus Railway & Light Company.

Rose Ave. Shops. TIME CHECK. _____ 190__

Name _____ No. _____

			CHARGE

Total Hours _____

FIG. 14.—DAILY TIME CHECK MADE OUT BY EVERY SHOP MAN

cleans mouldings and crevices and gets into corners in a manner impossible with sand paper. The sand is bought by the wagon load, and costs $4 per ton, as compared with pumice at 7 cents per pound. In cleaning dirty woodwork the company first uses a preparation of soft soap, made by dissolving Star laundry soap in hot water, which is then rubbed thoroughly with the silica sand. The cleaning is done thoroughly, and the woodwork is not scratched in the least. The saving in time by this method is enormous. In painting cars the company does not use any rough stuff, and prefers the less glossy finish. All cars are touched up and revarnished once a year. Rusty steel dashes are burned off, treated with a coat of boiled linseed oil, applied hot, and brought up to a color with lead surface. The Columbus cars have considerable fancy lettering and striping, but it is figured that this costs practically nothing, because it is done entirely by the foreman, who is not expected to assist in the ordinary work.

This spring all summer cars were fitted with eaves troughs. These are made of galvanized iron, worked in a molding, and there is down-spout of ¾-in. gas pipe at each corner post. The scheme cost about $9 per car, but it is figured that it will save the car by taking the water off from the woodwork, joints and curtains and prevents it from blowing onto the seats, and it is also an innovation that is greatly appreciated by the conductors, being in line with the company's well-known policy of taking an unusual interest in the men. It will be remembered, as hereinbefore outlined in the STREET RAILWAY JOURNAL, the Columbus company gives every employee an annual dividend, figured on the basis of his earnings.

Form 41—3-20-04-5000 REQUISITION No. _____

THE COLUMBUS RAILWAY & LIGHT CO.

REQUISITION FOR MATERIAL.

Date _____ 190__

Account of _____

NOTE—Do not order more than one kind of material on this Requisition. Write plainly, and put each item on a separate line. When sketches or samples are necessary, please furnish promptly.

To be ordered of _____

Quantity	MATERIAL WANTED

Ordered by _____

FIG. 15. ORDER ON THE MAIN OFFICE FOR MATERIAL

A very complete system of records is kept. The company keeps mileage records on cars, trucks, car bodies and motors; also on wheels, armatures, commutators, pinions, brasses, axles, gears, trolley wheels, etc., and monthly and annual reports are prepared covering all these details. The master mechanic receives a daily report from car house as to car mileage; the cars average about 150 miles per day. From the shop foreman he receives daily reports as to repair work done and replacements made, the reports covering both the time of the men employed on the work and the car on which the work was performed.

The master mechanic maintains in his office a card rack, showing the numbers of the cars in service on each division. The cards show the type of car, size, motor, truck and other details. If a car is disabled the card is reversed and shows up a red face indicating that the car is out of service.

The shops of the company are in charge of C. E. Hott, master mechanic, who has occupied this position since the horse-car days. He is responsible for nearly all the innovations introduced.

The sink hole on the Urbana, Bellefontaine & Northern Railway near Round Prairie, Ohio, is proving a most expensive obstacle. Reference to this hole was made some months ago, when it was thought it was being filled up. At present, however, the situation seems to be worse than ever. The hole is only 50 ft. across, but the many thousands of feet of cinders, rock and gravel, besides large quantities of timber, which the company has dumped into the hole have disappeared in a few hours. Quite recently the company made another determined effort to complete the fill. It dumped more than thirty train loads of earth, and came near losing some of its cars, which had been allowed to stand on the track over the hole for a few minutes. The Cleveland & Southwestern Traction Company had such a hole on its line two years ago, but after persistent efforts it was finally filled up. C. A. Alderman, chief engineer of the Appleyard system, is offering a prize to any one who will tell him how to fill the hole.

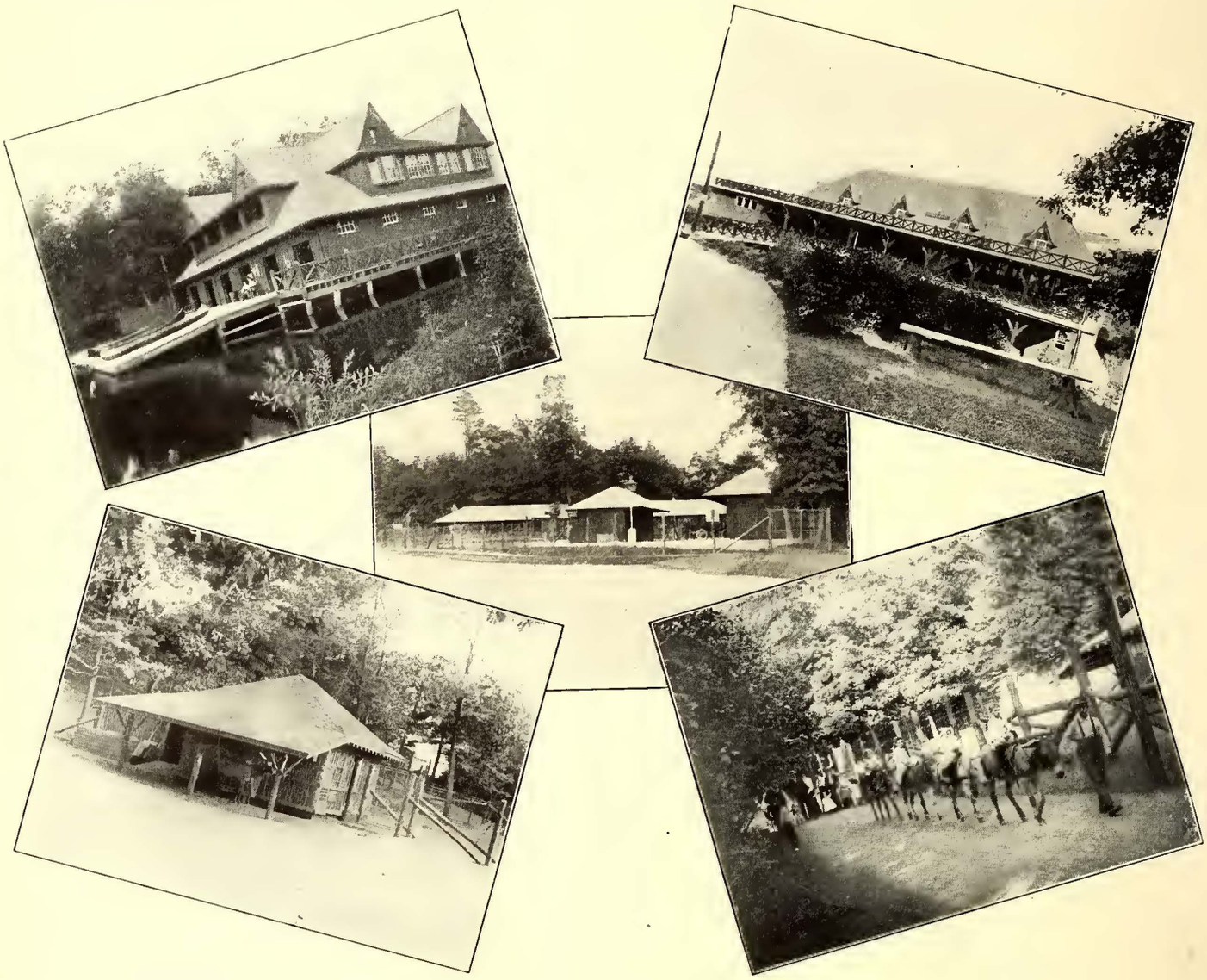
NEW CAR TERMINAL AND LARGE NEW THEATER FOR NORUMBEGA PARK, AUBURNDALE, MASS.

Reference has previously been made in the columns of the Street Railway Journal to the attractive features of this beautiful park, but this year extensive improvements have been made, as were found necessary owing to its increasing popularity as a summer resort and the resulting large crowds which frequented the place last summer. Norumbega Park has grown to be one of the most beautiful resorts, as well as also probably the most popular, in the New England States, being situated as it is on the Charles River, amidst the most beautiful, wild and uncultivated surroundings, while not inconvenient of access from Boston. An idea of its present popularity may be gained from the fact that during last season the total attendance on Saturdays often reached 12,000 to 14,000, while upon Labor Day it reached the figure of 18,000.

This park is operated by the Boston Suburban Electric Companies, which also controls the Commonwealth Street Railway, the Newton Street Railway and other important electric railway lines in the suburbs of Boston in the vicinity of Newtonville and Waltham.

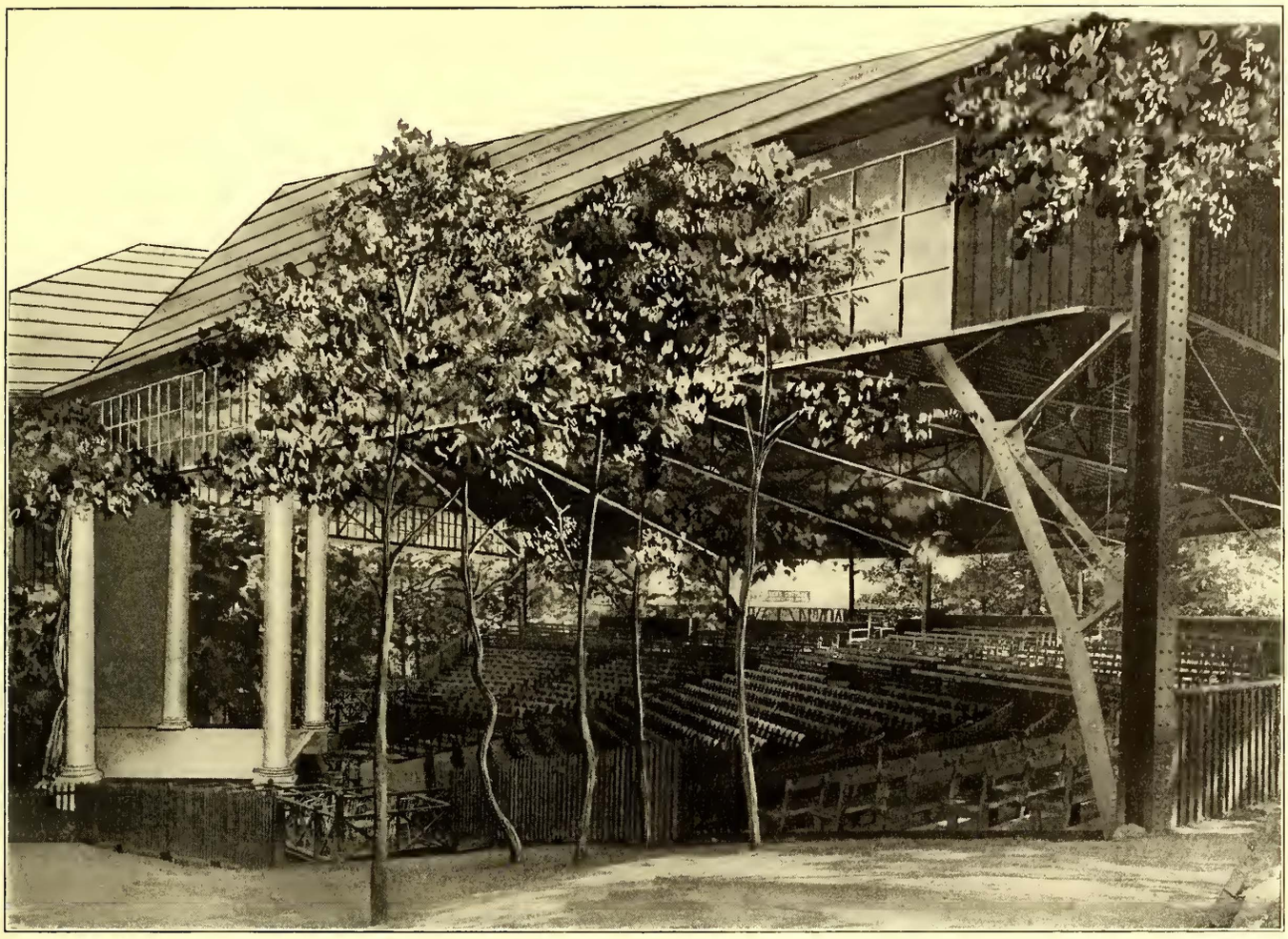
As referred to in the former article descriptive of the park (May 5, 1900, page 462), it is located near Auburndale, about 10 miles from Boston, and about 5 miles above the tidewater point of the Charles River; at this spot the river is very broad, resembling a lake. The park has an area of about 12 acres, and has a long water frontage on account of the winding path of the river. The park land is undulating in character, being heavily wooded and in many places still remains very wild. The park management operates many amusements and attractions in connection with the park, including a theater and also a zoological garden. Particular attention is paid to the latter feature; the best specimens of different animals are kept at the zoo, which is found to be one of the most important attractions of the park.

This park has taken an important place in the street railway park development in this country, inasmuch as while operated primarily to create traffic for the various car lines of the operating company, it is still maintained as a separate organization, and is operated with a material profit. It is prevalent practice for street railways operating parks to maintain the park and offer attractions as an inducement for people to travel over their lines to the park, but this park is notable for its differentiation, as an admission to the grounds of 10 cents is charged, causing the park to operate for a profit. A combination rate is, however, made to passengers traveling to the park over the lines of the operating company, by which, if a return ticket is purchased, entrance to the park may be gained for the additional payment of 5 cents only.



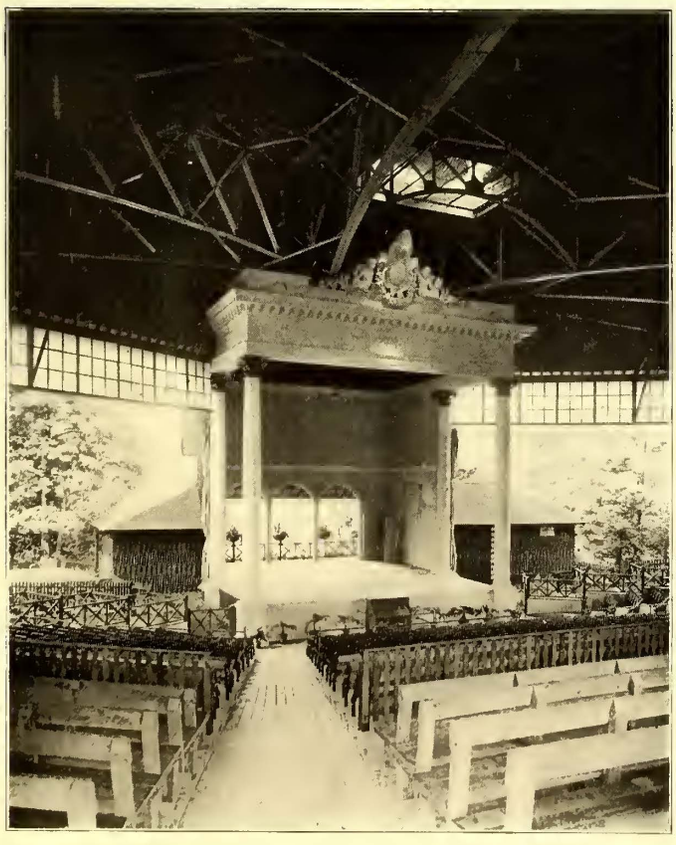
The Boat House for Private Canoes.
Café above Car Terminal Depot.
Storage Station for Bicycles, Automobiles, Etc.
Elk House in the Zoological Garden.
An Amusement Feature—The Donkey Rides.

TYPICAL VIEWS IN NORUMBEGA PARK, AUBURNDALE, MASS.



SIDE VIEW OF THE NEW THEATER STRUCTURE AT NORUMBEGA PARK, SHOWING GENERAL FEATURES OF ROOF DESIGN AND ARRANGEMENT OF SEATING

This reduced rate of fare is secured for the passengers upon the payment of 15 cents to the car conductor, whereupon he issues a coupon ticket of the form shown in the accompanying engraving. The upper half of this ticket is printed on a green background and the lower half on a red background; the upper half, as may be seen, provides an admission to the park, while the lower half, which is retained by the purchaser until leaving the park, is good for a ride upon any of the car lines of the company on leaving the park. It will be noticed that upon the park-admission half of the ticket the management reserves the right to revoke the right granted by this ticket by refunding the purchase price, this serving as a precautionary provision by which the management may refuse admission to intoxicated or other objectionable parties. A feature of the return-fare ticket upon the car lines is that the red ticket is good only at the park turnstiles, and is not acceptable if presented to a conductor after boarding a car; this ensures the use of this ticket in returning from the park only by entrance to the cars through the turnstiles at the depot. These tickets are made valid for the entire season, those shown in the engraving representing the form which is valid for the season of 1904.

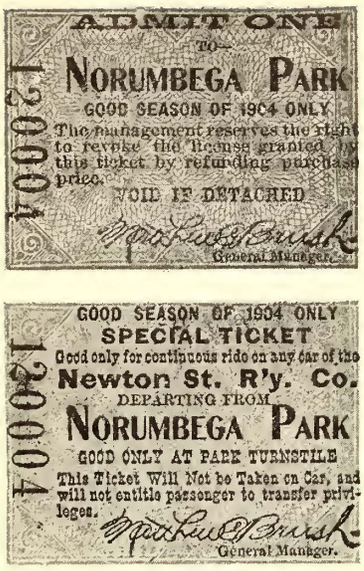


INTERIOR VIEW OF THEATER, SHOWING NEW STAGE

THE PARK THEATRE

Probably one of the most important features of Norumbega Park is the open-air theater, which is operated throughout the park season with high-class vaudeville entertainments. This is a feature that was started in the park several years ago and which has proved one of the most important and successful of the attractions that have been installed there. No charge is made to visitors to the park for general admission to the theater, but the rows of seats toward the front and the boxes are reserved at moderate prices; the front seats are reserved at 25 cents each, while the seats to the rear are held at less prices, according to the location. Nearly 1500 seats at the rear and the space behind them are held free to all visitors to the park.

The important feature of the improvements at the park this

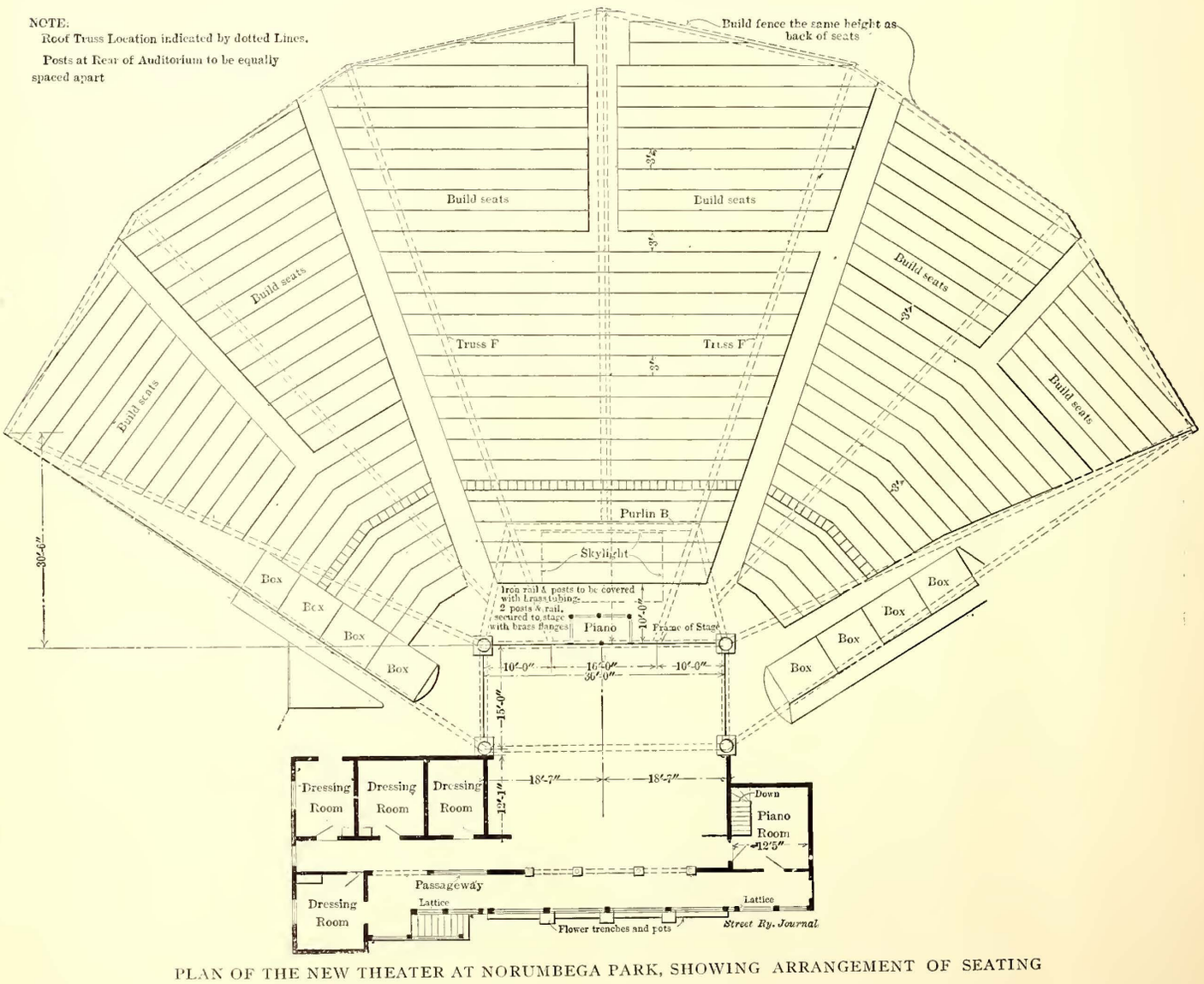


SPECIAL COUPON TICKET USED FOR RETURN CAR FARE AND ADMISSION TO PARK

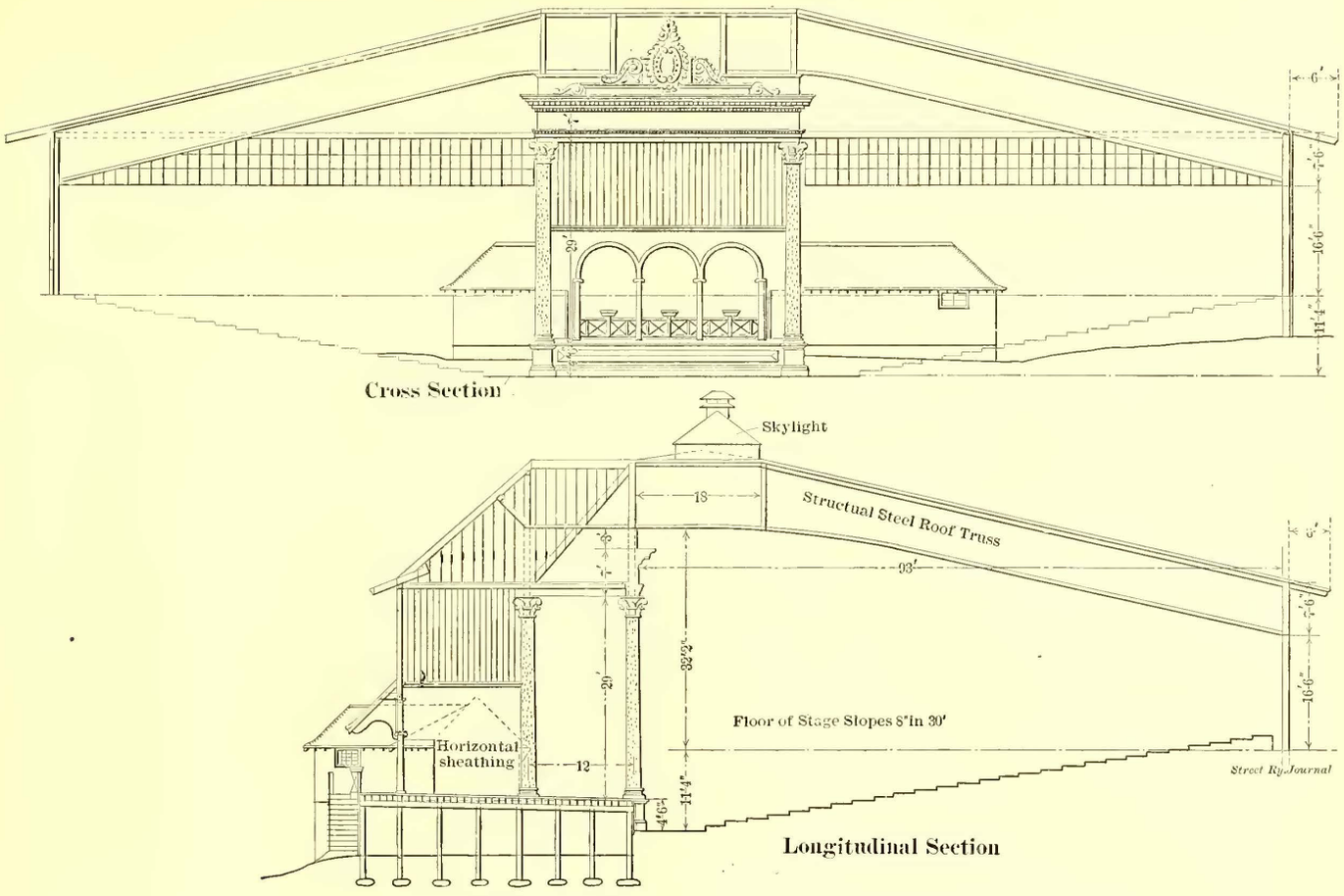
year lies in the rebuilding of this theater. The theater has been operated heretofore without roof covering, the entire seating capacity, now providing for 3000 people, being entirely unprotected from the weather. This year it was thought desirable in enlarging the scope of the theater to provide a roof covering which should serve as a protection from the sun for the afternoon entertainments, as well as also provide protection from the sudden storms which frequently arise in summer time. In doing this the theater has been entirely rebuilt with the exception of the stage portion, which is very little changed. A very pretty rustic stage effect was presented by the former stage, and this has been left unchanged, while the steel roof structure and the seating equipment are entirely new, the latter providing a capacity 500 greater than the former theater. This is probably one of the first structures of its kind in which a steel roof construction is used, and in this case the details of construction are remarkable for the size.

As may be seen from the accompanying plans, the theater is laid out on a fan-shaped section of ground, the stage being arranged in the lowest portion and the seats sloping upwards to the rear, radially from it in all directions, as shown in the longitudinal section. This construction was favored by the natural ground level at this point, little surfacing being found necessary. The total rise from the lowest level of the auditorium to the ground level at the rear of the seats is 11 ft. 4 ins., thus giving all seats the preference of an excellent view. There are two main aisles leading from rear to the front, while additional aisles extend down from the rear to cross aisles, as shown. Further general features of the theater construction are shown in the accompanying engravings.

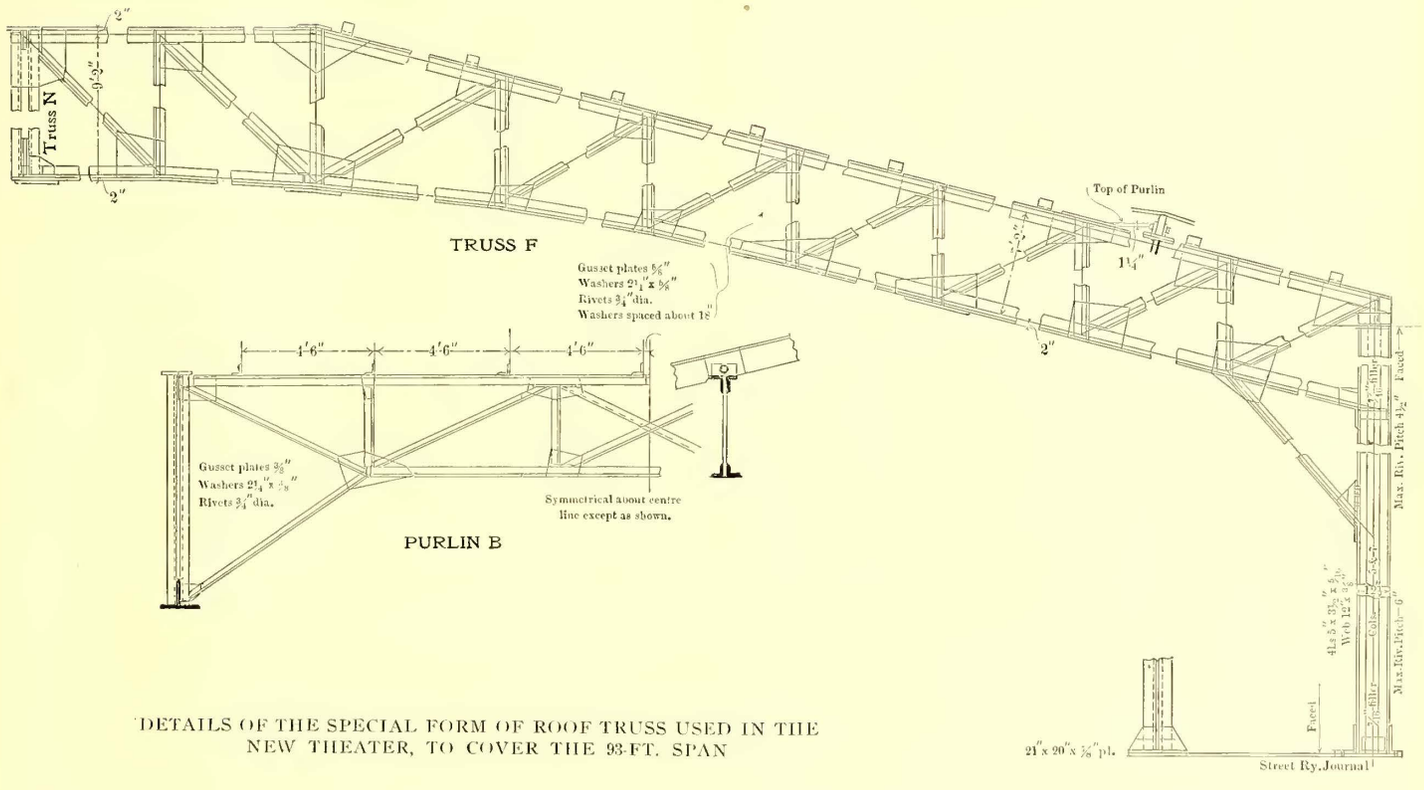
The details of the roof-truss construction are shown in a drawing of truss F. This truss is designed for a span of 93 ft. between the center of the rear column support and the cross-truss between the stage columns, where it terminates. There are seven of these long-span trusses, all radiating from the framework above the stage, which is erected upon the columns at its four corners, as shown; this framework is provided with trussing projecting out over the auditorium for receiving and stiffening the intermediate trusses. This special roof construction above the stage, as well as also the details of the stage setting and the dressing rooms, are shown in the accompanying longitudinal and cross sections of the structure.



PLAN OF THE NEW THEATER AT NORUMBEGA PARK, SHOWING ARRANGEMENT OF SEATING



CROSS AND LONGITUDINAL SECTIONS OF THE NEW THEATER STRUCTURE



DETAILS OF THE SPECIAL FORM OF ROOF TRUSS USED IN THE NEW THEATER, TO COVER THE 93-FT. SPAN

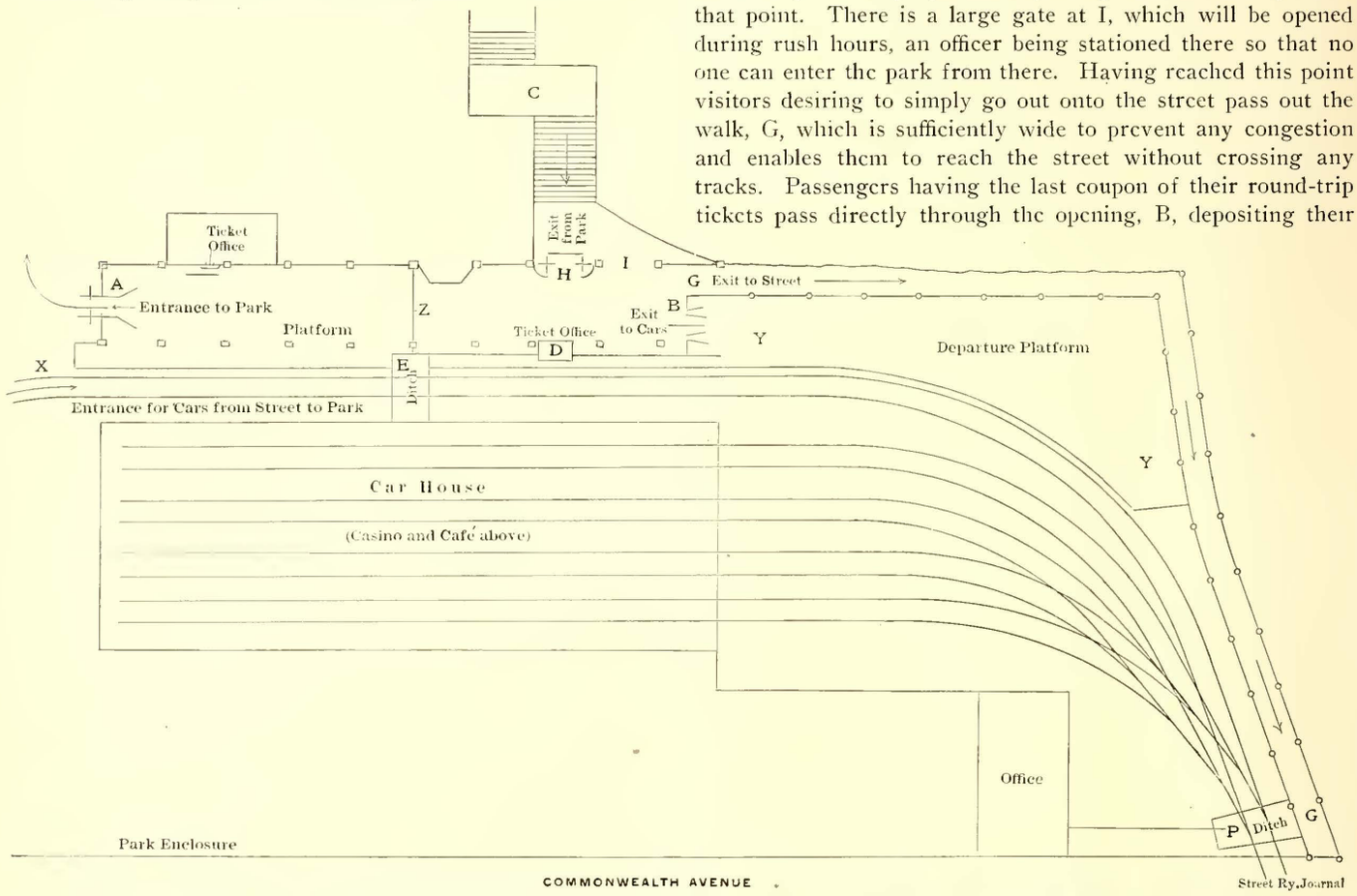
The proscenium over the stage is beautified by an attractive design of cornice surmounting the large columns at the front corners; these columns are 2 ft. 1 in. in diameter and 29 ft. high, being built up on a composite order. The entablature is 7 ft. high and over it are placed figures representing music and drama. The entablature is designed with a very elaborate cornice frieze and architrave and is crowned with an acroterie consisting of a cartouche in the center with a wreath under it and figures on either side. The stage is neatly set off by an arcade consisting of triple arches and columns at the rear, behind which is a rustic railing with flower pots. These features, all of which are new, will add greatly to the attractiveness of the theater, and also the roof covering will prove very effective in providing the greater need of protection for the audience.

The work upon this building is a model that may well be followed by those considering similar installations, and reflects great credit upon the operating company as well as also the architect. The architect of the new theater structure is Samuel

J. Brown, 164 Federal Street, Boston, Mass., who made the designs for all the buildings at this park. For the design of the roof structure Mr. Brown called in the assistance of J. R. Worcester, of Boston, as consulting engineer on the steel framework.

THE NEW CAR TERMINAL

In the engraving below is shown the plan of the basement of the Casino building, at the entrance to the park, upon Commonwealth Avenue, which is used as a car storage house and also an entrance and departure depot for the visitors. This has been entirely rearranged and rebuilt for the operation of cars at the terminal, upon an entirely new plan, for facility of handling the large crowds. In previous years it has been found that the task of collecting fares upon the cars departing from the park, with such heavy crowds as have been carried, has been difficult, and that it was almost impossible to secure the fares of all the passengers. The new plan will provide a means of taking the fares of all passengers before entrance to the cars, in order that the former errors of registration by conductors may be effectually done away with.



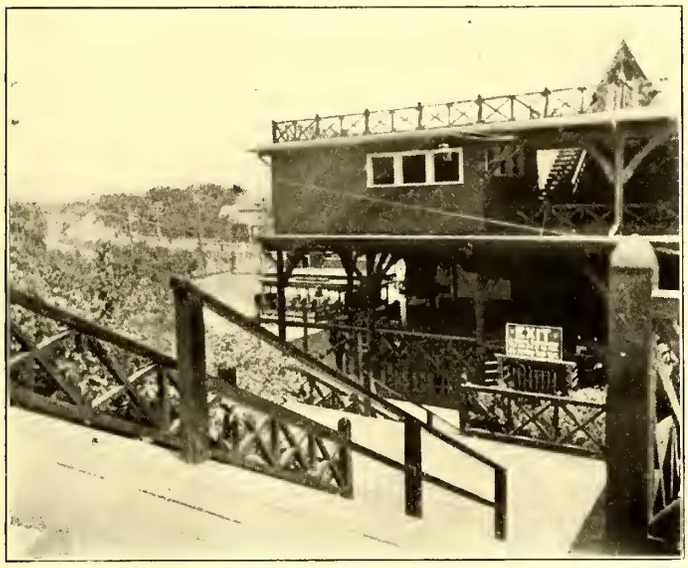
PLAN OF THE NEW CAR TERMINAL AND DEPOT AT NORUMBEGA PARK, SHOWING ARRANGEMENT OF ENTRANCE AND DEPARTURE PLATFORMS

As may be seen from the plan of the new terminal the cars coming from the city loaded with passengers for the park pass along Commonwealth Avenue, and enter the grounds at the point marked X. They stop directly beside the platform, opposite the ticket office, where everybody is required to leave the car. Those holding the coupon round-trip ticket which they have purchased on the car, enter the park, depositing the green coupon of this ticket in this box at A. Those who have not purchased a round-trip ticket secure a regular straight admission ticket at the ticket office for 10 cents, and enter also at A. As soon as the car is unloaded it passes over the ditch, E, which is provided and so arranged that passengers cannot get across, and enters the departure enclosure, passing along to the end of the platform, Y. In the fence marked Z is an opening whereby passengers getting off the car at the park and desiring to return immediately without entering the park, can pass through on to another platform, and from that point enter the enclosure, where they can board a car for the city or pass outside the grounds.

Passengers leaving the park come down the stairs, C, and pass through the turnstiles at H and onto the platform. This turnstile prevents people from passing back into the park at that point. There is a large gate at I, which will be opened during rush hours, an officer being stationed there so that no one can enter the park from there. Having reached this point visitors desiring to simply go out onto the street pass out the walk, G, which is sufficiently wide to prevent any congestion and enables them to reach the street without crossing any tracks. Passengers having the last coupon of their round-trip tickets pass directly through the opening, B, depositing their ticket in the chop-box for admission into the enclosure for departing cars. Those who have not secured a round-trip ticket purchase a 5-cent ticket at the ticket office, D, and pass through the opening, B, depositing their ticket into the chop-box to enter upon the platform. The track along the edge of the plat-

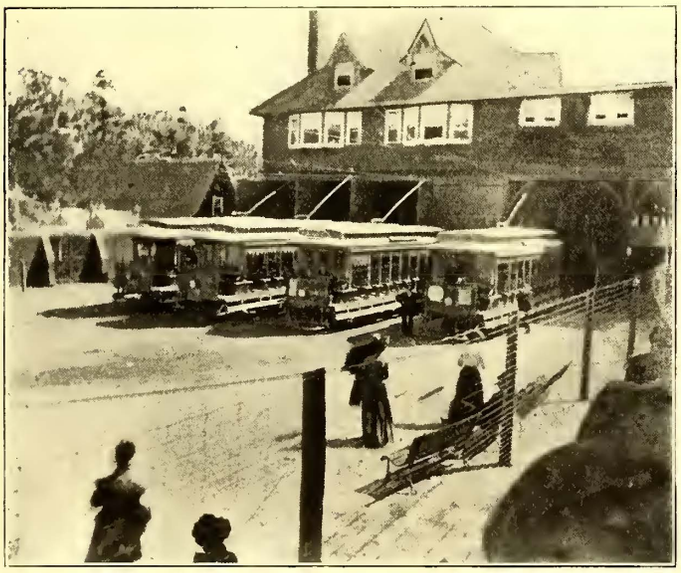
THE RECEIVING PLATFORM AND TICKET OFFICE A, AT ENTRANCE TO PARK

form is of sufficient length to enable three cars to be placed there at one time. The car house has a storage capacity for fourteen cars, and the four tracks just outside the doors have a capacity of six cars more. It is the practice of the management to anticipate very largely the number of people who will probably leave the park after the last theater performance, and endeavor

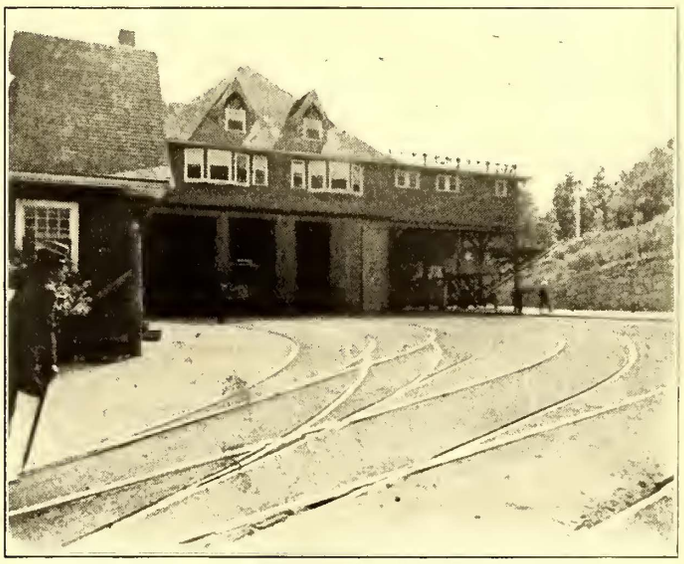


STAIRWAY C, LEADING TO EXIT GATES AND DEPARTURE PLATFORM

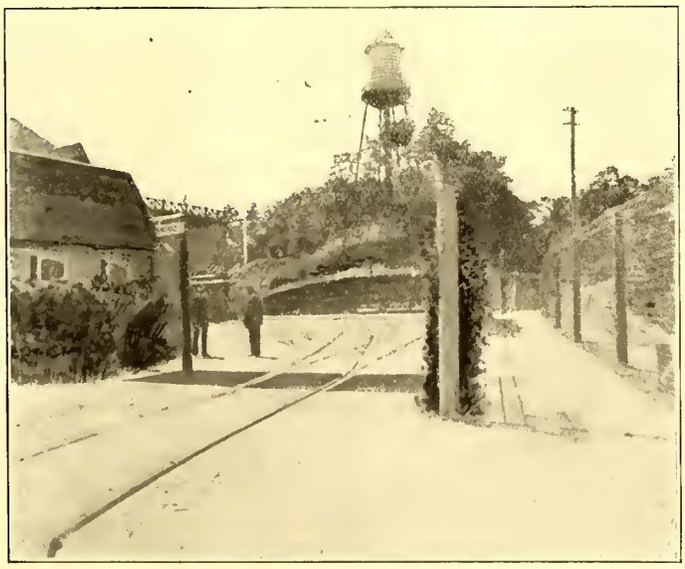
EXIT TO DEPARTURE PLATFORM FOR CARS LEAVING PARK, AND PASSAGE TO STREET



VIEW OF THE DEPARTURE PLATFORM AND CAR HOUSE FOR STORAGE OF CARS



THE CAR HOUSE AND TERMINAL, SHOWING ARRANGEMENT OF TRACKS



OPENING TO STREET FROM THE CAR TERMINAL, SHOWING PIT TO PREVENT ENTRANCES AT THAT POINT

to have this yard stored full of cars in order to handle the people as quickly as possible when they leave the park.

When it is time for a car to leave it runs past the platform, over the switches and out over the ditch, P, onto the avenue. After passing over the ditch, P, the car does not make a stop for some distance, in order to encourage the people to enter the enclosure and take the car there, rather than delaying it on the street. In order to still further encourage this, signs are placed on the avenue at point G, inviting passengers to enter this walk, pass around onto the platform and purchase a 5-cent ticket for entrance to the enclosure at point B. Any passenger leaving the park and desiring to transfer from any of the car lines to some other line farther down the system, secures a transfer at the ticket office, D, when purchasing the 5-cent ticket. Transfers are not given on the round-trip tickets, as they are sold at a reduced rate.

In reference to the operation of this new system the general manager, Mr. Brush, states: "We believed that by this method of handling the people we could better accommodate them and prevent a large percentage of loss, due to conductors not being able to collect all fares on a crowded car and also prevent any-

one withholding any fares from us. Our experience so far with this scheme has seemed to more than justify our claim for it previous to its inauguration.

"Up to the present time we have experienced no difficulty with it, and from all we can learn the people are better satisfied, for the reason they don't have to pay their fare on the car, and it also gives us very much larger platform room than we have had in the past years. The conductors are apparently better pleased, for it prevents the necessity of crawling along on the running boards, which is troublesome in pleasant weather and highly objectionable in stormy weather."

This paper is greatly indebted to Matthew C. Brush, general manager of the Boston Suburban Companies, for this information, and to Samuel J. Brown, the architect, for the drawings of the new theater construction.

NEW POWER PLANT EQUIPMENT FOR THE CONEY ISLAND & BROOKLYN RAILWAY

To provide for its greatly increased city and seashore traffic, the Coney Island & Brooklyn Railway Company has recently installed a large additional direct-connected generating unit in its large power plant at Smith and Ninth Streets, in South Brooklyn. This unit is of particular interest, as it involves the use of the new type of horizontal Corliss engine, recently brought out by the Westinghouse Machine Company. This company has experienced a very rapid growth of traffic during the past few years, operating as it does two important lines to Coney Island and another important line through the center of Brooklyn. The total mileage of road operated by this company is, it will be noted, about 50 miles, while the service given requires over 600 cars.

The new generating unit consists of a horizontal cross-compound engine, of the new Westinghouse-Corliss type, which is direct-connected to an 800-kw railway-type Westinghouse generator, to deliver direct current at 600 volts. The engine and generator are designed to operate at 80 r. p. m., the rated capacity of the engine at this speed, with the normal steam pressure of 150 lbs. and a vacuum of 26 ins. in the exhaust pipe, being 1250 indicated hp, while an overload capacity up to 2100 hp is provided for.

The valve gear of this engine is of the Corliss rocking type, the admission and exhaust valves in each cylinder being driven by separate eccentrics. The admission valve is operated by a ¾-in. gear, while the exhaust valve is operated by a toggle mechanism, securing quick opening and closing. The governor is of the housed pendulum type, controlling the cut-off on the high-pressure cylinder, or upon both cylinders, if desired.

The engine is controlled by a Monarch safety engine stop, with speed-limit attachment, working in connection with the main throttle valve. The governor is designed to provide such regulation for the engine that between friction load and 25 per cent the speed will not vary more than 2 per cent above or below normal. When operating under the conditions above named, the consumption of dry steam at the point of best efficiency is designed to not exceed 13½ lbs. per ihp hour.

GENERAL DIMENSIONS OF ENGINE

Diamcter of low-pressure cylinder, 52 ins.
Diameter of high-pressure cylinder, 26 ins.
Stroke, 48 ins.
Main journals, 20 ins. x 36 ins.
Diameter of shaft at center, 24 ins.
Crank pins, 9 ins. x 9 ins.
Crosshead pins, 7¼ ins. x 9 ins.
Diamcter of H. P. piston-rod, 5 ins.
Diameter of L. P. piston-rod, 5 ins.
Connecting rod, center to center, 11 ft.
Total length of engine, approximately, 34 ft.
Total width of engine, approximately, 27 ft. 4 ins.
Diameter of fly-wheel, 18 ft.
Weight of fly-wheel, 100,000 lbs. (estimated).
Weight of engine without fly-wheel, 230,000 lbs (estimated).
Total weight with fly-wheel, 330,000 lbs.

The generator is designed so as to obviate sparking within the limits of no load to 50 per cent overload, without changing position of the brushes. The regulation of generator is taken care of by the compounding so that the voltage will vary from 550 to 600 volts from no load to full load, respectively.

The field frame is split along a vertical plane so that the two halves may be separated for obtaining access to the armature winding. The pole pieces are of laminated steel, cast integral with the field frame. The armature and commutator are built together upon a spider pressed upon the engine shaft; the armature is of the slotted drum type, with multiple winding, and is provided with balancing rings in order to equalize the voltage at the several corresponding points of the armature and prevent sparking should the armature get slightly out of true. The armature core is of laminated sheet steel, dovetailed into the spider and held in place by end plates, and the armature coils are of bar copper machine-formed and held in position in the slots by hard fiber retaining wedges. Carbon brushes are used, supported by a cast-iron ring mounted upon the face of the field frame, and arranged to be rotated through a small arc by means of a gear and hand wheel.

The installation of this generating equipment necessitated the installation of additional boilers. Two 500-hp Morin-Climax vertical boilers have accordingly been installed, in addition to the former large boiler equipment. A feature of this new work is the use of concrete foundations throughout; the engine is provided with a massive foundation of great stability.

AGREEMENT BETWEEN NORTHWESTERN ELEVATED RAILROAD AND CHICAGO, MILWAUKEE & ST. PAUL

The Chicago, Milwaukee & St. Paul Railway Company and the Northwestern Elevated Railroad Company, of Chicago, have at last come to an agreement whereby the Northwestern Elevated will take charge of the Evanston line suburban service of the Chicago, Milwaukee & St. Paul, north of Wilson Avenue, which is the present northern terminus of the Northwestern Elevated. The Evanston line of the Chicago, Milwaukee & St. Paul has long been a poorly paying line, operated for suburban service only, as it extends only from Chicago to North Evanston. The plan is for the Northwestern Elevated to operate its trains over the C., M. & St. P. right-of-way. The Northwestern Elevated Railroad Company, of course, will pay a rental to the steam railroad for the use of its tracks and right-of-way. Power will be furnished by the Northwestern Elevated Railroad Company, which will also furnish motive power for whatever freight traffic is taken over the line. The freight traffic, however, is very limited. This arrangement will permit the Northwestern Elevated to operate its trains from the heart of Chicago to North Evanston without change of cars, and the elevated structure at Wilson Avenue will be connected with the Chicago, Milwaukee & St. Paul tracks by a long incline. An ordinance permitting the use of electric motor power on the Chicago, Milwaukee & St. Paul tracks has been drawn up for passage in the City Council.

CONVENTION OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

William W. Cole, secretary and treasurer of the Street Railway Association of the State of New York, has announced that the date of the next convention of the association will be Sept. 13 to 14. The convention will be held in Utica.

The Oneonta, Cooperstown & Richfield Springs Railway Company, of Cooperstown, N. Y., has offered a prize of $100 to the car crew making the best record for the ensuing three months.

COMMERCIAL PRACTICABILITY OF ELECTRIC TRACTION BY SURFACE CONTACTS*

BY C. E. C. SHAWFIELD, A. M. I. E. E., M. I. Mech. E.,
Borough Electrical and Tramway Engineer, Wolverhampton.

The surface contact system in operation at Wolverhampton was first brought before the notice of the Wolverhampton Tramways Committee in March, 1901, and after lengthy negotiations a contract was entered into between the corporation and the Lorain Steel Company by which the latter was to equip about 11½ miles of single track with its system, and allow the corporation to operate the lines so equipped for a period of twelve months. It was a condition of the contract that if the system proved itself a commercial success during the period of experimental operation, the corporation was to take over and pay for the same at an agreed upon rate, but if it failed to prove itself safe and reliable and commercially successful, the Lorain Steel Company was to remove its apparatus and bear the whole cost of the experiment.

The twelve months' experimental operation terminated on April 17, 1903, and although there was a great deal of difference of opinion in the Town Council as to the advisability of retaining the system, it was eventually decided on Sept. 11, by a large majority, that the system should be accepted. Shortly afterward it was decided to proceed with the reconstruction of existing routes operated by horse traction and the construction of new routes, amounting in all to an additional 7 miles of single track, and the Council decided that these extensions should also be equipped with the Lorain surface contact system. About 5 miles of these extensions have already been completed, and it is expected that the remainder will be finished very shortly. The design and general arrangement of the Lorain surface contact system has already been fully described and illustrated in the technical press, and is probably well known to the majority of the members of this association, and therefore the author does not propose in his paper to give any technical description of it.

In comparing the respective merits of the overhead system and the surface contact system, the author proposes to do so from the following standpoints, namely:

1. Safety to human beings and animals.
2. Reliability of operation.
3. Cost of operation and maintenance.
4. Cost of installation.
5. Disfigurement of streets and obstruction to traffic.

In comparing the respective advantages from the point of view of safety of the overhead system and the surface contact system, it is evident that only one source of danger need be seriously considered, namely, that of electric shock, as practically all other risks are common to all systems of electric traction. In the case of surface contact systems it is evident that the only portion of the apparatus exposed to the public from which a shock could under any possible conditions be obtained is the metal stud in the center of the track, and that this can only become or remain alive (except when it is covered by a car) in the event of some failure of, or defect in, or damage to the mechanism which operates it. The actual value of this risk may best be estimated in the light of actual experience, and the author has therefore analyzed the records of defective boxes during the past twelve months, and has extracted therefrom the particulars given in Table I.

It will be seen from the accompanying table that a total of 109 boxes were found more or less alive during the twelve months in question, 59 of which were alive at an e. m. f. of over 50 and under 500 volts. The author has divided the live boxes into two sections, namely, those under and those over 50 volts, as he has found by experiment that it is quite impossible for any person or animal to feel the slightest sensation of shock from a box which gives a reading of 50 volts or under, and it is only in rare cases that anything approaching a shock can be obtained from a box which gives a reading of less than 100 volts.

It will be noticed that out of the total of 109 defective boxes, in nine cases the trouble was due to moisture in the granite basin; that is, to the accumulation of water on the surface of the granite basin under the dope, which formed a leakage path to the top plate. This may be said to be due to every case to carelessness in fixing in the first instance, sufficient care not having been taken to see that the interior of the granite basin was thoroughly clean and well brushed over with a coating of hot dope before the remainder of the dope was poured in. The remaining 100 defective boxes were the result of damage done to the interior of the cups by heavy and repeated short circuits. These short circuits are caused by pieces of scrap iron which are picked up by the magnet system and come in contact at the same time with the collecting skate and with a cross-rail at junctions and turn-outs. The effect of a number of short circuits on any one cup is that the interior of the top half of cup becomes burnt and charred, and thus loses its insulating properties, consequently the top plate or stud becomes alive at an e. m. f. which may be anything from a few volts up to nearly the full line pressure. In this connection it is interesting to note that recent experiments made by the author show that the degree of damage to the cup in the event of a short-circuit entirely depends upon the time element of the circuit-breaker controlling the main feeder. When the traction switchboard was installed at the power station, the possibility of the adoption of a surface-contact system had not been considered by the tramways committee, and the circuit breakers for the tramway feeders were specially designed to give a comparatively slow break, with the object of preventing the rise of pressure which is frequently caused by the sudden rupture of an inductive circuit. Experience has shown, however, that this is the very worst type of apparatus that could have been selected for use with the surface-contact system, as it allows the heavy current due to a short circuit to flow for a sufficient length of time to give rise to a considerable amount of arcing or flashing between the carbon contacts inside the cup, resulting in the charring of the latter and sometimes in the fusion of the copper ribbon. The author is now replacing the original circuit breakers with others of a new type, which give a more rapid break with magnetic blow-out, and as a result of experiment he has found that with the circuit breaker set to operate at 600 amp., the tramway bus-bars may be short-circuited a large number of times in rapid succession through the contact-making mechanism of the cup without the latter receiving any appreciable damage, and he has every reason to believe that this alteration in the type of circuit breaker will very greatly reduce the number of defective boxes in the future.

TABLE 1.—DEFECTIVE BOXES FOUND DURING TWELVE MONTHS ENDING MARCH 31, 1904

Quarter Ending	Cups Damaged by Short Circuits		Moisture in Granite Basin		Total		Average per Mile of Single Track per Annum
	E.M.F. above Earth, as shown by Weston Voltmeter						
	Volts 10 to 49	Volts 50 to 500	Volts 10 to 49	Volts 50 to 500	Volts 10 to 500	Volts 50 to 500	
June 30, 1903.....	10	14	0	1	10	15	10
Sept 30, 1903.....	14	23	0	2	14	25	
Dec. 31, 1903.....	12	6	2	0	14	6	
Mar. 31, 1904.....	10	11	2	2	12	13	
Totals	46	54	4	5	50	59	

*Abstract of paper read at the Ninth Annual Convention of the Incorporated Municipal Electrical Association at Derby, England.

It will be observed that instances of defective boxes due to short circuits are more frequent in the summer than in the winter months, the reason for this being that light pieces of iron or steel are more easily picked up by the magnet when the track is dry and dusty than when it is covered with wet and sticky mud.

The presence of a metallic stud in the street surface electrically charged at a pressure of 500 volts above earth would at first sight appear to constitute a grave source of danger, but the author would point out that in speaking of a stud being alive at 500 volts it does not necessarily imply that the stud is capable of transmitting a dangerous shock to any animal or person stepping thereon; as an actual matter of fact this is by no means the case, as owing to the comparatively high resistance of the conducting path formed by the charring of the interior of the cup, the quantity of current that can pass is exceedingly small, and in many cases the readings obtained from the same "live" stud by different voltmeters will vary enormously, a difference of one or two hundred volts being by no means uncommon, this variation being simply due to the difference in internal resistance of the respective voltmeters.

In only one instance has the shock received from a "live" stud been attended with serious results, and this occurred on Feb. 17, 1904, when a sheep and a dog were electrocuted through treading on a faulty box on the Tettenhall Road route.

This accident was the result of a curious combination of conditions, the absence of any one of which would probably have prevented its occurrence. In the first place, the box had been improperly fixed, the vulcabeston cup was cracked, and the space around it was not properly sealed with dope. A car passing over the box picked up a large piece of scrap iron, causing a heavy short circuit, which completed the fracture of the vulcabeston cup and separated the top half from the bottom. Secondly, owing to a heavy snowfall the track in the vicinity had been salted, and at that particular spot was more or less covered with a fairly strong solution of brine. Owing to the absence of the proper seal of dope, this brine found its way into the interior of the cup establishing a low resistance connection between the "live" lower contact and the top plate and causing the top plate to become "alive" at practically full line pressure. Lastly, the animals to which the accident happened had been traveling for some considerable distance along the salted track, and their feet were saturated with brine solution, thus greatly reducing the resistance of their bodies to the passage of an electric current. Immediately after the accident to the sheep and the dog, and before any warning could be given, a horse attached to a butcher's cart stepped on the same box and was brought down by the shock. It got up again immediately, however, and when examined shortly afterwards by a veterinary surgeon was reported as being none the worse for its adventure.

As a result of actual experiments the author is inclined to believe that horses, in spite of the fact that they are shod with metal shoes, are much less sensitive to a shock sustained by stepping on a charged metallic substance than to a shock received from a live conductor falling on them from above. Several instances have occurred of horses stepping on boxes, which when tested with a Weston voltmeter, gave readings of 500 volts and over, and although in the majority of cases the animals were brought down, in no case was there any resulting injury from the shock. The author has on more than one occasion watched a pedestrian step on a box which he has known to be "alive" at a pressure of 500 volts, as recorded by a Weston voltmeter, but in all cases the individual was apparently quite unaware of the fact. The comparative harmlessness of the shock received from studs "alive" at the apparently high pressure of 500 volts is of course due to the comparatively high resistance of the charred surface of the vulcabeston cup, and to the fact that there is never under any condition of break-down or defect any metallic connection between the top plate and the main supply.

On a large percentage of the tramway systems of this country center-pole or side-pole bracket-arm construction is largely used, and in accordance with the usual practice the poles are erected in concrete. It is well known that under certain contions which may frequently occur in practice, these poles are virtually insulated from the general mass of the earth, and can therefore become charged at a high potential relatively to the earth. When it is considered that in a very large number of cases single insulation only is used between the trolley wire and the bracket-arm, it is evident that failure of the straight-line insulator, which supports the trolley wire—either from mechanical stress or other cause—may result in a pole becoming "alive" at an e. m. f. of anything up to 500 volts, and prove a source of very serious danger to human beings and animals in the vicinity. It is evident, moreover, that the failure of an insulator under the conditions named would not be easily detected under ordinary service conditions, and there would be nothing to indicate the fact that anything was wrong until an accident had occurred.

That instances of falling trolley wires and "live" tramway poles do occur with startling frequency in many districts where tramways are operated on the overhead system is undoubtedly true, and that these mishaps are not more frequently attended by injury to human beings or animals appears to the author to be largely due to the beneficent interposition of Providence. It must be remembered, moreover, that a shock received from a falling trolley wire or a live telephone wire is of necessity infinitely more dangerous than any shock which can be received from stepping on a "live" stud, as in the former case the shock is generally transmitted through the most sensitive part of the body, and there is much greater risk of the "live" substance coming in contact with bare flesh. In proof of this contention it is only necessary to refer to the files of the daily press, from which it will be found that in nearly, if not quite, every instance where a shock has been received under these conditions, it has proved fatal in the case of animals, and has always been attended with serious and sometimes fatal results in the case of human beings. In conclusion, so far as the question of safety is concerned, the author is of opinion that the balance of advantage lies with a well-designed and carefully installed surface-contact system.

RELIABILITY OF OPERATION

Owing to the entire absence of any statistical information regarding the number of journeys lost through defects in or failures of the overhead electrical equipment on tramways where the overhead system is adopted, it is very difficult to institute anything like a comparison between the overhead system and the surface-contact system so far as reliability of operation is concerned.

From the very commencement of the operation of the tramway system in Wolverhampton, the author has kept minute records of every delay that occurred on any route and the cause thereof, together with the number of journeys lost by the cars affected by such delay or stoppage.

Thus, if an accident occurs causing a delay of fifteen minutes on any one route the mileage lost is reckoned as the total mileage that would have been run by each car affected by the delay during the period that the stoppage occurred. Table II shows the total mileage lost due to faults in the electrical equipment of the Wolverhampton tramways during the twelve months ending March 31, 1904.

Out of a total of 173 car miles lost due to defects in the Lorain surface contact equipment during the period covered by the above table, it will be seen that only 27 are debited against the track equipment; these were due to the following causes: Three car miles were lost owing to a delay arising from an improperly soldered joint in a cable terminal, the remaining

24 miles being lost owing to a top plate situated very close to a cross-rail being permanently earthed thereto by a piece of iron wedged between the plate and the rail, it being about

TABLE II.—CAR-MILES LOST DUE TO DEFECTS IN ELECTRICAL EQUIPMENT OF TRACK AND CARS

Quarter Ending	Miles of Single Track in Operation	Total Car Miles Run	Total Car Miles Lost	Total Car Miles Lost per 10,000 Miles Run	Car Miles Lost Due to Faults in Lorain System			
					Lorain Car Equipm't	Lorain Track Equipm't	Total	Total per 10,000 Miles Run
1903								
June 30	11	139,563	177	12.7	43	..	43	3.1
Sept. 30	11	131,805	172	13.0	39	..	39	2.9
Dec. 31	11	122,576	147	12.0	38	27	65	5.3
1904								
March 31	11	121,434	248	20.4	26	..	26	2.1
Totals		515,378	744	14.4	146	27	173	3.3

twenty minutes before the source of the trouble was discovered. The 146 car miles lost due to defects in the car equipment may be classified as given in Table III.

TABLE III.—DETAILS OF MILES LOST DUE TO FAULTS IN LORAIN CAR EQUIPMENT

	June Quarter	September Quarter	December Quarter	March Quarter	Total.
Earthed magnets	22	21	16	20	79
Buckled skates	10	7	20	3	40
Battery faults	8	6	..	3	17
Other causes	3	5	2	..	10
	43	38	38	26	146

It will be seen that during the period in question the total number of car miles lost due to defects in the electrical equipment of both cars and track averaged 3 1-3 car miles out of every 10,000 car miles run, and having regard to the fact that during the months of February and March there were frequent and heavy snowfalls, the author is of the opinion that this constitutes a record of regularity of service which it is difficult to surpass.

In considering the car miles lost due to the Lorain car equipment, it must be remembered that the defects which were the cause of the delays have a parallel in the case of the overhead system in respect of broken and damaged trolley wheels and trolley poles and in the earthing of the cables inside the trolley standard.

The first heavy snowstorm since the system has been in operation occurred on Feb. 17, 1904, when about 6 ins. level fall of snow occurred in the early hours of the morning. The electrically-driven snow sweepers were at once put into service and the lines were kept clear without difficulty, and no delay of any kind occurred. It is noteworthy that although the snowfall in the surrounding districts, operated on the overhead trolley system, was not quite so severe as it was at Wolverhampton, yet considerable difficulty was experienced, especially in the early morning, in maintaining a regular service.

Owing to an abnormal rainfall in the early part of September certain routes were flooded, and at one point the track was submerged for a considerable distance to a depth of nearly two feet. No trouble, however, was experienced as regards the running of the cars, and no defects developed in the car equipments, in spite of the soaking to which they had been subjected.

In considering the respective liabilities to break-down of the rival systems, it should be borne in mind that in the case of the surface-contact system as installed at Wolverhampton, any accident or break-down can only affect one, or, in very rare cases, two boxes, and the momentum of the car is sufficient to enable it to coast over the short length of track thus disabled. Further, any faulty box can be removed and replaced by a new one in an average time of fifteen minutes without any interruption of service. It may in effect be said that the surface-contact system is equivalent to an underground trolley wire divided into ten feet sections, each of which is independent of the rest, and may be removed and replaced without interference with the efficient operation of the remainder. It is in this respect that the surface-contact system has, in the author's opinion, a distinct advantage over the overhead system, inasmuch as with the latter an accident of any kind to the overhead equipment usually means the putting out of service temporarily from a quarter of a mile to half a mile of route, and a total cessation of traffic along the section affected for a more or less lengthy period.

Another respect in which the surface-contact system possesses a marked advantage over the overhead system is that the conductors are free to devote the whole of their time to the collection of fares and to looking after the convenience and comfort of passengers. In nearly all of the tramway systems at present in operation in this country, a considerable proportion of the conductor's time is occupied in nursing the trolley pole through frogs and crossings or round awkward curves on the overhead equipment, but in spite of the care which is taken in this respect interruptions of service are frequently caused through the trolley pole jumping and displacing a portion of the overhead equipment. Similarly, also, no reversal of the collecting apparatus is required when changing the direction of running of a car, whether at a terminus or elsewhere on the line, and consequently there is no risk of an accident occurring through forgetfulness or carelessness on the part of the motorman or conductor.

One of the most attractive features of the surface-contact system as installed at Wolverhampton is that it is virtually "fool proof," inasmuch as it is practically beyond the power of the motorman to inflict damage thereon by careless or incompetent handling of his car, and in this respect it possesses an advantage which is not shared by any other system of electric traction. As a result of the two and and a half year's experience the author has had of the operation of a surface-contact system, he believes that for reliability of operation it has many and noteworthy advantages over either the overhead trolley system or the conduit system.

COST OF OPERATION AND MAINTENANCE

It must be admitted at the outset that from the point of view of cheapness of operation and maintenance, no system of electrical traction can rival the overhead trolley system. The following statement shows the expenditure on the maintenance of the Lorain surface contact system at Wolverhampton during the twelve months ending March 31, 1904.

TABLE IV.—REPAIRS AND MAINTENANCE COSTS OF LORAIN SYSTEM FOR TWELVE MONTHS ENDING MARCH 31, 1904

	Total Cost	Cost per Mile of Single T'ck	Cost per Car Mile
TRACK EQUIPMENT	£ s. d.	£	d.
Repairs and maintenance of cups and top plates	125 5 5	11.3	.058
Raising top plates	5 19 2	0.5	.002
Miscellaneous repairs	12 2 1	1.1	.005
Inspection and testing of track	94 15 6	8.6	.044
Total for track equipment	238 2 2	21.6	.11
CAR EQUIPMENT		Cost per Car per Annum	
Repairs and maintenance of magnet systems	72 13 2	3	.033
Repairs and maintenance of switches and batteries, including charging	20 3 4	0.8	.009
Repairs and maintenance of collecting skates	115 11 8	4.7	.053
Inspection and adjustment of magnet systems and collecting skates	102 13 11	4.2	.047
Total for car equipment	311 2 1	12.9	.144

The expenditure under the heading of track equipment the author considers to be very reasonable, and is of opinion that it will bear comparison with the cost of maintenance of any similar length of overhead equipment running in a busy manufacturing town.

The whole of the work of inspection and testing of the electrical equipment of the track, the removal and replacement of faulty boxes, and the execution of all repairs of every kind required in connection with the maintenance of the electrical equipment of the 15 miles of single track is performed by two men who are paid wages of 32 shillings and 28 shillings per week, respectively. The working day of approximately seventeen hours is divided into two shifts, so that there is only one man on duty at a time. Every box is tested once a week, and the boxes in the vicinity of points and crossings and other special track work where there is a liability to short circuits are tested daily.

During the period covered by the foregoing statement of costs, the average time required to test about 11 miles of single track was ten hours, the apparatus used for testing consisting of a portable Weston voltmeter slung round the neck of the operator, the flexible leads from the voltmeter being attached to terminals on a pair of walking sticks, one of which was placed on the box to be tested and the other on the rail. As this method of testing proved to be a slow process, the operator not being able to cover more than about one mile of single track per hour, the author has devised an arrangement by which a light trolley carrying a contact skate can be towed behind any car in service, and by this means every box on about 15 miles of track can be tested in two and a half hours. It is expected that this will result in a considerable reduction in the expenditure on inspection and testing of the track.

The expenditure on the inspection and maintenance of the car equipment has been rather heavy, the items relating to the magnet systems and batteries being, in the author's opinion, abnormal, and considerably in excess of what may be expected in the future.

It is impossible to obtain reliable figures as to the cost of inspection and maintenance of the trolley wheels, trolley poles and standards in the case of the overhead system, as records apparently are not kept separately of the expenditure incurred in these respects, but it is probable that the car equipment of the overhead system can be more cheaply maintained than that of a surface contact system.

One of the most serious disadvantages of the surface-contact system is the increased consumption of electrical energy involved. The additional quantity required varies according to the type of surface contact system adopted, but with practically every type of system there are three causes which must involve additional current consumption, and these are as follows:

(1) The energy required to operate the circuit-closing mechanism of the track equipment. (2) The additional energy necessary for the propulsion of the cars owing to the extra weight of the special apparatus carried on the car. (3) The surface leakage from box to rail over the paving under each car on the track.

Of the above-mentioned sources of power waste, the first two only need be seriously considered, as in the case of the third the amount of energy wasted by surface leakage is so small as to be negligible.

In the case of the Lorain system as installed at Wolverhampton, the current required for the operation of the circuit closing mechanism in the track equipment, which is in this case the energy required for the excitation of the magnets, represents a power consumption of 670 watts per hour, which is equivalent under the ordinary conditions of service to 11 per hour per car mile. The additional energy required to propel the cars owing to the extra weight carried must, of course, vary in different localities, being obviously more in a hilly district than in a flat. It would also be affected to a certain extent by the type of rolling stock in use and the distance apart of the stopping places. It is, therefore, impossible to give a general estimate as to the additional energy consumed under this heading.

In Wolverhampton the routes at present in operation include some rather severe gradients, and owing to the fact that a large proportion of the road surfaces in the vicinity of the routes are macadamized, the track is always very muddy and greasy in wet weather, and correspondingly dusty in dry weather. The tendency is, therefore, for the current consumption per car mile to be rather heavy, the average during the past twelve months being 1.49 kw. hour.

The average total weight of a single truck double-deck car, together with driver and conductor and an average number of passengers, but exclusive of Lorain equipment, is 8¾ tons. To this must be added the weight of the magnets, collecting skate, battery, cables and connections of the surface contact apparatus, amounting in all to one ton.

The steepest gradient has a rise of 1 in 17, and there are a number of sharp curves varying from 40 ft. 0 in. to 37 ft. 6 in. radius. Under these conditions the author has calculated that the additional current consumption due to the weight of the Lorain equipment is approximately equal to .13 kw-hour per car mile. The total additional current consumption to be debited against the surface-contact system is in this case .24 kw-hour per car mile, or approximately 19 per cent in excess of what would have been required by the overhead system.

COST OF INSTALLATION

It is very difficult, if not impossible, to give a general figure for the difference in first cost of the overhead system and the surface-contact system, owing to the fact that while the cost of the former is practically the same for either double or single track, the cost of the electrical equipment of the latter is obviously twice as much for double track as for single. Consequently, the amount of the extra cost of installing a surface-contact system necessarily depends upon the proportion of double to single track on the routes concerned. Speaking generally, however, it may be taken that first-class overhead construction costs from £1,500 to £2,000 per mile of route, whether double or single, whereas the cost of the surface-contact system will be from £2,000 to £2,500 per mile of single track.

DISFIGUREMENT OF STREETS AND OBSTRUCTION TO TRAFFIC

It seems at the present time to be almost an article of faith among those in charge of the promotion of tramway schemes that the adoption of electric traction must of necessity involve the disfigurement of the streets, either by the erection of tramway poles and overhead wires or by the construction of an open slot between the center of each track. Where center-pole construction is in use, there is, in addition to the unsightliness involved, another very serious objection, namely, the obstruction to traffic. There can be no doubt whatever that the introduction of center poles into a street of average width very largely reduces the accommodation for vehicular traffic, and materially adds to the congestion of the already overcrowded streets in many of our large towns. Where side-pole construction is adopted, this inconvenience is not so marked, although the presence of a large iron pole, with massive base, every forty yards along the sidewalk, is not by any means conducive to the comfort and convenience of pedestrians.

It is claimed for the surface-contact system that it offers less impediment to the free use of the streets and sidewalks than any other system of electric traction in which the energy for the propulsion of the cars is collected from an external source, and the experience of the author in connection with the Wolverhampton tramway leads him to believe that this claim is justified.

It was anticipated when the system was first installed that trouble would be experienced through the metallic studs between the rails projecting above the normal level of the paving, proving a source of danger to the ordinary street traffic and to horses in particular, and that considerable expense would be occasioned through the extra wear and tear of the

paving surrounding the studs. During the two and a half years that the system has been in operation no complaint of any kind has been received as to any obstruction or inconvenience to traffic having been caused by the iron top plates in the street surface, and so far as the author is aware, no accident of any kind has ever been attributed to them. There is, moreover, no indication of any abnormal wear of the paving surrounding the studs, neither wood nor granite paving in the immediate vicinity of the metal top plates appearing to wear any faster than at other parts of the track.

On the score of appearance it may fairly be said that the surface-contact system is the least conspicuous and the least objectionable of any system of electrical traction; in fact, it is the author's experience that unless the track is abnormally clean and free from dirt it is very difficult to distinguish the studs from the remainder of the paving. During dusty or muddy weather it needs a close examination of the track to detect the exact whereabouts of the metal top plates, and probably owing to this reason a very large proportion of visitors to the town go away with the impression that the electric energy for the propulsion of the cars is carried in storage batteries on the cars themselves.

In considering the results achieved at Wolverhampton in the operation of tramways by a surface-contact system, it should be borne in mind that in many respects the local conditions at Wolverhampton are probably more unfavorable to the successful operation of a surface-contact system than in almost any other town in the United Kingdom. Owing to the larger number of factories in the town engaged in the production of stamped steel and iron articles, a very large quantity of scrap iron of all sorts and sizes is produced and has to be carted away from the various works. This scrap iron is usually very carelessly heaped in open carts, with the result that a considerable percentage of each load is scattered in the street, and it unfortunately happens that the principal repositories for scrap iron are situated on the busiest tramway routes. As previously explained, the presence of this scrap iron constitutes the most serious difficulty the system has had to contend with.

The heavy rainfall of the last two years, in conjunction with the very general use of macadam in the majority of the streets in the town, has resulted in a clean track being a luxury but rarely attained, the track being usually covered with a sticky mud, which an hour or two's wind and sun speedily converted into equally objectionable dust.

It should be pointed out, moreover, that in Wolverhampton the track is laid to a 3 ft. 6 in. gage, and consequently the space available between the rails, and between the side frames of the trucks, for the reception of the surface-contact apparatus is comparatively limited, and the author believes that with the standard 4 ft. 8½ in. gage many of the troubles experienced with the upkeep of the magnet and collecting skates would largely, if not entirely, disappear, and the arrangement of the track equipment at points, crossings and other special track work would be considerably simplified.

The conclusions arrived at in the foregoing paper may be briefly summarized as follows:

A well-designed and carefully installed surface contact system is superior to the overhead trolley system in respect of the questions of safety, reliability, disfigurement of streets, and obstruction to traffic.

The overhead system is considerably cheaper both as regards the capital cost of installation and the annual cost of operation and maintenance.

For tramway systems where low initial cost and low annual charges are the first consideration, and especially for light railways in thinly populated districts, the overhead system is to be preferred.

In many of our larger towns, and especially at watering places and other pleasure resorts, the surface contact system has many claims for serious consideration in preference to the overhead trolley system.

The author has made no attempt to treat this subject at all fully in the limited scope available in a paper of this description, his object being merely to provide a basis for discussion of a subject which has previously been brought very little before the notice of tramway engineers as a body.

A NEW TYPE OF CAR FOR THE BOSTON ELEVATED RAILWAY

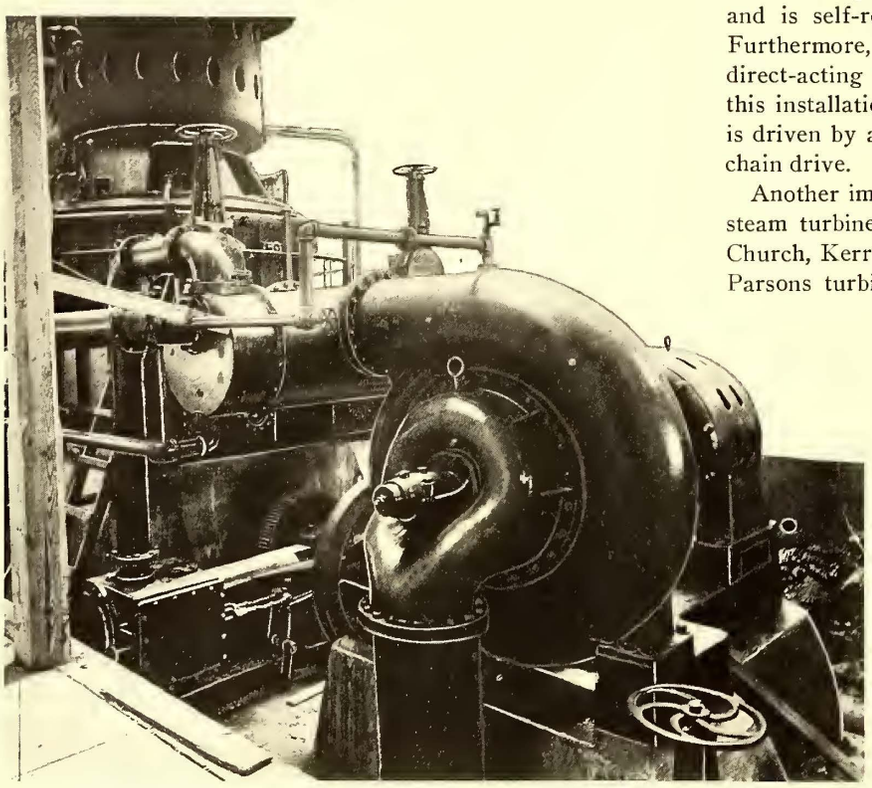
The Boston Elevated Railway Company is receiving twenty-four new cars for use upon its elevated division, which are a radical departure from former car construction for such service, and which will be of especial interest to the operating officials of all roads operating under similar heavy traffic conditions. These cars have been designed to incorporate certain changes which it is expected will overcome some of the serious difficulties that have been experienced with the present type of car. The cars which are now in use upon that road are similar to the so-called "Manhattan type" of elevated car, with open-end platforms enclosed by gates of the "swing back" type, except that they have sliding side doors upon each side, similar to the arrangement used upon the Brooklyn Bridge cars, in New York City. As is the experience of the elevated railways in all of our large cities, the handling of the crowds during the rush hours, through the congested end platforms and narrow doorways is most difficult, and involves serious delays at every station from which heavy traffic originates.

The novel features of the new cars are that they have been constructed without open end platforms, the space occupied by the usual end platforms being taken into the car and enclosed, access to the car being provided by sliding doors at the ends of the car in positions corresponding to that occupied by the former swing platform gates. These sliding side doors at the ends of the cars are operated by means of compressed air cylinders, which are to be controlled by the guards standing across the two platforms in end-door openings, in a manner similar to that which is usual upon the cars with the open-end platforms. These door-operating air cylinders are arranged with their piston rods directly connected to the sliding doors, and are operated by means of air valves which admit compressed air to either end of the cylinder at will. The doors will be normally held in their closed position by means of a spring latch, which may be released for opening the doors by means of foot levers convenient for the guards. Another decided novelty in the construction of these cars is in the provision against the shock of the quick closing of the side doors. The door in closing comes to a stop, at the end of the air-cylinder's piston travel, some distance from the door frame; this open space, which is provided to prevent catching the clothes or hands of passengers in closing, is to be filled in by an elastic striker consisting of a pneumatic cushion, which will permit of the easy removal of any clothing that may happen to be caught in this way, and would not cause injury to a passenger's arm or foot if caught thus in closing.

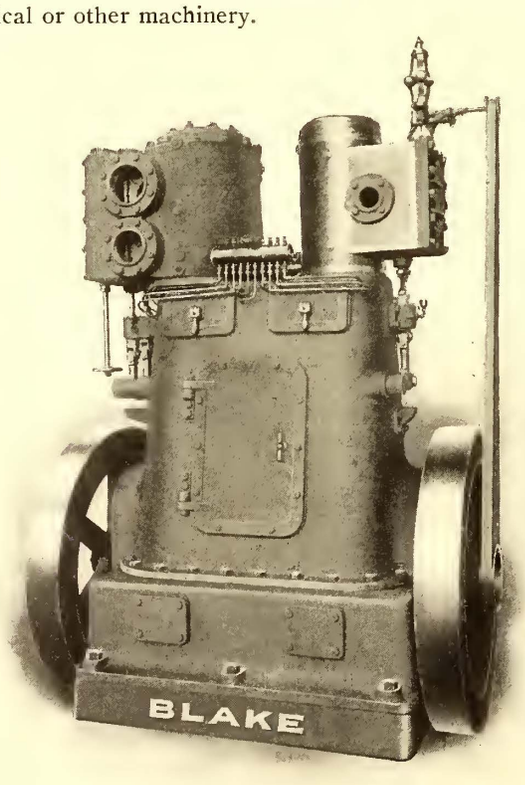
A great increase of speed in handling passengers will result from thus avoiding the usual end-door between the end platform and the body of the car, which in this case is left out in much the same manner as is the case in the new Illinois Central side-door suburban cars, which were described in the April 30, 1904, issue (page 661). This valuable provision causes the entrance and egress capacity at each end of the car to be dependent only upon the width of the sliding side doors, as the platform is thus contained in the body of the car. The side doors are made very wide, so that passengers may enter two abreast, and when inside they are not confronted by another narrow entrance door. This method of enclosing the entire floor of the car will effect an important protection for the guards as well as passengers in winter weather. Further details of these improvements will be presented in a later article illustrating and describing these interesting new cars more fully.

THE INTERNATIONAL STEAM PUMP COMPANY'S APPARATUS AT THE WORLD'S FAIR

Although the International Steam Pump Company has no individual exhibit at the Louisiana Purchase Exposition, it is well represented by conspicuous products of its manufacture used in connection with the exhibits of manufacturers of steam, electrical or other machinery.



CIRCULATING PUMP AND ROTATIVE DRY VACUUM PUMP USED WITH 2000-KW TURBINE

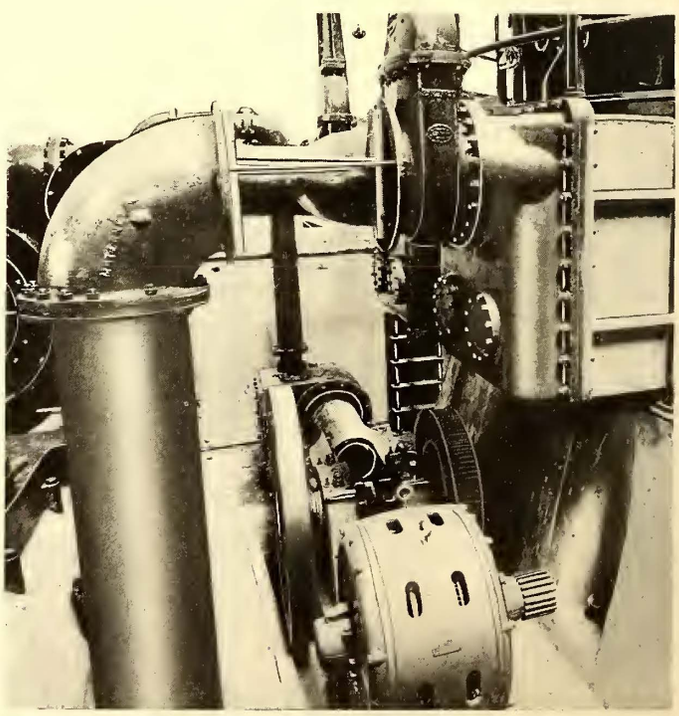


VERTICAL TYPE OF ROTATIVE DRY VACUUM PUMP

One of the most prominent of these combination exhibits is that of a 2000-kw Curtis turbine, in connection with which the International Steam Pump Company will show a Worthington surface condenser having a surface of 8000 sq. ft., and furnished with an air cooler. The condenser is located directly in the base of the turbine. The circulating water is handled by a 20-in. horizontal volute pump delivering to an open heater. This latter pump is located several feet below the condenser, and is self-regulating, requiring neither floats nor valves. Furthermore, there is no possibility of vapor binding, as in direct-acting pumps. The rotative dry-vacuum pump used in this installation has a 22-in. air cylinder and 18-in. stroke. It is driven by a General Electric motor through a Renold silent chain drive.

Another important application of the company's apparatus to steam turbines may be seen in the exhibit of Westinghouse, Church, Kerr & Company. The latter have installed a 400-kw Parsons turbine, in connection with which will be shown a 1500 sq. ft. surface condenser, with a hot well and air cooler. A horizontal rotative dry-vacuum pump is also provided.

The horizontal rotative dry-vacuum pump mentioned is of special interest. It possesses many new features and is distinctively a dry pump, intended to handle air practically free from water and is very valuable wherever high vacuums are essential. Unlike so-called dry vacuum pumps that require considerable water in the cylinders to lubricate them and to fill the clearance spaces, this machine needs none at all in the cylinders, as the pistons are lubricated by oil in the same manner as the steam cylinders, and the clearance spaces are reduced to a minimum because, there being no water, large passages are unnecessary. A very small amount of water is allowed to pass through the jackets to keep the cylinders cool and to preserve the lubricating effect of the oil. Not only is a saving in water made by this machine, but the very doubtful method of putting into the cylinders water that may carry sand and grit is entirely avoided.

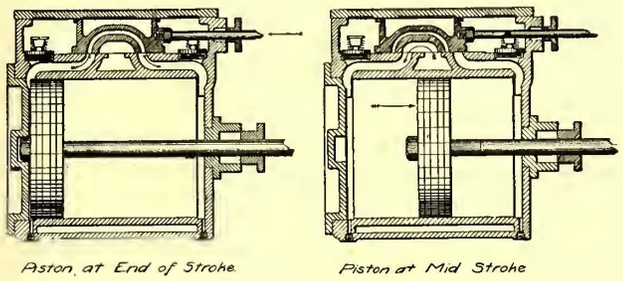


VIEW OF HORIZONTAL ROTATIVE DRY VACUUM PUMP WITHOUT CHAIN

Both the steam and the vacuum pistons are on the same piston rod. The steam valve is a slide valve, with an adjustable eccentric to vary the point of cut-off according to the

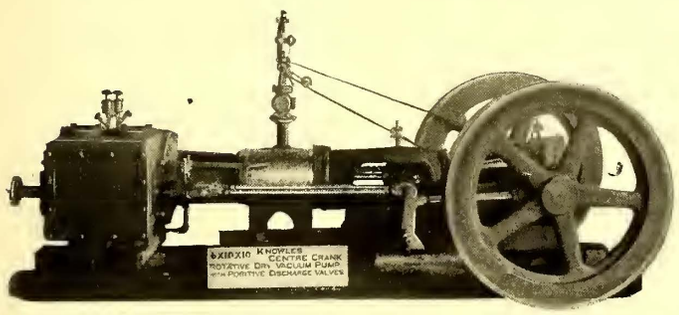
steam pressure. The suction air valve is also positively driven by an eccentric on the shaft, and so set as to open the ports fully at the proper time, leaving an unobstructed passage for the attenuated air and vapor to enter the cylinder. Unlike other air pumps, using even the smallest quantity of water, the capacity for handling air is practically in proportion to the speed.

The vertical dry-vacuum pump is a new and improved form especially adapted for marine use, or similar service where floor space is limited. It has been designed especially to meet the requirements calling for high degree of vacuum, such as demanded for the condensing system of steam turbines, etc. The machine is very compact, substantial and simple, and consists of but one air cylinder and one steam cylinder, both being double-acting. The suction and discharge valves of the air cylinder are positively operated by means of eccentrics, and



SKETCH, SHOWING THE OPERATING PRINCIPLE OF ROTATIVE DRY VACUUM PUMP CYLINDER, WITH POPPET DISCHARGE VALVES

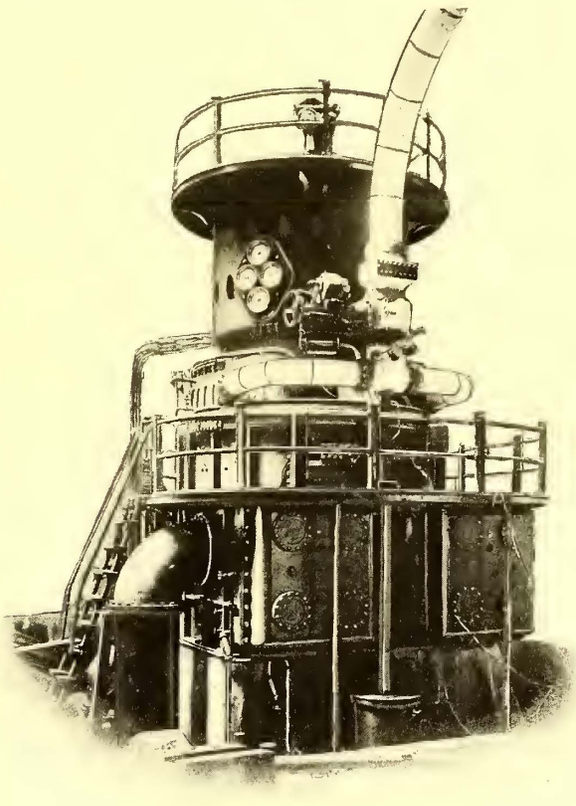
the speed of the machine is only limited by the conditions that usually exist with ordinary engines. As no water is admitted to the interior of the air cylinder, no difficulty is encountered in securing high rotative speed. Manufacturers of rotative dry-



HORIZONTAL ROTATIVE DRY VACUUM PUMP

vacuum pumps who employ the ordinary suction and delivery valves (necessitating water to be injected into the air cylinders to keep them cool and to seal the valves) require such pumps to run at a slow rate of speed to permit the water to be safely discharged as the pistons approach the end of each stroke.

The details of the air cylinder of this dry vacuum pump are as follows: The main slide valve controls the suction and is a balanced valve similar in construction to the steam valve. The discharge valve, which is made in two parts, rides on top of a balancing plate of the main slide valve referred to; these parts are adjustable by means of an outside hand wheel, so as to open and close the discharge at any position of the piston —from half to full stroke—depending upon the amount of air handled and the vacuum desired to be maintained. There are also several small poppet relief valves located on the back of the balancing plate, which automatically open and discharge at any portion of the stroke when the pressure in the air cylinder becomes greater than that of the atmosphere. These poppet valves, therefore, prevent any excessive pressure in case of a large in-rush of air, as might occur in case of unusual leakage or a break-down in the condenser or suction pipes. The suction valve, being mechanically moved, opens promptly, and therefore offers no obstruction to the entrance of vapors to overcome the tension of suction valve springs, as in the ordinary type of vacuum pump. An equalizing port formed by the suction valve and the balancing plate connects the two ends of the air cylinder at the instant of the reversal of the piston. The result is that the vapors collected in the clearance space in front of the piston, at atmospheric pressure, immediately pass back into the vacuum space at the rear of the piston; the pressure on the two sides of the air piston, being thus equalized, is reduced very nearly to that in the suction pipe, so that when the piston begins to make its return stroke, instead of the clearance space being filled with vapor at atmospheric pressure (which would expand and prevent the immediate production of a complete vacuum), work begins at once, consequently the



CONDENSER USED FOR 2000-KW TURBINE

full displacement of the piston is effective at each stroke.

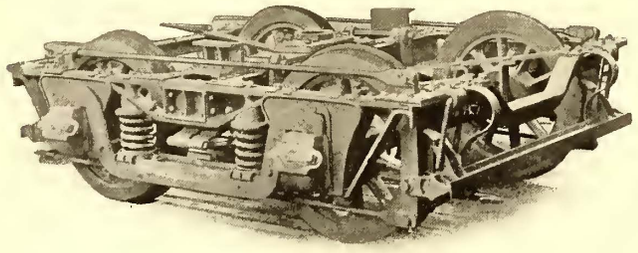
In combination with the reciprocating engine display of Westinghouse, Church, Kerr & Company, the International Pump Company will show two 40-in. elevated jet condensers, equipped with air coolers to cool and dry the air on its way from the condenser cone to three rotative dry-vacuum pumps, two horizontal and one vertical. Four cooling towers are used in connection with the elevated jet condensers. The water will be circulated by three 24-in. single stage turbine pumps. The capacity of this plant will be about 15,000 hp.

The company has also finished three 35,000 gallon Worthington 36-in. single-stage turbine pumps for the grand cascade. Other apparatus used includes fourteen 1000-gallon fire pumps; a 500-gallon multi-stage turbine pump; four 12-in. centrifugal sewage pumps, and a 2000 sq. ft. Worthington surface condenser, vertical twin Blake steam air pump and volute circulating pump for a 1000-hp Willans engine.

The International Steam Pump Company is represented in England by the Worthington Pump Company, Limited, of London, which also manufactures the former company's apparatus mentioned in this description.

NEW TRUCKS FOR THE NORTHWESTERN ELEVATED

The accompanying illustration is from a photograph of the seventy new trucks for the Northwestern Elevated Railroad Company, of Chicago, built by the St. Louis Car Company, to

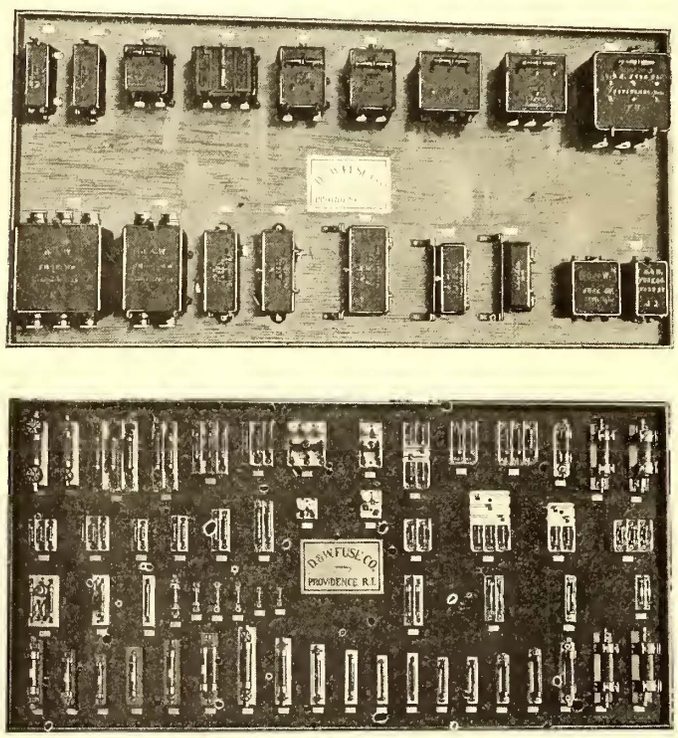


TRUCK USED ON NORTHWESTERN ELEVATED RAILWAY, OF CHICAGO

go under car bodies which are also being built by the same company. This is to be known as the St. Louis Car Company No. 50 truck. It is of the so-called M. C. B. type. Among the special features of this truck are the method of hanging the brake-shoes at the ends of the truck frame, and the outside brake rods. These features were, of course, introduced to secure a maximum amount of room for the motors without the interference of the brake rods.

SWITCHBOARDS EXHIBITED AT ST. LOUIS

The D. & W. Fuse Company, of Providence, R. I., has on exhibition in the Western Electric Company's headquarters at the Louisiana Purchase Exposition, the two sample boards

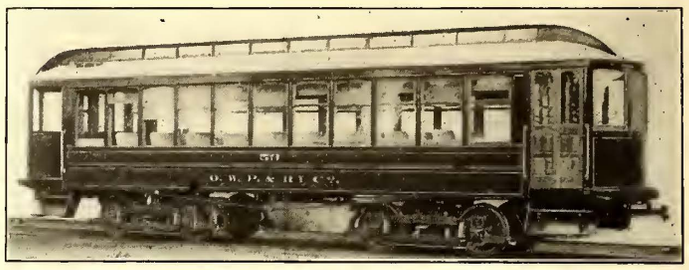


TWO SWITCHBOARD PANELS AT ST. LOUIS EXPOSITION

shown in the accompanying illustrations. One panel contains a number of open porcelain cut-outs, with cartridge fuses mounted upon them, and the second exhibits cut-outs enclosed in iron bodies. In the latter is included the iron fuse box for electric car service. This cut-out has heavy contact jaws, into which a large fuse cartridge is pushed, giving a contact similar to a knife switch. Many other fuses suitable for car lighting circuits, as well as regular lighting circuits, are shown.

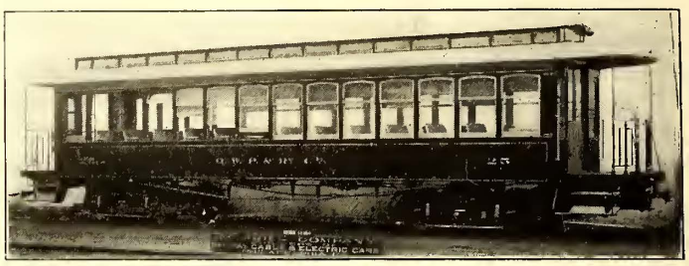
NEW CARS FOR THE OREGON WATER POWER & RAILWAY COMPANY

The eight interurban cars lately delivered to the Oregon Water Power & Railway Company, of Portland, Ore., by the J. G. Brill Company, have a number of interesting points. The trailer cars are provided with means of access from one car to another, and the motor cars are vestibuled at both ends.



MOTOR CAR ON OREGON WATER-POWER & RAILWAY COMPANY'S LINES

They are intended to be operated in trains of three cars. The platforms are flush with the car floors and constructed with extra heavy draft timbers fitted with channel-iron draw bars. Both styles of cars have the semi-convertible window system



TYPE OF TRAIL CAR USED IN PORTLAND, ORE.

of the builder. The illustrations show that the sashes may be held at different heights, admitting as little or as much air as is desirable. Arm rests are placed on the window sills, as the

CAR INTERIOR, SHOWING SEATING ARRANGEMENT AND POSITIONS OF SASHES

height from floor to top of sill is but 24⅝ ins.—too low to be reached by the elbows of adult passengers.

The interior illustration gives a good idea of the bright and attractive appearance afforded by the large windows, both open

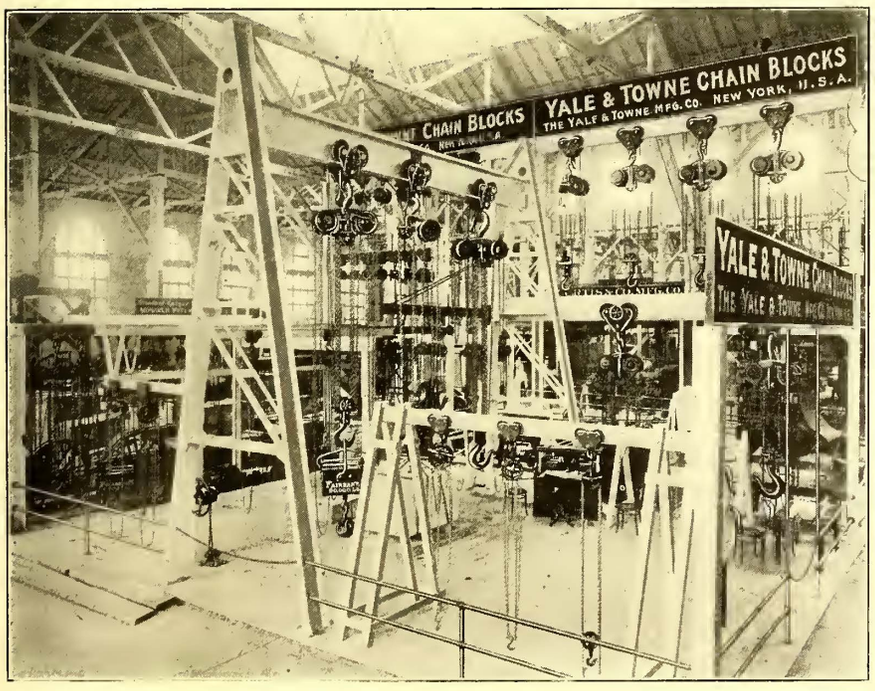
and closed. It will also be noticed that the aisle is wide enough for persons to pass comfortably; the width is 22 ins. and the seats are 36 ins. long, and yet the width over the posts is but 8 ft. 2 ins.

The general dimensions of the vestibuled cars are as follows: Length over end panels, 30 ft. 8 ins., and over vestibules, 40 ft. 1 in.; length of platforms, 4 ft. 8½ ins.; width over sills, 7 ft. 10½ ins.; and over posts at belt, 8 ft. 2 ins.; sweep of posts, 1¾ ins.; the side sills are 4 ins. x 7¾ ins., with 12-in x ⅜-in. plates on the inside; end sills, 5¼ ins. x 6⅞ ins.; thickness of corner posts, 3¾ ins., and side posts, 3¼ ins. The trailers are 38.8 ins. over the end panels, and 46 ft. 8 in. over the crown pieces. The platforms are 4 ft. from end panels over crown pieces. These cars have under trusses, with double truss needle beams.

The cars are mounted on Brill 27-E-1 trucks, with 6-ft. wheel base, 33-in. wheels, and the motor cars are equipped with four motors of 50-hp capacity each. The cars are to be run on fast schedules and are capable of sixty miles an hour. The railway company's lines are nearly all over private right of way. The main line of the system traverses the valley of the Williamette River between Portland and Oregon City.

THE YALE & TOWNE CHAIN BLOCK EXHIBIT AT THE LOUISIANA PURCHASE EXHIBITION

The Yale & Towne Manufacturing Company has spared no pains to make its exhibit interesting to the casual man, as well as to the engineering student, and it is attracting considerable attention. The company shows blocks of all three types and from one-eighth ton to twenty tons capacity, but the most interesting part of its exhibit is the moving hoists. The new electric hoist is shown in operation, and also one each of its triplex, duplex and differential blocks operated by electric motors for the purpose of showing their relative efficiency. Each block is supplied with a 1000-lb. weight, and so arranged that equal power is applied to each. The result is that the triplex block lifts its load much quicker than the others, while at the same time the ammeters show equal power applied to each block. The mechanism is automatic, so that when the triplex weight arrives at the top all three blocks reverse their motion and lower the weights until they reach the floor, when they again automatically reverse and begin to hoist. The arrangement shows at a glance the comparative efficiencies of the blocks, and is of particular interest to any engineer.



YALE & TOWNE CHAIN BLOCK EXHIBIT IN MACHINERY HALL

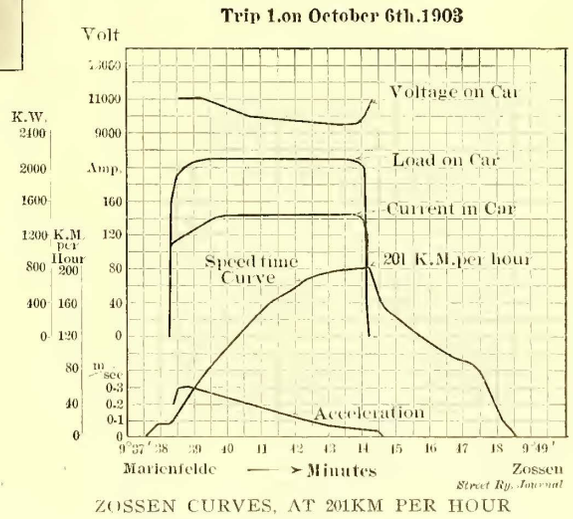
Yale & Towne triplex blocks have also been used largely for installing many of the heaviest machines at the Exposition.

TRENTON & NEW BRUNSWICK RAILROAD GIVES OUTING TO NEWSPAPER MEN

The Trenton & New Brunswick Railroad gave the newspaper men of Trenton and New Brunswick their second annual outing on Saturday evening, June 25. The affair was in charge of Herbert E. Reed, the new superintendent, who recently came to Trenton from Easton, Pa., where he was in charge of the Northampton Traction Company's lines. Thirty-one sat down to the banquet, which was served at New Brunswick. A resolution was adopted, signed and forwarded to the company's Philadelphia office regretting the non-appearance of any of the executive officers, and extending the thanks of the assemblage. Another resolution was adopted and forwarded to former Superintendent E. T. Wagenhals, who was in charge of last year's outing, but who, as vice-president of the Wagenhals Construction Company, with headquarters at Winchester, Ind., is now constructing a new line. This resolution expressed the wish that he were present, and also wished him success in his new field of labor. The Trenton & New Brunswick Company is one of the few electric railway companies in the United States that have come to realize the value of a liberal policy as regards the newspapers. As a result, stories about the company that appear in the papers can be relied on, for the company never fails to give the facts in so far as they are not positively detrimental to its interests. Through liberal advertising and its policy of publicity, the company may be said to have gained much traffic. Last year, basing the figures upon the earnings, without complete terminals, and with but ten scheduled daily trips for four months, the company carried more than 100,000 passengers a greater distance than 25 miles, aside from the local travel. This year, with practically a half-hour service and through cars to Jersey City, it would be impossible even to approximate the traffic figures.

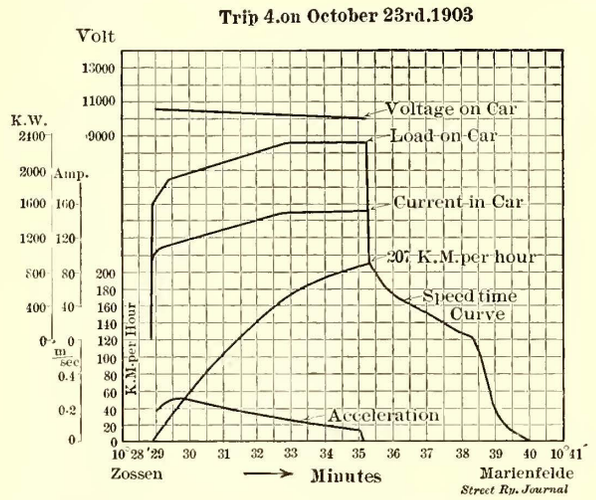
CURRENT COLLECTION ON HIGH-SPEED ELECTRIC RAILWAYS

At a recent meeting of the Elektrotechnischer Vereins, held in Berlin, Dr. W. Reichel, of the Siemens-Schuckert Company, gave an interesting lecture relative to the Siemens-Halske apparatus used in the Marienfelde-Zossen high-speed tests, and he presented the



ZOSSEN CURVES, AT 201KM PER HOUR

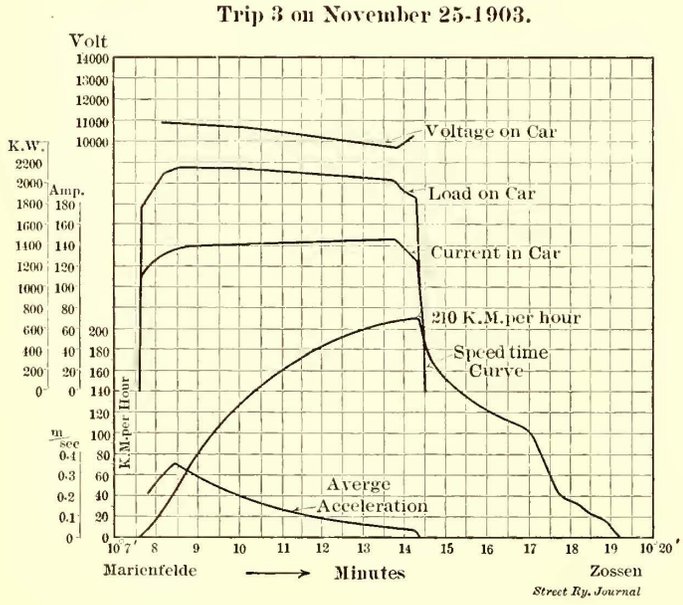
accompanying performance curves, obtained on the first, third and fourth trial trips. The early part of the discourse was given over to the comparison of the amount of power required by electrically-operated elevated trains and high-speed trunk line trains. It was shown that a four-car elevated train, weighing 90 tons, and having an acceleration of .65 m to .7 m (2.1 ft. to 2.3 ft.) per second, would require during the starting 500 kw to 600 kw, while a 250-ton



ZOSSEN CURVES, AT 207 KM PER HOUR

train consisting of one motor car and four trailers running at 150 km to 200 km (90 miles to 120 miles) an hour, would require during the acceleration period 2000 kw to 3000 kw; that is, 2000 amps. to 3000 amps. at 1000 volts, direct-current. At this comparatively low voltage the current collector would, of course, have to be very heavy.

The recognition of this difficulty in operating high-speed lines by direct-current, led Wilhelm von Siemens to suggest, in



ZOSSEN CURVES, AT 210 KM PER HOUR

1897, the use of high-tension alternating current. Following the Siemens-Halske Company's experiments at Lichterfelde in 1897, a high-tension three-phase equipment was built for the Marienfelde-Zossen tests, which began in 1901. As is well known, the early trials proved the electrical apparatus to answer all requirements, but it was found necessary to strengthen the roadbed.

In 1903 the experiments were renewed, beginning with speeds of 145 km (87 miles) and finally reaching 210 km (126 miles) per hour. When the car attained a speed of 175 km (105 miles) per hour, it was found that the weight and lack of elasticity of the current collectors induced considerable swaying of the power wires, causing serious interruption in the collection of current. Several changes were therefore made in the design of these collectors, so that it became possible to collect as much as 2500 kw, although the pressure of the current collectors on the line was only 2.5 kg to 3 kg (5 lbs. to 6 lbs.)

In conclusion, Dr. Reichel stated that he felt convinced that the sliding type of current collector was far superior to any form of rolling contact; that where trolley wheels are used the pressure of the wheel against the wire is often as much as 20 kg to 25 kg (40 lbs. to 50 lbs.), even at speeds not exceeding 75 km (45 miles) per hour, and that on interurban lines the life of the trolley wheel was hardly one-third of what it would be in ordinary city service.

STREET AND ELEVATED RAILWAY MILEAGE, CARS AND CAPITALIZATION OF THE UNITED STATES AND CANADA

The accompanying table shows the mileage, number of cars and capitalization of the street railway companies in the United States and Canada for the year 1903, and has been compiled from the 1904 edition of "American Street Railway Investments." The reports in "American Street Railway Investments" are, in the main, for the year ending Dec. 31, so that the figures given in the table for 1902 and 1903 may fairly be said to represent the condition of the industry at the end of each calendar year. Similar tables have been published in this paper annually for several years back, but statistics for the cable and steam motive powers have been given separately. In view of the rapid disappearance of both motive powers for street railway work, it has been considered better to unite them this year. In this column it will be seen that outside of New York, Illinois and Missouri, the use of these outside motive powers are confined largely to the Pacific Coast. The New York figures are made up almost entirely of the steam equipment of the Brooklyn elevated railways, which is now disappearing. Illinois still reports a considerable number of cable cars, owing to the continued use of the cable in Chicago, but there has been a decrease in Colorado, Washington and California.

The capital liabilities for the United States have increased slightly less than 10 per cent, whereas in Canada they have increased slightly more than 20 per cent. The principal increases in the United States are in New York, Pennsylvania, Ohio, Indiana, Illinois, Colorado, Washington and California. These increases have been due both to the formation of large holding companies in a few cities in each State, and also to new enterprises.

Under "electric railways" a new classification was adopted by providing a column for service cars, in which are included mail cars, tower cars, snow plows, freight cars, and, in fact, all cars outside of passenger cars used in the operation or construction of a line, but this column does not include vehicles which do not run upon the track. In previous years no special effort was made to secure statistics of these cars, but when reported they were grouped with the trail cars.

In a few cases, where reliable reports could not be obtained of the capital stock and funded debt of the companies, estimates have been made based upon the known physical property of the separate companies. As the roads so not reporting were very small, however, both in number and importance, the estimates, it is thought, do not vitally affect the accuracy of the table. More important estimates had to be made of the outstanding capital stock and funded debt in cases where holding or leasing companies owned portions of the outstanding obligations and capital of sub-operating companies. These estimates were required, as many of the holding companies do not report the proportion of the capitalization of sub-companies controlled by them.

STREET AND ELEVATED RAILWAY MILEAGE, CARS AND CAPITALIZATION IN UNITED STATES AND CANADA.

COMPILED FROM THE STATISTICS OF THE VARIOUS PROPERTIES CONTAINED IN "AMERICAN STREET RAILWAY INVESTMENTS," EDITION OF 1904.

STATES.	No. of Roads.	ELECTRIC RAILWAYS.							CABLE AND STEAM RAILWAYS.						HORSE RAILWAYS				TOTAL RAILWAYS.				CAPITAL STOCK.			FUNDED DEBT.			CAPITAL LIABILITIES.			STATES.
		TRACK MILEAGE.		MOTOR CARS		TRAIL CARS.		SERVICE CARS.	TRACK MILEAGE.		GRIP CARS OR LOCOMOTIVES.		TRAIL CARS.		TRACK MILEAGE.		CARS.		TRACK MILEAGE.		CARS.		TOTAL.		INCREASE FOR YEAR.	TOTAL.		INCREASE FOR YEAR.	TOTAL.		INCREASE FOR YEAR.	
	1903	1902	1903	1002	1903	*1902	1903	1908	1902	1903	1902	1903	1902	1903	1902	1903	1902	1903	1902	1903	1902	1903	1902	1903		1902	1903		1902	1903	
New England States.																															**New England States.**
Maine	19	331	353	432	450	50	57	182	....	....	....	....	....	....	3	3	6	6	334	356	488	645	$4,207,075	$5,081,813	$784,738	$5,408,000	$5,961,000	$553,000	$9,705,075	$11,042,813	$1,337,738	Maine
New Hampshire	21	223	362	245	364	58	6	40	....	....	....	....	....	....	....	....	....	....	223	362	303	410	4,914,900	6,004,900	1,090,000	10,043,500	11,350,500	1,307,000	14,958,400	18,255,400	3,297,000	New Hampshire
Vermont	10	95	112	98	126	2	2	2	....	....	....	....	....	....	....	....	....	....	95	112	100	130	1,825,000	2,800,100	975,100	1,450,000	2,168,000	718,000	3,275,000	4,968,100	1,693,100	Vermont
Massachusetts	117	2,466	2,621	7,144	7,403	1,043	146	1,094	....	....	....	....	....	....	....	....	25	25	2,466	2,621	8,212	8,668	85,655,050	88,709,718	3,053,668	40,058,000	43,744,000	3,686,000	125,713,050	132,452,718	6,739,668	Massachusetts
Rhode Island	11	347	384	765	872	103	6	32	....	....	....	....	....	....	....	....	....	....	347	384	868	910	14,725,000	17,725,000	3,000,000	18,762,500	19,360,200	597,700	33,487,500	37,085,200	3,597,700	Rhode Island
Connecticut	28	591	668	1,116	1,264	102	20	178	....	....	....	....	....	....	....	....	...	....	591	668	1,218	1,462	23,851,240	27,887,390	4,036,650	16,751,000	20,222,000	3,471,000	40,602,240	48,109,890	7,507,650	Connecticut
TOTAL	206	4,053	4,500	9,800	10,479	1,358	237	1,478	....	....	....	....	....	...	3	3	31	31	4,056	4,503	11,189	12,225	135,268,265	149,108,421	13,840,156	92 473,000	102,805,700	10,332,700	227,741,265	251,914,121	24,172,856	TOTAL
Eastern States.																															**Eastern States.**
New York	124	2,921	3,175	0,834	11,788	1,721	2,114	987	37	37	125	122	2,717	533	122	122	1,025	940	3,030	3,334	15,422	16,484	300,158,298	324,490,117	24,337,819	286,109,782	298,226,060	12,116,278	586,268,080	622,722,177	36,454,097	New York
New Jersey	59	907	1,025	1,800	1,939	232	112	11	....	2	....	28	....	....	6	6	25	8	913	1,033	2,057	2,098	85,252,300	86,089,160	836,860	73,733,000	74,836,090	1,103,090	158,085,300	160,925,250	1,939,950	New Jersey
Pennsylvania	223	2,842	3,342	6,706	7,298	748	232	656	3	....	....	....	23	....	....	....	....	....	2,845	3,342	7,471	8,186	200,484 286	224,518,826	24,034,540	151,163,964	153,177,559	2,013,595	351,648,250	377,696,385	26,048,135	Pennsylvania
Delaware	0	127	136	173	313	2	3	....	....	....	....	....	....	....	....	....	....	....	127	136	175	316	4,020,000	4,900,000	880,000	3,505,000	6,974,000	3,469,000	7,525,000	11,874,000	4,340,000	Delaware
District of Columbia	8	294	204	828	828	243	243	13	....	....	....	....	....	....	....	....	....	....	294	294	1,071	1,084	29,605,000	29,605,000	.....	20,226,350	20,267,450	41,100	49,831,350	49,872,450	41,100	District of Columbia
Maryland	9	431	471	1,658	1,700	53	10	45	....	....	....	....	....	....	....	....	....	....	431	471	1,711	1,755	16,823,306	16,908,306	85,000	52,251,695	53,116,604	864,999	69,075,001	70,025,000	949,990	Maryland
Virginia	18	371	402	578	594	60	14	84	....	....	....	....	....	....	....	2	....	2	371	404	638	694	22,586,250	26,469,500	3,883,250	25,708,000	28,520,814	2,821,814	48,294,250	54,999,314	6,705,064	Virginia
West Virginia	9	222	228	300	313	3	....	3	....	....	....	....	....	....	....	....	....	....	222	228	303	316	4,653,000	6,530,500	1,877,500	4,089,000	6,429,100	2,340,100	8,742,000	12,959,600	4,217,600	West Virginia
TOTAL	456	8,115	9,073	21,871	24,773	3,062	2,728	1,799	40	39	125	150	2,740	533	128	130	1,050	950	8,283	9,242	28,348	30,033	663,582,440	719,517,409	55,934,969	616,786,791	641,556,767	24,769,976	1,280,369,231	1,361,074,176	80,704,945	TOTAL
Central States.																															**Central States.**
Michigan	30	1,199	1,359	1,741	1,896	168	71	145	....	.. .	....	....	....	....	2	....	2	....	1,201	1,359	1,911	2,112	34,068,400	39,920,000	5,851,600	33,773,000	42,474,000	8,701,000	67,841,400	82,394,000	14,552,600	Michigan
Ohio	92	2,881	3,481	4,499	4,806	390	261	135	7	6	76	4	....	....	....	....	....	....	2,888	3,487	4,965	5,206	154,061,050	174,910,550	20,849,500	78,592,500	95,182,100	16,589,600	232,653,550	270,092,650	37,439,100	Ohio
Indiana	47	1,026	1,597	1,097	1,500	180	121	21	....	....	....	....	....	....	7	7	28	15	1,033	1,604	1,305	1,657	20,175,900	48,605,900	19,430,000	31,701,500	42,189,000	10,487,500	60,877,400	90,794,900	29,917,500	Indiana
Kentucky	14	250	276	569	733	284	242	5	....	....	....	....	....	....	....	....	....	....	250	276	853	980	8,390,900	9,781,900	1,391,000	8,604,300	9,766,300	1,162,000	16,995,200	19,548,200	2,553,000	Kentucky
Wisconsin	19	507	525	783	800	77	70	....	....	....	....	....	....	....	....	....	....	2	507	525	860	872	15,239,500	17,791,500	2,552,000	13,818,050	17,032,250	3,214,206	29,057,550	34,823,756	5,766,206	Wisconsin
Illinois	54	1,871	1,986	4,031	4,778	801	863	222	92	103	604	467	2,433	2,433	14	14	10	6	1,977	2,103	7,879	8,769	165,197,860	168,807,916	3,610,250	99,610,650	107,724,000	8,113,350	264,808,310	276,531,910	11,723,600	Illinois
Minnesota	10	383	383	811	813	304	300	....	....	....	....	....	....	....	....	....	....	....	383	383	1,115	1,119	25,186,495	25,591,495	405,000	13,881,000	15,895,000	2,014,000	39,067,495	41,486,495	2,419,000	Minnesota
Iowa	24	442	478	729	791	113	85	....	....	....	....	....	....	....	4	2	4	2	446	480	846	878	15,288,000	16,536,000	1,248,000	8,823,000	9,313,500	490,500	24,111,000	25,849,500	1,738,500	Iowa
Missouri	24	974	988	2,394	2,407	71	174	16	33	33	187	187	198	198	8	3	9	5	1,015	1,024	2,859	2,987	66,497,800	69,125,100	2,627,300	86,379,000	93,443,300	7,064,300	152,876,800	162,568,400	9,691,600	Missouri
TOTAL	314	9,533	11,073	15,654	18,524	2,388	2,193	544	132	142	867	658	2,631	2,631	35	26	53	30	9,700	11,241	22,593	24,580	513,105,705	571,070,355	57,964,650	375,183,000	433,019,456	57,836,456	888,288,705	1,004,089,311	115,801,106	TOTAL
Southern States.																															**Southern States**
North Carolina	9	82	77	109	113	11	2	8	....	....	....	....	....	....	2	2	3	3	64	79	123	128	1,815,600	2,348,100	532,500	1,375,000	2,732,500	1,357,500	3,190,600	5,080,600	1,890,000	North Carolina
South Carolina	5	73	80	107	128	16	16	....	....	....	....	....	....	....	3	3	8	3	78	83	131	147	2,012,000	2,718,000	706,000	3,035,000	3,450,000	415,000	5,047,000	6,168,000	1,121,000	South Carolina
Georgia	13	330	359	459	510	22	22	1	....	....	....	....	....	....	6	0	6	6	336	365	487	539	16,736,400	19,441,000	2,704,600	14,072,500	16,793,000	2,720,500	30,808,900	36,234,000	5,425,100	Georgia
Florida	8	83	81	58	67	8	8	18	9	9	18	3	....	....	6	6	4	4	78	96	88	100	1,606,000	2,466,000	860,000	1,532,000	2,069,000	537,000	3,138,000	4,535,000	1,397,000	Florida
Alabama	12	213	234	287	267	110	90	19	....	10	....	2	....	10	7	....	7	....	220	244	404	398	8,475,000	11,075,900	2,600,900	7,663,000	9,109,000	1,446,000	16,138,000	20,184,900	4,046,900	Alabama
Mississippi	7	39	55	59	73	2	....	1	....	....	....	....	....	....	....	....	....	....	39	55	61	74	885,500	1,925,000	1,039,500	680,000	1,408,000	728,000	1,565,500	3,333,000	1,767,500	Mississippi
Tennessee	20	268	294	394	458	110	103	1	17	7	21	13	....	4	....	....	....	....	285	301	525	577	9,632,000	9,674,500	42,500	8,100,000	9,708,625	1,608,625	17,732,000	19,383,125	1,651,125	Tennessee
Louisiana	0	207	217	611	578	7	5	....	....	...	....	....	....	....	9	5	14	14	216	222	032	697	32,538,000	36,692,800	4,154,800	25,442,200	30,880,000	5,437,800	57,980,200	67,572,800	9,592,600	Louisiana
Arkansas	8	65	75	119	141	27	28	....	....	....	....	....	....	....	....	....	....	....	65	75	146	169	1,200 000	2,970,000	1,770,000	1,400,000	2,070,000	670,000	2,800,000	5,040,000	2,440,000	Arkansas
TOTAL	85	1,320	1,472	2,203	2,433	313	274	48	28	20	39	18	....	14	33	22	42	30	1,379	1,520	2,597	2,817	74,900,500	89,311,300	14,410,800	63,299,700	78,220,125	14,920,425	138,200,200	167,531,425	20,331,226	TOTAL
Western States.																															**Western States.**
North Dakota	2	....	13	....	11	..	....	....	....	....	....	....	....	....	....	....	....	....	....	13	....	11	.....	260,000	260,000	.....	210,000	210,000	.....	470,000	470,000	North Dakota
Nebraska	7	147	166	202	347	52	80	....	....	....	....	....	....	....	19	19	23	23	186	185	277	456	10,200,500	10,587,500	387,000	7,450,000	7,875,000	425,000	17 650,500	18,462,500	812,000	Nebraska
Kansas	11	112	116	116	139	55	35	5	....	....	....	....	....	....	17	17	26	26	129	133	197	205	2,665,000	2,665,000	.....	1,595,000	1,885,000	290,000	4,260,000	4,550,000	290,000	Kansas
Indian Territory	1	9	9	9	0	....	....	....	....	....	....	....	....	....	....	....	....	....	9	9	9	9	212,500	212,500	.....	191,000	191,000	.....	403,500	403,500	.....	Indian Territory
Oklahoma	1	7	11	7	10	2	2	....	....	....	....	....	....	....	....	....	....	....	7	11	9	12	160,000	220,000	80,000	160,000	220,000	60,000	320,000	440,000	120,000	Oklahoma
Texas	20	343	349	548	562	50	41	....	....	....	....	....	....	....	....	....	....	....	352	358	608	613	14,624,500	15,807,500	1,183,000	9,850,000	11,979,000	2,129,000	24,474,500	27,786,500	3,312,000	Texas
Colorado	10	245	320	377	410	62	57	29	86	19	84	47	....	....	2	....	2	....	333	339	525	543	11,305,000	17,650,000	6,345,000	9,564,000	15,802,000	6,233,000	20,869,000	33,452,000	12,583,000	Colorado
Montana	5	81	62	74	77	25	16	12	....	....	....	....	....	....	....	....	....	....	01	62	99	105	1,395,000	1,695,613	300,613	1,105,500	1,200,000	3,500	2,591,500	2,895 613	304,113	Montana
Idaho	2	4	36	2	9	....	7	....	....	....	....	....	....	....	....	....	....	....	4	30	2	16	54,000	404,000	350,000	.....	.....	.....	54,000	404,000	350,000	Idaho
Utah	3	105	105	103	146	26	7	....	....	....	....	....	....	....	....	....	....	....	105	105	129	153	3,400,000	6 400,000	3,000,000	1,263,000	2,870,000	1,607,000	4,663,000	9,270,000	4,607,000	Utah
Washington	14	255	377	301	460	26	71	102	21	21	75	55	67	....	....	....	....	4	276	393	469	692	16,889,100	24,091,100	7,202,000	10,909,000	15,690,000	4,781,000	27,798,100	39,781,100	11,983,000	Washington
Oregon	8	159	198	241	263	00	47	127	2	2	4	2	....	9	3	....	2	2	184	200	343	450	4,807,000	4,888,000	81,000	9,978,000	9,978,000	.....	14,785,000	14,866,000	81,000	Oregon
California	38	1,113	1,321	1,103	1,429	244	69	70	100	103	619	595	40	123	39	29	84	52	1,252	1,453	2,090	2,338	69,421,750	86,560,400	17,138,650	72,309,000	78,042,000	5,733,000	141,730,750	164,602,400	22,871,650	California
Arizona	3	11	11	10	10	7	7	....	....	0	....	4	....	....	5	5	5	7	16	22	22	28	77,500	277,800	200,300	61,500	120,000	58,500	139,000	397,800	258,800	Arizona
TOTAL	125	2,571	3,094	3,093	3,882	645	445	345	209	151	782	703	107	132	94	79	152	124	2,874	3,324	4,779	5,631	135,211,850	171,719,413	36,507,563	124,527,000	146,062,000	21,535,000	259,738,850	317,781,413	58,042,563	TOTAL
United States	1,187	25,592	29,212	53,521	60,091	7,768	5,877	4,214	407	358	1,813	1,529	5,478	3,310	293	260	1,328	1,165	26,292	29,830	70,006	76,186	1,522,008,760	1,700,726,898	178,658,138	1,272,269,491	1,401,664,048	129,394,557	2,704,338,251	3,102,390,946	308,052,695	**United States**
Canada	42	815	860	1,973	2,305	383	71	40	39	60	25	12	73	76	....	....	....	....	854	920	2,404	2,504	28,903,894	34,201,080	5,297,186	17,546,258	25,147,658	7,601,300	46,450,152	59,348,638	12,898,488	**Canada**

* Includes service cars.

FINANCIAL INTELLIGENCE

WALL STREET, July 9, 1904.

The Money Market

The money market has given another proof of its extremely easy state in the unconcerned way with which it handled the half-yearly corporation settlements. Although the demands for this purpose came at the time when Wall Street was arranging its loans for a three days' holiday, there was scarcely a stir in money rates to indicate that anything unusual was taking place. Call money on the first day of July did not get above 1¼ per cent, and all renewals were made at this or even a slightly lower figure. The report of the national banks under the recent call of the Controller was interesting for one fact of great importance which it brought to light. It showed that the deposits of outside institutions (that is, trust companies, States banks, banks with a Federal charter, but not located at the reserve centers) carried with the central reserve banks have increased during the year almost as much as the loans of the entire country. The significance of this lies in its bearing on the question whether there has been any great credit inflation within the last twelve months. It appears to prove a negative; that is to say, it shows that while the larger banks have been increasing their credits, other institutions have been reducing theirs, preferring to keep their funds on deposit to putting them out at unremunerative rates of interest. The conclusion naturally follows that were money to harden at all in the autumn, these outside lenders would reappear in the market and assume a good part of the loans now being carried by the central banks, causing the loan account of the latter to decrease. There is little to say by way of comment on the other features of the immediate money situation. They remain substantially unchanged from a fortnight ago. The New York surplus reserve has been slightly reduced because of an excess of loan expansion over addition to cash held in reserve. But the decrease is of no consequence whatsoever. Currency continues to pour in from the interior of the country in undiminished and, for the season, in almost unprecedented volume. Sterling exchange shows no inclination to move any nearer the gold-shipping point. Consequently, the only outlet to these fresh accessions to the cash supply, lies in an extension of banking credits. The plethoric condition is best illustrated by the unwillingness of borrowers to bid more than 3 per cent for loans running over the first of next year.

The Stock Market

Two circumstances have cast their influence powerfully upon the movement of prices during the last two weeks. The first is the probability, which events have developed into a virtual certainty, that there will be no cause of disturbance to business from the Democratic nominations about to be made this week. The second and more important is the excellent reports which are coming in from the harvest regions. The July government estimates on cotton are particularly worthy of note, revealing an advance from 83 to 88 per cent in the condition of the crop during June on the largest area ever under cultivation. What this means, of course, is that it will take some extraordinary accident in the three months intervening before picking time, to prevent the greatest yield of cotton the country has ever known. The first definite statistics on the corn crop are due on Monday next, when the agricultural bureau will give out its calculations on the condition and acreage, as of the first of July. In the meantime the most trustworthy information is that a record area has been seeded to corn this season, and that while the plant is rather backward and in many localities not up to the standard of growth, its average position is very satisfactory. On the strength of the promising crop outlook and the clearing political situation, the upward tendency previously observed on the Stock Exchange has become more distinct, and some rather heavy buying has started in the leading railway issues. A sustained bull movement is hardly expected yet awhile, but what has happened, and what is happening, all bears out the analysis of the Wall Street condition as one where recovery has set in slowly but surely and is likely to make steady progress.

A violent rise in Metropolitan Street Railway and Metropolitan Securities issues at the close of last week still awaits some satisfactory explanation. Opinion is divided as to whether it was merely a bold demonstration against a weak short interest or whether there has not been recently heavy accumulation of the stocks in anticipation of some announcement which will add materially to the value of Metropolitan as an investment. Both Manhattan and Brooklyn Rapid Transit sold at the highest prices of the present upward swing, but their rise seemed to be wholly sympathetic with the pyrotechnics in the Metropolitan market.

Philadelphia

Advances in the investment and semi-investment group of traction stocks have been the main characteristic in the two weeks' Philadelphia dealings. Philadelphia Traction is up from 96⅞ to 98—the highest reached in a long while past. Union Traction has risen steadily from 50½ to 52, which also is the high mark for the season. Nothing, save the improvement in the general investment demand, appears to explain the gains in these stocks. In the usual speculative favorites trading has been comparatively light.

Price variations have likewise been exceedingly limited. Philadelphia Company common has not sold below 38¾, nor above 39⅜, ending for the period under review at the higher quotation. Philadelphia Electric has fluctuated between 6 and 6 3-16, the stories industriously circulated of an alliance with the Electric Company of America failing to have any effect. American Railways did not go above the top price—46—of two weeks ago; the stock reacted slightly, 160 shares selling at 45¾. Only 45 shares of Rapid Transit sold, altogether, at 12. Five hundred Consolidated of New Jersey sold on an advance from 67¾ to 68¼, after which, with the dividend off its price, the stock changed hands at 67⅝. Seventy shares of Scranton Railway common sold at 17½, an advance of 5½ points from the last previous sale. Sixty shares of the preferred went at 40. Easton Consolidated Electric sold at 11 for a small lot, after which 500 shares were dealt in at 10. Other minor transactions included Union Passenger Railway (5 shares) at 240, West Philadelphia Passenger (50 shares) at 247½, and United Railways of San Francisco preferred at 47.

Chicago

Prices, as a rule, have worked lower in the Chicago market. Securities of the elevated companies have been affected adversely by the ordinance calling for a universal transfer system which, it is feared, may be forced upon the roads. Metropolitan Elevated preferred on scattered transactions of a few hundred shares melted away from 57 to 52. The common sold down 2 points to 19. Ten shares of Northwestern common went at 17. South Side at 91, and Lake Street at 3½ to 3¾ were comparatively steady, but the weakness of the other elevated stocks was the most important incident of the fortnight. The transfer proposal will be brought up before the Council again at its next meet, and will be fought by the railroad companies. It has been rumored, however, that the roads might make the concession if they were given the right to extend their platforms. Franchise negotiations between the city and the Union Traction Company have been broken off abruptly, because the company refuses to accept the city's commutation plan. There have been virtually no dealings in the surface line issues during the past fortnight. Five shares of North Chicago sold at 70, or 10 points down from the high of a month ago. Later 72 was paid for 10 shares. West Chicago sold between 45 and 45¼, for a few odd lots.

Other Traction Securities

The Boston Traction specialties have been inclined to sell off in the recent trading. Elevated shares were offered down from 151½ to 149, bringing out some stock. Cessation of the recent investment buying is evidently what this decline reflected. Massachusetts Electric common rose from 19½ to 20¼, and then fell back to 18¾. The preferred, selling "ex" dividend advanced from 71 to 73½, reacted to 72 and rallied to 73. West End common gained a point from 90½ to 91½, but quickly eased off to 91. The preferred "ex" dividend advanced from 109 to 110¼. In Baltimore trading in the usually active issues was very light. There were no sales of United Railways stock. Several small lots of the income bonds were taken between 42 and 43¼. The general 4s were bought more freely between 90 and 90½. Other trading for the fortnight comprised Baltimore Traction 5s at 113¼, City and Suburban (Washington) 5s at 98½, Augusta Street Railway 5s at 100½, Wilmington (North Carolina) 5s at 100, and Pittsburg Traction 5s at 113¼. On the New York curb Interborough Rapid Transit was again the feature. In the week ending last Saturday week, it advanced from 118 to 121 on sales of 1450 shares. Last week it rose to 123 with 3800 shares changing hands, and

yesterday it made still another high record—125—on sales of 1770 shares. Ninety shares of New Orleans common went at 9⅞ to 9½, 100 St. Louis Transit at 13⅜ and 100 at 13. Not quite 100 shares of Brooklyn City Railway were dealt in at 232, and Nassau bonds in the same group were very strong, advancing from 83⅜ to 84½. One lot of Chesapeake Traction 5s sold at 101.

Security Quotations

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

	Closing Bid	
	June 21	July 5
American Railways	44½	45½
Aurora, Elgin & Chicago	a14	a14
Boston Elevated	150	148
Brooklyn Rapid Transit	48¾	49¼
Chicago City	a175	a168
Chicago Union Traction (common)	—	4⅞
Chicago Union Traction (preferred)	a30	a30
Cleveland Electric	69	70
Consolidated Traction of New Jersey	67	*67¼
Consolidated Traction of New Jersey 5s	105¾	106¾
Detroit United	60¾	61
Interborough Rapid Transit	118½	124¼
Lake Shore Electric (preferred)	—	—
Lake Street Elevated	—	3⅜
Manhattan Railway	148½	149⅞
Massachusetts Electric Cos. (common)	18	19¾
Massachusetts Electric Cos. (preferred)	70½	*72
Metropolitan Elevated, Chicago (common)	18½	18½
Metropolitan Elevated, Chicago (preferred)	55	52
Metropolitan Street	110⅞	115
Metropolitan Securities	76¼	84
New Orleans Railways (common)	9	9
New Orleans Railways (preferred)	27½	29
New Orleans Ralways, 4½s	74	74
North American	85½	86½
Northern Ohio Traction & Light	13	13¼
Philadelphia Company (common)	38⅝	38¾
Philadelphia Rapid Transit	11¾	11¾
Philadelphia Traction	96½	98
St. Louis (common)	13	12¾
South Side Elevated (Chicago)	90½	90¾
Third Avenue	119	121½
Twin City, Minneapolis (common)	94	94½
Union Traction (Philadelphia)	50¼	51⅞
United Railways, St. Louis (preferred)	56½	56½
West End (common)	90¾	90½
West End (preferred)	109	110

a Asked.

Iron and Steel

The past week, having been pretty largely a holiday period, has developed little that is new in the iron situation. A better feeling undoubtedly exists so far as the future is concerned, but actual conditions are scarcely changed from what they have been during the last two months. Business is very dull, and prices are still being shaded in various lines. The "Iron Age" records the fact that with a capacity of 3,500,000 tons, the rail mills have booked 1,500,000 tons of orders thus far this year, including orders carried over from 1903. This is encouraging, inasmuch as it indicates that if the rail trade were to pick up at all during the next six months, the mills would have more than enough to do. Quotations are as follows: Bessemer pig iron $12.65, Bessemer steel $23, steel rails $28.

Metals.

Quotations for the leading metals are as follows: Copper 12¾ and 12½ cents, tin 26 cents, lead 4¼ cents, and spelter 4 13-16 cents.

ELECTRICITY ON THE DERBY LINE OF THE NEW HAVEN —NEW TERMINAL STATION IN NEW HAVEN

The announcement is made that the next step in the development of the plans of the New York, New Haven & Hartford Railroad Company for electrical equipment will be the operation of the Derby branch by electricity and the construction of a large power house in New Haven. It is possible that water power in Windham County, where under the charter of the new Consolidated Railway Company, the New Haven road has peculiar water privileges, will be developed for this purpose. The Derby cars will be run by the overhead trolley system rather than by the third rail, as President Mellen is said to consider the former preferable.

The plans for the construction of the new depot in New Haven have recently been altered by the company. These plans were tentatively drawn some time ago, and they have now been changed to accord to the new conditions made by the purchase by the steam road of the local electric railway lines. In the changes of the architectural plans the new depot, which is to be located in Union Avenue, between the present depot and the office building, will be a trolley as well as a steam depot. Trolley cars will run into it, in shelter, and it will be possible for steam passengers to step from the New York road, for instance, on to a trolley car that will carry them to Whitney Avenue. Cars of the Derby branch when equipped with electricity will run into the new station and through it to Chapel Street, whence they will run over the present New Haven-Derby trolley line back to Derby. It will thus be a loop line. The new station is to cost $1,000,000 and the improvement in the railroad cut here will cost another $1,000,000. Work on both will be begun next spring.

President Mellen is credited with the statement that within ten years a speed of 75 miles an hour can be made by cars of the New York, New Haven & Hartford Railroad, between Boston and New York by means of electricity, and the rapid development of his plans for the utilization of the trolley is believed to forecast the the carrying out of his prediction. The general expectation seems to be that announcement of the purchase of additional trolley lines is likely to be made very soon.

IMPORTANT TRANSFER DECISION FOR LOS ANGELES

Judge N. P. Conrey, of the Superior Court of Los Angeles County, has handed down an important decision, in a legal fight inaugurated by private citizens, wherein he grants a writ of mandate for the issuance of transfers between the Pacific Electric Railway Company and the Los Angeles Railway Company on East Ninth Street. When the East Ninth Street line was acquired by the Pacific Electric Railway Company, Jan. 1, 1904, the previous rule of giving transfers to other lines of the Los Angeles Railway Company was suddenly dispensed with. Then it was that the citizens of the East Ninth Street section of the city realized that to get to many parts of the municipality by street car they were compelled by circumstances to pay two fares. Finally, the courts were resorted to.

It is announced that immediate appeal will be taken to the Supreme Court, by the railways, from Judge Conrey's opinion, which follows:

D. S. Reynolds vs. Pacific Electric Railway Company and Los Angeles Railway Company:

Petition for writ of mandate to compel defendants to issue and receive transfers on East Ninth Street and all intersecting lines of street railway owned or operated by said corporations.

The evidence does not sustain the petitioner's claim that one of the defendants controls the other defendant. As business corporations, it appears that defendants are separate and independant of each other, although it is true that they have the same president and their stock is, in large part, owned by the same individuals.

There is no doubt that, during the four years preceding Jan. 1, 1904, while the Los Angeles Railway Company owned and operated the East Ninth Street line and all the intersecting lines, that company was obligated to give and receive transfers between said lines. This obligation arose out of the terms of the franchise granted by the city for the construction and operation of said line on East Ninth Street. After taking into consideration the language of the franchise ordinance, together with the purpose for which the franchise was granted and the manner in which the roads were being operated prior to the preesnt year, and the nature of the rights held and exercised by the defendants, it is my opinion that the burden of giving and receiving such transfers as these here in question has not ceased to accompany the benefits which the defendants enjoy.

I think that when the Los Angeles Railway Company surrendered to its co-defendant the possession of East Ninth Street (so far as such possession existed for street railway purposes) the Pacific Electric Railway Company received that possession subject to all existing burdens thereof.

It willl be ordered that the writ of mandate issue as prayed for.

ELECTRIC TRACTION FOR BALLARAT, AUSTRALIA

Australian advices state that the Electric Supply Company, of Victoria, Ltd., the company which recently purchased the horse-car line in Ballarat, formerly operated by the Ballarat Tramways Company, with the intention of installing an electric traction system in that prosperous Victoria mining center, is seeking the sanction of the municipal authorities and the Victoria Parliament to several extensions of the line, all of which will be operated by electric motive power.

South African advices state that the Cape Electric Tramways are to be considerably extended. The present system is about 30 miles long. J. E. Lloyd is general manager of the company. The London offices of the concern are at 56 Bishopsgate Street, Within, E. C.

A NEW ELEVATED TRAIN FOR THE BROOKLYN ELEVATED LINES

An interesting trial trip was made, Friday, July 1, upon a newly equipped elevated train for the Brooklyn Rapid Transit lines, which marks the inauguration of a new standard of car equipments for this company. The company has for some time had under way the work of rebuilding and re-equipping its elevated cars in order to bring them up to a standard which would be second to none in matter of modern equipment, safety details, and provisions for the comfort of passengers. The direct results of this new departure were for the first time brought to the attention of the public in this trial, which was given to representatives of the newspapers and technical press of New York and Brooklyn.

A trial run was made over the "Coney Island Express" route, which is now operated via the Fifth Avenue Elevated and the old "Sea Beach" surface lines, in order to give an idea of the remarkably high-speed service that is now maintained over this route between the New York terminal and Coney Island. This run, which is nearly 11 miles long, is now made in the schedule time of thirty-four minutes, including three stops. After covering this route in considerably less than this schedule time, the trial train returned to the new Thirty-Ninth Street repair shop of the company, recently equipped for work upon elevated cars, where a complete inspection was afforded of the new features of the equipment of the cars, including the very careful provisions for the fireproofing of all the wiring, the new Westinghouse unit switch system of control, the changes in arrangement of the auxiliary equipment under the car, and the platform and cab changes. From this point the train was operated via the Culver route to Coney Island, where a brief inspection was made of the new Culver terminal, which was fully described in the STREET RAILWAY JOURNAL of June 11, 1904.

The return trip to New York was made over the Brighton Beach route, which connects at Franklin Avenue with the Fulton Street Elevated line. In this way a very complete inspection of the elevated lines of the company, and the various improvements, was afforded. An important feature of the trip was the exhibition of a working model of the turret controller, which was mounted inside the parlor car and so connected as to operate in conjunction with the regular control of the train. The operation of the controller in accelerating, and in changing to the various running positions was in this way made clear to the observers. The trip was very pleasantly arranged and was greatly enjoyed. Refreshments were served and every possible opportunity was given for a careful study of the new equipment.

This new work was heralded with pleasure by all those interested in the betterment of city traffic conditons, and the improvement of suburban service. These improvements were learned of with great reassurance, in view of the recent marine disaster in New York Harbor, which has had the effect of restraining the majority of pleasureseekers from further indulgence in water trips. The careful provisions for the safety of traveling to the various ocean pleasure resorts over the elevated lines will do much to restore the confidence of the public at this critical time, and will be found of material benefit in urging upon them the greater safety of this mode of travel.

The visitors upon the trip consisted largely of daily newspaper representatives from both New York and Brooklyn. The Brooklyn Rapid Transit Company was represented by E. W. Winter, president; J. F. Calderwood, general manager; G. R. Folds, assistant to general manager; D. S. Smith, general superintendent; R. C. Taylor, mechanical engineer, and W. O. Wood, superintendent of the elevated division. The Westinghouse interests were ably represented by J. L. Crouse, who explained the details of the new unit switch control with which the train was equipped.

TRANSFER DECISION CAUSES TROUBLE IN BROOKLYN

The decision of the Appellate Division of the Supreme Court in Brooklyn in the transfer suit, noted in the STREET RAILWAY JOURNAL of July 2, resulted in demands from passengers for transfers all over the city, and was interpreted by some of the patrons of the lines running to Coney Island to mean that only a single 5-cent fare could be charged on lines operating to that place. To protect itself the Brooklyn Rapid Transit Company on June 30, the end of the fiscal year of the Nassau Electric Railroad Company, terminated the lease of that company to the Brooklyn Heights Railroad Company. Before this was done, however, the unscrupulous element of the community made all the trouble they could for the company by demanding transfers where they knew the company's rules did not permit conductors to issue tickets. As a consequence, a number of suits for damages are likely to follow under the ruling of the court, which says that a city railway company must give transfers to its leased lines where any of these leased lines intersect.

The question of the rate of fare to Coney Island was settled by the court some time ago. The lines of the Brooklyn Rapid Transit Company to that place are for a part of the route over private right of way and operated under steam railroad charters, and the company is by law permitted to charge a fare of 3 cents per mile. The lines of the Coney Island & Brooklyn Railroad Company, which also operates to the Island, are, however, on the public highway. This company charges a 5-cent fare to the Island on week days, but charges 10 cents on Sundays and holidays. As previously stated, the impression spread that only one fare could be charged on these lines, and a number of patrons refused to pay the extra fare. At first offenders were dealt with leniently, the companies not caring to disturb the peace of their patrons by forcibly ejecting those who refused to pay the extra fare. The number of the latter increased so rapidly, however, that it was finally decided the only way of bringing the people to a realization of the fact that the law was on the side of the company was to eject all offenders. As a consequence there were a number of disturbances over the recent holiday at points where the extra fare is collected. Both the companies had inspectors at these points, and all passengers who refused to comply with the rules of the company were ejected. There certainly is something wrong with the instrument of justice that makes it possible for the unscrupulous element of the community completely to disrupt the organization of a public service corporation and to inconvenience the great mass of the patrons of that company, and the public can be counted on soon to discover that in this particular instance they have been cleverly tricked. The Brooklyn Eagle beseeches the people not to base too gaudy hopes of wealth on damage suits, because, as it says, "nothing succeeds long that is founded on a palpable injustice, and it is an injustice to demand a quarter of a dollar's worth of travel for 5 cents."

CONTRACTS PENDING FOR EXTENSIVE CUBAN SYSTEM

The Cienfuegos, Palmira & Cruces Railroad & Electric Power Company, which was organized last fall for the purpose of constructing an extensive electric railway system in Southern Cuba, will award important contracts this month for power house equipment, rails, cars, etc. In the first instance about 40 miles of road will be built, but it is the intention of the company eventually to construct and operate some 90 miles of system. The power house will be located at the Habananilla Falls, which are situated about 30 miles from Cienfuegos. The available head is 470 ft. The initial capacity of the plant will be 4000 hp. Ultimately the company intends to add further machinery which will bring the development up to 10,000 hp. The equipment about to be ordered will include three generators of 1000-kw each, direct connected to water turbines. About 5 miles of track will be constructed in Cienfuegos, one of the most flourishing seaport cities in Cuba, where at present, however, there are no tramways of any description. The line will run from Cienfuegos to Caonao, a suburb of the city, thence to Palmira, Horringuero and Cruces, thence on to Ranchuelo and from there to Santa Clara, one of the most important cities in the interior of the island. From the harbor of Cienfuegos to Caonao there will be a second line built to carry freight exclusively. Owing to the number of sugar, coffee and tobacco plantations along the route, the company anticipates conducting a considerable freight business. All the lines will be standard gage. The Cienfuegos-Caonao section will be operated on a street franchise, but the balance of the system will be on a private right of way.

Twelve passenger cars will be ordered, practically immediately. They will each be 42 ft. long, equipped with four 40-hp motors. The Cienfuegos-Caonao section is expected to be in operation inside of twelve months, while the entire Cienfuegos-Santa Clara line will be ready within eighteen months. The construction of the Caonao-Los Guaos-Cumanayagua branch is deferred for the present.

The Cienfuegos, Palmira & Cruces Railroad & Electric Power Company is composed of Cuban capital principally, though there is some German money invested in the enterprise. Bruno Diaz, a large Cuban tobacco exporter, is president of the company. Cornelius C. Vermeule, of 203 Broadway, New York, is the consulting engineer.

TOLEDO COMPANY APPLIES FOR FRANCHISE EXTENSION

As recently forecasted in these columns, the Toledo Railways & Light Company has made formal application to the Council for a twenty-five-year extension of existing franchises. The conditions of the grant are left for future negotiations of the parties concerned. It will be necessary to advertise the application for three weeks before a discussion of the terms to be entered into can take place.

PROGRAMME OF THE INTERNATIONAL ELECTRICAL CONGRESS

The general arrangements and plan of the circular tour for the reception and entertainment of visiting electrical engineers attending the International Electrical Congress next September have just been announced. The congress will be held at St. Louis, Sept. 12-17, in the Coliseum, at Olive and Thirteenth Streets. Up to June 22, 1778 persons had signified their desire to become members of the congress. Of this number 286 were residents of countries outside the United States and Canada. The fee for membership in the congress is $5, which may be forwarded either to the secretary, Dr. A. E. Kennelly, Harvard University, Cambridge, Mass., or to the treasurer, W. D. Weaver, 114 Liberty Street, New York City.

In connection with the International Electrical Congress a chamber of delegates will be held, these delegates being appointed by the various governments, and the proceedings will be conducted in a manner essentially similar to the meetings of the chambers of government delegates at the International Electrical Congresses of Chicago in 1893, and of Paris in 1900. Switzerland, Norway, Sweden, India and Mexico have already appointed delegates to represent their respective governments, and a similar action is expected to be taken in the near future by the United States, Great Britain, France, Germany, Austria-Hungary, Belgium, Italy, Denmark, Spain, Portugal, Australia, Japan, China, Brazil, Chili and Peru.

In view of the large number of European engineers who will attend the congress, arrangements have been made for circular tour of the principal cities of the country, in which it is expected a large number of the foreign visitors will participate. The party from Great Britain, composed of members of the Institution of Electrical Engineers, many accompanied by ladies, is expected to arrive in this country by the White Star steamship "Republic," reaching Boston Sept. 2. There will also be a large delegation of the Associazione Elettrotecnica Italiana, with a number of ladies, which is expected to arrive in New York Aug. 24, and who will proceed to Boston, joining the main party there on Sept. 3.

In Boston the local reception committee has arranged to take the visiting engineers on a visit to the power houses in Boston, to the Massachusetts Institute of Technology and to Harvard University, where a reception will be held on Saturday, Sept. 3. After the reception the visitors will leave by train for New York. On Sunday afternoon, Sept. 4, the visiting electrical engineers, and all the members of the American Institute of Electrical Engineers, will be the guests of Messrs. J. G. White & Company on a steamboat excursion either up the Hudson or down to Coney Island, as may be arranged later. On Sept. 5, a visit will be made to the electrical power stations of New York City. On the evening of Sept. 5 a reception and dinner will be given by the American Institute of Electrical Engineers to all the foreign visitors.

The circular tour, which will be by special train composed of Pullman drawing room and sleeping cars, will leave New York on Tuesday, Sept. 6, and the itinerary will be as follows: Schenectady, Sept. 6; Montreal, Sept. 7 and 8; Niagara Falls, Sept. 9; Chicago, Sept. 10; St. Louis, Sept. 11 to 17; Pittsburg, Sept. 18 and 19; Washington, Sept. 20, and Philadelphia, Sept. 21. In all the cities the visitors will be met by local committees who, in addition to entertaining the party, will in many cases provide special and separate entertainments for the ladies of the party.

The cost of a ticket for the special tour, including railroad fares, sleeping car berths, hotel accommodation (St. Louis also), meals, and all necessary expenses from New York following the itinerary above outlined and back to New York will be $150. This rate, however, does not include hotel expenses in New York City, or the expenses of the Boston trip—previously referred to—and does not include admission to the grounds of the Louisiana Purchase Exposition.

All foreign electrical engineers who may visit the United States in connection with the International Electrical Congress are invited to take part in the circular tour. It is expected, however, that they shall come properly accredited by the electrical engineering society of which they are members. The foreign visitors will be accompanied during the circular tour by representatives of the American Institute of Electrical Engineers, many of whom will be accompanied by ladies, to act as guides to the visitors. This representation will include members of Council of the American Institute of Electrical Engineers, of the Council-elect, and the general reception committee, also committee on organization, advisory committee, and chairmen and secretaries of sections of the International Electrical Congress, officers of the National Electrical Engineering Societies co-operating with the congress, American reception committees of the foreign societies and members of the A. I. E. E. who may be assigned as special guides to accompany the party. It is desired that as many as possible of the American representatives be accompanied by their ladies to assist in entertaining the visiting ladies. Foreign electrical engineering societies who may take part in the tour represented by a delegation of their membership, and foreign visiting electrical engineers who desire to accompany the party are requested to make application at once, giving their names, address and the electrical engineering society with which they are affiliated and from whom they come accredited, and to state when they expect to arrive in the United States, and at what port, to Ralph W. Pope, secretary, American Institute of Electrical Engineers, 95 Liberty Street, New York City, to whom all communications respecting the circular tour should be addressed. To him also should be addressed all letters, telegrams, etc., for those participating in the tour and while they are en route, and his office will forward them to the nearest stopping place.

ANNUAL OUTING AND GAMES OF NEW YORK CITY RAILWAY COMPANY'S EMPLOYEES

The employees of the Broadway, Columbus, Lenox, Sixth and Seventh Avenue divisions of the New York City Railway Company held their seventh annual outing and games at Donnelly's Grove, College Point, L. I., on July 4. The picnic was a most successful one in every respect, and was greatly enjoyed by all present.

At 8:30 a. m. the participants marched from the Ninety-Sixth Street car house to the Ninety-Ninth Street ferry to music furnished by the First Irish Volunteers' band, embracing twenty-one pieces, and the railway men's own fife and drum corps, numbering nineteen pieces. Luncheon was served shortly after reaching the fine waterside grove, and then the sports began in earnest.

The first athletic event was an exciting baseball game between Captain Bodkin's Sixth Avenue nine and Captain Mack's Broadway team. At the end of the eighth inning the score was tied, but in the ninth the Sixth Avenue players developed a wonderful batting streak and won out by the score of 31 to 17. The 100-yard dash took place immediately after the baseball game, the first prize, a gold medal, was won by Victor Brock, his brother Fred winning the silver medal given for the second prize. The fat men's race was won by Barney Spaulding, who received a gold medal for his efforts. In the half-mile race, Fred Brock won the gold medal and J. Sullivan the silver one. The latter was also an easy winner in the shoe race. V. Armanino was presented with a fine silver medal for winning the sack race. The Sixth Avenue men covered themselves with glory, winning all the prizes in the athletic events.

After the games, a group photograph was taken of the assembly, and then the latter retired to enjoy dinner. After dining, the members of the association presented President J. J. Cahill with a beautiful floral tribute as an appreciation of his efforts in their behalf.

Quite a number of the company's officials were present at the outing, including P. J. Travers, superintendent of construction, T. A. Delaney, superintendent of transportation, and J. J. Shea, division superintendent. The officers of the association are: J. J. Cahill, president; C. H. J. Schwarz, vice-president; J. H. Edwards, secretary; M. T. Keeshen, treasurer, and P. Morgan, sergeant-at-arms.

ST. LOUIS ENGINEERS' CLUB WORLD'S FAIR SOUVENIR

The Engineers' Club of St. Louis has prepared a fine souvenir volume which contains a large amount of valuable information to engineers who, when visiting the Fair, would also like to examine the important engineering works in and near St. Louis. Division I. contains a history and general description of the Louisiana Purchase Exposition, Division II. a guide to the large engineering features of St. Louis and vicinity, Division III. local engineering data, and Division IV. the ninth annual bulletin of the club.

NEW YORK CENTRAL-DELAWARE & HUDSON JOINT PURCHASE OF SCHENECTADY RAILWAY

The "Wall Street Journal" says that notwithstanding technical official denials, it is probable that announcement will soon be made of the joint acquisition by New York Central and Delaware & Hudson, of the Schenectady Railway, which operates a system of interurban street railways extending from Schenectady to Albany and Troy.

THE STRIKE AT HOUSTON

The strike of the employees of the Houston Electric Company, of Houston, Tex., has petered out. The full schedule of cars is being operated, and except for an occasional demonstration, there is no outward evidence that a strike is on. On some of the lines special officers continue to be used, but there seems to be little occasion for them. The traffic of all lines is almost normal. No clue has as yet been obtained that would lead to the solution of the Houston Heights dynamiting mystery. The police are hot on the trail of the dynamiters and hope soon to run them down.

CHICAGO ELEVATED TRAFFIC

The reports of the elevated traffic in Chicago for June show considerable falling off. The absence of ball games on the west side and the closing of the Washington Park race track on the south side are considered to account for this. The figures are given below:

	1904	1903	Increase	Per Ct.
METROPOLITAN ELEVATED				
January	112,413	112,771	358	0.3
February	119,073	116,090	2,983	2.5
March	112,507	116,717	5,790	4.9
April	121,924	117,597	4,327	3.6
May	114,372	109,330	5,042	4.6
June	110,923	111,613	*650	*0.6
SOUTH SIDE ELEVATED				
January	87,601	86,637	961	1.1
February	90,330	88,516	1,814	2.0
March	92,547	87,989	4,558	5.1
April	91,500	87,553	3,947	4.5
May	83,342	82,884	458	0.5
June	81,405	85,265	*3,860	*4.5
NORTHWESTERN ELEVATED				
February	73,193	69,885	3,308	4.7
March	74,344	70,070	4,274	6.1
April	74,217	71,340	2,871	4.0
May	69,232	66,990	2,242	3.3
June	68,222	66,571	1,651	2.4

* Decrease.

THE CAPITALIZATION OF THE UNDERGROUND TUBES IN LONDON

Some interesting testimony on the cost of underground tube railways in London was brought out in the testimony of Edgar Speyer, of Speyer Brothers, at a recent hearing before the Royal Commission on London Traffic. Messrs. Speyer Brothers, it will be remembered, are the principal backers of Mr. Yerkes in his underground lines in London. The enterprises with which they are identified are as follows:

	Capital Authorized		
	Share	Loan	Total
Baker Street & Waterloo	£1,250,000	£416,000	£1,666,000
	75,000	25,000	100,000
	60,000	20,000	80,000
	1,000,000	333,000	1,333,000
Charing-cross, Euston & Hampstead	1,416,000	472,000	1,888,000
	360,000	120,000	480,000
	2,550,000	850,000	3,400,000
Brompton & Piccadilly	600,000	200,000	800,000
	400,000	133,000	533,000
	1,425,000	475,000	1,900,000
Great Northern & Strand	2,400,000	800,000	3,200,000
Great Northern, Piccadilly & Brompton	250,000	83,000	333,000
Edgware & Hampstead	360,000	120,000	480,000
	£12,146,000	£4,047,000	£16,193,000

From the above it will be seen that the total share and loan capital authorized for these several enterprises amounts to £16,193,000, which represents about £700,000 per mile if the Edgware & Hampstead line is omitted. The Central London Underground Railway has a capitalization of £4,200,000, or £650,000 per mile. In his testimony Mr. Speyer pointed out that the slightly higher capitalization of his enterprises was required by a number of conditions, among them the necessity for constructing subways in a number of places, the purchase of sites for stations, etc. The important Bank Station of the Central London was acquired without the purchase of any land, being under the street.

ADVERSE REPORT ON CLEVELAND FRANCHISE ORDINANCE

The street railway committee of the City Council, of Cleveland, has reported adversely on a resolution recently presented to the Council instructing the city solicitor to draw up an ordinance providing for franchise extensions for the Cleveland Electric Railway Company for twenty years, if the company in return would grant seven tickets for twenty-five cents, with universal transfers. The committee thought the company should take the initiative in the matter of asking for franchise extensions. The committee is considering an ordinance for the extension of lines at present existing on Doan Street, Woodland Hills Avenue and Harvard Street, to form a new crosstown line from the section known as Newburg to the Lake Shore. Citizens of the South End are strongly in favor of this line, as it would greatly improve their facilities for crossing the city, and they are willing that the existing rate of fare shall prevail on the new line. The council committee has decided to hold a public hearing on the question.

THE NEW PORTLAND REPAIR SHOPS

In the last week's issue of this journal (page 16), interesting details were presented regarding the important new repair shop installation of the Portland (Me.) Railroad Company. It should be added that the engineering firm responsible for the design of the shop installation was Sheaff & Jaastad, who have offices at 85 Water Street, Boston, Mass. This is one of the most important electric railway shop installations that has ever been designed, and the excellent character of the work reflects more than usual credit upon the designing engineers. The work of installation of these new shops is in charge of E. A. Newman, general manager of the Portland Railroad Company, the plans having been prepared by Sheaff & Jaastad, to whom this journal is indebted for the drawings which were used in the above-mentioned descriptive article.

VISIT OF THE BRITISH INSTITUTE OF MECHANICAL ENGINEERS TO MILWAUKEE

The recent visit of the Institute of Mechanical Engineers of Great Britain, to Milwaukee, in response to an invitation from the president of the Allis-Chalmers Company, was described by President Wicksteed, of the institution, in his speech at West Allis, as "one of the pleasantest experiences that had come to the members during their American visit." The president, secretary and other members of the institution said that in the way of industrial sights they had never seen anything more impressive than the huge erecting shop of the Allis-Chalmers Company, filled as it is with engines ranging from 30 hp to 12,000 hp in process of construction.

METROPOLITAN ELEVATED OF CHICAGO ADOPTS AUTOMATIC AIR BRAKES

The Metropolitan West Side Elevated Railway Company, of Chicago, has abandoned the use of the straight air brake on its trains, which it is equipping with multiple-unit control, and has adopted in its stead the Westinghouse quick-action automatic air brake, as used in steam railway service with the few modifications necessary for adaptation to trains operated by multiple-unit control. It also adopted as its standard motor-driven air compressors and electric pump governors of the same manufacture, and will equip the new cars now building with the Westinghouse Traction Brake Company's latest type of compressor, which is said to embody a number of valuable improvements over previous forms.

The work of equipping the cars of the company with the Westinghouse multiple-unit system is progressing rapidly. The first equipment has been installed on a trial train, and all of the cars will be equipped by about Oct. 1. The company is proposing to install the unit switch control on 186 motor cars, and to equip the remaining 300 cars with the requisite connections for trail cars, making a total of 486 cars altogether to be equipped. The standard train will consist of two motor cars and three trail cars. In view of the extended use on this road of the single motor car system, the change to the multiple-unit system is of great interest.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ALLOWED JUNE 21, 1904

763,016. Ball-Bearing Trolley Wheel; James A. Norton, Wilkesbarre, Pa. App. filed Oct. 22, 1903. A separable wheel having a flange rotatably mounted on each arm of the harp, and a removable middle section between the flanges. One arm of the harp swings laterally and carries with it one flange of the wheel, thus making it possible to remove the tread of the wheel.

763,043. Street Railway Switch; Albert E. Caughey, Omaha, Neb. App. filed June 8, 1903. Two levers pivoted on one of the track rails and means whereby depression of one of the levers will move the switch point in one directon and depression of the other lever will move the switch in the other directon.

763,046. Pneumatic System of Motor Control; Fred. B. Corey, Schenectady, N. Y. App. filed Dec. 5, 1902. This and the two inventions following, relate to a pneumatic system of train control in which a plurality of train pipes connected with a source of compressed air is used. The admission of air to one pipe operates the reversing switch or switches on the train, and while the pressure is maintained in said pipe, air is admitted to a second pipe to start the train; then by properly manipulating the air in the various pipes, the motor connections are changed to increase the speed.

763,047. Motor Control System; Fred B. Corey, Schenectady, N. Y. App. filed Dec. 5, 1902. See preceding patent.

763,071. Motor Control System; Charles L. Perry, Schenectady, N. Y. App. filed July 22, 1903. See patent No. 763,046.

763,108. Electric Brake; Frank C. Newell, Wilkinburg, Pa. App. filed April 1, 1902. An improved form of braking controller and circuit connections by means of which the brakes may be applied more evenly and gradually than heretofore, and also whereby leakage from the brake magnet coils to ground is prevented.

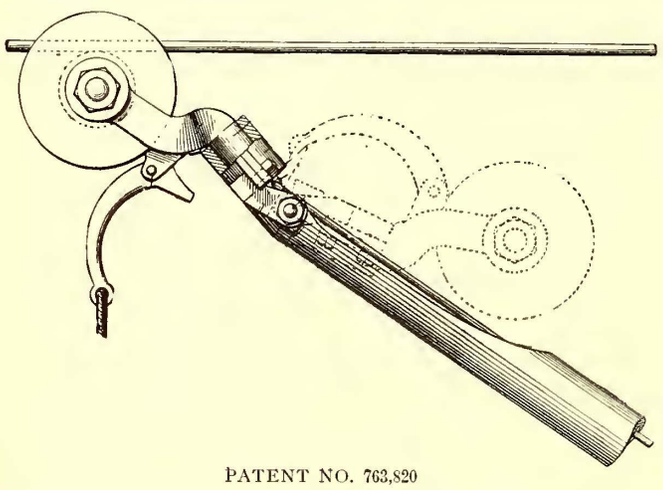
763,134. Car Brake; Evan Williams, Newcastle, Pa. App. filed April 2, 1904. Mounted beneath the bottom of the car is a framework in which are supported two angularly-disposed sliding bars adapted when projected to bear against the inner sides of the flanges of both track rails.

763,341. Street Railway Crossing; Harlan Currence and Ivan MacIvor, St. Louis, Mo. App. filed Aug. 20, 1903. Details of construction.

UNITED STATES PATENTS ISSUED JUNE 28, 1904

763,364. Third Rail for Electric Railways; Jacob Caesar, New York, N. Y. App. filed March 2, 1903. The body portion is thick and provided with outwardly inclined flanges, with one of which the supporting bracket is connected, the current being taken from the under side of the rail between the flanges.

763,390. Electric Railway Switch; Edward A. Gray and Silas H. Brand, Chicago, Ill. App. filed Feb. 11, 1904. When the wheels of the car run upon insulated plates in the rails, two switch-throwing magnets are connected in circuit.



PATENT NO. 763,820

763,434. Insulating Support for Electric Third Rails; Frederick R. Slater, New York, N. Y. App. filed May 28, 1903. A clamp mounted in the top of the string-piece grips the web of a T-rail between its two lips.

763,435. Contact Device for Under-Contact Third Rails; Frederick R. Slater, New York, N. Y. App. filed June 20, 1903. The shoe is counter-balanced on its support to thereby make under contact by gravity, and has a spring applied in such a manner as to prevent chattering.

763,543. Track Sander; William M. Deal, Philadelphia, Pa. App. filed June 17, 1903. A revoluble feed cylinder in the sand receptacle having a series of pockets disposed around the periphery thereof, a rachet wheel on a journal of the feed cylinder and having the same number of teeth as there are pockets in the feed cylinder, a lever and a pawl on the lever and engaging the ratchet wheel.

763,658. Control of Dynamo Electric Machinery; Eugene R. Carichoff, East Orange, N. J. App. filed Aug. 1, 1901. In multiple unit control systems, a series of magnets controlling switch in the motor circuit, a master switch, an actuating circuit for connecting and disconnecting the magnet and a source of current, a maintaining circuit and means adapted to include the magnets successively in the actuating circuit and to shift each magnet when it has operated to the maintaining circuit.

763,723. Guard Rail for Street Cars; James J. Collins, Boston, Mass. App. filed Nov. 9, 1903. Relates to guard rails for open cars and provides novel means for operating the rails and for locking them in their out-of-use position.

763,759. Trolley; George A. Hunsinger and Edward A. Dewald, Allegheny, Pa. App. filed Jan. 20, 1904. Four horizontal rollers arranged in two pairs and mounted above the trolley wheel to prevent the latter from leaving the wire.

763,806. Track Switch; Ernest Smith, Philadelphia, Pa. App. filed Nov. 13, 1903. The combination in a switch of a piece placed to engage a car wheel, with a device for moving the piece vertically, so that it shall be out of operative position and a spring for raising it out of inoperative position.

763,807. Flexible Wheel Base Car; Gustavus L. Stuebner, Flushing, N. Y. App. filed Dec. 11, 1903. A sleeve concentric with and encircling the car axle, a journal box for the sleeve with the axle, arranged to allow the sleeve to roll and carry the axle to different positions.

763,820. Trolley Pole; Andrus S. Weaver, Joy, N. Y. App. filed Aug. 19, 1903. In case the wheel leaves the wire, the upper end of the pole folds downward.

PERSONAL MENTION

MR. ELMER P. MORRIS, of the Elmer P. Morris Company, of New York, has left on a short trip to Mexico City.

MR. RICHARD EICK has been appointed division superintendent of the Public Service Corporation of New Jersey, in charge of that company's Elizabeth division. Mr. Eick was until recently a division superintendent in the employ of the United Railroad, of San Francisco, and before that was connected with the North Jersey Street Railway Company.

MR. W. F. HERRIN, at the head of the law department of the Southern Pacific Railroad, has been elected vice-president of the Pacific Electric Railway Company, of Los Angeles, Cal., and also of the Los Angeles Interurban Railway Company, in place of Epes Randolph, resigned. Mr. Huntington explans that the appointment of a Southern Pacific official to an important position with his company is purely complimentary, and in no way indicative that the steam road has gained any control whatever over the electric railway situation in Southern California.

MR. A. M. MATTICE, chief engineer of the Allis-Chalmers Company, has returned from his European tour of inspection and has now settled down to the duties of his position in Milwaukee. While in Europe Mr. Mattice visited the hydraulic machinery works of Escher, Wyss & Company, of Zurich, and arranged important details concerning the manufacture in the United States of their lines of product. He also inspected the Nurnberg gas engine works, at Nurnberg, and, at the well-known engineering establishment of Willans & Robinson, at Rugby, England, he paid particular attention to the products and methods of manufacture of the Steam Turbine Advisory Syndicate, of which important organization the Allis-Chalmers Company is the American member.

MR. DAVID KIRKCALDIE, one of the railroad commissioners of the New South Wales Government, whose department has the supervision of constructing the extensive electric traction system in Sydney and suburbs, is now on this side and will inspect some of the principal American roads, mainly with a view to getting pointers for the extension and operation of the Sydney lines. At time of writing he is in Canada, but is expected to visit Boston Monday next, and will be in New York about the middle of next week. While here he will make his headquarters at the offices of R. W. Cameron & Company, 23 South William Street. Mr. Kirkcaldie is booked to sail for Europe on the White Star liner "Majestic," July 20. As mentioned in last week's issue, Mr. Deane, the engineer in chief of the New South Wales Government railroad and tramway department, is also on a trip here now. Some interesting contracts for equipment, etc., are expected to be placed as a result of these gentlemen's sojourn in America.